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# Transforming Education Through Project-Based Learning (PjBL): Enhancing Students' Learning Outcomes and Critical Thinking

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**Abstract**

This study explores the impact of Project-Based Learning (PjBL) on teaching social studies to primary school students, specifically focusing on its influence on critical thinking skills and learning outcomes. The research used a mixed-methods approach and employed proportional stratified sampling to select participants from five accredited public primary schools in Banyumas, Central Java. Quantitative data was collected through pre-tests and post-tests to measure students' performance before and after implementing PjBL. Additionally, qualitative insights were obtained from semi-structured interviews with teachers to understand their experiences and perceptions of PjBL. The findings demonstrate a statistically significant positive correlation between PjBL implementation and improving students' critical thinking skills and academic performance in social studies. Furthermore, teachers reported increased student engagement and a more profound understanding of social studies concepts. This research contributes to the existing knowledge of PjBL by providing empirical evidence of its effectiveness in primary education, particularly within social studies instruction. The findings offer practical strategies for educators who aim to use PjBL to enhance critical thinking and academic achievement among young learners.



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## INTRODUCTION

Recently, the landscape of education has undergone significant transformation, driven by the imperative to equip students with competencies suited for the demands of the 21st century. Project-Based Learning (PjBL) has emerged as a powerful pedagogical approach that promotes deep learning through active student engagement and real-world problem-solving (Chen & Yang, 2022; Holmberg et al., 2021). While PjBL has been

extensively implemented and studied in STEM (Science, Technology, While the fields of Engineering and Mathematics are well-studied, their application in social studies education remains relatively underexplored, presenting a vital opportunity to assess their broader educational implications (Alfieri et al., 2020).

PjBL is known for its student-centred approach, where students actively participate in projects that involve extended inquiry, collaboration, and critical thinking (Karami et al., 2022). This approach differs greatly from traditional didactic teaching methods, shifting the emphasis from memorising to developing vital skills such as communication, collaboration, and creative problem-solving, which are essential for success in a rapidly changing world (Guerra et al., 2021). Additionally, PjBL aligns with educational frameworks that prioritise the development of 21st-century skills, including critical thinking, digital literacy, and teamwork (Heinrich et al., 2023).

Critical thinking is a vital part of Project-based Learning (PjBL). It involves analysing, evaluating, and synthesising information in a thoughtful, systematic way. This skill allows students to approach problems from various perspectives and make well-informed decisions (Vasconcelos et al., 2020). In the context of social studies, critical thinking is particularly important as it encourages students to engage deeply with complex social, political, and economic issues, leading to a more nuanced appreciation for historical and contemporary events (Mulcahy & Watson, 2021). Through promoting inquiry and exploration, PjBL empowers students to challenge assumptions, develop well-reasoned arguments, and improve their critical thinking abilities (Lozano et al., 2022).

The learning outcomes linked with Project-based Learning (PjBL) are diverse and encompass both academic achievement and personal growth. When applied to social studies, these outcomes may involve expanding one's knowledge about historical events, geographical principles, and civic responsibilities, as well as honing essential skills in research, communication, and collaboration (Silva et al., 2023). Moreover, the practical nature of PjBL fosters a strong sense of relevance and motivation among students, as they can witness firsthand the real-world implications of their learning (Huang et al., 2021). Additionally, this student-centred approach encourages ownership of learning, which has been shown to enhance knowledge retention and the ability to apply learnt concepts to novel situations (Abdullah et al., 2023).

Despite evidence supporting its effectiveness, there is a lack of literature on implementing Project-based Learning (PjBL) in social studies at the primary school level (Parker et al., 2020). Social studies education, which includes history, geography, and civics, is essential for nurturing informed and engaged citizens. However, traditional teaching methods in this subject often do not help students understand the relevance of these topics to real-world issues (Mackenzie et al., 2022). PjBL presents a promising alternative by offering authentic learning experiences that improve critical thinking and analytical skills, better preparing students for the complexities of the modern world (Liu et al., 2021). In the Indonesian context, social studies (Ilmu Pengetahuan Sosial) is an integrated subject combining elements of geography, history,

economics, sociology, and civics, which differs from how social studies is conceptualised in many Western countries. Therefore, a clear understanding of this localised definition is crucial for framing and interpreting educational interventions. Furthermore, empirical data from national surveys such as those conducted by the Ministry of Education, Culture, Research, and Technology (Kemdikbudristek) indicate that Indonesian students often face challenges in applying critical thinking skills in social studies, thus underscoring the urgency of pedagogical innovations like PjBL.

The primary objective of this study is to investigate how PjBL enhances critical thinking skills and overall learning outcomes in primary school students, particularly within the context of social studies education. Specifically, this study aims to:

1. Explore the impact of PjBL on the development of critical thinking skills in primary school students.
2. Assess the effects of PjBL on students' academic performance and understanding in social studies.
3. Identify the specific benefits and challenges associated with implementing PjBL in primary school social studies curricula.

As educators continue to explore innovative pedagogical strategies, it is crucial to deepen our understanding of PjBL's potential across various subject areas, including social studies. This research seeks to contribute to the growing body of knowledge on PjBL, offering insights that may enhance student outcomes and better prepare learners for the complexities of contemporary society.

## METHOD

A mixed-methods approach, incorporating both quantitative and qualitative methodologies, was employed to evaluate the effectiveness of PjBL in primary school social studies education in this research. The study adopted an explanatory sequential mixed-method design, enabling a comprehensive analysis by combining numerical data with in-depth qualitative insights. Initially, quantitative data were collected through pre-test and post-test measures to assess the impact of PjBL on students' critical thinking skills and learning outcomes. This phase provided a baseline understanding of the cognitive shifts that resulted from the intervention.

Following the quantitative phase, qualitative data were gathered through semi-structured interviews to explore the perceived benefits and challenges of PjBL, specifically from the perspectives of teachers in primary school settings. The qualitative data were analysed using a a thematic analysis involving open coding to identify recurring patterns, which were then grouped into categories and refined into major themes. The coding process was conducted manually without the aid of qualitative data analysis software such as NVivo and was guided by the research questions and interview protocols to ensure consistency and credibility.

Table 1. The Indicator of Critical Thinking Skills

| Critical Thinking Ability | Indicators |
|---|---|
| Formulating problems | Understanding problems, formulating questions that lead to investigation |
| Giving arguments | The arguments are based on the needs; it shows similarities and differences |
| Making deduction | Providing logical deduction and interpreting the individuals or groups appropriately |
| Making induction | Analysing data, generalising, and drawing conclusions |
| Evaluating | Evaluating based on facts, providing another alternative |
| Deciding and Taking actions | Determining solutions and taking possible ways to be implemented |

This study was conducted in Banyumas, Central Java, from September 2023 to April 2024, focusing on fifth-grade students during social studies lessons. A probability sampling technique, precisely proportionate stratified sampling, was employed to ensure the sample was representative. Probability sampling ensures that every member of the population has an equal opportunity to be selected. In contrast, proportionate stratified sampling is particularly effective when the heterogeneous population comprises subgroups with distinct characteristics. In this study, the stratification criterion was the accreditation level of the primary schools, ensuring comparability among the student populations from different institutions. The final sample consisted of 39 students drawn from two primary schools: 20 from SDN 02 Sidabowa and 19 from SDN 01 Karanganyar, both of which were Grade A accredited institutions.

Table 2. The Indicator of Critical Thinking Skills

| Critical Thinking Ability | Indicators |
|---|---|
| Formulating problems | Understanding problems and formulating questions that lead to investigation |
| Giving arguments | The arguments are based on the needs; it shows similarities and differences |
| Making deduction | Providing logical deduction and interpreting the individuals or groups appropriately |
| Making induction | Analysing data, generalising, and drawing conclusions |
| Evaluating | Evaluating based on facts, providing another alternative |
| Deciding and Taking actions | Determining solutions and taking possible ways to be implemented |

This study used three distinct instruments to collect comprehensive data before and after the intervention. The first instrument, a critical thinking proficiency test, was This study is designed to assess the impact of Project-Based Learning (PjBL) on students' critical thinking skills. This test, aligned with specific social science topics

relevant to the fifth-grade curriculum, consisted of ten carefully constructed questions to evaluate various dimensions of critical thinking. The pre-test was administered one week before the implementation of PjBL strategies, and the post-test was conducted one day after the completion of the intervention, allowing for a clear comparison of cognitive gains.

Table 3. The Indicators of Cognitive Learning Outcome

| Basic Competences | Indicator |
|---|---|
| Cognitive Learning Outcome | The Indicators of Cognitive Learning Outcome in Social Science Learning<br>Identifying the forced cultivation system carried out by the Dutch colonial government in Indonesia<br>Analysing resistance to the Portuguese and Dutch colonial governments<br>Examining the events surrounding the youth oath. |

The second instrument was used to measure the influence of PjBL on students' overall learning outcomes, focussing on knowledge retention, comprehension, and the application of key concepts in social science. This assessment provided quantitative data on the academic performance shifts resulting from the PjBL methodology.

Additionally, a third instrument, semi-structured interviews, was employed to explore the perceived benefits and challenges of PjBL from the perspective of the participating teachers. This qualitative method provided a deeper understanding of how PjBL influences classroom dynamics, instructional practices, and student engagement. Teachers were asked a series of carefully designed questions to capture their experiences with PjBL implementation. Key areas of focus included (1) overall experiences with implementing PjBL, (2) the influence of PjBL on students' critical thinking and cognitive learning outcomes, (3) challenges faced during the application of PjBL in the classroom, (4) students' responses to PjBL activities, and (5) necessary support or resources for effective PjBL implementation. These interviews generated rich qualitative data, offering critical insights into the practical aspects of PjBL adoption and its perceived impact on teaching and learning.

It is important to note that the PjBL intervention in this study was implemented directly by the researchers rather than the classroom teachers. This approach ensured consistent application of the PjBL methodology across the study sites. However, it also presents potential for a Hawthorne effect or early enthusiasm bias, as students may respond differently to an external instructor or novel instructional method. This limitation is acknowledged in interpreting the study's findings.

## RESULT AND DISCUSSION

### Result

### The Impact of PjBL on the Development of Critical Thinking Skills

The results of the study demonstrate a significant impact of PjBL on the development of critical thinking skills among primary school students. In the experimental class, where PjBL was implemented, the mean score for the pre-test was 60.65, which increased substantially to 84.95 in the post-test. This substantial improvement suggests that PjBL offers an effective framework for fostering critical thinking by engaging students in collaborative problem-solving and real-world applications, which are key components of this pedagogical approach. The increase in critical thinking scores highlights the potential of PjBL to enhance higher-order cognitive skills, as students are required to analyse, evaluate, and create solutions for the projects they undertake.

In contrast, the control class, which followed a more traditional instructional approach, also saw an improvement in critical thinking skills, but to a lesser extent. The pre-test mean score for the control group was 59.21, with a post-test mean of 75.47. While there is a noticeable gain, the increase is not as pronounced as in the experimental class, indicating that traditional teaching methods may contribute to the development of critical thinking, but not as effectively as PjBL. These results align with previous findings that emphasise the superiority of active learning strategies, like PjBL, in promoting critical thinking skills compared to passive learning environments. The comparative results between the experimental and control classes, as visualised in the graph below, clearly illustrate the greater improvement in critical thinking skills in the PjBL group, underscoring its effectiveness in primary education contexts.

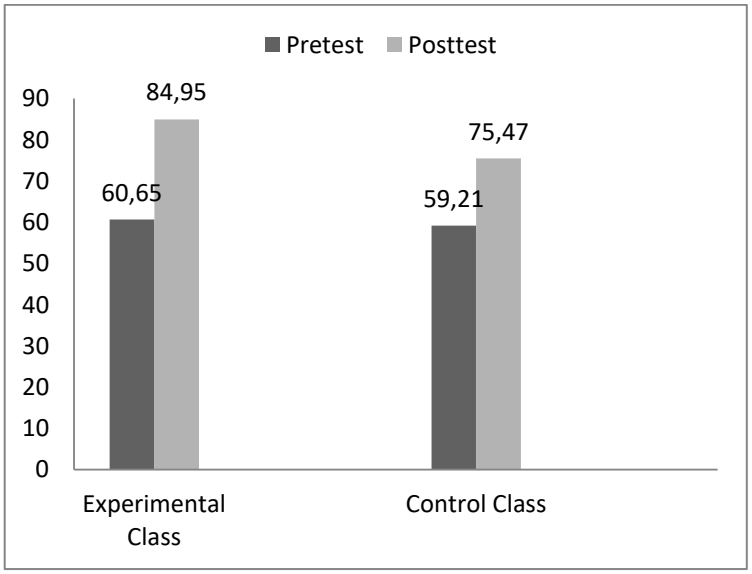


Figure 1. Results of the Students' Critical Thinking Skills Test

**The Effects of PjBL on Students' Learning Outcomes**

According to the independent sample t-test results presented in the table above, the Sig. (2-tailed) value is 0.000, which is significantly lower than the threshold of 0.05 (0.000 < 0.05), leading to the rejection of the null hypothesis (H0) and the acceptance of the alternative hypothesis (Ha). This indicates that a statistically significant difference exists in the learning outcomes between students who were taught using the Project-Based Learning (PjBL) approach and those who experienced traditional instructional methods in the context of social studies for Grade 5 students.

The mean cognitive learning outcome score for students who participated in PjBL was 91.15, whereas students who followed traditional teaching methods had a lower mean score of 80.10. These findings suggest that, on average, students exposed to PjBL achieved significantly higher cognitive learning outcomes compared to their peers in the traditional learning group. This result underscores the effectiveness of PjBL in enhancing student performance in social studies, highlighting its potential as a superior instructional model for fostering deeper cognitive engagement and understanding in primary school contexts.

| | Levene's Test for Equality of Variances | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 95% Confidence Interval of the Difference | |
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower | Upper |
| Equal variances assumed | 1.183 | .284 | 10.889 | 37 | .000 | 28.518 | 2.619 | 23.212 | 33.825 |
| Equal variances not assumed | | | 10.819 | 34.067 | .000 | 28.518 | 2.636 | 23.162 | 33.875 |

Figure 2. Results of the Cognitive Learning Outcomes Comparison Test for Students

**The Benefits and Challenges in Implementing PjBL**

The exploration of PBL in elementary school social science instruction has garnered increasing attention due to its potential to transform traditional educational practices. Through a semi-structured interview with the homeroom teachers, this study sought to uncover the nuanced perspectives of educators on the advantages and challenges of implementing PBL in the classroom. The findings from these interviews reveal a difficult relationship between the perceived benefits of PBL, such as heightened student engagement, motivation, and skill development, and the practical challenges that educators face in its implementation.

Teachers reported that the implementation of PBL had a notably positive impact on student engagement and motivation, which was reflected in improved learning outcomes. One teacher highlighted,

*"Honestly, I see that PjBL significantly increases student engagement and motivation. They are more enthusiastic because they feel like they control all the activities they do in class. (T1)"*

*"PjBL really boosts student engagement. When students are given the opportunity to lead their projects, they become more enthusiastic about participating. Let me give you an example: when we worked on a project about the history of the proclamation, the students were very excited to interview community figures about their understanding of the proclamation. Such enthusiasm is what made them more motivated to learn. (T2)"*

Another significant finding was the enhancement of critical thinking and collaboration skills through PBL. Teachers observed that PBL promotes critical thinking and problem-solving abilities, as students engage with real-world problems.

*"PBL really helps students develop critical thinking skills. For example, in the independence proclamation project, they had to identify the potential problems that existed at the time and predict solutions if they were in the position of Indonesia's leaders back then. This assignment required them to evaluate various options, understand the consequences, and make the best decisions (T1)."*

*"I have seen a significant improvement in students' collaboration skills. When they work in groups, they have to communicate, share ideas, and solve problems together. However, challenges arise when there is an imbalance in contributions, where some students work harder than others. (T2)"*

However, challenges in group dynamics were also identified, as some students might take on more work than others, leading to an imbalance in group participation. Despite its benefits, several challenges in the implementation of PBL were identified. Time management emerged as a significant challenge, with one teacher stating,

*"One of the biggest challenges is time management. PBL requires a lot of planning, and it's challenging to cover all the required curriculum within the time limits. (T1)"*

It was often difficult to balance the exploration time for students with the need to meet academic goals. Resource availability was another challenge, as PBL frequently demands materials and technology that are not always accessible, limiting the scope and impact of projects. Teacher also said that the role of the teacher has been significantly transformed by PBL.

*"PBL has transformed my role from being the 'sage on the stage' to more of a facilitator. I spend more time guiding students and less time lecturing. This shift requires me to prepare differently, focusing more on scaffolding and providing the right resources. (T1)"*

*"The biggest challenge for me is the lack of resources. PjBL often requires technology or materials that aren't always readily available around us. This actually limits the students' creativity and the scope of the projects we can do. (T2)"*

Shifting from a traditional lecturing approach to that of a facilitator. Teachers now spend more time guiding students and less time lecturing, requiring different The preparation methods emphasise scaffolding and the provision of appropriate resources.

Assessment practices have also evolved, with traditional methods being insufficient to capture the full scope of student learning in PBL settings. Teachers have adapted by using rubrics, self-assessments, and peer evaluations, which, although time-consuming, provide a more comprehensive picture of student learning.

## Discussion

### The Influence of PjBL to Students' Critical Thinking

The findings of this study clearly demonstrate the significant impact of PjBL on enhancing primary students' critical thinking skills in social science classrooms. PjBL encourages students to engage in real-world problem-solving, promoting deeper cognitive engagement and facilitating the development of critical thinking. This aligns with the conclusions of Larmer et al. (2020), who found that students engaged in PjBL exhibited more advanced critical thinking abilities due to the complexity of tasks that require higher-order thinking and self-directed learning. Similarly, studies by Kokotsaki et al. (2021) and Chan (2020) corroborate these findings, indicating that students participating in PjBL projects show significant improvements in critical thinking compared to those in traditional learning environments, where rote learning often dominates. These studies collectively suggest that PjBL is a potent strategy for fostering critical thinking in primary school settings.

Moreover, the collaborative nature of PjBL contributes significantly to critical thinking development and fosters 21st-century skills. When students work together on projects, they are exposed to diverse viewpoints, which challenges them to evaluate information critically and articulate their thoughts clearly. According to Othman et al. (2020), collaborative learning through PjBL enhances students' ability to analyse, synthesise, and evaluate information—key components of critical thinking. This is further supported by Kim and Choi (2021), who found that peer collaboration during PjBL projects improved critical thinking skills and fostered essential communication skills, which are necessary for 21st-century learners. The combination of collaboration and critical analysis inherent in PjBL provides a dynamic environment that nurtures both cognitive and social skills, preparing students for the challenges of the future.

Integrating PjBL in social science subjects has proven particularly effective in encouraging students to question assumptions, analyse complex social phenomena, and reflect on historical events from multiple perspectives. Recent studies have emphasised the subject-specific benefits of PjBL in social sciences. For example, Malik et al. (2022) demonstrated that PjBL in social studies enhanced students' factual understanding and promoted critical engagement with societal issues, thereby nurturing critical thinking. Furthermore, according to research by Jiang and Lee (2023), PjBL's emphasis on inquiry and exploration allows students to understand cause-and-effect relationships within social and historical contexts better, a critical component of higher-order thinking. This evidence strongly supports the notion that PjBL is a valuable instructional method in

social sciences, where understanding complexity is crucial, and PjBL plays a significant role in fostering this ability in students.

**The Impact of PjBL to Students' Learning Outcomes**

The results of this study provide compelling evidence that PjBL also enhances students' learning outcomes. The active, student-centred approach to PjBL fosters a deeper understanding of subject content by engaging students in hands-on activities and collaborative problem-solving, which allows them to apply knowledge in meaningful contexts. This is consistent with the findings of Thomas and Brown (2020), who noted that students engaged in PjBL showed marked improvements in their comprehension and retention of subject matter. Similarly, Bell (2021) and Filippatou and Kaldi (2022) observed that the experiential nature of PjBL contributes to enhanced cognitive development, as students must connect theoretical knowledge with real-world applications. Furthermore, recent research by Sung et al. (2021) and Krajcik and Shin (2020) suggests that PjBL enhances content knowledge and improves students' ability to transfer learning to new situations, a critical factor in achieving long-term learning outcomes.

PjBL enhances content mastery and plays a pivotal role in promoting higher-order thinking skills, such as analysis, synthesis, and evaluation. These skills are essential for achieving strong learning outcomes. The process of engaging in inquiry-driven projects requires students to critically assess information, collaborate with peers, and develop solutions to complex problems. According to Tseng et al. (2021), students who participate in PjBL tend to exhibit better problem-solving skills and are more adept at using critical thinking strategies compared to their peers in traditional classrooms. This finding is reinforced by research from Hmelo-Silver and Eberbach (2019), who found that PjBL improves students' ability to tackle interdisciplinary challenges, leading to higher levels of academic achievement. Moreover, Darling-Hammond et al. (2020) and Barak (2022) also highlighted that PjBL encourages students to take ownership of their learning, which leads to improved motivation and, ultimately, better learning outcomes.

The collaborative aspect of PjBL is a key factor contributing to enhanced learning outcomes. When students work together on projects, they share knowledge and challenge each other's thinking, which fosters a deeper understanding of the material. Recent studies have identified collaborative learning as crucial to PjBL's effectiveness. As emphasised by Cho and Lee (2022), peer collaboration in PjBL environments leads to greater cognitive engagement and promotes the development of communication and teamwork skills, both of which are essential for success in the 21st-century learning landscape. Other researchers, such as Ramli et al. (2020) and Othman et al. (2022), have found that the social interaction inherent in PjBL improves students' ability to articulate their ideas and negotiate meaning, leading to better comprehension and improved learning outcomes.

**Benefits and Challenges of Using PjBL in Social Science Classes**

Implementing PjBL in social science classrooms has been observed to offer significant benefits from the teachers' perspective. It enhances student engagement, motivation, and skill development. Educators have noticed that PjBL's active learning approach fosters higher student involvement, encouraging them to engage with the subject deeply. According to Meier et al. (2020), teachers reported that students show increased engagement when they take ownership of their learning process through PjBL, as it promotes responsibility and curiosity. Similarly, Johnson and Delaney (2021) found that PjBL boosts intrinsic motivation in students by connecting classroom content to real-world issues, making learning more relevant. This increase in engagement is also supported by McGarry and Walsh (2022), who emphasise that PjBL allows students to explore topics that interest them, leading to improved focus and effort. The literature widely acknowledges the benefits of PjBL in fostering student motivation and engagement.

In addition to engagement, teachers recognise that PjBL supports developing critical skills that are crucial for 21st-century learners. These skills include critical thinking, collaboration, problem-solving, and communication. As Darling-Hammond et al. (2020) demonstrated, teachers observed significant improvements in students' ability to work together to solve complex problems, which is particularly important in social science education. Similarly, Krajcik et al. (2021) noted that teachers found PjBL to be effective in promoting students' critical thinking and reasoning skills, as the project-based tasks required learners to analyse information, evaluate multiple perspectives, and synthesise solutions. Teachers have also reported improvements in students' communication skills, as PjBL often involves presenting findings to peers and teachers (Barak, 2022). These findings align with Kim et al. (2022) and Choi and Lee (2023), who confirmed that the collaborative and inquiry-based nature of PjBL helps students develop essential life skills that extend beyond academic content.

Despite these clear benefits, teachers also highlight the significant challenges they face when implementing PjBL in the classroom. One of the most commonly cited difficulties is the extensive planning and preparation required to facilitate effective PjBL activities. According to Chang et al. (2021), teachers often struggle with the time-consuming nature of designing and organising projects, particularly when trying to align them with curriculum standards and assessment requirements. Furthermore, there are concerns about balancing PjBL with standard testing demands, as noted by Dole et al. (2022). Teachers also report difficulties in managing group dynamics, as PjBL often requires students to work in teams, and ensuring equitable participation can be challenging (Hassan & Rahman, 2020). Additionally, research by Othman et al. (2020) highlights that teachers need ongoing professional development to effectively implement PjBL, as many educators feel inadequately prepared to facilitate such complex learning experiences. These challenges create barriers to the widespread adoption of PjBL in classrooms.

The difficulties in implementing PjBL are further exacerbated by the variability in student readiness and resource availability. Teachers have expressed concerns about the diverse abilities of students, noting that not all students are equipped to handle the self-directed nature of PjBL (Zheng et al., 2022). Differentiating instruction within PjBL frameworks to meet the needs of all learners requires additional effort from teachers, which can be overwhelming, particularly in large or under-resourced classrooms. This concern is echoed by Lee and Kim (2020), who found that teachers in lower-income schools face significant challenges in accessing the materials and technological tools necessary to facilitate PjBL. Moreover, teachers must often navigate limited administrative support, as schools may not have the infrastructure or flexibility to support project-based approaches (Chang et al., 2021). While daunting, these systemic barriers underscore the urgency and importance of policymakers' support in overcoming them and making PjBL a feasible and effective pedagogical strategy for all schools.

## CONCLUSION

This study highlights the transformative potential of PjBL as an innovative pedagogical approach in primary school social science education. The significant improvements observed in students' critical thinking skills and learning outcomes underscore PjBL's capacity to shift conventional teaching methods. By fostering a dynamic, student-centred learning environment, PjBL not only enhances students' analytical and problem-solving abilities but also promotes a deeper understanding of complex social science concepts. However, challenges such as time management and the complexities of assessing student progress persist, alongside the need for comprehensive teacher training and an adjustment period for students. Despite these hurdles, the benefits of PjBL clearly outweigh the difficulties. This research contributes to the expanding body of literature supporting the integration of PjBL in primary education, particularly in subjects that demand critical engagement with content. Future research should prioritise strategies to address these implementation challenges, especially in relation to scalable teacher development, curriculum alignment, and effective assessment methods. Ultimately, PjBL is an effective instructional strategy that prepares students with critical thinking skills and a richer understanding of academic content, equipping them for the complexities of an increasingly dynamic world.

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