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Analysis of Student Engagement in Project Based Learning in The Merdeka Curriculum

Oktian Fajar Nugroho[a]*, Lisna Hikmawaty[a], Silvia Ratna Juwita[b]
[a] Faculty of Teacher Training and Education, Universitas Esa Unggul, Indonesia
[b] Faculty of Computer Science, Universitas Esa Unggul, Indonesia
oktian.fajar@esaunggul.ac.id*; lisna.hikmawaty@esaunggul.ac.id; silvia.ratna@esaunggul.ac.id
*Corresponding author

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ABSTRACT

This study aims to analyze the level of student engagement in project-based learning (PjBL) within the Merdeka Curriculum at one of high school in Tangerang and identify the factors that influence it. Using a mixed-methods approach, this research involved 32 students as respondents through survey questionnaires and in-depth interviews, alongside interviews with teachers. Data were collected using a validated student engagement questionnaire covering cognitive, affective, and psychomotor dimensions, as well as interview guides for deeper insights. Quantitative data were analyzed using descriptive statistics, while qualitative data were processed through thematic analysis. The results reveal that most students demonstrate high cognitive engagement 75 percent frequently ask questions, 80 percent offer new ideas, and 85 percent strive to complete their projects well. In the affective domain, 90 percent of students express interest in the project topics, and 85 percent feel motivated to complete them. Psychomotor engagement is also high, with 90 percent collaborating effectively in groups. However, challenges such as time management 65 percent, lack of confidence 60 percent, and group coordination difficulties 55 percent persist. Teacher support, student motivation, project relevance, and adequate resources significantly influence engagement. The study concludes that while PBL is effective in enhancing student engagement, schools must address implementation challenges by strengthening teacher facilitation, improving infrastructure, and ensuring enough time for project completion. These findings offer practical implications for refining active learning practices and advancing the implementation of the Merdeka Curriculum in Indonesian education.

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Introduction

Education plays a central role in preparing the younger generation to face global challenges in the modern era (Mahmudin, 2023; Tan et al., 2018; dos Santos Cunha, 2025). In Indonesia, the national education goals stated in Law No. 20 of 2003 on the National Education System aim to develop students' potential so that they become individuals who are faithful, pious, of noble character, healthy, knowledgeable, competent, creative, independent, and responsible democratic citizens (Hadi, 2019; Reimers & Chung, 2025; Rothstein & Jacobsen, 2012). In line with this, the government has introduced various curricula, including the Merdeka Curriculum, which is expected to provide flexibility in the teaching and learning process, allowing students to learn in a more active and relevant manner (Haq, 2024; Zidan & Qamariah, 2023).

Project-Based Learning (PjBL) is one of the approaches expected to support the Merdeka Curriculum (Wulandari & Nawangsari, 2024; Irawan et al., 2023). This method is designed to promote deeper learning, where students engage directly in projects relevant to real-life situations (Marley, et al, 2022). The expectation is that through project-based learning, students will not only gain a deeper understanding of the subject matter but also develop 21st-century skills such as critical thinking, collaboration, and creativity (Gabuardi, 2021; Zubaidah, 2016; Martinez, 2022). Research has shown that despite significant efforts to implement the Merdeka Curriculum (Fathurahman, 2024), student engagement in project-based learning still varies (Morais, et al, 2021). Some students demonstrate high engagement and produce high-quality projects, while others show minimal involvement, indicating gaps in the implementation of this method (Napitupulu & Murniarti, 2024).

Given the high expectations for project-based learning and the real challenges encountered in practice, further research is needed to explore student engagement in this method, particularly at one of state high school in Tangerang. This study aims to identify the factors influencing student engagement and provide recommendations to enhance the effectiveness of project-based learning within the Merdeka Curriculum. Its novelty lies in exploring engagement from cognitive, affective, and psychomotor perspectives specifically within the context of the Merdeka Curriculum, while its significance contributes practical insights to improve teaching strategies and support student-centered learning in Indonesian education. Therefore, this research is expected to make a significant contribution to improving the quality of education in schools and supporting the achievement of national education goals. The implementation of Project-Based Learning (PjBL) in the Merdeka Curriculum aims to provide students with autonomy and enhance their engagement in the learning process. However, several challenges have emerged in the application of this method.

Method

This study falls under the category of mixed-methods research. Mixed-methods research is a combination of quantitative and qualitative approaches in collecting, analyzing, and interpreting data (Dawadi et al, 2021). The integration of both approaches provides a more comprehensive understanding of student engagement in project-based learning within the Merdeka Curriculum (Basri et al, 2024). This study will employ a cross-sectional research design, which is an observational research design that collects data from participants at a single point in time (Wang & Cheng, 2020). A cross-sectional design is suitable for exploring relationships between variables within a specific time period and is appropriate

for this study's objective (Spector, 2019), which is to examine students' perceptions, experiences, and the effectiveness of their engagement in project-based learning within the Merdeka Curriculum.

The study involved a total of 32 students from SMA Negeri 8 Kota Tangerang who had participated in a STEM-based project. In addition, 2 teachers who facilitated the project-based learning were interviewed for triangulation purposes. A purposive sampling method was used to select students who had completed a project under the Merdeka Curriculum framework and teachers who had experience implementing project-based learning in the same context.

The study will combine two data collection methods: surveys and interviews, to gather both quantitative and qualitative data (Jain, 2021). The survey will be used to collect quantitative data on teachers' and students' perceptions of student engagement in project-based learning within the Merdeka Curriculum (Aisyah & Novita, 2025). Meanwhile, interviews will be conducted to collect qualitative data by exploring in-depth perspectives (Eppich et al, 2019) and experiences of teachers and students regarding student engagement in project-based learning. By integrating quantitative and qualitative approaches, this study will generate more comprehensive and complementary data, providing a deeper understanding of student engagement in project-based learning within the Merdeka Curriculum (Zen & Ariani, 2022). The data analysis will integrate findings from both data collection methods, ensuring that the study's results and conclusions are more robust and reliable.

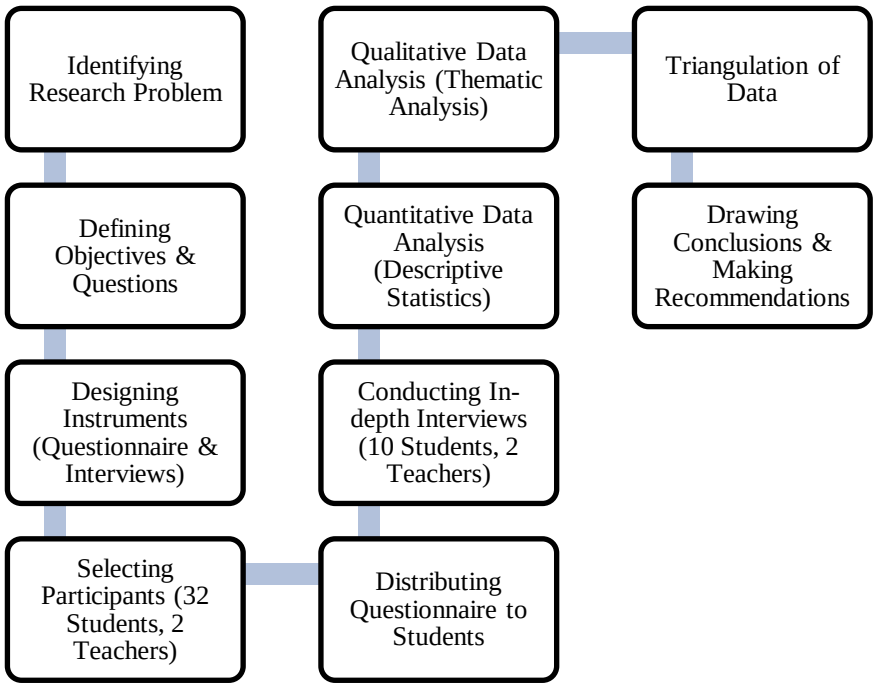

Figure 1. Research procedure

This research is planned to be conducted within a specific timeframe. The research duration will cover several phases, including planning, preparation, data collection, data analysis, and the preparation of the research report. The study will be conducted at SMA Negeri 8 Kota Tangerang, which has agreed to participate in this research. The selection of SMA Negeri 8 Kota Tangerang is based on the willingness and cooperation of the school, as well as considerations regarding the availability of technological access and its relevance to science subjects. Additionally, data collection will take place in classrooms designated for

science learning at the school. Interviews with teachers and classroom observations will be conducted in the classroom environment to obtain accurate and in-depth information.

Results and Discussion

This study was conducted to assess the level of student engagement in project-based learning using the STEM (Science, Technology, Engineering, and Mathematics) approach. Data was collected through a questionnaire measuring student engagement across various aspects, including cognitive, affective, and psychomotor engagement, as well as teacher support and challenges encountered during the learning process. The following are the results of this study based on the collected data.

The findings indicate that students exhibited strong engagement across cognitive, affective, and psychomotor dimensions in project-based learning. In terms of cognitive engagement, 75 percent of students reported frequently asking questions during group discussions, 80 percent actively contributed new ideas to solve project tasks, and 85 percent put forth their best effort in completing their projects. Additionally, 70 percent felt confident presenting their project outcomes to the class. The findings of this study show that project-based learning (PjBL) within the Merdeka Curriculum has significantly fostered student engagement across cognitive, affective, and psychomotor domains. These results are consistent with previous studies by Sarifah (2024), which emphasize that PjBL increases student motivation and engagement by encouraging active learning and real-world application. The high percentage of students who ask questions (75 percent), generate new ideas (80 percent), and complete projects diligently (85 percent) reflects strong cognitive involvement echoing the findings of Yu (2024), who found that meaningful project tasks boost intellectual curiosity and knowledge construction.

Regarding affective engagement, 90 percent of students expressed interest in the project topics, 85 percent felt motivated to complete the projects, 80 percent were satisfied with their group work results, and 85 percent held a positive attitude toward project-based learning. In the affective domain, the high level of interest (90 percent) and motivation (85 percent) reported by students aligns with research by Renninger and Hidi (2024), suggesting that personal interest in learning tasks can drive deeper engagement. Furthermore, the high rate of collaborative behavior and tool use reported supports studies by Zhang et al (2024), which highlight how hands-on, cooperative learning in PjBL develops both social and technical competencies.

For psychomotor engagement, 80 percent of students actively participated in discussions, 90 percent collaborated effectively with peers, and 75 percent felt confident in using the necessary tools and materials for the project. These results reflect a high level of overall engagement among students throughout the learning processes. However, the challenges identified such as time management (65 percent) and difficulties in group collaboration (55 percent) mirror the concerns raised by Regan and Jesse (2019), who argued that without proper scaffolding and time allocation, students may struggle with the demands of PjBL. Additionally, confidence issues during group presentations (60 percent).

Teachers and schools play a vital role in supporting student engagement in project-based learning. The majority of students feel well-supported by their teachers, with 90 percent agreeing that teachers provide clear explanations regarding project tasks. Furthermore, 85 percent of students feel that teachers are consistently available to assist when challenges arise, and 80 percent acknowledge receiving constructive feedback that helps improve their work. This supportive environment contributes significantly to students' motivation and

success in completing project-based learning activities. The role of teacher support was also critical. Consistent with studies by Ion et al (2019), students in this research appreciated teachers who provided clear guidance and constructive feedback. This suggests that while PBL promotes autonomy, the presence of a responsive teacher remains essential to student success. In conclusion, while this study confirms the benefits of PBL, it also highlights implementation challenges, particularly in fostering confidence and managing time effectively. Schools should consider these factors in planning and supporting future project-based learning initiatives.

The challenges faced by students and teachers in implementing project-based learning include several key issues despite the overall high level of student engagement. Approximately 65 percent of students reported difficulties in managing their time effectively to complete their projects. Additionally, 60 percent of students expressed a lack of confidence when presenting their opinions in group discussions, while 55 percent faced challenges in collaborating with peers who held different viewpoints. These challenges highlight the need for better time management strategies, communication skill development, and guidance in group dynamics to enhance the effectiveness of project-based learning.

Factors influence student engagement in project-based learning in the Merdeka Curriculum. In the Merdeka Curriculum, project-based learning (PjBL) is one of the main approaches to enhancing critical thinking, creativity, and collaboration skills. However, student engagement in this learning method is influenced by various factors, which can be categorized as follows:

Table 1. Factors Influence Students' Engagement During Activities

No	Indicator	Results
	Internal Factor	
1	Learning Motivation	Students with a high interest in the subject matter and assigned projects tend to be more actively engaged. Intrinsic motivation, such as curiosity and the desire to develop new skills, plays a crucial role in their involvement.
2	Independence and Responsibility	The Merdeka Curriculum encourages students to be more independent in their learning. Students who are aware of their responsibilities in the project tend to be more engaged in discussions, planning, and task completion.
3	Collaboration and Communication Skills	Project-based learning is often carried out in groups. Students with good communication skills find it easier to collaborate and actively contribute to the project.
4	Self-Confidence	Confidence in expressing opinions, asking questions, and presenting project results also influences the level of student engagement.
	External Factor	
5	Teacher Support	Teachers who provide clear guidance, offer constructive feedback, and create a positive learning environment can enhance student engagement in the project.
6	Teaching Methods and Project Design	Projects that are engaging, relevant to real life, and aligned with students' interests will better motivate them to participate actively.
7	Facilities and Resources	The availability of tools, materials, and technology that support project implementation plays a significant role. Students with better access to resources tend to complete projects more effectively.
8	Peer and Parental Support	Active and supportive peers can boost students' enthusiasm for participation. Additionally, parental support in providing motivation and necessary resources also plays a crucial role.
	Challenges and Obstacles Factors	
9	Time Management	Students often struggle with managing their time between project tasks and other subjects, which can affect their level of engagement.

No	Indicator	Results
10	Differences in Learning Styles	Not all students feel comfortable with the project-based learning method. Some students may be more accustomed to structured learning methods and require time to adapt.
11	Differences in Group Abilities	If there is a gap in abilities within the group, some students may participate less because they feel incapable or lack confidence.
12	Project Difficulty Level	If the project is too difficult or lacks sufficient guidance, students may feel overwhelmed and lose motivation to complete it.

Student engagement in project-based learning within the Merdeka Curriculum is influenced by a combination of internal and external factors. Therefore, a holistic approach is necessary, including enhancing student motivation and independence, providing optimal teacher support, and ensuring that projects are engaging and aligned with students' abilities. This way, project-based learning can be implemented more effectively and have a positive impact on students' skills and understanding.

This study aims to explore students' perceptions of project-based learning implemented in the classroom. The instrument used is an in-depth interview consisting of various questions related to general experiences, student engagement, learning effectiveness, and the support needed throughout the project. These interviews provide insights into how students perceive project-based learning and its impact on their understanding of the material and skill development.

Table 2. In-depth Interview

No	Indicator	Result	Key point
1	General Experience	Most students find project-based learning very enjoyable and believe it provides a different learning experience compared to conventional methods. They feel more engaged in the learning process as they can directly apply the material taught in real-life projects.	Project-based learning provides students with the opportunity to be more creative and learn through collaboration.
		Students enjoy the freedom to design their projects and the opportunity to work with their peers. However, some students struggle with limited time and the significant responsibilities within the group.	The freedom to be creative is appreciated, but time management and task distribution remain challenges.
		Students learn collaboration, communication, and time management skills that are essential in the real world. Some students also feel that the project teaches them how to face challenges and solve problems as a team.	The learning of soft skills such as teamwork, communication, and problem-solving is highly valued.
2	Engagement	Most students feel quite active in group discussions, although some feel less involved, especially if they do not fully understand the material.	Active participation is higher in groups where members support each other and understand the material.
		The main motivation comes from a sense of responsibility toward the group and the desire to achieve good results. Some students are also motivated by the challenge of completing the project within the given time frame.	A sense of responsibility and the desire for success are the main driving factors.
		The common challenges faced are difficulties in coordination and uneven task distribution. Students overcome these by improving communication and helping peers who struggle.	Coordination and task distribution are often challenging, but they can be managed through better communication.
3	Lessons Learned	Most students find project-based learning more effective because they feel more engaged and can connect theory with practice. However, some students struggle when the projects are too complex.	Project-based learning is preferred because of active engagement and the direct application of the material.
		Projects help students understand the material more deeply as they learn through real-world applications. They feel	Project-based learning provides a better

No	Indicator	Result	Key point
		they comprehend the subject better when it is taught in a more practical way.	understanding of the material as it is directly applied to real life.
		Students reported gaining various skills, such as teamwork, collaborative problem-solving, and presentation skills to explain project outcomes.	Collaboration, problem-solving, and presentation skills are the primary skills acquired.
4	Support	Students want more guidance from teachers in project direction, especially when facing difficulties in understanding topics or dividing tasks. They also need more feedback to ensure they are on the right track.	More frequent teacher guidance and constructive feedback are highly needed.
		Most students feel they receive sufficient support from classmates and teachers, although some occasionally feel they do not get the help they need.	Support from teachers and classmates is generally sufficient, but some students still feel they lack proper guidance.
5	Suggestion	Some students suggested that project-based learning should be given more time and include more discussion sessions with teachers to address challenges during the project. Additionally, some students recommended extending the allocated time for projects, improving available facilities and resources, and increasing teacher-led discussion sessions to help resolve difficulties encountered.	More time and teacher-led discussion sessions are considered necessary to improve project success.
		Students suggest that schools provide better facilities for projects, such as larger spaces for group discussions and improved access to tools and resources to support project completion.	The provision of better facilities and resources can enhance the smooth implementation of the project and support optimal student engagement.

Overall, students perceive project-based learning very positively, as it provides them with opportunities to learn in a more practical and enjoyable way. Although there are some challenges, such as team coordination and time management, project-based learning is highly effective in helping students develop skills relevant to real life. Greater support from teachers and improved facilities would further enhance the effectiveness of this learning approach.

The research results indicate that students demonstrate a relatively high level of engagement in project-based learning using the STEM approach. In terms of cognitive engagement, 75 percent of students actively ask questions during group discussions, 80 percent contribute new ideas, and 85 percent show strong commitment in completing their projects. Moreover, 70 percent of students feel confident when presenting their project results in front of the class. Regarding affective engagement, 90 percent of students find the assigned projects interesting, 85 percent are motivated to complete them successfully, and 80 percent are satisfied with the outcomes of their group work, reflecting the positive emotional impact of this learning method. Meanwhile, in the aspect of psychomotor engagement, 80 percent of students actively participate in group discussions, 90 percent collaborate effectively with their peers, and 75 percent feel confident in handling the tools and materials needed for the project. These findings suggest that project-based learning significantly fosters comprehensive student involvement across cognitive, emotional, and practical domains.

The role of teachers and schools is essential in ensuring the success of project-based learning. Teachers who provide clear guidance and constructive feedback significantly enhance student engagement. In this study, 90 percent of students agreed that their teacher

explained the project tasks clearly, while 85 percent felt that their teacher was always ready to provide assistance when challenges arose. Moreover, 80 percent of students acknowledged that the feedback given by their teacher helped them improve the quality of their project outcomes. Despite this strong support, several challenges were still encountered in the implementation of project-based learning. About 65 percent of students reported difficulty in managing their time effectively to complete the project. In addition, 60 percent of students lacked confidence in expressing their opinions during group activities, and 55 percent experienced difficulties in collaborating with peers who had differing viewpoints. These challenges suggest the need for additional strategies to strengthen students' soft skills and time management abilities in the project-based learning environment.

There are various internal and external factors that influence student engagement in project-based learning:

Table 3. Factors which Influencing Students Engagement

No	Factors	Results
	Internal Factors	
1	Learning Motivation	Students with high interest are more active in projects
2	Independence and Responsibility	Awareness of responsibility increases student engagement
3	Collaboration and Communication Skills	Good communication skills facilitate teamwork within groups
4	Confidence	Confident students participate more actively in discussions and presentations
	External Factors	
1	Teacher Support	Guidance and feedback from teachers are highly beneficial
2	Learning Methods and Project Design	Engaging and relevant projects enhance student involvement
3	Facilities and Resources	The availability of tools and materials supports project success
4	Peer and Parental Support	Motivation from the surrounding environment influences student engagement
	Challenges and Barriers	
1	Time Management	Difficulty in managing time is a major obstacle
2	Differences in Learning Styles	Not all students feel comfortable with project-based methods
3	Differences in Group Abilities	Students with varying skill levels may not participate actively
4	Project Difficulty Level	Overly complex projects can reduce student motivation

The interview results indicate that students enjoy project-based learning as it provides a different experience compared to conventional methods. They feel more engaged in learning and acquire essential skills such as teamwork, communication, and problem-solving. However, some students struggle with time management and group coordination. To address these issues, they improve communication and distribute tasks more effectively. Additionally, students express a need for more guidance from teachers and better access to adequate facilities.

In the affective domain, the high level of interest (90 percent) and motivation (85 percent) reported by students aligns with research by Renninger and Hidi (2024), suggesting that personal interest in learning tasks can drive deeper engagement. Furthermore, the high rate of collaborative behavior and tool use reported supports studies by Zhang et al (2024), which highlight how hands-on, cooperative learning in PjBL develops both social and technical competencies.

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The role of teacher support was also critical. Consistent with studies by Ion et al (2019), students in this research appreciated teachers who provided clear guidance and constructive feedback. This suggests that while PBL promotes autonomy, the presence of a responsive teacher remains essential to student success. In conclusion, while this study confirms the benefits of PjBL, it also highlights implementation challenges, particularly in fostering confidence and managing time effectively. Schools should consider these factors in planning and supporting future project-based learning initiatives.

Conclusion

Overall, project-based learning at SMA Negeri 8 Kota Tangerang has proven effective in increasing student engagement across cognitive, affective, and psychomotor domains. The majority of students actively participated, showed interest in the projects, and collaborated well with their peers. However, challenges such as time management, lack of confidence in group discussions, and difficulties in resolving differing opinions within groups remain significant obstacles. These findings highlight the importance of structured guidance and support throughout the project phases. To enhance the effectiveness of this learning approach, schools can provide more mentoring sessions, extend project duration, offer more comprehensive facilities, and integrate skill-building activities that focus on communication, teamwork, and time management. This research underscores the potential of project-based learning in the Merdeka Curriculum to foster meaningful student engagement and better prepare learners for real-world problem solving.

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