




## The power of project-based learning: A catalyst for student engagement, collaboration and academic excellence

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### ABSTRACT

#### Article History

Received: 5 October 2023

Revised: 1 December 2023

Accepted: 19 December 2023

Published: 26 April 2024

#### Keywords

Academic achievement

Academic performance

Collaboration learning

Learning model

Project-based learning

Student engagement

Student performance.

This research aims to explore the impact of using project-based learning methods on academic achievement and student engagement in education using mixed methods. The sampling technique was carried out in two stages. The three best private universities in Semarang City were selected based on the 2023 Webometrics results (University of Dian Nuswantoro, Catholic University of Soegijapranata, and the Islamic University of Sultan Agung), then the sample selection was carried out using stratified random sampling techniques, which comprised 318 students. Data collection was carried out through questionnaires, interviews, and literature studies. The hypotheses were tested using structural equation modeling via AMOS 26 software. The practical implications of this research show that the project-based learning (PBL) method positively impacts academic achievement and student involvement in the learning process. The PBL method also effectively increased students' conceptual understanding, reflecting a shift from traditional approaches to more interactive, creative, and innovative learning. From a managerial perspective, these findings emphasize the integration of PBL into the curriculum to optimize student potential. It is also essential for lecturers and educational policymakers to provide ongoing professional training to support the effective use of PBL in educational environments. PBL methods are a valuable learning strategy and their implementation can be a significant challenge that needs to be overcome in an educational context. This research concludes that project-based learning may effectively increase student participation, engagement, collaboration, and future academic achievement.

**Contribution/Originality:** The uniqueness of this research lies in exploring the effects of combining project-based learning and collaborative learning on the development skills of leadership, critical thinking and decision-making, time management, and confidence. This study provides new insights into a learning model that comprehensively integrates both academic and non-academic needs.

## 1. INTRODUCTION

Changes in the 21st century significantly impact various aspects of human life, especially in the education sector (Holcomb, 1993). In this era, students are central to the learning process (Mugizi, Katuramu, Dafiewhare, & Kanyesigye, 2021). This means that students must be actively involved in every stage of teaching and learning

activities and should be given the opportunity to face real-world challenges and problems and experience learning material that is relevant and authentic (Msonde & Msonde, 2017). This approach aims to encourage students to maximize their potential and skills. The demand to master skills is known as the "6Cs", namely creativity, citizenship, collaboration, connectivity, critical thinking, and communication (Karim, Safran, Shuib, & Azmi, 2021).

Creativity helps students to think innovatively and find creative solutions to their problems. Citizenship involves students understanding their responsibilities as citizens participating in a global society. Collaboration refers to the ability to work as part of a team and share ideas. Connectivity means that students must be able to connect information and knowledge from various sources. Communication is essential for conveying ideas and information clearly and effectively (Karim et al., 2021). In connection with this, learning design must focus on developing 6C skills using technology in today's educational environment. This helps prepare students to face increasingly complex and globally connected challenges.

Addressing the challenges of integrated designing and teaching competencies requires a creative and collaborative approach. Lecturers must be open to change and work closely with fellow lecturers to ensure that the learning approaches are relevant and effective in developing the desired holistic competencies. In line with this, Sáiz-Manzanares, Almeida, Martín-Antón, Carbonero, and Valdivieso-Burón (2022) explain that these challenges are not only in academic abilities but also creativity, communication, cooperation, and adaptation abilities. Monteiro, Sherbino, Sibbald, and Norman (2020) stated that the particular skill demands that need to be empowered in learning activities are critical thinking, problem-solving, collaboration, and various other skills. Current collaboration skills make cooperation an important interaction structure to facilitate collective efforts to achieve common goals. Through collaboration, students have social competency abilities to achieve learning goals. To achieve this, success in education cannot be separated from the lecturer's ability to effectively utilize different learning methods.

Effective learning methods combine teaching concepts and learning concepts used by lecturers. These two concepts are a combination of a learning system that involves students, objectives, materials, facilities, procedures, tools, or learning media to impact the quality of education. However, education standards are still weak in several developing countries, such as Indonesia. Therefore, the quality of education needs to be further improved by adopting a modern education system (Velez, 2023). Educational instructors play an essential role in teaching, but students can rarely actively participate in classroom activities. To overcome this, the existing education system must be updated to provide quality education, utilize students' abilities, and actively contribute to teaching and learning activities (Maseleno et al., 2019).

Conventional approaches with repetition teaching methods cause the education and mastery of the material being taught to be less than optimal, and students are less able to think critically because the current era is the information era, so students are used to getting information online and using technological tools to communicate and collaborate. Students are no longer told to sit quietly on a bench, listen to the teacher's lecture, and do assignments. The modern method in question is a method where the teacher not only transfers knowledge but does more than just repetition. The conventional method trains students' brains to memorize instead of critically analyze, and this method is no longer suitable in the current era because it is not the best way for students to learn (Anekeya, 2015).

Students participate in problem-solving exercises and can work independently to learn through the project-based learning (PBL) paradigm (Sakamaki, Taguri, Nishiuchi, Akimoto, & Koizumi, 2022). Learning focuses on a scientific discipline's core principles and concepts, getting students involved in problem-solving investigations and meaningful task activities (Fatma, Muzaffer, & Özbaşı, 2021). PBL allows students to work autonomously to build knowledge and reach the peak of producing natural products. This learning model is suitable for increasing students' learning creativity so that their interest in learning increases and they do not become bored. It makes the classroom atmosphere enjoyable and students more enthusiastic about learning because this model requires

students to produce a product; as John Dewey showed in his research, student learning leads to better retention of knowledge and skills.

In PBL, students still need to learn content knowledge. Short lectures and textbooks serve as reference sources, and worksheets provide appropriate enlightenment. However, in PBL, these traditional tools are only used strategically and placed in context to motivate, interest, and challenge. The PBL approach is the right choice for developing 21st-century capabilities by promoting critical thinking and problem-solving, interpersonal communication, information and media literacy, leadership, collaboration, innovation, and creativity. PBL is one of the most effective strategies for building students' skills compared to traditional forms of teaching. Today's learning standards demand more than simply teaching factual knowledge and skills in isolation. The standards required are critical thinking, solving real problems, communicating and collaborating with diverse groups, and building speaking and listening skills, including methods for making presentations using technology.

Previous studies examining the impact of the PBL approach on students show that it can improve students' problem-solving abilities (Fatma et al., 2021) and academic performance (Sáiz-Manzanares et al., 2022). Formative evaluation is beneficial for teachers because it helps students to achieve proper awareness of the learning objectives, the results of which can improve the learning experience under the supervision of teachers, while most of the PBL literature studies are focused on the curriculum (Des, Bureau, Dumais, & Pigeon, 1992).

Applying the PBL method in teaching Strategic Management at the Faculty of Economics and Business offers several strong reasons that can improve the quality of student learning. One of the main advantages of PBL is its ability to provide the application of concepts in authentic contexts. Strategic management requires making complex decisions in a fast-paced work setting. Strategic management courses cover how companies set long-term objectives and design strategies to achieve them. It evaluates an organization's performance regarding its internal and external contexts before creating a plan to implement the required changes to achieve long-term goals. PBL allows students to develop solid business strategies, understand the challenges that companies and organizations face, and apply abstract ideas to actual business situations. PBL challenges students to evaluate business-related issues, identify opportunities, and overcome barriers, all of which assist them in developing their critical thinking skills. Because these abilities are crucial to strategic management, students must create solutions based on reliable information and analysis (Behrouzi, Shaharoun, & Ma'aram, 2014). The ability to work in a team is a crucial aspect of strategic management, and a PBL approach can help develop this skill.

In PBL projects, students work in groups, which allows them to learn to collaborate, communicate, and lead teams effectively (Boscart et al., 2017). PBL also helps students apply theory to practice. In strategic management, theoretical concepts are often abstract. Through PBL, students can see how these theories are used in business contexts, allowing them to test and develop their understanding of strategic management. In addition to academic benefits, PBL can also increase students' intrinsic motivation because they feel involved in projects directly relevant to the real world (Ren, 2022). Outcome-based performance assessment in PBL reflects a more authentic approach to assessing students' understanding and abilities than traditional written exams. Ultimately, students who engage in Strategic Management PBL will be better prepared to face career challenges as they will have gained practical experience in developing and executing business strategies, a highly sought-after competency by companies and organizations.

This research aims to develop a framework focusing on teaching practices in the Management Study Program in the Faculty of Economics and Business in Central Java's private universities. The main focus is to increase the effectiveness of student learning in this program, emphasizing interaction between students and lecturers, student involvement in learning, and the impact on academic achievement. The framework considers various factors, such as effective teaching methods, applying relevant educational technology, and developing learning materials that align with job market demands. It aims to prepare students with relevant knowledge and skills for career success.

This framework includes evaluation and assessment methods to measure teaching effectiveness. This may involve evaluation by students, assessment of faculty performance, or the use of other appropriate indicators.

From a learning standpoint, responsiveness is paramount, and teachers do not impart unidirectional teaching independently. Nonetheless, students and teachers collaborate to negotiate instruction, which evolves in tandem with the growth of students' ideas. As a result, some academics refer to the PBL approach as instruction that emphasizes teacher experience and preparedness for following directions (Goodman & Stivers, 2010). To increase academic performance through student involvement and collaborative learning, this project examines the PBL approach to actively immersing students in strategic management courses.

## 2. LITERATURE REVIEW

### 2.1. Project-Based Learning and Student Engagement

Many definitions of PBL, such as Hayden, Dufel, and Shih (2002) and Sakamaki et al. (2022) state that it is an innovative learning model or approach emphasizing contextual learning through complex activities, according to Monteiro et al. (2020). The PBL model enables teachers to oversee student learning in the classroom by including project work. Project work is a type of employment that consists of complex tasks founded on complicated queries and issues. Students can work autonomously while being guided to develop, solve problems, make decisions, and conduct investigations (Condliffe et al., 2017). Thus, the PBL model is an innovative learning model involving project work where students work independently to construct their learning and combine it into natural products. Stentoft (2019) concluded that PBL is significant for student engagement; the findings were carried out in online learning, which requires complete involvement. Online PBL requires constant interaction between students and educational institutions as a peer group.

Table 1 contains an overview of literature on PBL and student engagement.

Table 1. PBL and student engagement.

Author	Result
Qureshi, Khaskheli, Qureshi, Raza, and Yousufi (2023)	Forming classrooms for active learning is part of a comprehensive push to actively involve students in learning, thereby influencing collaborative learning and student academic performance.
Johnson and Delawsky (2013)	PBL significantly influences students' cognitive behavior and emotional engagement. Engagement levels are determined using surveys, attendance, and test results. Teachers and schools provide recommendations to improve PBL teaching pedagogy.
Lopez-Gazpio (2021)	PBL consists of a sense of organization, problem-solving, learning, and process accountability in children. A PBL approach to lectures proves that students' active engagement results in far greater comprehension when paired with game design.
Peek-Brown (2022)	PBL builds students' sense of ability to achieve something and allows them to develop ownership of their work. If we can create that in children, we will see them become extraordinary citizens and do extraordinary things for the rest of their lives.

H1: There is a significant relationship between PBL and student engagement.

### 2.2. Project-Based Learning and Collaboration Learning

Active student participation and comparison learning define the PBL method, a common cooperative and research-based learning strategy (Nepal & Panuwatwanich, 2011). PBL students typically collaborate to solve a given problem, create a product for a specific market, and then assess the project and its development process (Chandra, 2015). PBL students usually work in groups to solve problems, design products for specific markets, and evaluate the project and the development process (Chandra, 2015). The PBL methodology was created with constructivism in mind. Constructivism creates an environment in the classroom where students must build their knowledge. PBL is an instructional strategy that enables students to organize lessons, work together on projects, and create final products that they may display to others.

Table 2 contains an overview of literature on PBL and collaborative learning.

Table 2. PBL and collaboration learning.

Author	Result
Eckardt, Craig, and Kraemer (2020)	The goal of this learning model is a collaborative project that incorporates many courses or curricular elements and allows students to study the material in meaningful ways while working together to conduct experiments.
Almulla (2020)	PBL is a comprehensive learning approach that involves students in ongoing cooperative and investigative activities.
Qureshi et al. (2023)	Developing classrooms for active learning is part of the push for higher education to comprehensively involve students in learning, thereby influencing collaborative learning and student academic performance.
Al-Rawahi and Al-Mekhlafi (2015)	According to this study, students' writing abilities in the post-test demonstrated the primary benefit of online collaborative project-based learning (i.e., the experimental group outperformed the control group).
Zhang, Peng, and Hung (2009)	The findings of this study revealed an interesting phenomenon due to cultural influences and the education system's impact. Students experience various benefits of PBL learning. PBL and online collaborative learning seriously threaten several of Taiwan's deeply ingrained cultural customs. This study provides valuable information about the cross-cultural ramifications of integrating PBL and online collaborative learning in Taiwanese higher education.

H2: There is a significant relationship between PBL and collaborative learning.

### 2.3. Project-Based Learning and Academic Performance

PBL is a learning method that can be applied at all levels of education. In this learning method, the educator acts as a facilitator. PBL aims to help students learn how to solve problems and develop critical thinking skills. To understand the concept and necessary thinking skills, learners work together in groups to study fundamental problems. Applying this learning method is expected to make students more active and creative by learning from what they see in their environment (Fatma et al., 2021).

PBL is a learning model that focuses on contextual problems experienced directly by students, and this learning trains students to think critically and increase creativity through development that can produce meaningful and valuable products (Katili, 2018). This learning aims to achieve competency in attitudes, knowledge, and skills. PBL emphasizes knowledge construction and meaning creation through sharing, active learning, iterative questioning, and reflection on the part of the students.

Table 3 contains an overview of literature on PBL and academic performance.

Table 3. PBL and academic performance.

Author	Result
Qureshi et al. (2023)	Developing classrooms for active learning is part of the push for higher education to comprehensively involve students in learning, thereby influencing collaborative learning and student academic performance.
Fatma et al. (2021)	The academic achievement and behavior scores of students in programming classes with project-based teaching methods differed significantly from those learning via traditional methods.
Condliffe et al. (2017)	Students who participate in project-based learning get extensive hands-on experience with the issue that the project is built on. Students learn how to plan their assignments and manage their time well to finish them successfully through project-based learning. Groups work together to construct projects that help students learn various skills, including problem solving, collaboration, decision making, and investigative activities.
Guo, Saab, Post, and Admiraal (2020)	The PBL approach improved students' cognitive outcomes through knowledge, mental strategies, and behaviors such as skills and engagement.
Bilgin, Karakuyu, and Ay (2015)	According to the findings, pupils in the treatment group outperformed their peers in the science and technology teaching achievement test and the self-efficacy belief scale. The utilization of the project-based learning methodology was deemed satisfactory by most students in the treatment group.

H3: There is a significant relationship between PBL and academic performance.

2.4. Collaboration Learning and Academic Performance

Collaboration learning is an interaction that requires students to be active and creative and enjoy engaging themselves optimally, mentally and physically. The level of activeness, creativity, and enjoyment in learning ranges from the lowest to the highest (Katili, 2018). Therefore, teaching and learning interactions with a collaborative paradigm require students to act, be involved in activities, observe visually, and absorb verbal information. Collaborative learning is a system that allows students to collaborate with others on structured tasks.

Collaborative learning differs from traditional teaching approaches in several aspects. The first is its goal structure. Holubčík (2015) refers to goal structure as the type of interdependence among students and is categorized into three categories: collaborative, competitive, and individualistic. In a joint goal structure, learners can achieve their learning goals when their peers also achieve their goals. Although the proportion is relatively different from one another, less able learners can still achieve learning goals depending on their capacity. A competitive goal structure only allows some individuals to achieve their learning goals. Instead, one learner achieves their goal while the others do not. In an individualistic goal structure, there is no connection between individual achievement and the involvement of others in either collaborative or competitive learning. In other words, one's achievement does not depend on the accomplishment of others. This happens because each learner learns alone. There is no peer mentoring or competition with others. In this regard, Qureshi et al. (2023) concluded that collaborative learning falls into the category of collaborative goal structures. In contrast, competitive and individualistic goal structures are similar to traditional teacher-first learning.

Table 4 contains an overview of literature on collaboration learning and academic performance.

Table 4. Collaboration learning and academic performance.

Author	Result
Loes (2022)	Collaborative learning is a successful teaching strategy because it can foster the growth of self-efficacy, increase learning motivation, improve attitudes, and increase understanding that is active and results in better learning outcomes.
Al-Rahmi, Othman, and Yusuf (2015)	Empirical evidence indicates that social media intention, engagement, and collaborative learning are positively and significantly correlated with increased academic performance and group member interaction.
Chandra (2015)	This paper clarifies the significant average achievement differences between collaborative and individual learning through a t-test in English using collaborative and individual learning.
Schmidt, Schreiber, Pinheiro, and Bohnenberger (2020)	Collaboration between members in an organization is more important than the work being done individually to achieve results efficiently and effectively. It is important to remember that there is a strong positive relationship between collaboration among team members and overall team performance.
Oswald and Zhao (2022)	The results of this study show how, in coworking spaces, collaborative learning may play a critical role in enhancing individual work performance. They also suggest that cooperative learning is a notion that should be explored further in collaborative space research. The results also imply that owners of coworking spaces wish to promote learning in their areas and foster cooperation even more.

H4: There is a significant relationship between collaborative learning and academic performance.

2.5. Student Engagement and Academic Performance

Researchers concur that student engagement is correlated with self-efficacy and practical high school completion, yet there is no universally accepted definition of engagement (Zyngier, 2007). Engaging pupils in behavior and cognition is more straightforward when they are emotionally invested first. Students are more likely to be behaviorally and cognitively engaged when they are emotionally invested. Consequently, engaging pupils'

behavior, cognition, and emotions is critical. Diverse pedagogies promote a vital component of learning—student participation. According to Zyngier (2007) engaging pedagogies should foster a sense of community among students, give them a sense of ownership over their work, respond to their experiences, and give them hope that they can make a difference in the world.

Student engagement is a manifestation of motivation seen through students' actions, cognition, and emotions. It refers to energetic, directed, and persistent actions when encountering difficulties or student qualities in their interactions with academic assignments (Sattar, Ullah, & Ahmad, 2022).

Student involvement is a crucial factor influencing their learning and academic success because they are active in learning. Involved students will be more motivated and willing to interact with the subject content (Condliffe et al., 2017; Eckardt et al., 2020). A positive relationship was found between behavior engagement, academic performance (Burns, Bai, Fu, Pfladderer, & Brusseau, 2019) attendance (Wheaton, Chapman, & Croft, 2016), and extracurricular activities. High involvement in academic activities is a characteristic of academically strong students, as evidenced by higher subject grades.

Table 5 contains an overview of literature on student engagement and performance.

Table 5. Student engagement and performance.

Author	Result
Lee (2014)	The findings of this study, which looked at the connection between academic success and student involvement, demonstrated that behavioral and emotional engagement were significant predictors of reading achievement. Behavioral engagement acts as a mediating factor between the impacts of emotional engagement and academic performance.
Gupta and Bakker (2020)	The results of the three-wave multi-level analysis show that future perspective influences group performance through the level of student engagement. Additionally, intragroup cohesion also interacts with student engagement, influencing predictions of performance in group tasks.
Sakamaki et al. (2022)	Students who engage in appropriate cognitive processes can learn better, impacting academic success.
Burns et al. (2019) and Wheaton et al. (2016)	A positive relationship was found between behavioral engagement and attendance and academic and extracurricular performance. High concentration in educational activities characterizes academically strong students, evidenced by higher course grades.
Bakker, Sanz Vergel, and Kuntze (2015)	Student performance and engagement are not constant. In particular, this paper looked at how weekly study and personal resources affected students' performance, active learning habits, and engagement. Furthermore, it looked into whether students' reactions to their weekly resources varied depending on how open their traits were.

H5: There is a significant relationship between student engagement and academic performance.

### 2.6. The Theoretical Framework of the Project-Based Learning Model

The theoretical framework of the PBL model illustrates that student engagement, collaboration in learning, and student performance are closely related. When students are actively involved in projects, they tend to collaborate well and their learning outcomes improve. Strong engagement and collaboration in PBL often result in better student performance, creating an effective and resilient learning environment.

Figure 1 illustrates the theoretical framework of the PBL model.

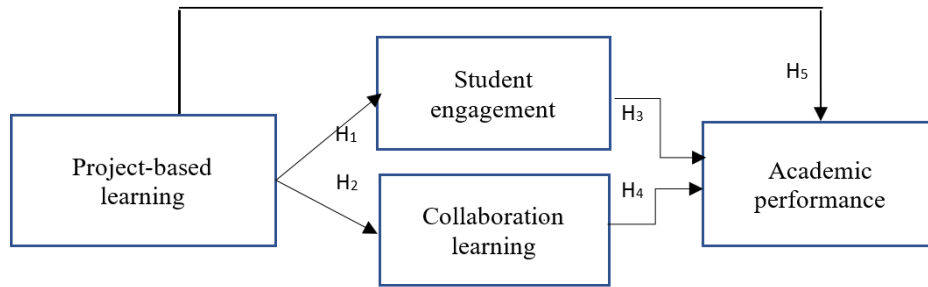


Figure 1. Framework of the PBL model.

### 3. RESEARCH METHODS

This study uses mixed methods, which integrate quantitative and qualitative research techniques into a single research endeavor to ensure that the information and data collected are more thorough, legitimate, reliable, and impartial. The research subjects were students taking strategic management courses. The sampling technique was carried out in two stages. First, the three best private universities in Semarang City were selected based on *Webometrics 2023*, namely University of Dian Nuswantoro (UDINUS), Catholic University of Soegijapranata (UNIKA), and Islamic University of Sultan Agung (UNISULA). A sample of 318 students was selected using a stratified random sampling technique. Data collection was carried out through questionnaires, interviews, and literature studies.

An online questionnaire was used, from May to July 2023, and in-depth interviews were carried out for two weeks in July, which aimed to identify the impact and benefits of the learning method. The questionnaire was used to understand respondents' perceptions of the eight concepts of the PBL model. The in-depth interviews were conducted with six sources—two students, two lecturers, and two heads of study programs. Quantitative data hypothesis testing of the responses was carried out using structural equation modeling (SEM) with AMOS version 26 software. Then, triangulation was carried out on the qualitative data to identify concepts in the interviewees' answers. PBL indicators are measured by [Eckardt et al. \(2020\)](#) academic performance indicators are measured by [Iwamoto, Hargis, and Vuong \(2016\)](#) collaborative learning indicators were measured by [Collazos et al. \(2007\)](#) and student engagement was measured by [Hofkens and Ruzek \(2019\)](#).

### 4. RESULTS AND DISCUSSION

Online questionnaires were used for the research, which ran from February to July 2023. In-depth interviews were also conducted with people at each university, including instructors, students, and leaders of study programs. The questionnaire items were scored on a 7-point Likert scale (1 = disagreement and 7 = agreement). In terms of respondent identity, males made up 61.64% of the sample, those between the ages of 21 and 25 made up 52.83%, and those with achievement indices between 2.75 and 3.89 made up 52.52%.

#### 4.1. Structural Model Assessment

The Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Comparative Fit Index (CFI), and Tucker–Lewis Index (TLI) values met the necessary cut-off value of >0.9, the root mean square error of approximation (RMSEA) value of 0.020, and the C min/df of 1.101. These results were obtained using the full model SEM analysis (see [Figure 2](#)) with AMOS version 26. The Hoelter Index values for alpha 0.05 and 0.01 are 202 and 205, respectively. According to the Hoelter Index value, the sample size is sufficient to generalize the analysis findings. Additionally, the group difference test revealed significant differences in the observed variables, with various coefficients suggesting significant differences across the groups. This was done to examine bias and invariance. As a result, the model is deemed viable for use in further research to test the five proposed hypotheses.

[Table 6](#) presents the constructed scale of statistical measurement.



Table 6. Construct scale measurement statistics.

No.	Construct and indicator	Factor loading*	Cronbach's alpha**	Average variance extracted***		
1	Project-based learning		0.861	0.507		
	Original content (PBL1)	0.700				
	Authentic assessment (PBL2)	0.698				
	Explicit educational objectives (PBL3)	0.733				
	Cooperative learning (PBL4)	0.715				
	Reflection (PBL5)	0.705				
	Incorporation of adult skills (PBL6)	0.721				
2	Student engagement		0.793	0.561		
	Behavior engagement					
	Positive behavior (BE1)	0.721				
	Engagement in learning (BE2)	0.780	0.788	0.554		
	Active participation in school (BE3)	0.745				
	Emotional engagement					
	Enjoyment (EE1)	0.767	0.780	0.542		
	Sense of belonging (EE2)	0.693				
	Happiness (EE3)	0.771				
	Cognitive engagement		0.766	0.521		
	Physical and mental presence (CE1)	0.733				
	Have a willingness to strive to exceed standards (CE2)	0.731				
	Actively participate (CE3)	0.745	0.789	0.556		
	Academic engagement					
	Actively deepen mastery of the material (AE1)	0.759				
	Arrive on time (AE2)	0.703				
	Actively visit the library (AE3)	0.703	0.880	0.551		
3	Collaborative learning					
	The performance of the group (CL1)	0.718				
	Intra-group cooperation (CL2)	0.709				
Students' participants (CL3)	0.806	0.880			0.551	
4	Academic performance					
	Knowledge mastery (AP1)					0.778
	Skills (AP2)		0.768			
	Earned value (AP3)		0.697			
	Pass on time (AP4)		0.695			
	Graduation predicate (AP5)		0.733			
Further education attainment (AP6)	0.778					

Note: \* Factor loading should be more than 0.7; \*\* Cronbach's alpha should be more than 0.7; \*\*\* AVE should be more than 0.5.

#### 4.2. Hypothesis Testing

The critical ratio (C.R.) and p-value of causality integrated into the conceptual framework serve as the foundation for hypothesis testing. The study model's causation is deemed significant if the p-value is less than 0.05.

The relationships between PBL, student engagement, collaborative learning, and academic performance—the variables included in this research—are explained in Table 7. The C.R. value, representing the analysis results, indicates that PBL strongly impacts the student engagement variable, with a value of 2.874 at the  $p < 0.05$  significance level. In addition, the C.R. value indicates that PBL significantly influences collaborative learning. It amounts to 2.852 ( $p < 0.05$ ) at the 0.05 significance level. Furthermore, the C.R. value indicates that PBL considerably impacts academic success. At a significance level of 0.01 ( $p < 0.01$ ), it amounted to 3.061.

Table 7. Weights for standardized regression.

Path	Estimate	Standard error	C.R.	p-value*
Student engagement ← PBL	0.277	0.030	2.874	0.004
Collaborative learning ← PBL	0.195	0.086	2.852	0.004
Academic performance ← PBL	0.205	0.064	3.061	0.002
Academic performance ← Student engagement	0.221	0.260	2.634	0.008
Academic performance ← Collaborative learning	0.235	0.053	3.430	***

Note: \* p-value should be less than 0.05.  
 \*\*\* p < 0.01

The results of the analysis show that student engagement has a significant impact on academic performance, even though the standard error is high at 0.260; however, the C.R. of 2.634 indicates that this relationship is significant at the 0.01 significance level ( $p < 0.01$ ). Furthermore, collaborative learning significantly influences academic performance, as expressed by the C.R. value of 3.430, reaching a very high (\*\*\*) level of significance. The results of this analysis indicate that PBL, student engagement, and collaborative learning significantly influence academic performance variables. With high C.R. values, this relationship is solid and essential in explaining variations in academic performance. These results also provide empirical support for the importance of project-based teaching and student involvement in improving academic achievement. Furthermore, the results of the in-depth interviews with lecturers and students regarding the PBL method in strategic management courses can vary depending on the experience and preferences of each individual.

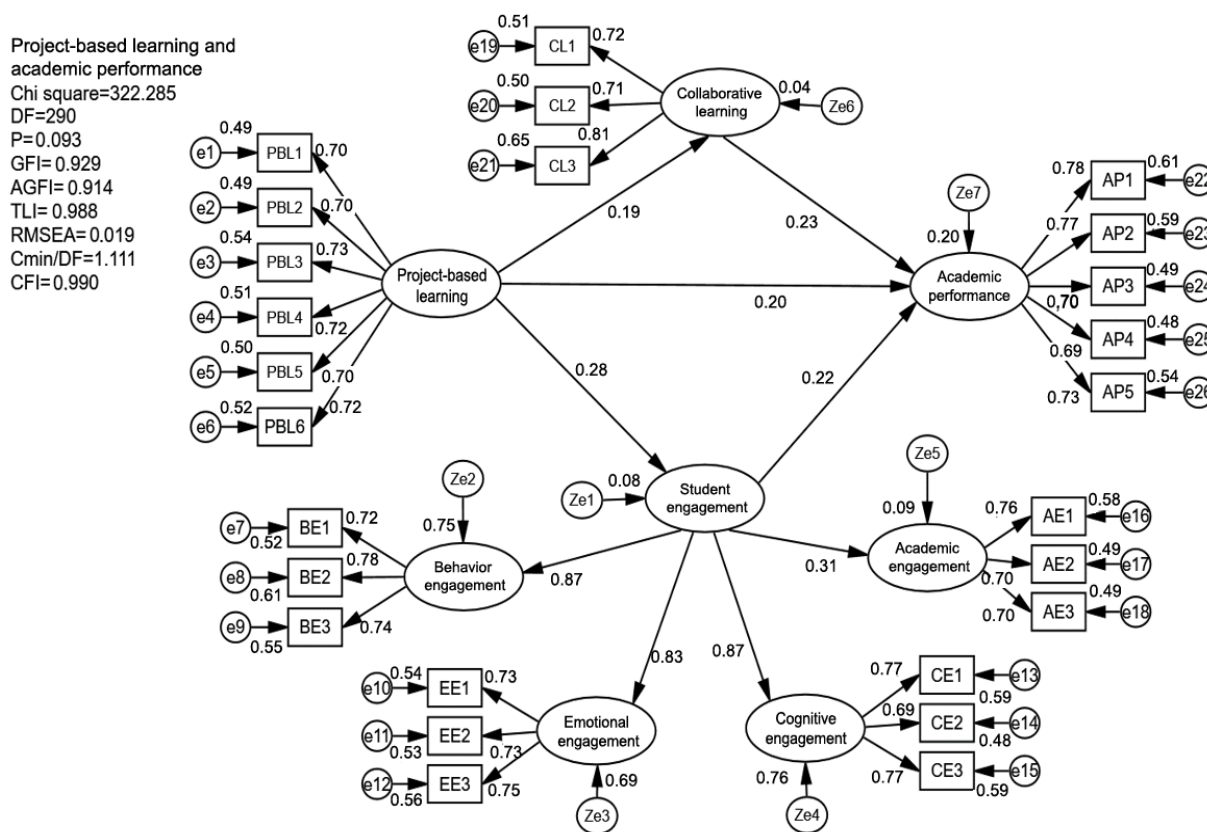


Figure 2. Results of the structural model.

The findings of the qualitative analysis can explain that PBL allows students to develop a deeper understanding of strategic management concepts through practical experience and feel involved in projects relevant to the real world. Students are also motivated to study harder and can enjoy collaborating with classmates, thereby developing social skills. This was explained by Student A, who stated: "PBL can make the class atmosphere more

active than conventional learning where the lecturer only gives a lecture and then gives homework". In the PBL learning model in the Strategic Management course, students feel that there is added value in developing the problem-solving and creativity skills they have acquired so that they can understand this course well and gain in-depth and contextual learning experiences as well as feel involved in projects that are relevant to the world. The real world allows students to apply theory to practice.

On the other hand, the lecturer sees it as an effective way to teach Strategic Management. Lecturer B stated, "PBL allows students to develop a deeper understanding of strategic management concepts through practical experience". This lecturer was also pleased with the high student involvement in PBL and said that PBL is a learning method that can inspire students' creativity and critical thinking and believes that PBL skills can help students apply theoretical concepts in real projects, resulting in a more robust understanding of Strategic Management.

The second lecturer uses PBL to teach strategic management because he has had previous success with this method and sees a positive impact on students' understanding and skills that help prepare them for real-world challenges in strategic management. He also said that PBL is an innovative and compelling learning approach to teaching strategic management, allowing students to experience in-depth and relevant learning in the real world.

Furthermore, the information is supported by an interview with the Head of the Study Program, who said that PBL has benefits in classroom learning in strategic management courses and other subjects. The Head of the Study Program also stated that PBL helps bridge the gap between theory and practice in teaching because students not only listen to theoretical lectures but are also actively involved in designing, planning, and implementing business strategies in the context of real projects. Even more interestingly, the Head of the Study Program stated that PBL helps develop students' sense of responsibility for the results of the projects they take part in, creating a strong and memorable learning experience where students feel that they are genuinely contributing to solving complex business problems.

## 5. DISCUSSION

This study investigates how PBL affects students' academic achievement. For a sample of 318 students enrolled in the Management Study Programme at the Faculty of Economics and Business at private universities in Central Java, it is mediated via collaborative learning and student involvement. The findings of the study demonstrate that PBL improves academic achievement. This motivates instructors to use contemporary teaching techniques, namely PBL teaching tactics, so that students can potentially love learning. Compared to typical teacher-centered instruction, PBL model activities aim to engage students more in education. PBL is one factor that might enhance students' motivation to learn. According to [Eckardt et al. \(2020\)](#), the PBL approach uses projects to motivate students, which allows them to show and explain what they have learned.

On the other hand, the demands of special skills, such as critical thinking, problem solving, collaboration, and various other skills, must be achieved through learning. Collaboration skills make cooperation an interaction structure that facilitates collective efforts to achieve common goals. Through collaboration, students can work collaboratively and socially to achieve learning goals.

Awareness of collaboration in learning requires cooperation by utilizing all available resources to achieve the learning goals set effectively and efficiently ([Condliffe et al., 2017](#)). Collaboration learning is an interaction that requires students to be active, creative, and happy to engage themselves optimally, mentally and physically. Student involvement represents an individual's drive to do something or a motivational factor that can be a strong predictor in improving academic achievement ([Carter, 2016](#)). This study shows that PBL can facilitate students' problem-solving abilities; this is proven by several indicators of students' abilities, such as being motivated to complete learning assignments on time and having learning dynamics that are more flexible so that they stimulate students

to participate actively. It also has a positive impact on lecturers, namely obtaining new models so that the teaching and learning processes are more dynamic and varied.

This study aligns with the findings of Behrouzi et al. (2014). It reveals that using PBL methods positively impacts students' knowledge acquisition in three Foundations of Education courses in teacher education programs. Additionally, students and researchers positively perceived the use of PBL as a pedagogical tool. This study provides initial evidence that PBL can improve students' conceptual understanding and can be a valuable strategy for improving the quality of learning. Thus, this research provides important insights for educational practice and curriculum development. Likewise, Stentoft (2019) highlighted that the concept of PBL has received widespread support among educational policy advocates and funders at the primary to tertiary education levels and has produced evidence of the effectiveness of PBL in improving student learning outcomes; however, it has limitations regarding evaluation due to weak measurements that are less valid and reliable for in-depth learning and interpersonal competence that PBL aims to improve. Some studies show positive impacts of PBL in social studies, but evidence in mathematics and literacy is more limited. Some schools that implement PBL noted increases in student engagement, motivation, and confidence.

Research by Carter (2016) evaluated the impact of project-based learning compared to traditional learning methods on students' academic achievement in advanced mathematics subjects. The analysis of covariance (ANCOVA) results showed that the group taught using PBL achieved a statistically significantly higher average performance than those taught using traditional methods. Similar findings were obtained when the achievements of male and female students were compared between the two groups. However, no significant differences in student motivation were found between the groups taught with PBL and traditional learning. The results of this study provide evidence that the PBL method can improve student achievement in mathematics subjects. This research also reminds us of the importance of considering the role of motivation in project-based learning.

For decades, many lecturers have implemented traditional learning strategies in class, and students continued this by doing homework. Traditional learning strategies make students passive, and project-based learning strategies make students active and creative.

This information becomes valuable when students actively participate in the learning process. Many instructors and researchers, including Monteiro et al. (2020), concluded that most lecturers have moved away from traditional learning strategies because these strategies have proven to be ineffective for students in the current learning environment (Sakamaki et al., 2022). Project-based learning strategies are an essential phase in the learning process and are one of the most effective learning strategies. Project-based learning strategies involve problem-solving content. The knowledge gained while working on a project are then shared to solve problems (Hayden et al., 2002). The differences between traditional and project-based learning strategies are illustrated in Table 8.

Table 8. Traditional education vs modern education.

Traditional education	Modern education
1) Education-related	1) Learner-focused
2) Expertise in a given field	2) Subject-specific knowledge based on innate skills
3) One-way information transfer	3) Knowledge transfer in multiple ways
4) Passive and constrained	4) Dynamic and captivating
5) Conceptual	5) Both theoretical and useful

The efficacy of project-based learning methodologies at different educational levels has been assessed by numerous studies, from primary to higher education (Eckardt et al., 2020; Melguizo-Garín, Ruiz-Rodríguez, Peláez-Fernández, Salas-Rodríguez, & Serrano-Ibáñez, 2022; Stentoft, 2019). Table 9 presents the efficacy of project-based teaching and learning methodologies across disciplines and educational levels.

Table 9. PBL effectiveness based on past research findings.

Author	Subject	Result
Clark (2017)	Undergraduate engineering	Project-based learning strategies have a positive impact on academic achievement.
Eckardt et al. (2020)	Undergraduate students	There has been a significant increase in the academic scores of various subjects through project-based learning.
Sattar et al. (2022)	College students	The project-based learning strategy succeeded in improving students' English learning skills.
Melguizo-Garín et al. (2022)	College students	Students achieve better critical thinking skills and increased self-confidence through project-based learning strategies.
Carter (2016)	Undergraduate students	The study findings demonstrate how project-based learning techniques can improve students' comprehension of mathematical concepts.

## 6. CONCLUSION

According to the study, the PBL approach aids academic achievement. Furthermore, PBL has been shown to boost students' passion for learning and promote their participation in the process through teamwork. PBL is, therefore, applicable at all educational levels. PBL mandates that students build connections across disparate topic areas. Through this avenue, learners can view knowledge holistically. Moreover, PBL is an in-depth investigation of a real-world topic, which is beneficial for developing learners' attention and increasing their effort.

Students explore fundamental issues in groups to acquire concepts and critical thinking abilities. Group members will engage in a give-and-take dialogue via this technique to get thorough and mature knowledge. PBL also attempts to overcome difficulties and teach students the fundamental problems they need to be aware of to hone their critical thinking abilities. Students engage in groups to investigate key issues while gaining an awareness of the concepts and necessary thinking abilities required. Using this teaching strategy, students are anticipated to become more engaged and imaginative as they draw knowledge from their surroundings.

Thus, this study supports the theory that PBL can be a valuable learning strategy in improving the quality of learning and reflects a shift from a more passive traditional learning approach to more interactive and creative project-based learning. These results align with previous research supporting the effectiveness of PBL in improving student understanding.

### 6.1. Managerial Implications

PBL is one of the teaching strategies based on knowledge needs that necessitates a setting naturally conducive to learning, given the real-world context of the subject. As a result, teachers should be able to adapt their teaching strategy to the issues they instruct. Students will learn from their surroundings and become more engaged and imaginative using this learning style. Consequently, instructors and educational officials should consider including PBL in their curricula to increase learning efficacy.

### 6.2. Theoretical Implications

PBL has theoretical implications that include constructivism, collaboration, the concept of interconnectedness, active learning, intrinsic motivation, authentic assessment, and an understanding of lifelong learning. PBL allows students to gain knowledge through practical experience, collaborate in teams, connect concepts to the real world, be actively involved in learning, feel ownership of the project, and be assessed based on their performance in authentic tasks. This approach creates a learning environment that supports deep and relevant understanding for students.

### 6.3. A Challenge for Further Research

This research has several limitations because it was only conducted in the Central Java region, so the results

may not be directly applicable to other contexts. In addition, the data used in this study is limited to a small population. Broader investigations involving various universities in other regions and subjects are recommended. Further research can also explore the factors that influence the effectiveness of PBL and analyze the long-term impact of PBL on students' academic achievement and learning motivation. Finally, it needs to be acknowledged that implementing PBL in schools is often a challenge because it requires lecturers to change their roles to facilitators, accept uncertainty, and adapt to a more dynamic classroom environment. Therefore, ongoing professional training may be required to support the effective use of this project-based learning method.

**Funding:** This study received no specific financial support.

**Institutional Review Board Statement:** The Ethical Committee of the University of 17 August 1945 Semarang, Indonesia has granted approval for this study (Ref. No. 2.762/G.05.01/XI/2023).

**Transparency:** The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.

**Competing Interests:** The authors declare that they have no competing interests.

**Authors' Contributions:** All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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