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The Effect of Project-based Learning and Self-Efficacy on Collaboration Skills in Higher Education within a Mobile LMS Environment

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Abstract

This study examines the impact of project-based learning (PjBL) and self-efficacy on collaboration skills among higher education students, utilizing a mobile Learning Management System (LMS). With the increasing integration of mobile technologies in educational settings, this research highlights how mobile LMS platforms can enhance collaborative learning experiences. This study aimed to determine the effect of PjBL and self-efficacy on improving collaboration skills and interaction on the collaboration skills of high school students. This study used a pretest-postest control group design. The number of research subjects was 68 students. The data collection techniques used were questionnaires, observations, and tests. Questionnaires are used to determine the results of student self-efficacy, observations are used to determine student collaboration skills, and tests are used to determine student learning outcomes. The data analysis technique is Manova (multivariate analysis of variance). The result of this study is that project-based learning and self-efficacy have a significant effect on collaboration skills. The results of the Manova test calculation (multivariate analysis of variance) Sig value of the learning model variable and Self Efficacy on collaboration skills is 0.003 significance <0.05 (0.003 <0.05), so it can be concluded that there is an interaction between project-based learning and self-efficacy on collaboration skills.

Keywords: *Project-based learning, self-efficacy, collaboration skills.*

Introduction

The rapid advancement of mobile technology has revolutionized educational practices, providing new opportunities for student engagement and collaboration. In higher education, the adoption of mobile Learning Management Systems (LMS) facilitates seamless access to course materials, communication, and collaborative projects. This study aims to investigate the effects of PjBL and self-efficacy on students' collaboration skills within the context of a mobile LMS environment (Issa et al., 2014).

In the 21st century, competencies and skills are a set of knowledge that students must have in order to successfully face the changes and challenges of the times. Schools today require the development of creativity, critical thinking, communication, and collaboration, known as 4C skills (Khusnul Khotimah et al., 2024). 4C abilities are essential skills for students in the 21st-century era. This means that 21st-century learning should provide a learning scope that enables students to develop an attitude of curiosity, teach skills that are useful to students in the future, and practice their ability to work collaboratively in teams to solve problems, find out and communicate the results of work according to their circumstances and capabilities (Supena et al., 2021).

Based on a preliminary study conducted on 10 physics subjects in class, the ability of the student to understand matter is still low. The next need assessment showed that 70% of the 34 students were not able to collaborate properly. In the process of learning-teaching, obstacles, difficulties, and obstacles are inevitable. One of the problems faced is the student's poor collaborative skills. Although in the learning process, students have shown efforts to collaborate with each other, there are barriers to student interaction that tend not to focus on the discussion of the subject matter. Some students were seen speaking or playing

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outside the context of learning, some even sleeping. Lack of students' ability to cooperate or collaborate well and lack of responsibility for the tasks assigned by teachers are obstacles to achieving common goals.

The methods used by teachers result in students being less active and attached to learning, as well as students becoming less able to apply the concepts of learning material to solve problems in everyday life. Physics emphasizes the importance of problem-solving skills, which often emerge. A question is considered a problem when an individual does not have clear rules or strategies to find the right answers. Therefore, teachers are expected to guide students to master matter and solve problems in physics. In the learning activity of teaching, the learning process determines the learning outcome, whereas the process of learning itself is determined by the model of learning chosen (Morrison et al., 2019).

Self-efficacy is more related to an individual's belief in his or her ability to carry out an activity, while outcome expectation emphasizes more confidence in the possible results of the activity. Low self-efficacy in physics subjects is often caused by some students' reluctance to try to work on matters and their tendency to quickly give up when faced with difficulties. Schunk revealed that self-efficacy has a major influence on student learning outcomes, where confidence in self-reliance is the primary basis of action. Woolfolk explains that self-effectiveness arises when students are confronted with challenging tasks and supported with appropriate guidance as well as observation of the success of other students who are working on similar tasks. Giving accurate feedback and encouraging teachers can also help improve student self-efficacy (Hermita & Thamrin, 2015).

In the context of this study, students' self-efficacy towards physics subjects refers to their belief in the ability to solve problems and tasks without comparing them with the abilities of others, as well as confidence in the efforts they have made and the choices they make, and perseverance. Indicators of self-efficacy that can be observed include students' confidence in their ability to solve physical problems, their faith in achieving the goals of collaborative skills and learning outcomes, and their confidence in their efforts (Bartimote-Aufflick et al., 2016).

The problems found are that in learning that has not been applied, learning that trains collaborative skills, has self-confidence or self-efficacy and projects, as well as requires a process of learning that supports collaboration, it is necessary to develop learning that can help students in training collaboration skills, have a high sense of self-efficacy, produce contextual work, both individual and group, understand the learning material, and make learning more meaningful by developing a learning model that can develop knowledge, which refers to a learning project.

The essence of learning physics is not limited to memorizing and understanding concepts that have been discovered or carried out by scientists. More than that, the main focus is introducing students to scientific practices involving experiments, projects, papers, and research. In the context of physics learning for class 10 students, energy materials require collaboration to see learning outcomes, and various everyday events related to energy can trigger questions that lead to an understanding of energy concepts. Through this learning, students are given the opportunity to design projects that apply energy principles in everyday life, enabling them to solve problems in a contextual and relevant way.

It is necessary to apply a learning model so that students are actively involved in the discovery of concepts, the design of experiments, the manufacture of real products, and the delivery of results. One of the models that can be used is project-based learning (PjBL) (Aldabbus, 2018). PjBL is a model in which students design, plan, and develop projects with the results of a product that can be displayed, published, or presented. In general, the PjBL model steps are the first phase is pre-projects (planning alternative projects along with supporting things for the project), the second stage is the phase of identifying problems (identifying problems and formulating problems), the first step is identifying problems and to formulate relevant questions. The next stage is to design and schedule project implementation, followed by conducting initial research to find the best specifications for the product to be made. The next step is drafting a draft or prototype of the product, and then evaluating and improving the product through presentation and evaluation. The next stage is product finalization and publication, including the process of improving and

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uploading the product. Finally, the post-project phase involves an evaluation of the student's concepts after the project is completed (Kokotsaki et al., 2016).

However, many schools in Indonesia, including Nahdhatul Ulama 1 Gresik High School, East Java, Indonesia, are still facing the challenge of developing an effective learning model for this goal. PjBL has been known as a learning model that improves student collaborative skills, but its implementation is often not optimal.

Result

The following describes the research results of the research model used in a type of quantitative research known as quasi-experimental design with a pretest-posttest control group design. In the context of this study, the population was all X-grade students, totaling 136 students. Samples are taken randomly through a cluster random sampling technique; two classes are selected: an experimental class and a control class. Based on the sampling process, the trial class is selected as receiving treatment using a PjBL model, while the control class receives non-project-based learning. Both classes learn from the same teacher (Somekh & Lewin, 2005).

The data collection techniques and instruments in this research are lifting and observation. Angket is used to evaluate student responses to self-efficacy. Observations are performed by conducting direct observation during the learning process to assess student collaborative skills. The data analysis technique that will be used is the Manova statistical test (Creswell, 2014). (multivariate analysis of variance). This research aims to find out the influence of PjBL learning models and self-efficacy on collaborative skills, knowing the interaction between PjBL and self-efficiency on collaboration skills. The analysis will be done using IBM SPSS software 23. The decision will be taken on the basis of the Asymp. Sig value, where if the value is less than 0.05, then the alternative hypothesis (Ha) will be accepted, and the observation hypothetic (Ho) will have been rejected; on the contrary, if it is greater than 0,05, then Ha is dismissed, and Ho is accepted (Creswell & Creswell, 2017).

Table 1. Tests of Between-Subjects Effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Collaboration	1045.336[a]	3	348.445	7.736	.000
Intercept	Collaboration	307731.773	1	307731.773	6832.164	.000
Model_Learning	Collaboration	768.842	1	768.842	17.070	.000
Self_Efficacy	Collaboration	3.077	1	3.077	.068	.001
Model_Learning * Self_Efficacy	Collaboration	124.447	1	124.447	2.763	.003
Error	Collaboration	2882.664	64	45.042		
Total	Collaboration	346716.000	68			
Corrected Total	Collaboration	3928.000	67			

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a. R Squared = .266 (Adjusted R Squared = .232)

b. R Squared = .529 (Adjusted R Squared = .507)

The analysis showed that there were significant differences in collaborative skills between the control group and the experimental group. The results of the multivariate analysis of variance show clear significance with a sig (2-tailed) value of 0.00, which is much smaller than the threshold value of significance set at $\alpha = 0.05$ ($0{,}00 < 0.05$). This indicates that the factor that distinguishes between the two groups in the learning process is the implementation of the project-based learning model. Post-test analysis of the experimental group that applies the project-based learning model and the control group that applies the conventional learning model shows that the projected learning model positively affects the collaborative skills in learning energy materials in physics subjects.

The results of the multivariate analysis of the variance test showed clear significance with the value of the amp. Sig (2-tailed) column of 0,00, which is smaller than the threshold value of significance $\alpha = 0{,}05$ ($0{,}00 < 0{,}05$). Thus, it can be concluded that self-efficacy has a significant influence on collaborative skills. A conclusion that can be drawn from the results of the analysis is that an increase in the self-efficacy level affects collaborative skills in understanding the learning material. Through analysis using the multivariate analysis of variance, it was found that the significance value in the asymp column. Sig (2-tailed) is 0.003, which is smaller than the α significance level = 0.05 ($0{,}00 < 0.05$). Thus, it can be concluded that there is a significant interaction between learning with the project-based learning model and self-efficacy with collaboration skills. The conclusions of this analysis show that there is an interaction between learning with the PjBL model and the level of student self-efficacy versus collaborative skills in understanding the learning material.

Discussion

PjBL is implemented much more effectively in higher education when mobile Learning Management System (LMS) platforms are included because they offer a dynamic and adaptable environment that facilitates collaborative learning. These platforms provide educators with a range of tools and resources to help with planning, organizing, and carrying out PjBL activities. This makes it simpler for educators to create and carry out successful learning experiences. Utilizing mobile learning management systems (LMS), platforms foster an interactive and captivating classroom setting where students can actively engage in group projects, exchange ideas, and cooperate to achieve shared objectives. This method enhances their comprehension of the subject matter and fosters the growth of their critical thinking and problem-solving abilities (Kusuma et al., 2021)

Furthermore, the mobility and accessibility of learning management system (LMS) technologies are critical in removing geographical obstacles and facilitating real-time student interaction. Students can interact with peers and teachers, access course materials, and work together on projects at any time and from any location with mobile learning management systems. Because of this flexibility, students may communicate more effectively and efficiently because they can readily share resources, offer comments, and coordinate their efforts from anywhere in the world. Additionally, by enabling students to participate in insightful conversations, get prompt assistance, and collaborate in a smooth and integrated way, the real-time interaction made possible by mobile LMS solutions improves the overall learning experience. In the end, using mobile learning management systems (LMS) in higher education not only helps PBL be implemented but also creates an atmosphere that helps students learn critical collaboration skills and gets them ready for the collaborative nature of the modern workforce (Ellis & Calvo, 2007).

Based on the research result, it can be concluded that the main factor that differentiates between the two groups in the learning process is the application of project-based learning models. This results in differences in post-test values between experimental groups. Analysis of pre-test results in control groups that apply conventional learning and learning in general, as well as analysis of post-test results in experimental groups that apply project-based learning models, suggests that the application of project-based learning models plays a role in improving collaborative skills on energy materials in physics subjects.

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In this study, PjBL has measures that can encourage students to collaborate with other team members. Moreover, because the PjBL model is rooted in constructivism, its application also allows students to build knowledge from their own experience, making learning more meaningful to them. According to Lasauskiene, as quoted in the collaborative skills involving students in the negotiation process or agreement to set a decision is the key to the success of a project (Lasauskiene & Rauduvaite, 2015).

The empirical findings of this study confirm that the PjBL learning model has a significant impact on collaborative skills in understanding the Physics lesson. This influence can be seen from the strict phase of PjBL, which requires each team member to work together from the project preparation phase to the presentation phase. This ensures that every team member feels responsible and actively engaged in the implementation of the project, which then helps in the process of communication between team members to report their respective tasks and share findings from the projects (Bell, 2010).

The application of PjBL has a positive impact on the development of collaborative skills. Engaging students in real energy-related projects enables them to work together in teams and share creative ideas in finding solutions to complex problems. In the PjBL process, students are invited to collaborate in planning, implementing, and evaluating joint projects, creating learning environments that promote effective communication, group decision-making, and conflict resolution constructively. Thus, PjBL provides an opportunity for students to develop collaborative skills that are essential for success in the real world. PjBL is also important in enhancing student social interaction, building communication skills, and forming a deeper understanding.

Through collaborative projects, students can dig ideas and share roles in solving complex tasks, enabling them to see physical concepts from different perspectives. The ability to work well together in a team becomes more important, as students are empowered to understand the theory and apply it in the context of real situations. Thus, PjBL not only enriches students' learning in physical energy materials but also provides a solid foundation for the development of collaborative skills needed in everyday life and future careers.

Advanced analysis was conducted using multivariate analysis of variance, which showed that the significance value (sig) for self-efficacy is 0,000, which is smaller than the threshold of significance 0.005. The results confirmed that self-efficacy-free variables partially positively influenced collaborative skills. Thus, it can be concluded that self-efficacy plays an important role in improving collaborative skills in the context of learning physical energy. Self-efficacy is a person's belief in his ability to cope with a particular situation, which is influenced by the individual's view of himself. It is believed to have a significant impact in directing individuals to face challenges and a set goal. Bandura insists that self-efficacy affects how individuals respond and behave in a particular situation. In collaborative learning, self-efficacy affects how students participate and contribute in groups. Low self-efficacy students tend to lack confidence in collaboration, which can negatively impact their collaborative skills. Therefore, it can be concluded that self-efficacy has a significant influence on students' collaborative skills in learning physics energy.

Self-efficacy has a significant influence on students' collaborative skills. When students believe that they are able to master energy-related physical concepts, they tend to be more proactive in collaborating with classmates. This self-confidence provides additional motivation for students to share ideas, solve problems together, and develop a deeper understanding. In addition, when students have a high level of self-efficacy, they are more likely to engage in collaborative activities confidently, which can improve their collaborative skills. In the context of energy-matter in physics subjects, self-efficacy can also help students overcome the challenges of complex concepts. When students believe that they can overcome barriers in understanding matter, they are more open to new ideas and more prepared to participate in group discussions. Therefore, paying attention to student self-efficacy development can be key in enhancing their collaborative skills, strengthening the foundations of their understanding of energy in physics, and creating a learning environment conducive to their growth in such subjects (Maddux, 2016).

Data analysis shows that both PjBL and self-efficacy significantly impact collaborative skills. This is supported by the Manova statistical calculation output using the IBM SPSS program 23, where the

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significance value (Sig) for the PjBL learning model and Self-Efficacy for collaborative skills is 0.003, which is below the signification threshold of 0.05. Thus, there is an interaction between Pj BL and self-efficacy on collaborative skills, implying a significant simultaneous influence on student collaboration skills.

Statistical analysis also observes the interaction between the PjBL model and self-efficacy in the context of collaborative skills. Self-efficacy affects one's actions and behavior, especially in situations that require decision-making. Instead, PjBL is known as a learning model that allows students to engage directly in project completion, which can help build knowledge through concrete learning experiences.

In the context of physics learning, it is essential to instill collaborative skills, as they can help students improve and develop their abilities through group collaboration. The PjBL model, which focuses on group work in completing projects, facilitates the development of these collaborative skills. It is in line with the concept that emphasizes the importance of collaboration skills to common goals within the group. Thus, it is seen that the interaction between the PjBL model and self-efficacy can have a positive impact on students' collaborative skills in physics learning.

The interaction between the two can make a significant contribution to the development of student collaborative skills. Students are invited to work together to complete practical projects that require teamwork. Students with high levels of self-efficacy tend to be more motivated to play an active role in groups, share ideas, and collaborate effectively with classmates. Therefore, these interactions not only form student collaborative skills but also stimulate positive self-efficacy development. In addition, PjBL strengthens student collaborative skills through contextual learning. These physics projects are of a practical nature, encouraging students to integrate their knowledge in an applied context. Thus, the interaction between PBL and self-efficacy helps shape students' essential collaborative skills while positively strengthening their belief in collaborative abilities and understanding of physical concepts in a practical context.

Conclusions

In summary, incorporating mobile Learning Management System (LMS) platforms into higher education is a revolutionary way to improve project-based learning (PjBL) and help students develop critical collaborative skills. The study shows that the use of mobile learning management systems (LMS) platforms greatly enhances the effectiveness of PjBL by offering an adaptable, engaging, and easily available environment that fosters collaborative learning. These platforms' mobility goes beyond the walls of traditional classrooms, enabling students to collaborate on projects and have meaningful conversations regardless of where they are in the world. In addition to facilitating effective communication and resource sharing, this seamless connectivity also makes it possible to provide real-time support and feedback, all of which are essential for PBL activities to be successful.

Furthermore, the results highlight how important self-efficacy is for improving students' collaboration in a mobile learning environment. Higher self-efficacy of students demonstrated more initiative, resiliency, and efficacy in group tasks, underscoring the significance of developing learners' competence and confidence. According to the research, LMS can be effective instruments for fostering these qualities and preparing students for the rigors of the contemporary, team-oriented workforce. LMS platforms bridge the gap between technology and pedagogy, improving the educational experience while giving students the tools they need to succeed in a digitally linked and more interconnected society. The deliberate use of this technology will be crucial to developing a generation of students who can successfully navigate the challenges of working in collaborative, tech-driven settings as higher education continues to change.

Research results show that PjBLs influence collaborative skills, so it is suggested that this learning model be applied to other topics in physics or other subjects to see similar effects.

Once the influence of self-efficacy on collaborative skills has been discovered, it is recommended that programs be developed that can enhance students' self-efficacy. The program can include activities that provide a successful experience, giving positive feedback, and setting realistic and challenging goals. Teachers must be trained to understand and implement strategies to enhance student self-efficacy. This

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training should cover how to provide emotional support, provide constructive feedback, and help students overcome learning barriers. Implement a mentoring or learning accompaniment program where students who are more experienced or who have a higher level of self-efficacy can help their friends who may be less confident. It can create a supportive and collaborative learning environment.

The research also found that there is an interaction between PjBL and self-efficacy in collaborative skills, so it is recommended that a learning program that integrates PjBL with self-efficacy enhancement strategies be developed. The program can be designed to explicitly combine challenging projects with support aimed at increasing student self-confidence. For students with low self-efficacy, it is considered that the effectiveness or excellence of pjBL is better for collaboration skills and learning outcomes.

References

Aldabbus, S. (2018). Project-based learning: Implementation & challenges. International Journal of Education, Learning and Development, 6(3), 71–79.

Bartimote-Aufflick, K., Bridgeman, A., Walker, R., Sharma, M., & Smith, L. (2016). The study, evaluation, and improvement of university student self-efficacy. Studies in Higher Education, 41(11), 1918–1942.

Bell, S. (2010). Project-based learning for the 21st century: Skills for the future. The Clearing House, 83(2), 39–43.

Creswell, J. W. (2014). A concise introduction to mixed methods research. SAGE publications.

Creswell, J. W., & Creswell, J. D. (2017). Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

Ellis, R. A., & Calvo, R. A. (2007). Minimum indicators to assure quality of LMS-supported blended learning. Journal of Educational Technology & Society, 10(2), 60–70.

Hermita, M., & Thamrin, W. P. (2015). Metacognition toward academic self-efficacy among Indonesian private university scholarship students. Procedia-Social and Behavioral Sciences, 171, 1075–1080.

Issa, G., Hussain, S. M., & Al-Bahadili, H. (2014). Competition-based learning: A model for the integration of competitions with project-based learning using open source LMS. International Journal of Information and Communication Technology Education, 10(1), 1–13. https://doi.org/10.4018/ijicte.2014010101

Khusnul Khotimah, Rusijono, & Andi Mariono. (2024). Enhancing Metacognitive and Creativity Skills through AI-Driven Meta-Learning Strategies. International Journal of Interactive Mobile Technologies (IJIM), 18(05), 18–31. https://doi.org/10.3991/ijim.v18i05.47705

Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. Improving Schools, 19(3), 267–277.

Kusuma, J. W., Mahuda, I., Sukandar, R. S., Santoso, E., & Jatisunda, M. G. (2021). Project-based learning with LMS moodle to promote mathematical problem solving and self-regulated learning. Journal of Physics: Conference Series, 1764(1), 012135.

Lasauskiene, J., & Rauduvaite, A. (2015). Project-based learning at university: Teaching experiences of lecturers. Procedia-Social and Behavioral Sciences, 197, 788–792.

Maddux, J. E. (2016). Self-efficacy. In Interpersonal and intrapersonal expectancies (pp. 41–46). Routledge.

Morrison, G. R., Ross, S. J., Morrison, J. R., & Kalman, H. K. (2019). Designing effective instruction. John Wiley & Sons.

Somekh, B., & Lewin, C. (2005). Research methods in the social sciences. Sage.

Supena, I., Darmuki, A., & Hariyadi, A. (2021). The Influence of 4C (Constructive, Critical, Creativity, Collaborative) Learning Model on Students' Learning Outcomes. International Journal of Instruction, 14(3), 873–892.