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IMPLEMENTING PROJECT-BASED LEARNING AND SIMULATION MODELS TO STRENGTHEN STUDENTS LEARNING MOTIVATION IN HIGHER EDUCATION

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Abstract

The need to respond to the increasingly complex challenge of increasing students' motivation to learn in the modern education era, which can hinder academic achievement and student engagement in the learning process, is the main basis for this study. Therefore, this research aims to explore a new approach that is effective in strengthening students' passion for learning. Through the combination of project-based learning and simulation (PJBLS), we hope to provide a significant contribution to understanding how this approach can increase students' learning motivation in higher education. Using a mixed-method research design, we tried to explore the impact of this model on students' learning motivation through questionnaires and interviews. The results of data analysis using a t-test showed a significant increase in students' learning motivation after the implementation of the learning model. The integration of project-based learning and simulation can increase student engagement in active and interactive learning in higher education. This means, the implementation of this model effectively strengthens students' learning motivation in higher education. The new findings emphasize the importance of implementing this learning model as the latest innovation in learning approaches and provide a solid foundation for curriculum development that is more adaptive and responsive to the needs of today's students.

Keywords: Higher Education, Learning Motivation, Project-Based Learning, Simulation.

INTRODUCTION

Increasing the quality of learning has become the main agenda for educators in the current era (Boeren, 2019; Madani, 2019). This is driven by the rapid development of technology and the transformation that occurs in various aspects of life. As technology continues to advance, approaches to learning need to be carefully considered in order to increase the quality of learning and strengthen students' motivation to learn (Bhagat & Huang, 2018; Hernandez-de-Menendez et al., 2020). In addition, educators must be able to adapt and innovate to create an interesting learning environment that can motivate students to be active in learning (Hang & Van, 2020). Increasing the quality of learning cannot be seen as a necessity but rather a necessity in an effort to ensure that the education system remains relevant and contributes significantly to the development and success of future generations. This will have a direct impact on their ability to contribute positively to the challenges and opportunities of the future.

A general problem faced in today's education system is students' lack of motivation to learn due to their lack of conceptual knowledge and their lack of engagement in the learning process (Garcia & Pintrich, 2023). Previous studies have shown that students are less motivated to learn because they have difficulty seeing the real connection between the subject matter and everyday life. For example, research by Shin found that students tend to lose motivation in learning when they feel that the material taught is irrelevant to their practical needs in the real world (Shin, 2018). In addition, students' lack of engagement in the learning process has also been identified as a significant factor in lowering learning motivation. They lose motivation because they are not used

to active learning that is done through practice and requires extra effort to build knowledge (Owens et al., 2020). When students lose motivation to learn, they tend to lose interest and enthusiasm to engage in learning actively. Previous studies have overcome this problem by implementing learning approaches such as project-based learning. It is even overcome in various ways, for example, by adapting (Pan et al., 2023; Suradika et al., 2023; Lu, 2023), modifying (Potvin et al., 2021), utilizing various learning media (Ummah et al., 2019) and information technology (Chen & Yang, 2019).

Nonetheless, the implementation of project-based learning in higher education faces challenges that result in slow progress accompanied by difficulties (Shpeizer, 2019). The challenge is the paradigm change in education that requires adaptation and transformation of the higher education system, including adjusting the curriculum. The change in focus from lecturer-centered learning to student-centered learning requires a cultural change that is not always easy to do in an academic environment (Sabah & Du, 2018). Another challenge is to evaluate project-based learning and measure student learning outcomes objectively (He et al., 2023; Pan et al., 2021). Furthermore, it requires strong collaboration between lecturers and students in implementing project-based learning (Hussein, 2021). In addition, how project-based learning can increase students' learning motivation is still unclear (Tanaka, 2023).

Despite facing challenges and difficulties, the implementation of project-based learning in higher education can provide significant benefits for students, namely increasing creativity (Chang et al., 2022; Hanif et al., 2019), problem-solving (Karan & Brown, 2022; Kartini et al., 2021; Song, 2018) and critical thinking (Loyens et al., 2023; Cortázar et al, 2021; Sasson et al., 2018); develop collaboration skills, communication, motivation and student engagement in the learning process (Wijnia et al., 2024; Markula & Aksela, 2022; Shin, 2021); and increase understanding of concepts and application of theory in real contexts (Issa & Khataibeh, 2021; Rumahlatu & Sangur, 2019; Fini et al., 2018; Perrault & Albert, 2018).

There seems to be a need to investigate how learning models can influence and strengthen students' learning motivation because it is rarely investigated. The combination of project-based learning and simulation (PJBLS) emerged as a response to the need to fill this gap. The effectiveness of the PJBLS model on students' learning motivation has not been investigated because this model combination is a new learning model that researchers developed. This study aims to explore the effectiveness of project-based learning and simulation in strengthening students' learning motivation and creating a challenging and meaningful learning experience for them. This research provides an empirical basis for a more effective learning process and can be adopted for the learning process in higher education.

LITERATURE REVIEW

Project-based Learning

Project-based learning has been established as a student-focused approach that can be effectively implemented in higher education environments. A study by Shpeizer found that project-based learning can increase creativity (Shpeizer, 2019). This finding is supported by Isabekov and Sadyrova's study, which confirmed that project-based learning has been proven effective in increasing students' creative skills in various fields (Isabekov & Sadyrova, 2018). In addition, teachers consider project-based

learning as a method that can improve the quality of learning (Pache-Durán et al., 2020). This is because project-based learning allows students to be directly involved in project activities and gives them the opportunity to apply knowledge to materials that are relevant to real-world life (Brandt et al., 2021; Dörnyei & Muir, 2019; Choi et al., 2019) and adjusted to their learning needs (Alamri et al., 2020).

In the learning process, students are placed as the main agents by giving them the responsibility to plan, implement, and evaluate projects that are relevant to the material being studied (Yusri et al., 2019; Delyana et al., 2018). This allows them to develop their skills through the process of problem-solving (Rupavijetra et al., 2022; Shpeizer, 2019) and allows them to acquire knowledge (Chen & Yang, 2019). In addition, the project activities they do can improve collaboration (Wulansari et al., 2022; Potvin et al., 2021; Pan et al., 2021; Lobczowski et al., 2021), communication (Rahayu & Putri, 2021; Parrado & Sánchez, 2020), and can motivate them in learning (Pan & Kuo, 2023; Lu, 2023; Barak & Yuan, 2021). Not only do they acquire theoretical knowledge, but they can also apply that knowledge in real-world situations. Thus, project-based learning becomes an effective method in the learning process (Tsybulsky & Muchnik, 2023; Holmes & Hwang, 2016). Therefore, educators need to consider the integration of this model in learning design to improve the effectiveness and relevance of learning.

Simulation

Many studies have also highlighted the effectiveness of simulation in the learning process (Theelen et al., 2019; Widiyatmoko, 2018; Farashahi & Tajeddin, 2018). The use of simulation in learning can increase conceptual understanding (Lehtinen, 2023) skills (Sierra, 2020; Kaufman & Ireland, 2016), provide opportunities for them to engage in higher-order thinking (Fallon, 2019) and increase learning motivation (Hannel & Cuevas, 2018). Similarly, a study by Huang et al. showed that simulation can increase active participation, skills (Huang et al., 2022) and academic performance in learning (Herron et al., 2022). Nevertheless, although simulations have demonstrated their effectiveness and advantages, there are also limitations to consider. For example, research shows that inappropriate simulation design (Amri et al., 2020) or learning content that is irrelevant to the material (Lindgren et al., 2016) can reduce its effectiveness.

METHODOLOGY

Research Design

This study uses mix-method. Mix-method is a research method in which researchers combine research results using two different approaches, namely quantitative approaches and qualitative approaches (Creswell, 2014). The quantitative approach is used to analyze numerical data (Bloomfield & Fisher, 2019) and use statistical tools in testing predetermined hypotheses. In this study, the quantitative approach uses a pre-experiment method that allows researchers to measure and analyze the impact of learning models on the variables under investigation.

Meanwhile, the qualitative approach is used to investigate and understand the meaning of individuals or groups related to the problem under study. This approach can be used to interpret, explore, or gain a deeper understanding of certain aspects. This approach has also been applied in previous research (Potvin et al., 2021; Barak et al., 2020; Holmes & Hwang, 2016). In this research, the qualitative approach uses descriptive methods.

Data Collection

The data collected in this study are quantitative and qualitative. Data collection is an important stage in a study. This process includes the activity of collecting and measuring the information needed to answer the research questions posed (Kabir, 2016). Quantitative data were collected through a questionnaire administered before and after the model was implemented to obtain an overview of student motivation. The use of questionnaires as a research instrument aims to collect quantitative data regarding students' learning motivation.

This instrument helps researchers to measure variables related to learning motivation so that statistical analysis can be carried out. Meanwhile, qualitative data was obtained through semi-structured interviews which aimed to deeply investigate and understand students' experiences, perceptions, and viewpoints during learning. Interviews were conducted with several students who were selected with reference to their questionnaire entries. Thus, several students from different categories, namely high, medium and low, were taken.

Analyzing of Data

Once the data was collected, the next step was to check for completeness and correctness. The researcher carefully reviewed each data entry to ensure there were no missing information or filling errors that could affect the quality of the data. After this process was completed, a careful recapitulation of the data was done using Excel to ensure every data was entered correctly.

Then, the next step was to analyze the data using SPSS 16.0 software. Data analysis was carried out using statistical tests, namely independent t-tests. First, data normality and homogeneity tests were conducted. Furthermore, to test the hypothesis, a t-test was used to compare the difference in students' learning motivation before and after treatment through the implementation of project-based learning and simulation.

Decision-making criteria related to the proposed hypothesis were carried out by comparing the significance value (Sig) obtained with the predetermined test significance level (α) at the 95% confidence level, where $\alpha = 0.05$.

After completing the quantitative data analysis, this research proceeded to the qualitative stage. The selection of an appropriate analysis method can ensure that the resulting findings accurately reflect the research objectives (Johnson et al., 2020; Kelly et al., 2008).

The method applied is triangulation of findings, which involves aligning and comparing the findings found during the quantitative phase. Triangulation of findings plays an important role in ensuring the validity of data (Santos et al., 2020), thus increasing confidence in the final results of the study. Figure 1 shows the process conducted to analyze the qualitative data.

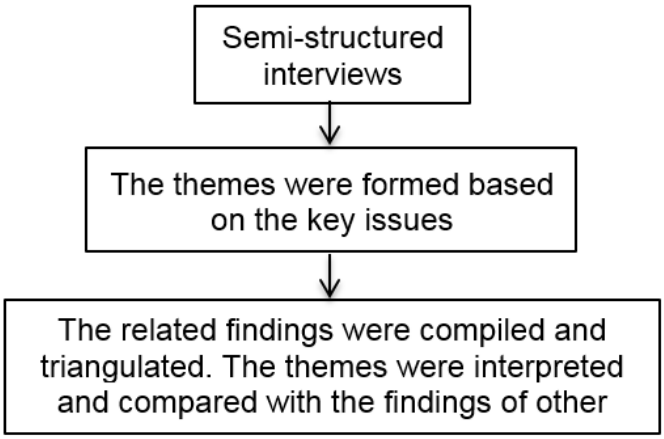

Figure 1: The Processes of the Data Analysis

The first step in analyzing the interview data findings is to carefully read each sentence of each interview transcription to identify and understand the key issues that emerged during the interview, namely students' views of the implemented learning, students' interest in the learning process, skills that students can improve through the learning model, and problems or difficulties experienced by students during the learning process. Then, matching them with these issues to get an overview of the patterns that emerged based on the informants' answers.

RESULTS

The results of the analysis show that there are differences in the value of student learning motivation based on variable factors. So, it can be concluded that the student's learning motivation after being taught through project-based learning and simulation models was better than before being taught through project-based learning and simulation. The analysis results are presented in Table 1 below.

Table 1: Results of Data Analysis of Student Learning Motivation

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	2535.000[a]	1	2535	9.818	0.003
Intercept	1702861	1	1702861	6.60E+03	0
Nilai	2535	1	2535	9.818	0.003
Error	14975.93	58	258.206		
Total	1720372	60			
Corrected Total	17510.93	59			
a. R Squared = ,145 (Adjusted R Squared = ,130)					

Table 1 presents the results of the ANOVA (Analysis of Variance) test, which is used to compare the means of two groups of data to determine if there is a statistically significant difference between the data groups. In this case, the Significance value is less than $\alpha = 0.05$, which is 0.003, indicating that the null hypothesis can be rejected and that there is a statistically significant difference between the means of the data groups. The table shows two types of total squares: the total sum of squares and the corrected total sum of squares. The total squares reflect the total variation in the data, while the corrected total squares calculate the variation after considering the differences from the data means. Analysis of Variance (ANOVA) was used to compare means between two groups, with one degree of freedom for the model and 58 degrees of freedom for the error. The intersection between the factors showed 1 degree of

freedom and a mean square of 1702861.067, which was significant with a significance value of 0.000. The "Value" factor has 1 degree of freedom and a mean square of 2535,000, which is also significant with a value of 0.003. These results indicate a statistically significant difference between the groups of data being compared.

Meanwhile, the results of the interview analysis found that students' views on the implemented learning showed high satisfaction with the effectiveness of the learning model. The majority of students expressed positive views on their learning experience, which integrated and motivated them to engage in the learning process actively. They see that this learning model not only provides subjective satisfaction but also has a concrete impact on their understanding of concepts and knowledge. Active involvement in group discussion, product creation, as well as practical application are important factors that increase students' interest and motivation towards learning. In addition, the use of technology in learning contributes significantly to learning efficiency. Engagement in learning has also increased students' ability to work together, think critically and creatively, and increase self-confidence and communication skills. Nevertheless, some students also faced obstacles and difficulties during the learning process, such as interpersonal challenges in group work, time management, difficulties in understanding the concept of the material, as well as difficulties in uniting ideas or ideas in the group. However, students' positive attitudes and commitment to overcoming these obstacles demonstrate their resilience and motivation in facing complex learning challenges.

DISCUSSION

This finding contributes to learning motivation that supports the effectiveness of project-based learning and simulation (PJBLS) model. The findings are similar to previous studies which show that project-based learning (PJBL) is able to mobilize and increase student motivation significantly (Santos et al., 2023; Anwer, 2019; Shin, 2018). Students are not only passive recipients of information, but they are actively involved in solving challenging problems. This is supported by a study (Seman et al., 2018) which confirms that PJBL provides opportunities for students to take an active role in facing challenges, developing solutions, and collaborating with fellow students. Other studies also show that PJBL has a positive impact on student motivation, interest and satisfaction in the learning process (Rodríguez et al., 2015; Holmes & Hwang, 2016). These results further reinforce that through PJBLS, students are not only actively involved in learning, but also feel personal satisfaction and fulfillment in achieving learning goals. The collaborative process, active engagement, and direct connection with real-world problems can create a positive and satisfying learning environment for students.

The challenging activities in this study created student engagement, where students felt they had complete control over the problems they faced and solved. Through engaging in project activities that require critical thinking and creativity (Tang et al., 2020), students not only improve their understanding of the learning material but also develop their self-confidence (Liu et al., 2018) and responsibility toward the learning process (Mahasneh & Alwan, 2028). In addition, collaboratively conducted activities allow students to develop teamwork, increasing their learning motivation (Noguera et al., 2018; Vogler et al., 2018).

Interactions between students in solving complex tasks can build independence, self-confidence, and social competence needed to succeed in learning. The findings of this study imply that collaborative activities in PJBLS provide students with meaningful learning experiences and strengthen their motivation and interest in learning.

Another finding in this study highlighted that the processes involved in PJBLS provide students extensive opportunities to take an active role in determining the projects they work on and making decisions about implementing the project activities. This makes students feel like they have complete control over their projects, thus increasing motivation and ownership of learning (Song, 2018). Students are actively involved in planning, organizing, and executing their projects, so they learn to take responsibility for their own decisions, which is essential to forming independence and leadership skills. In addition, through PJBLS, students can develop and hone their skills directly to apply that knowledge in relevant real-world situations (Killian et al., 2023). Through the various projects and simulations they undertake, students can design solutions, solve problems, and adapt to challenges that arise.

In addition, our study found that PJBLS involves a process of reflection and feedback that makes students actively evaluate and improve the quality of their work. Through structured reflection, students are invited to consider the steps they have taken, the difficulties they have faced, and the solutions they have designed. Feedback mechanisms from lecturers and peers also play an essential role in improving the quality of student work. By receiving constructive feedback, students can improve their understanding, correct mistakes, and improve their overall performance. In this study, the reflection and feedback process integrated into PJBLS not only functions as a medium to increase the quality of the final result but also as a way to develop students' metacognitive competence and self-regulation.

CONCLUSION

Based on data analysis and study findings, implementing the project-based learning and simulation (PJBLS) model significantly increases students' learning motivation. This finding is supported by the ANOVA statistical test results, which show a significant difference in learning motivation before and after PJBLS. Descriptive data analysis also confirmed the increase in students' learning motivation after implementing PJBLS. The interview results showed that students responded positively to this PJBLS model, feeling highly satisfied with their learning experience. They were actively engaged in the learning process, felt connected to the learning materials, and were encouraged to participate actively in learning activities.

The use of technology and collaboration between students within the project framework contributed significantly to their increased motivation to learn. In addition, PJBLS allows students to take an active role in planning and implementing their projects, thus increasing their sense of responsibility and motivation towards the learning process. The structured reflection and feedback process in PJBLS also plays a vital role in improving the quality of student learning through active engagement, use of technology, collaboration, and an integrated reflection and feedback process. These findings fill the previously identified gaps and have important implications for developing learning approaches that can increase the quality of learning and students' learning motivation in higher education.

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