



The influence of the project based learning model on student knowledge based on science process skills (KPS) viewed from student learning motivation

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ABSTRACT

This research is a quasi-experimental research. This research aims to look at students' science process skills using the Project Based Learning (PjBL) learning model in terms of student motivation. This research was conducted at Potenti Utama University with the research sample being Industrial Engineering students in class A and B odd semester FY 2023 - 2024. The results of this research are learning using the PjBL learning model has an average difference value of 27.90, while in the control class it is 12.37. This shows that there is an increase in students' Science Process Skills in the experimental class compared to the control class. The difference in Science Process Skills of students in the experimental class is 29.00 for classes with low learning motivation and 43.00 for high learning motivation. Meanwhile, the control class for students' Science Process Skills was 23.00 for students with low learning motivation, and 39.00 for students with high learning motivation. This shows that there is a relationship between student learning motivation and Science Process Skills. Based on the test results using SPSS, it can be seen that the F-count value is 4.86. The calculated F result obtained compared with the F table at N = 38 is 4.10 with a significance level of 0.05. The calculated F results obtained are greater than the F table (4.86 > 4.10). Thus it can be concluded that it is accepted and rejected. So it can be said that there is a significant influence of the PjBL learning model on science process skills (KPS). $H_1 H_0$.

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INTRODUCTION

Education is a motivation that humans experience directly or indirectly directly, consciously or unconsciously. Education is the main factor in forming human character. Through education that can be obtained both from educational institutions and from experience in the environment, home,

etc. Education has an important role in determining the quality of society in a country, because good education will shape the character of good society as well.

Implementation of education is generally carried out through learning activities. The learning process in the classroom has several problems. According to Gage and Berliner in Fadhillah Suralaga, one of the problems in learning is designing learning procedures, motivating and interacting with students. As well as determining the right learning method (Suralaga, 2021). According to Fadhillah, determining the right learning method in the learning process is one of the problems encountered in the learning process, meaning that if the learning process is carried out using a fixed method, it is hoped that the learning objectives will be achieved by students.

Nowadays Education in the 21st Century Era. 21st century education has challenges in strategies and roles in bridging the gap between the education process in higher education. Learning in the 21st century is expected to be able to remind Shiva critical thinking skills (critical thinking), the ability to communication, collaboration and ability Creativity (Veloo & Ayob, 2020). The PjBL learning model is a learning model that is in accordance with education in the 21st century (Nirmayani & Dewi, 2021). 21st century learning components include communication and collaboration, collaboration and communication skills can be found in PjBL learning. students will be given activities that stimulate students to collaborate to complete projects and communicate the results of the projects carried out (Kembara et al., 2019) The curriculum currently being used in higher education is the OBE-based curriculum. Achievement-based curriculum (OBE) emphasizes the continuity of interactive, innovative and effective learning activities. Based on the demands of OBE-based learning, teaching staff have an important role, namely being effective educators as explained by Fadhillah, namely mastering the material and using learning strategi (Suralaga, 2021). A teacher must be able to have creativity in presenting learning so that learning is not boring because of interaction. Teachers present learning with varied interaction patterns, varied teaching styles, and elaborate on varied messages (Fitriyani et al., 2021)

Learning model is a working concept that provides a systematic description for carrying out learning to help students achieve the goals of that learning. The Project Based Learning (PjBL) learning model is a learning model that applies the Merdeka curriculum. PjBL stimulates students to explore, assess, interpret, synthesize and process other information to produce various forms of learning that are very close to real work in the field. The syntax of the PjBL learning model is in accordance with that developed by The George Lucas Educational Foundation (2005), namely: (1) asking essential questions to students, (2) designing project plans, (3) preparing activity schedules, (4) monitoring student motivation, (5)) assess student success, and (6) evaluate student experience. According to Purnomo.H, et al in his book, the objectives of PjBL learning include, among others, achieving thinking skills, social skills, psychomotor skills and process skills (Purnomo, 2019).

The PjBL learning model has many positive currents in the learning process, such as learning outcomes, motivation, creativity as proven by Yusikah.V, et al and Ramadhanti, N. Project-based learning has enormous potential to create a more engaging and meaningful learning experience for students as well as (Irman, 2020). PjBL learning model serves to increase students' learning motivation to learn, encourage their ability to do important work, and they need to be rewarded (Oksa & Soenarto, 2020). The PjBL learning model is also effective in improving student affectiveness (Suranti et al., 2017) According to Yusikah, I. the model in his research concluded that learning can increase student learning creativity (Yusika & Turdjai, 2021). Ramadhanti's research resulted in the completeness of student learning classically in cycle I it reaches 40% with an average value of 69.5. While the completeness of student learning outcomes classically in cycle II experienced increase compared to cycle I to 90% (Ramadhanti et al., 2023). Aside from creativity Learning motivation is a major influence for students in achieving learning outcomes. High motivation can improve learning outcomes in students (Muhammad, 2017). Model PjBL learning is a learning model that is able to increase student learning motivation so that it has an effect on student learning outcomes which will later achieve the learning objectives. This is in accordance

with what was stated by Jaka, A, namely that PjBL involves an inquiry process so that it can motivate strongly due to appearance. PjBL is able to increase interest in learning for teachers and students, able to stimulate many skills (Afriana, 2015). In accordance with the results of research conducted by Anggraini. (Anggraini et al., 2023).

Research related to learning with the PjBL model has been carried out by several researchers. According to Jusita, the ML Project-based learning model is able to increase motivation and learning outcomes, this can be seen from the significant improvements obtained in each cycle.(SMP Negeri 2 Ngantang, Malang Regency & Martina Lona, 2019). Rineksiane.NP in his research concluded that the positive impact of implementing Pjbl is that the student learning process is better and students have the stimulus to think critically in solving a problem. Although there is a negative impact in the form of quite large costs in implementing the PjBL model (Rineksiane, 2022). Ramadhanti.N, et al concluded that the results of their research increased student learning completeness from 40% in cycle 1 to 90% in cycle 2 (Ramadhanti et al., 2023). Fitri. H, et al concluded in their research that there was a significant influence on the PjBL model on high-level thinking abilities, motivation and achievement motivation which had a correlation with high-level thinking abilities (Fitri et al., 2018). Based on the results of initial observations carried out on students, it was found that the learning process carried out in the classroom was still less creative and innovative, although it was quite efficient because the learning material delivered was maximal. However, when learning is less innovative, students are less involved in the learning process, so the effect is that student learning motivation is very low. Based on the oral test carried out at each closing of the material given, around 70% of students were unable to apply the material that had been taught in the form of concepts or story questions.

Based on previous research on the implementation of the Project Based Learning (PjBL) learning model and several observation conditions found and aimed at implementing innovative learning and achieving learning objectives, the researchers conducted research entitled the influence of the PjBL Learning Model on motivation and Science Process Skills. This research was conducted at the Private Potential University of Medan. The population of this study were all Industrial Engineering students, Semester 1 of the Industrial Engineering Study Program. The sample in this research was Industrial Technical A students with a total of 28 people.

The theoretical implications of this research are expected to have a contribution in education-related learning. The practical implications of this research are expected to be taken into consideration for future researchers.

RESEARCH METHODOLOGY

This research is experimental research with a quasi-experimental type of research. The population of this study were all Industrial Engineering students, Semester 1 of the Industrial Engineering Study Program. The sample in this research was Industrial Technical A students as an experimental class with 38 people and TI B as a conventional class with 38 students.

Variable on This research is (Y) project based learning (PjBL) learning model as an independent variable. (X1) Science Process Skills as the dependent variable. And (X2) Student Learning motivation as a moderator variable. The instrument used in this research is a motivation questionnaire to measure student learning motivation which has been validated by a team of experts. To measure students' Science Process Skills, Science Process Skills test questions are used which have been validated by a team of experts.

The method used in this research using descriptive statistical analysis and multivariate tests which will use SPSS. Test the hypothesis with Two Way Analysis of Varieties (two way ANOVA) with the help of SPSS 20.0 for Windows. Previously, the data obtained from students would be tested for normality and homogeneity first.

RESULTS AND DISCUSSIONS

This research has two classes, namely the Experiment class which is given training using the PjBL learning model and the Control class which is the class which is given the learning process which is usually used in the learning process. In both classes, a pretest was given as a measurement of initial knowledge of the material being taught. Then a posttest is carried out at the end of the learning carried out. The pretest and posttest results obtained can be seen in table 1.

Table 1. Student pretest and posttest scores in experimental and control classes

Motivation to learn	Science Process Skills					
	Conventional Learning Control			PjBL Learning Experiment		
	Pretest	Posttest	Difference	Pretest	Posttest	Difference
Low	46.53	63.07	23.00	47.30	78.07	30.77
Tall	71.53	81.92	39.00	64.16	88.07	23.91
Average	59.86	72.23	12.37	55.65	83.55	27.9

Based on the results of the pretest and posttest scores, it was found that the average score for students given learning using the PjBL learning model had an average difference score of 27.90, while in the control class it was 12.37. This shows that there is an increase in students' Science Process Skills in the experimental class compared to the control class. The average results in the table above show that the application of learning using the PjBL learning model has an effect on students' motivation and Science Process Skills compared to classes that use the conventional learning model that is usually used.

The difference in Science Process Skills of students in the experimental class is 29.00 for classes with low learning motivation and 43.00 for high learning motivation. Meanwhile, the control class for students' Science Process Skills was 23.00 for students with low learning motivation, and 39.00 for students with high learning motivation. This shows that there is a relationship between student learning motivation and Science Process Skills. The results of two-way data analysis to test the hypothesis can be seen in table 2.

Table 2. Test of between-subjects effects

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	974.621	5	194.924	9.299	.000
Intercept	109912.308	1	109912.308	5243.487	.000
motivasi model	.000	0			
model	305.989	3	101.996	4.866	.007
Motivasi*model	.000	0			
Error	670.774	32	20.962		
Total	266925.000	38			
	1645.395	37			

a. R Square = .595 (Adjust R Square = .529)

Dependent Variabel : KPS

Hypothesis testing can be seen from the table above. Based on the test results using SPSS, it can be seen that the F-count value is 4.86. The calculated F result obtained compared with the F table at N = 38 is 4.10 with a significance level of 0.05. The calculated F results obtained are greater than the F table ($4.86 > 4.10$). Thus it can be concluded that it is accepted and rejected. So it can be said that there is a significant influence of the PjBL learning model on science process skills (KPS). $H_1 H_0$

Based on the results of the discussion that has been described, it can be concluded that there is a significant influence on students taught using the PjBL learning model having better

science processing abilities. This is in line with research conducted by Amanda, NG, et al. In his research, the PjBL learning model was produced which had an influence on the ability of Science Process Skills (KPS) with a significance value of $0.002 < 0.05$, based on this value it could be said that the hypothesis was accepted and rejected. $H_1 H_0$ (Amanda et al., 2023). Jatmika, S, et al in their research concluded that the use of the STEM integrated PjBL model in physics learning had a positive influence on students' science skills. (Jatmika et al., 2020). Paradise. A, concluded that the PjBL learning model was able to increase the KPS of junior high school students with an average N-gain score of 0.70 and was in the high category (Anthony Firdaus et al., 2020).

Model PjBL learning has been proven to be able to have a positive influence in improving science process skills. Looking at the phases of the PjBL learning model, namely; (1) generating problems, (2) designing project designs, (3) scheduling project activities, (4) project implementation, (5) assessment and evaluation. Looking at the phases of PjBL learning, it is clear that there is a stimulus given to students to be motivated in a scientific process. As explained by Rustaman, he stated that Science Process Skills are complex tools that scientists use in the process of scientific investigation, KPS is procedural knowledge that can be developed by students in stages (Rustaman, 1992). The results of this research also explain the difference in learning outcomes of students who have high learning motivation and students who have low learning motivation, namely, the experimental class difference is 29.00 for students with low learning motivation and 43.00 for high learning motivation. This proves that the PjBL learning model has an influence on student learning motivation. The average results in the table above show that the application of learning using the PjBL learning model has an effect on students' motivation and Science Process Skills compared to classes that use the conventional learning model that is usually used. The relationship between motivation and the PjBL learning model is in accordance with the results of research conducted by Sakilah, et al. which states that there is a significant difference in students' learning motivation using the PjBL learning model, namely that students who were taught using the PjBL learning model had a learning motivation of 89.33 and students who were taught with conventional learning has a learning motivation of 74.48 (Sakilah et al., 2020). Akbar.F, et al stated that PjBL is effective in increasing students' learning motivation (Akbar & Bahri, n.d.)

CONCLUSION

The results of this research can be concluded that there is a significant influence on students' Science Process Skills (KPS) in terms of student motivation using the PjBL (Project Based Learning) learning model. This can be seen in the Anava test results using SPSS, the F-count value is 4.86. The calculated F result obtained compared with the F table at $N = 38$ is 4.10 with a significance level of 0.05. The calculated F results obtained are greater than the F table ($4.86 > 4.10$). Thus it can be concluded that it is accepted and rejected. So it can be said that there is a significant influence of the PjBL learning model on science process skills (KPS). The difference in Science Process Skills of students in the experimental class is 29.00 for classes with low learning motivation and 43.00 for high learning motivation. Meanwhile, the control class for students' Science Process Skills was 23.00 for students with low learning motivation, and 39.00 for students with high learning motivation. This shows that there is a relationship between student learning motivation and Science Process Skills. Based on the results of the pretest and posttest scores, it was found that the average score for students given learning using the PjBL learning model had an average difference score of 27.90, while in the control class it was 12.37. This shows that there is an increase in students' Science Process Skills in the experimental class compared to the control class. $H_1 H_0$

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