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Transformation Through Problem Based Learning (PBL) to Improve Team Skills and Managerial Proficiency of Shipping Electrical Cadets Course in Diploma III Study Program

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Abstract. This study aims to determine the influence of the Problem Based Learning (PBL) method in learning Leadership of Teamwork Skills and Managerial Skills on the learning outcomes of Diploma III Electrical Sailing Cadets. This research was conducted at the Surabaya Shipping Polytechnic. The study runs from March to September 2023. The research method used was quasi-experimental with pretest-posttest control group design and sampling techniques with cluster sampling. Class DIV TRPK A as the control class and class DIV TRPK B as the experimental class. The instruments used are test instruments in the form of multiple-choice questions and non-test instruments in the form of student activity observation sheets. Based on the analysis of test data, it was found that there was an influence of the Problem Based Learning (PBL) model on student learning outcomes in learning Leadership of Teamwork Skills and Managerial Skills. It is based on the results.

Keywords. Problem Based Learning (PBL), Learning Outcomes, Leadership Teamwork Skills, Managerial Skills

1. Introduction

Education is a crucial stage in the development of individuals and society. In achieving quality learning outcomes, attention to effective learning resources is essential. Education is not only about transferring information, but also the process of discovery and formation of knowledge [1]. It emphasizes that education involves active interaction between learners in building their understanding.

The choice of teaching method has an important role in the effectiveness of delivering educational material to students. Teachers must choose a method that suits the learning material and the characteristics of students [2]. The compatibility between teaching methods and learning objectives becomes an important factor in assessing the extent to which learners understand the concepts taught. Effective teaching methods will stimulate active participation of learners, encourage critical thinking, and support deep understanding.

One approach that has proven successful in increasing student understanding is problem-based learning (PBL). PBL is a learning method that allows learners to be actively involved in real-world problem solving [3]. In this approach, learners are faced with complex

problems that require solving. They work together to find solutions, which encourage critical and creative thinking. PBL brings context into learning, allowing learners to integrate their knowledge in real-life situations.

PBL has been shown to be effective in improving concept understanding, analytical thinking skills, and application of knowledge [3]. Students also feel higher motivation because they see the relevance and practical application of learning [5]. Although PBL has many benefits, there are challenges in its implementation, including ensuring learners are actively involved in the learning process [6]. In addition to understanding concepts, education must also prepare learners with relevant skills for the increasingly complex world of work. Managerial skills, teamwork skills, and leadership become important in education [7]. Managerial skills include human resource management, decision making, and strategic planning [8]. The ability to work in teams is also highly valued in the modern world of work [9]. In the context of the Diploma III Electrical Shipping study program, effective leadership is essential in achieving the organizational and safety goals of the crew [10], [11].

By using PBL in leadership learning, teamwork skills, and managerial skills, learners can develop an in-depth understanding of concepts and mastery of skills relevant to the world of work [3], [7]. However, challenges need to be overcome in activating learners in PBL and planning its implementation well [12]. PBL is a powerful method of preparing learners for the complex world of work. By facilitating active and relevant learning, PBL helps learners understand, internalize, and apply their knowledge and skills in real-world contexts [13]. This approach has great potential in improving education and preparing generations of learners for future challenges.

2. Methodology

The method used in this study is quantitative. This method was chosen because quantitative research is one type of research activity whose specifications are systematic, planned, and structured from the beginning starting from making research designs, be it about research objectives, research subjects, research objects, data samples, data sources, and methodology [14]. Measurable research variables with various forms of measurement scales, namely nominal, ordinal, interval, and ratio scales [13],[14]. Population In this study are cadets of the DIV study program of ship machinery engineering technology, the samples used in this study are DIV TRPK cadets and as a control class are class A and as an experimental class class B .

The processed data was obtained through the value of pre-test and post-test results to determine the influence of the media used on the learning outcomes of nursing courses and improvement of ship accommodation control [15]. While the type of research used in this study is quasi-experimental research (quasi experiment) In the quasi experiment method, researchers try to determine whether a treatment affects the results of a study. This effect is assessed by applying a particular treatment to one group (treatment group) and not applying it to another group (control group), then determining how the two groups determine the final outcome [16]. In this study, the quasi experiment method used a form of nonequivalent control group design, where the experimental group (A) and control group (B) were selected without random assignment

In this study there are two kinds of instruments, namely learning media and tests (pre test and post test)[14]. The learning media is used to distinguish between the experimental class and the control class, while the test is used as a reference to determine the ability of students in

the pre-test and post test, students are required to do leadership and teamwork subject questions according to the material that has been delivered in the form of Multiple Choice questions[17]. For the validity test of learning media, both in the form of consulting and asking for consideration to teachers of leadership and teamwork subjects to be examined and evaluated systematically whether these media are in accordance with the material in leadership and teamwork subjects.

A test is said to have reliability if it gives consistent results when tested repeatedly. Reliability refers to the extent to which test results remain stable over time. In other words, if examinees are given the same test at different times, the relative ranking of the examinee will remain the same [18]Instrument reliability testing can be done through two approaches, namely externally and internally. The external reliability approach involves testing stability (test-retest), equivalence, or a combination of the two. In a stability test (test-retest), the instrument is tested at two different times, and the results are compared to see the extent of its consistency. External approaches also include equivalence tests, which involve comparing two equivalent versions of the test[19]

An internal approach to testing an instrument's reliability involves analyzing the consistency between items in the instrument using specific techniques [20]. One method used to measure internal reliability is to measure internal consistency. This method involves administering the test only once to the respondent, and then analyzing the results using certain statistical techniques. The results of the analysis are used to predict the extent to which the instrument can reliably measure what is intended.

In the context of this study, instrument reliability testing is important to ensure that the tests used can provide consistent and reliable results in measuring the ability of learners. Good reliability results will increase the validity of research findings and confidence in measurement results

The normality test is intended to determine whether the data obtained in the study has a normal distribution distribution or not. If the data is normally distributed, parametric statistical tests can be used. techniques that can be used to test data normality include Probability Paper and Chi Squared [21]].

In this study, the step of data analysis techniques carried out is a difference test. The difference test used is using a parametric method with the condition that the data must be normally distributed. The test technique used is the t-test technique (t-test). The T-test is often used in experiments using correlated samples [22]. What is meant by correlated samples is none other than samples that have been matched (matched) one of the variables (maybe also two three variables or more).

The homogeneity test is a test that must be done to see whether the two classes studied are homogeneous or not, then the results are compared with F table [23]. When calculations are obtained, then the sample is said to have the same variance or homogeneous. Determine with numerator $dk = n - 1$ and denominator $dk = n - 1$ with a significant level of 0.05. If, $F_{\text{calculate}} > F_{\text{table}}$, means Inhomogeneous If, $F_{\text{calculate}} \leq F_{\text{table}}$, means Homogeneous £ [24].

Decision making of the results of the hypothesis test is the results of the t test then compared with t tables with a significance level of 5% for the one-tail test to determine H_0 accepted or rejected. If $t_{\text{counts}} < t_{\text{table}}$ then H_0 is accepted, meaning that the learning outcomes of experimental class students are the same as the learning outcomes of control class students. If $t_{\text{counts}} \geq t_{\text{table}}$ then H_a is accepted, meaning that the learning outcomes of experimental class students are better than the learning outcomes of control class students. To find out how much influence the use of the Problem Based Learning method has on student

learning outcomes, it can be known by finding the difference in the average posttest score between the control class and the experimental class [23].

Based on these calculations, it can be concluded whether the use of the Problem Based Learning method affects the learning outcomes of students in leadership learning, teamwork skills and managerial skills [25]. The amount of this value is expected to be used as a comparison if there is similar research to test the influence of other learning media.

3. Result and Discussion

Pretest results obtained by students (DIV TRPK A) and (DIV TRPK B) using the Problem Based Learning (PBL) method at the Surabaya Shipping Polytechnic are shown in table 1 below.:

Table 1. Experimental and Control Class Pretest Results

Data Centralization and Dissemination	Class	
	Control	Experiment
Lowest Value	15	10
Top Rated	77	75
Mean	42,22	43,89
Median	40	50
Mood	20	50
Standard Deviation	18,33	16,55

The median or middle value produced by the control class was 40, while the experimental class was 50. The value that often appears or mode in control class is 20 while in experimental class 50. The control class obtained a standard deviation of 18.33 while the experimental class obtained 16.65.

Posttest results obtained by students (DIV TRPK A) and (DIV TRPK B) using the Problem Based Learning (PBL) method at the Surabaya Shipping Polytechnic are shown in table 2 below

Table 2. Experimental and Control Class Pretest Results

Data Centralization and Dissemination	Class	
	Control	Experiment
Lowest Value	30	50
Top Rated	90	95
Mean	61,94	75,97
Median	65	80
Mood	70	95
Standard Deviation	19,75	15,93

Based on Table 4.2 above, it can be seen that the lowest value obtained by the control class is 30, while the experimental class is equal to 50. The control class obtained the highest score of 90, while the experimental class received 95. The mean obtained in each control class and experimental class was 61.94 and 75.97, respectively.

The mode or median value of the control class is 70, the middle value of the experimental class is 80, and the median value of the control class is 65, the standard deviation of the experimental class is 15.93.

pretest and posttest result of the control class and experimentation tested normality. The calculation results are presented in the following Table 3:

Table 3. Normality Test Results

Statistics	Pretest		Post Test	
	Experiment	Control	Experiment	Control
Sample(n)	36			
Lo	0,085	0,136	0,116	0,109
Ltable	0,15			
Conclusion	Usual	Usual	Usual	Usual

Table 3 shows that both groups of data have a normal distribution at the level of 0.05. Data is normally distributed if you $< L_{table}$. The pretest normality test results for the experimental group were $0.085 < 0.15$ and the control group were $0.136 < 0.15$, respectively where $Lo < L_{table}$. The posttest normality test results for the experimental group were $0.116 < 0.15$ and the control group were $0.109 < 0.15$, respectively where $Lo < L_{table}$, meaning the data were normally distributed.

Homogeneity testing was carried out on pretest and posttest data of control classes and experiments. The following Table 4 is the result of the Homogeneity Test:

Table 4 Homogeneity Test Results

Statistics	Pretest		Posttes	
	Experiment	Control	Experiment	Control
Value of Variance	277,302	336,349	254,027	390,398
Calculate F value	1,2		1,53	
F value of the table	1,75		1,75	
Decision	homogeneous data		homogeneous data	

The F value of the table is taken from the statistical F table at a significance level of 5%. The decision is taken based on the provisions of testing the homogeneity hypothesis, that is, if $F_{counts} \leq F_{table}$ then it can be declared that both data are homogeneous. The data in Table 4.4 shows that the F value of both pretest and posttest data is smaller than the F value of the

table, so it can be stated that the pretest and posttest results in the control class and experimental class have the same student abilities during the pretest and posttest.

The prerequisite test of statistical analysis, showed that the data were normally distributed and homogeneous the pretest and posttest. Hypothesis testing is carried out to determine whether there are significant differences between the experimental group and the control group. Because both data are normally distributed and homogeneous, the statistical test used is the t test at a significant level $\alpha = 0.05$. The sample is stated to have a significant difference when $t_{count} > t_{table}$. The calculation results can be seen in Table 5. the following

Table 5. Pretest and Posttest Hypothesis Test Calculation Results

Statistics	Pretest	Posttest
tcount	0,46	3,14
ttable	1.99	
Decision	H0 accepted There is no difference	H0 rejected There are differences

The decision is taken based on the provisions of the hypothesis test, i.e. if tcount (t-test value) is greater than ttable (critical value), then H1 (alternative hypothesis) is accepted while H0 (null hypothesis) is rejected. In this context, the results of the hypothesis test show that there is a significant effect of problem-based learning (PBL) on student learning outcomes [5]. Then, the t-test results of the pretest data in the experimental and control groups indicated that both groups had equivalent levels of initial knowledge before the application of PBL. The students' pretest results did not show significant differences between the two, suggesting that differences in learning outcomes that emerged after treatment could be attributed to differences in learning approaches [6].

Furthermore, the results of posttest data analysis showed that tcount (t-test value) was greater than ttable (critical value), indicating that there was a significant difference in learning outcomes between the experimental group and the control group after the application of PBL. In other words, the application of PBL models effectively affects student learning outcomes in the context of leadership learning, teamwork skills, and managerial skills [7]. This significant difference suggests that PBL models have a positive impact on student learning outcomes, and these results are consistent with findings in previous studies that underscore the effectiveness of PBL in increasing students' active participation in learning and improving learning outcomes [8].

The observations also support these findings, noting that learning using PBL models in the context of leadership and teamwork learning achieves higher levels of student participation than conventional learning. This confirms that the PBL model encourages student engagement and better learning outcomes [9]. Overall, this study illustrates that the application of PBL models in leadership learning, teamwork skills, and managerial skills has a positive impact on student learning outcomes, corroborating findings in previous studies supporting the effectiveness of PBL as an active and effective learning method [6].

4. Conclusion

The conclusion of this study is that there is an influence model of the influence of the problem-based learning (PBL) method in learning leadership, teamwork skills and managerial skills on the learning outcomes of cadets of the diploma III electrical shipping study program. This is based on the results of the posttest hypothesis through a t-test with a calculated value = 3.14 and $t_{table} = 1.99$, so that H_1 can be accepted because the calculated value $> t_{table}$. This shows that student learning outcomes with the Problem Based Learning (PBL) learning model are higher than the conventional learning model (discussion and question and answer) [26] [24].

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