The Effectiveness Of Problem-Project Based Learning To Improve Students' Understanding Toward Gasoline Motor

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Abstract: this study aims to determine the effectiveness of problem-project based learning model to improve students' understanding of gasoline motors. With the cluster random sampling technique in selecting samples one control class and one experimental class were selected. After being given treatment in each class, obtained post-test data. This post-test data were analysed using the t test. The average post-test results showed that the experimental class was higher than the mean of the control class. Thus it means that learning problem based project learning is more effective than conventional models.

Index Terms: Problem Project Based Learning, Gasoline Motor, Post-test, Effectiveness.

1 INTRODUCTION

The challenges of technology education in Indonesia are very important because there will be an Asean Economic Community. The Asean Economic Community (AEC) is a form of economic integration in the ASEAN region. MEA is a new chapter for economic development that provides opportunities and challenges for member countries. In the ASEAN Economic Community not only opens the flow of trade in goods or services, but also the professional labor market, such as lawyers, doctors and others. The challenge for the development of productive workforce becomes an absolute thing that must be able to compete, in terms of quantity those who are at a young age will dominate in the life of the nation and state one or two decades ahead. If our young generation becomes a low skilled workforce, they will be unable to compete with outside workers. Therefore, Technology and Vocational Education must play a role to prepare workers who are ready to compete, have competencies that are able to face the ASEAN Economic Community [1].The development of learning innovations in the organization of vocational education must be carried out by the managers of vocational education so that the quality and quality of graduates is in accordance with the demands of the job market. Vocational education institutions must be able to overcome and face the changes that occur by utilizing various existing capabilities. Vocational education is as a provider of prospective workers, must be able to utilize the resources owned and network of partnerships with outsiders effectively, which challenges the world of work may be high along with the times and technology that will enter the Asian Economic Community (AEC), which refers to vocational education institutions must be able to anticipate and deal with changes that occur by utilizing all available capabilities.

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Innovation and development of the learning process is a process that involves management, lecturers or instructors as well as the whole community of institutions intended as stakeholders and can give birth to new ideas in the organization of vocational education [2][3].For that reason, efforts to overcome these problems are a real role that can be done is to facilitate human resources who have the skills to improve existing learning processes. This concrete manifestation is so that there is interaction between students and learning resources, both designed and utilized to produce learning experiences. Learning experience can be in the form of knowledge, skills, attitudes towards one field and professional performance [4]. The results of the review indicate that the implementation of learning in the automotive engineering department carried out so far generally provides a theoretical explanation using the lecture method and power point media that is interspersed with questions and answers. And from observations while developing this course, the problem often faced by students is that it is difficult to apply the concepts in the given assignment, as well as the low problem solving ability, the limited critical thinking skills possessed by students, and the low motivation of students with courses that are relating to tasks that require creativity. It is suspected that the possible factors causing these obstacles include the lack of student attention when the lecturer explains the learning material, because the learning model used is not appropriate. The learning model is always centered on the lecturer or teacher tends to fail in developing various skills such as the ability to solve problems, the ability to think critically, the ability to communicate, and the ability to cooperate [5]. Which class description faced shows that there is a gap between the actual conditions faced with the optimal conditions that must be achieved.Efforts made in the acceleration of learning activities for gasoline motorbikes are those that will be carried out will be focused on efforts to develop a Problem-Project Based Learning (PPjBL) model, which is a learning model that is an integration of Problem Based Learning (PBL) and Project Based Learning (PjBL). The integration of these two models is needed to synergize between the Problem Based Learning (PBL) model and the Project Based Learning (PjBL) in learning. As it is known that the PjBL model requires a good mastery of the concept of knowledge before entering the project model, so this becomes a weakness of this model for students with low ability. Therefore, this limitation will be overcome by integration

between models between Problem Based Learning (PBL) Problem-Project Based Learning (PPjBL), and Project Based Learning (PjBL). Before implementing PjBL students first learn with PBL learning models, so students have academic mastery and have good problem solving skills, which are very necessary for the successful implementation of the Problem-Project Based Learning (PPjBL) model [6].Although there have been many studies conducted on the application of PBL in the learning of various subjects, the development of calm research by integrating the PBL Model and the PBjL in learning Gasoline Motorcycles, has never been done in Indonesia. The selection of the project-based Problem-learning (PPJBL) model that will be developed on the grounds that the results of previous studies show that the Problem-based learning (PBL) and Project-based Learning (PjBL) models can separately find a way out to improve the problems faced, namely due to conditions actual and optimal conditions that can be expected in the implementation of learning [7].The Problem-project-based learning (PPJBL) learning system has an instructional impact and is expected to be able to improve student academic achievement and have an accompanying impact that can create good interactions between students, so that these conditions can; (1) improve the positive nature of the learning material, (2) it is very good for improving student learning achievement, (3) can increase student learning participation because all team members have the same responsibility in mastering the material, (4) can improve student communication skills , (5) can improve metacognition effort, and (6) improve competence in a healthy manner because there is an award to provide the broadest learning opportunities through learning activities. The purpose of this study was to determine the effectiveness of problem based project learning model learning to improve students' understanding of gasoline motors.

2 METHODOLOGY

This research is quasi experimental with pre-test post-test design that uses two classes as experiment group [8]. The first experimental class, the students were given treatment with the Problem project based learning model and the second experimental class, the students were given treatment with the learning based project learning model. The population in this study are students of class Jurusan Vokasi Teknik Otomotif Fakultas Teknik Universitas Negeri Padang, Sumatera Barat. The sampling of research used cluster random sampling technique. Problem based learning and project based learning are as independent variable and dependent variable is result of cognitive learning and environmental cares attitude. The technique of data collection in this research is by test and non-test. pre-test and post-test tests were used to determine students' cognitive learning outcomes. Data analysis techniques used prerequisite test (normality test, homogeneity test), and N gain test [9].

3 RESULT AND DISCUSSION

This study raised the research variable, namely the independent variable of gasoline motor learning with PPJBL model and the dependent variable, namely learning outcomes. Student learning outcomes data obtained by multiple choice tests. In this study, researchers obtained data from the results of pre-test and post-test conducted in the experimental class and the control class. Post-test is an ability test given to students before being given treatment, while post-test is done after students get treatment. Both of these tests serve to measure the effectiveness of the learning program. After the two classes are given treatment, then they are given a post-test for both classes. This is done to determine the student's final ability after treatment. To provide a clearer picture the research data is grouped by the experimental group and the control group.

3.1 Control Class

Pre-test Control Class with a total of 25 students, the average value of the overall data is 71 middle values of the sorted data is 70, while the most frequent data appears 70. Furthermore, for the distribution of statistical data of 4.12 and the square of the difference between each data against the average value is 17. For the highest score is 80 and the lowest score is 65, while the difference between the highest score and the lowest score is 15, and the total score is 1780.Control Class Post-test with the total data of 25 students, the average value of the overall data is 73 middle values of the sorted data is 73, while the data that most often appear 70. Furthermore, for the distribution of statistical data of 4.84 and the square of the difference between each data against the average value is 23.49. The highest score is 80 and the lowest score is 60, while the difference between the highest score and the lowest score is 20, and the total score is 1834.

3.2 Experiment Class

Pre-test Experiments Class with the total amount of data of 26 students, the average value of the overall data is 80 middle values of the sorted data is 80, while the most frequent data appears 75. Furthermore, for the distribution of statistical data of 5.31 and the square of the difference between each data against the average value is 28, 28 for the highest score is 89 and the lowest score is 70, while the difference between the highest score and the lowest score is 19, and the total score is 2087.Experimental Class post-test with the total data of 26 students, the average value of the overall data is 85 middle values of the sorted data is 85, while the data that most often appear 85. Furthermore, for the distribution of statistical data of 4.79 and the square of the difference between each data against the average value is 22.99. The highest score is 95 and the lowest score is 75, while the difference between the highest score and the lowest score is 20, and the total score is 2211. Before an analysis of student learning outcomes is carried out, first the analysis requirements test is performed, namely the normality test and the variance homogeneity test.

3.3 Normality Test

Normality test conducted using Kolmogorov Smirnov statistics with a significant level $\alpha = 0.05$, tested with SPSS. The test results can be seen in the Table 1 below:

One-Sample Kolmogorov-Smirnov Test

		VAR00001	VAR00002
N		25	26
Normal Parameters[a,b]	Mean	73,3600	85,0385
	Std. Deviation	4,84665	4,79567
Most Extreme Differences	Absolute	,164	,157
	Positive	,116	,123
	Negative	-,164	-,157
Kolmogorov-Smirnov Z		,820	,802
Asymp. Sig. (2-tailed)		,511	,541

a. Test distribution is Normal.

b. Calculated from data.

The post-test normality test results in Table 1 show the Asymp value. sig. (2-tailed), for the experimental class of 0.541 and the control class of 0.511 which means > from 0.05 means that both post-test data are normally distributed. This shows that the data used in this study are normally distributed and can be used for subsequent tests.

3.4 Homogeneity Test

Homogeneity test is carried out on the test of student learning outcomes by using the levene test with SPSS software with data criteria said to be homogeneous if the significance level is greater than 0.05. The test results can be seen in the table 2 below:

Test of Homogeneity of Variances

VAR00001

Levene Statistic	df1	df2	Sig.
,038	1	49	,847

Table 2 post-test Homogeneity Test Based on Table 2, it can be seen that the significance value of post-test is 0.847, which means> 0.05, so that the decision of post-test student data obtained in this study has the same variance.

3.5 T-test

From the results of tests given to the control class and the experimental class can be identified and analysed as follows table 3:

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
VAR0003	Equal variances assumed	,038	,847	8,649	49	,000	11,67846	1,35033	8,96488	14,39205
	Equal variances not assumed			8,647	48,875	,000	11,67846	1,35061	8,96413	14,39280

Based on the results of the post-test t test in Table 4.20 the significance results obtained from both classes amounted to 0,000, which means that it is small than 0.05 (sig 0,000 <0.05). It can be concluded that there is a significant difference between the learning outcomes of the control class and the experimental class. The mean score of the control class post-test was 73 while the average value of the post-test experimental class was 85.

From the results of the post-test test for the experimental control class there is no difference in meaning the control and experimental classes have the same ability. So that both classes are given treatment. Experimental class students are taught using the PPJBL model and the control class without using the PPJBL model. The experimental class and the control class were given treatment by giving pre-test and post-test. With the aim to find out whether student learning outcomes increase or not increase.To know the difference between pre-test and post-test learning outcomes, a t-test was conducted in the learning process using the PPJBL model. T-tests were performed on pre-test and post-test data. T-test on pre-test data aims to see the difference between the control class and the experimental class. Where the control class without using the PPJBL model and the experimental class using the PPJBL model.Thus, it can be concluded that the results of the t-test show significant differences in learning outcomes between classes using the PPJBL model (experimental class) and classes that do not use the PPJBL model (control class). This is evidence that the use of the PPJBL model is effective for use in learning about gasoline engines.

4. CONCLUSION

The conclusions of this study is that problem project based models is more effective in improving students' cognitive learning outcomes compared to project based models. Both of them show significant differences in improving students.

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