An Influence of Problem-Based Learning Models Assisted by Media Trainer Programmable Logic Control and Achievement Motivation on Skills Competence

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ABSTRACT
This study aims to obtain information: (1) differences in the competence of students who are taught using a problem-based learning model assisted by PLC trainer media and assisted by conventional media; (2) differences in the competence of students with high achievement motivation, compared to students with low achievement motivation. The research design is quasi-experimental: the non-equivalent control group design. In this design, the experimental group and the control group were not chosen randomly. As a measuring tool for competency achievement in this study, learning outcomes tools and instruments were made, which functioned as instruments to assess the competence of students during the learning process. The experimental treatment used a problem-based learning model assisted by the Programmable Logic Control media trainer and for the control class assisted by conventional media. The study found: (1) the competence skills for students who were taught using a problem-based learning model assisted by the Programmable Logic Control trainer learning media, were significantly higher than those assisted by conventional media; and (2) skill competence for students with high achievement motivation is significantly higher than those with low achievement motivation.

Keywords: *Problem-based learning model, Achievement Motivation, Skill competence*

1. INTRODUCTION

The definition of the National Education System for Vocational High Schools is education that prepares students ready to work in certain fields." To achieve expertise competence, several things are taken into consideration including technological developments, the job market, population growth, changes in work patterns, the concept of local excellence, infrastructure, number, and quality of teachers [1].

SMK Negeri 2 Probolinggo is one of the Vocational High Schools that have experience in education in the electrical power installation engineering expertise package. Based on an initial survey of other teachers and the curriculum section, It is found several problems that the students who study in the electrical power installation engineering expertise package lack of understanding of learning control systems. They lack understanding about Programmable Logic Control (PLC) subjects, lack understanding of sensor functions in real or near-real conditions. The student learning activities in PLC subjects less evenly (only a few students active), and less attractive learning media, especially Programmable Logic Control media.

The learning model according to [2][3] is one of the training approaches wont to stimulate students' higher-order thinking in problem-oriented things, together with learning the way to learn. The characteristics of problem-based learning are authentic problems, involving many subjects, scientific investigations, producing real work, developing thinking skills, and social skills in dealing with complex problems.

The ultimate goal of learning is to produce students who have attitudes, knowledge, and skills in solving problems faced in their lives. For this reason, teachers must have appropriate learning strategies. So it is necessary to plan a lesson that can be applied in PBM. To achieve optimal learning outcomes, it is necessary to design a problem-based learning model planning properly. Starting from preparing problems following the curriculum that will be developed in the classroom, raising

problems from students, equipment, and assessments used. The planning made is a means of smoothing the phases of problem-based learning and achieving the desired learning objectives.

In addition to the use of appropriate learning models, motivational factors also affect the competence of students. [4], "Motivation is an impulse contained people who always want to try to make behavioral changes to be better [9] argues that learning is very necessary for motivation. The higher motivation is given, the more attainment for the lesson[5]. The function of motivation can be as a driving force for humans to act, namely determining what actions must be done to achieve goals by setting aside actions that are not useful for these goals. Meanwhile, research in[4] argues that there are three motivational principles, namely to make something do something, to keep doing something, and to determine which direction to do something.

The motivation is an urge to go to certain conditions that have not previously had the urge to do something, with that urge someone will keep doing something, and determine which way to do something to meet his needs towards a better direction.

To improve the quality of learning outcomes, there is some method by applying the learning strategy or learning media. Problem-based learning is one of the strategies to improve the learning outcome of the student. Research that discusses problem-based learning to lead the pedagogical process has been explored in [6], improving transversal cognitive in [7]. develop computer-based learning in [8], constructive approach in [9], dynamic electricity course in [10], and cooperative PBL in [11]. There is some problem- based learning method to improve the student learning outcome.

Based on the background in the introduction, the aims of this study are. 1) Obtaining information on differences in competency skills of students who are taught using a problem-based learning model assisted by Programmable Logic Control learning media, compared to those assisted by conventional media in learning to describe the design and apply a series of Programmable Logic Control. 2) Obtaining information on the difference in competency skills of students with high achievement motivation compared to those with low achievement motivation in learning to describe the design and implementation of PLC circuits.

2. RESEARCH METHODS

This study uses the type of experimental research. The purpose of this experimental research is to: test the hypothesis proposed in the study, predict events or events in the experimental setting, and draw generalizations of the relationships between variables. The design used in this study is a Quasi-Experimental design: the non-equivalent control group design. In this design, the experimental group and the control group were not chosen randomly. In this design, both the experimental group and the control group are compared, the groups are selected and placed without going through random. The two existing groups were given a pre-test, then given treatment, and finally given a post-test. The design of this study involved an independent variable, and one dependent variable, with the complication that additional independent variables (moderator variables) were included in addition to the control variables.

Experimental treatment uses a learning model based on problems assisted by Programmable Logic Control media and in the control class using conventional media.

Illustration of the modification of the pre-test-post-test design of the control group with one variable into a factorial design with one treatment variable and one moderator variable (the moderator variable is indicated by the letter Y with two levels, Y1 and Y2), The research design is as shown in Figure 1

C_E	O_1	X_1	Y_1O_2
	O_3		Y_2O_4
Cc	O_5	X_2	Y_1O_6

Fig 1. Quasi-Experimental design: the non-equivalent control group design [11].

CE : Experiment class

Cc : Control class

X1 : Treatment / experimental class treatment

X2 : Treatment/control class treatment

$O_{1,3,5,7}$: Pre-Test

$O_{2,4,6,8}$: Post-Test

Y1 : High achievement motivation

Y2 : Low achievement motivation

In this study, the subjects were divided into two classes, namely: (1) CE class, which is a class that is taught using a problem-based learning model assisted by PLC media, and (2) CC class, which is a class that is taught using problem- assisted learning by conventional media.

Determination of the high and low attainment of motivation in the class group by finding the middle score, namely the lowest score is added up with the highest score divided by two. The high achievement motivation group has a score greater than or equal to the middle score, while the low achievement motivation group has a score less than the middle score.

Data analysis techniques used in this study include:

1.1. Analysis Prerequisite Test

1.1.1. Normality test

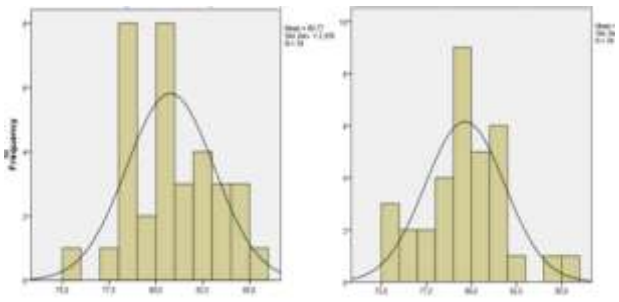
A normality test is used to test whether the learning outcomes obtained are normally distributed or not. The learning outcomes tested include: knowledge, attitudes, and skills learning outcomes. For learning outcomes, the knowledge tested includes a pre-test and post-test scores. The adopted test, in this case, is the Kolmogorov-Smirnov. It uses the SPSS program. If a significance level of 0.05 is obtained, the data is normally distributed, and if 0.05 then the data is not normally distributed.

1.1.2. Homogeneity Test

The experimental and control group are examined with the homogeneity test to get the knowledge performance of the student learning outcomes.

Table 1. Descriptive Statistical Data On Learning Outcomes In The Skills Area

Mean	80,77	79,64
Std. Deviation	2,335	2,205
Variance	5,450	4,860
Skewness	0,155	0,260
Kurtosis	-0,646	0,522



(a) (b)

Fig 2. Histogram and normal curve the expense of learning results in the skill field (a) in the control class, and (b) in the experimental class.

The two groups were the same or not. The learning outcomes tested include learning outcomes of knowledge, attitudes, and skills. For learning outcomes, the knowledge tested includes a test before and after treatment. In this study, Levene's was used to get the variance value.

Table 2. Testing The Statistical Hypothesis Of Learning Outcomes In The Domain Of Skills

Tests of Between-Subjects Effects
Dependent Variable: Learning Outcome Scores in the Experimental Class and Control Class Source

Source	Of Squares	df	Mean Square	F	Sig
Corrected	152,859a	3	50,953	15,603	0,000
Intercept	437431,654	1	437431,654	133948,	0,000
Model_PBM	21,606	1	21,606	6,616	0,012
Motivasi_Ber pre		1	103,592	31,721	0,000
Model_PBM * Motivasi_Ber stasi	27,661	1	27,661	8,470	0,005
Error	209,003	64	3,266		
Total		68			
Corrected Total		67			

a. R Squared = ,433 (Adjusted Squared = ,406)

Statistical hypothesis: $H_0 : \mu_1 = \mu_2$
$H_1 : \mu_1 \neq \mu_2$

To evaluate the homogeneity, the application of SPSS software has been purposed. obtained a significance level of 0.05 then the data is taken from a homogeneous sample and if 0.05 then the data is taken from a sample that is not homogeneous.

1.2. Hypothesis Evaluation

Testing the value of the hypothesis is the last way to determine what is the alternative answer to the problem formulation. It was noticed by considering the truth assumption in this research. Otherwise, statistical hypothesis evaluation is also meaningful if the null hypothesis is obtained or declined. The denominator hypothesis test usage is a two-way ANOVA. In this study, the separation of statistical hypothesis evaluation was carried out between knowledge learning outcomes, attitude learning outcomes, and skills learning outcomes on student achievement motivation. The research hypothesis above will be accepted if the significance value obtained from the calculation of the F value using SPSS is less than 0.05 and which effect is better by looking at the difference in the mean between groups.

3. RESULTS AND DISCUSSION

The results of statistical data processing scores of learning outcomes in the realm of skills are given in Table 1. Meanwhile, the normal curve for learning outcomes in the skill domains is shown in Figure 2. The measure of concentration and learning outcomes in the skill domain of the experimental class and the control class is in the form of a different average score, for the experimental class it is 80.77 and for the control class, it is 79.64. The size of the data distribution is indicated by the value of standard deviation, variance, skewness (slope), and kurtosis (slenderness). The value of standard deviation, variance, skewness (slope), and kurtosis (slope) of experimental class data are 2.335, 5.450, 0.155, and -0.646.

While for the control class are 2.205, 4,860, 0.260, and 0.522, respectively. In the experimental class the tendency of the data towards a low value because the value of positive skewness is 0.155 and the control class has a tendency of data towards a low value because the value of positive skewness is 0.260. The experimental and control classes have a kurtosis value below 0.263, so it can be consummate that the learning result score in the skill domain has a high distribution. Based on the histogram in Figure 2, it appears that both graphs have normally distributed.

Analysis Prerequisite Test

3.1. Normality test

The results of the normality test are adopted to examine whether the distribution of the scores is normal or not. It used is the Kolmogorov-Smirnov method. Then to answer the research hypothesis, hypothesis testing is carried out as follows.

3.1.1. First Hypothesis Testing:

H1: Skills learning outcomes for students who are taught using a problem-based learning model assisted by Programmable Logic Control media are powerfully assisted the student understanding than uses the conventional media in learning to describe the design and implement a series of Programmable Logic Control at SMK Negeri 2 Probolinggo.

H0: Skills learning outcomes for students who are learning using a problem-based learning model assisted by Programmable Logic Control media are the same as those assisted by conventional media in describing the design and implementation of a series of Programmable Logic Control at SMK Negeri 2 Probolinggo.

3.1.1.1. Skills Area Learning Outcomes

Table 2 exposes the hypothesis results obtained from the test. It got a Fcount of 6.616 with an important value of 0.012. If the the result achieved at = 5%, df1 = (3-1) = 2, df2 = (68-3) = 65, so the rate of Ftable is 3.99. Due to the Fcount = 6.616 > Ftable = 3.99, then H0 is rejected and H1 is accepted, meaning that the learning outcomes for students of the skills domain who use problem-based learning models assisted by Programmable Logic Control media are higher than the skills learning outcomes who use the learning model. problem-based conventional media assisted in learning to describe the design and implement a series of Programmable Logic Control at SMK Negeri 2 Probolinggo. Furthermore, to reinforce the research hypothesis, further testing of the mean is practiced, as presented in Table 3.

Table 3 shows the value result of student skills for experimental and control classes that consist of data distribution. The experimental class was assisted by Programmable Logic Control media of 80.769. It is greater than the skills learning outcomes using problem-based learning models assisted by conventional media of 79.641. With Fcount = 6.616 and a significance of 0.012 <0.05, then H0 is rejected and H1 is accepted. Thus, it can be concluded that the learning outcomes for the student with high motivation resulted in a higher score than the low motivation. From hypothesis testing, it can be concluded that the competence of students who use problem-based learning models assisted by Programmable Logic management media is beyond the competencies of scholars who use problem-based learning models assisted by standard media in describing the look and implementation of PLC circuits at SMK Negeri 2 Probolinggo.

3.1.2. Second Hypothesis Testing:

H1: Skills learning outcomes for students with high achievement motivation were significantly higher than those with low achievement motivation in learning to describe the design and implement a series of Programmable Logic Control at SMK Negeri 2 Probolinggo.

H0: Skills learning outcomes for students with high achievement motivation are the same as those with low achievement motivation in learning to describe the design and implement a series of Programmable Logic Control at SMK Negeri 2 Probolinggo.

3.1.2.1. Research Hypothesis Testing:

Skills Area Learning Outcomes on the Effect of Achievement Motivation

Table 3. The Mean Learning Outcomes Test Results In The Skills Area On The Effect Of Learning Models

Dependent Variable: KE KK K

			95% Confidence Interval	
Class	Mean	Std. Error	Lower Bound	Upper Bound
Experiment class	80,769	0,310	80,149	81,388
Control Class	79,641	0,310	79,022	80,260

In Table 3 it seems that the results of hypothesis testing obtained Fcount of 31.721 with a significant price of zero.000. If the check is allotted at = 5%, df1 = (3-1) = 2, df2 = (68-3) =65, therefore the price of Ftable is 3.99. Because Fcount = 31.721 > Ftable = 3.99, then H0 is rejected and H1 is accepted, meaning that the learning outcomes of the skill domain describe the design and apply a series of Programmable Logic Control on students who have high achievement motivation will be higher than students with low achievement motivation. Furthermore, to answer the research hypothesis, it used the mean result, as explored in Table 4.

Table 4. Results Of Testing Mean Prices Of Learning

Outcomes In The Skills Area On The Effect Of Achievement Motivation

KE KK K

Achievement motivation	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Low Achievement motivation	78,971	,310	78,351	79,590
High Achievement motivation	81,439	,310	80,820	82,058

Table 4 exposes the learning outcomes resulting in the skill domains based on the accomplishment of the students. It results in the high motivation got the value of 81,439, while low motivation got a result of 78,971. With Fcount = 31.721 and a significance of 0.000 <0.05, then H0 is rejected and H1 is accepted. So, by considering the results of the mean test and two-way ANOVA test, it can be achieved that the learning outcomes of the skill domain of describing the design and implementing a series of Programmable Logic Control on students who have high achievement motivation will be higher than students who have low achievement motivation.

From hypothesis testing, it could be drawn that student with high achievement motivation has higher competence than low ones.

4. CONCLUSION AND SUGGESTION

The competence of students in the realm of skills taught using a problem-based learning model assisted by Programmable Logic Control learning media is significantly higher than those assisted by conventional media in describing the design and implementation of electro- pneumatic control circuits at SMK Negeri 2 Probolinggo. The competence of students in the skill domain with high achievement motivation is significantly higher than those with low achievement motivation in learning to describe the design and implement a series of Programmable Logic Control at SMK Negeri 2 Probolinggo.

Problem-based learning model assisted by Programmable Logic Control learning media is very well used in learning to describe the design and implement a series of Programmable Logic Control. To apply a problem-based learning model assisted by Programmable Logic Control media, students need to be given more adequate preparation, especially in terms of mastery in learning to describe designs and apply PLC circuits related to DUDI. With sufficient preparation, it is hoped that during the implementation of the lesson there will not be many obstacles in planning and operation.

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