

# The Effect of Project-Based Learning Model (PjBL) and Direct Instruction (DI) on Result Learning of the Basics Building Construction and Survey Engineering From Student Learning Motivation

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## ABSTRACT

This study aims to: (1) obtain information on differences in result learning, students who use the project based learning model and the direct instruction model in DKTB, (2) answer the differences in result learning of participants students who have high motivation to learn, and students who have low motivation in the subjects of the DKTB, and (3) obtain information on the interaction between the model with learning motivation on student result learning in the subject of DKTB. The research used study was quasi-experimental, using the control class and the experimental class. The experimental group is a class that uses the Project-Based Learning model and the control class uses the DI learning model. The research design used was factorial design with hypothesis analysis using two-away ANAVA, the prerequisite test used was homogeneity and normality. The results of processing through SPSS 24 are: (1) the found a difference in result learning of students who use the PjBL learning model the mean value are 82.8 and the DI value is 67.5; (2) there are differences in result learning of students have high learning motivation of 83.72 and low learning motivation of 74.00; and (3) there is anninteraction model and students' learning motivation, in the use of the PjBL model of students who have high learning motivation the result learning are high but in the DI model of students who have low learning motivation the result learning are low.

**Keywords:** *Project Based Learning (PjBL), Learning Model, Direct Instruction (DI), and student motivation*

## 1. INTRODUCTION

Preparing skilled students at work requires a teacher's strategy or method to be applied to students to achieve these goals. Strategies that can be used are form of learning methods, learning models, and learning media as well as assessments that are customized to basic competencies. Observations that were made in January 2019 at SMK Negeri 3 Jombang, class XI Modeling Design and Building Information (DPIB) expertise program obtained information there were less than optimal result learning in the subjects basics of building construction and survey engineering.

Trianto means that the learning model is a plan that used as a guide in planning learning in class [1]. Learning model according to Agus states the learning model is the foundation of learning practices resulting from the decline in educational psychology theory and learning

theory designed based on an analysis of curriculum implementation and its implications at the operational level of the class [2].

The learning model used at SMK Negeri 3 Jombang is Direct Instruction. Direct Instruction. intended to complete two result learning, namely the mastery of knowledge that is well structured and mastery of skills [3]. According to Nur, the direct instruction learning model is teaching aimed at students learning basic knowledge and skills taught in a step-by-step manner [4].

Data obtained from the Head of the Expertise Group (Kakomli) in the 2017/2018 academic year the KKM value was 75 in the Basics Building Construction and Survey Engineering. Based on the observational data it can be concluded that the learning model which is not right causes the result learning to be less than optimal

because the selection of the right learning model can improve student result learning.

There are several learning models, one of them is Project Based Learning and Direct Instruction. Bie states that student-based project learning will go through a long process of inquiry in solving a problem and this trains the skills demanded in the 21st Century [5]. Project Based Learning according to the education and culture ministry (2013) states a learning model that uses problems as the first step in gathering and integrating new knowledge based on his experience in real activities. Harun argue that PjBL is a model activity in class that is different from conventional learning. centered on students and integrated with real world issues [6].

To improve result learning, learning motivation is also needed, according to Armstrong who differentiates between motives and motivation. The meaning of motive is generally defined as a person's tendency [7]. It is still considered potential. The actualization of motives is called motivation which is generally manifested in real life. Siagian states that motivation is an impulse of curiosity that causes someone to try or achieve their desires [8]. According Hamzah, the essence of the motivation to learn is the impetus of internal and external push to students who learn that changes occur [9].

According to Tri Setyo, with the research title Project-Based Electric Circuit Learning to Increase Activities and Learning Achievement of Students at TL SMKN 2 Samarinda, it has shown that it can increase activity and learning achievement in electric circuit lessons [10]. The study, entitled The Effect of Using Project-Based Learning Models on the Mathematical Problem Solving Ability of High School Students by Siska shows that there is a positive effect of using the Project-Based Learning model on mathematical problem solving and the independence of students with high categories.

The study, entitled Scaffolding Project-based Learning of Computer Programing in an Online Learning Environment by Demitrios, concluded that the PjBL learning model was able to motivate students in programming subjects. The research entitled Problem Based Learning and Project-Based Learning for Sustainable Development by Convers concluded that it was able to make students innovate and be active [11]. While the research entitled Developing Software Engineering Competences in Undergraduate Students: a Project - Based Learning Approach in Academy-Industry Collaboration by Juarez-Ramirez shows the results of the research can prepare students to work in the industrial world [12].

The research entitled Project-based learning (PjBL): results from student involvement in an external consulting project in Oman by Rakesh concluded that project-based learning offers them different skills beyond

what they would normally acquire in conventional teaching and learning environments [13]. The research from Beatriz entitled Project-Based Learning Approach to Improve Learning Skills and Motivation in Software Engineering results prove the positive effect of using PBL to improve student training in acquiring different skills as future software engineers [14].

This study aims to: (1) obtain information on differences in result learning, between students who use the Project-Based Learning model with the Direct Instruction model in the subjects Basics of Building Construction and Survey Engineering, (2) answer information on differences in participant result learning students who have high learning motivation and students who have low motivation in the subjects Basics of Building Construction and Survey Engineering, and (3) obtain information on the interaction between models and learning motivation on student result learning in the Subject Basics of Building Construction and Survey Engineering.

The formulation of the problems in this study are: (1) Is there a difference between the Project-Based Learning model and the Direct Instruction model on the result learning of students in the subjects of the Subject Basics of Building Construction and Survey Engineering, (2) Are there differences in the result learning of participants students who have high learning motivation and students who have low motivation in the subjects of the Subject Basics of Building Construction and Survey Engineering, and (3) Is there an interaction between learning models and learning motivation towards student result learning on result learning in subjects Subject Basics of Building Construction and Survey Engineering.

**2. METHOD**

**2.1. Type of research**

This research was conducted at State Vocational High School 3 Jombang with research subjects class X DPIB1 and X DPIB2, in the odd semester 2019/2020 in November-December 2019.

This type of research used in research is a quasi-experiment using the control class and the experimental class. The research design used is a factorial design. The following research design in Table 1.

**Table 1.** Research Design

Exp setting	Observation	treatment	posttest
E (Experiment)	O <sub>1</sub>	X <sub>1</sub>	Y <sub>1O<sub>3</sub></sub>
			Y <sub>2O<sub>4</sub></sub>
K (Control)	O <sub>2</sub>	X <sub>2</sub>	Y <sub>1O<sub>5</sub></sub>
			Y <sub>2O<sub>6</sub></sub>

Explanation.

E : Experiment class

- K : Control class
- O<sub>1</sub> : Observasi 1
- O<sub>2</sub> : Observasi 1
- X<sub>1</sub> : Treatment using DI
- X<sub>2</sub> : Treatment using
- PjBL Y1 : Motivation
- Y2 : Motivation

The research analysis design was a 2x2 factorial analysis. Factorial sorting is the motivation of students to learn, which is divided into two levels, namely the motivation of students to learn high and low motivation of students to learn. The following is the research analysis design in Table 2.

**Table 2.** Research Analysis Design

No	Motivation	Model Learning	
		PjBL (Y1)	DI (Y2)
1	High	Y1	Y2 M1
	Motivation (M1)	M1	
2	Low	Y1	Y2 M2
	Motivation (M2)	M2	

\*(Source: Sugiyono, 2018)

To answer the hypothesis using two-away ANAVA, before the analysis is required the following test are required.

1) Test- t

The t-test was used to determine the experimental group and the control group using pretest.

2) Normality test

The data normality test used the Kolmogorov-Smirnov test. A normality test is used to determine normal or abnormal population data. The analysis used is the parametric method, so the conditions that are met are normally distributed. The data is declared to be normally distributed if the significance is more than 5% or 0.05 and the data processing uses SPSS 24.

3) Homogeneity test

The homogeneity test is used to test the similarity of several parts of the sample, namely whether or not there are variations in the sample are taken from the population. Test homogeneous used in the study is the variance test of homogeneity. The test criteria used are two notarized distributions that have a homogeneous variance if the F count <F table. Homogeneity test using the Levene test.

4) Two-way ANAVA Hypothesis Test

Hypothesis testing is used to determine the differences in project-based learning models on result learning in terms of learning motivation. In addition to knowing the differences in result learning, hypothesis

hypothesis testing is used to determine the interaction between learning models and learning motivation. The hypothesis test used is two way ANAVA. Two way ANAVA is used to test the mean comparative hypothesis of k samples when the researcher categorizes the sample into several blocks. Hypothesis testing data processing using SPSS 24

**2.3. Hypothesis**

Hypothesis testing is used to determine the differences in the Project-Based Learning model, Direct Instruction learning model, and students' learning motivation.

- 1) To find out that students who use the Project Based Learning (PjBL) model have significantly higher result learning than group of students who use Direct Instruction learning.

Statistical hypothesis.

$$H_0 : \mu_{PjBL} = \mu_{DI}$$

$$H_1 : \mu_{PjBL} > \mu_{DI}$$

Test criteria:

H0 rejected if FA count > F table.

**2.2. Data Analysis Technique**

- 2) To find out the difference in result learning of highly motivated students have high result learning than students who are low motivated.

Statistical hypothesis.

$$H_0: \text{high motivation} = \text{low motivation}$$

$$H_1: \text{high motivation} > \text{low motivation}$$

Test criteria:

H0 rejected if FA count > F table.

- 3) To find out the interaction between Project-Based Learning learning models and learning motivation on result learning.

Statistical hypothesis.

$$H_0: \text{int.A} = \text{B}$$

$$H_1: \text{int.A} \neq \text{B}$$

Test criteria:

H0 is rejected if the FA count > F table

### 3. RESEARCH AND DISCUSSION

#### 3.1. Test -t

Based on the output below the sig value. The Levens Test for Equality of Variance is  $0.015 > 0.05$ , it means that the variance of the two groups is homogeneous. The value of t count is  $1.380 < t \text{ table } 2,000$ , where if t count  $< t \text{ table}$  then  $H_0$  is accepted and  $H_a$  is rejected, which means there is no difference in the mean difference of the pre-test results of students in class X DPIB 1 and X DPIB 2. Thus it can be concluded that there is no difference in the learning results of students in class X DPIB 1 and X DPIB 2, so that the two classes can be used as a trial class in this study. The following Table 3 results of the t test.

Table 3. Independent Sample Test

		F	Sig.	t	Sig. (2-tailed)
Output Pre-test	Equal variances assumed	.015	.901	1.380	.046
	Equal variances not assumed			1.380	.047

(Source: SPSS 24)

#### 3.2. Normality test

Meanwhile, to test the data used normally or not used the normality test. To test normality the Kolmogorov-Smirnov test was used. The following table 4 normality test results.

Table 4. Pre-Test Normality Test Of The Experimental Group And The Kolmogorof Smirnov One-Sample Control Group

N		The Pretest Value of the Exp class.	Control class pretest value
Normal Parameter <sup>sa,b</sup>	Mean	30	30
	Std. Deviation	74.9688	73.2813
Most Extreme Differences	Absolute	3.77158	3.30429
	Positive	.191	.152
	Negative	.125	.152
Test Statistic		-.191	-.136
Asymp. Sig. (2-tailed)		.191	.152
		.004 <sup>c</sup>	.058 <sup>c</sup>

#### 3.3. Homogeneity Test

Homogeneity test is used to determine the variance of the two groups is the same or not, namely the experimental group and the control group. In this study homogeneity test using the F test and Le results of the homogeneity of F test in table 5.

Table 5. Homogeneity Test of The Experimental Group And The Control Group

Levine Statistic	df1	df2	Sig.
3,438	1	62	..068

#### 3.4. Hypothesis 1

Hypothesis of difference between the Project-Based

Learning model and the Direct Instruction model on the result learning of students in the subjects of the Subject Basics of Building Construction and Survey Engineering

$$H_0 : \mu_{PjBL} = \mu_{DI}$$

$$H_1 : \mu_{PjBL} > \mu_{DI}$$

Test Criteria:

$H_0$  is rejected if the FA count  $> F \text{ table}$ .

Result learning using the PjBL learning model are 50.12 with a significant 0.00. Because it is significant  $0.00 < 0.05$ ,  $H_0$  is rejected and  $H_a$  is accepted. It can be concluded that there are significant differences in the use of the PjBL and DI models towards the result learning of students in the basic lessons of building construction and survey engineering. Furthermore, to answer the above hypothesis, it can be seen testing the mean result learning of students in Table 6.

Table 6. Testing Mean Result Learning For Effects Learning Model

Model Pemb.	Mean Difference	95% Confidence Interval of the Difference	
		Lower	Upper
DI	67.53125	65.2975	69.7650
PjBL	82.84375	82.0715	83.6160

Table 6 proves the mean value of result learning of students who use DI is 67.5 lower than the PjBL learning model of 82.8. Thus it can be concluded that student result learning of students who use PjBL are significantly higher than students who use the DI model.

#### 3.5. Hypothesis 2

Hypothesis of differences students who have high learning motivation and students who have low motivation in the subjects of the Subject Basics of Building Construction and Survey Engineering

H0 : high motivation = low motivation  
 H1 : high motivation > low motivation  
 Test Criteria : H0 is rejected if the FA count > F table.

The students' learning motivation with the use of the PjBL learning model is 4.22 with a significant value of 0.04. Because of the significant value < 0.05, then H0 is rejected and Ha is accepted. It can be concluded that there is a significant difference in the use of learning motivation towards student result learning in the subjects of building construction and survey engineering. To answer the research hypothesis above, it can be seen in Table 7.

**Table 7.** Student's Learning Motivation

Motivation	Learning Model	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
High Mot.	PjBL	83.720	.761	82.197	85.243
	DI	74.000	1.439	71.122	76.878
Low Mot.	PjBL	65.720	1.439	76.836	82.592
	DI	79.714	.761	64.197	67.243

The table above shows the mean result learning for students who use PjBL learning with the high motivation of 83.72 and the use of DI learning with low motivation is 74. While the use of PjBL models with low motivation is 65.72 and the use of DI with low motivation is 79.71. Thus it can be concluded that the result learning of students who are highly motivated for students using PjBL are significantly compared to the result learning of students who use DI.

**3.6. Hypothesis 3**

Hypotesis of interaction model learning and motivation

H0: int.A = int.B

H1: int.A ≠ B

Test Criteria:

H0 is rejected if the FA count > F table.

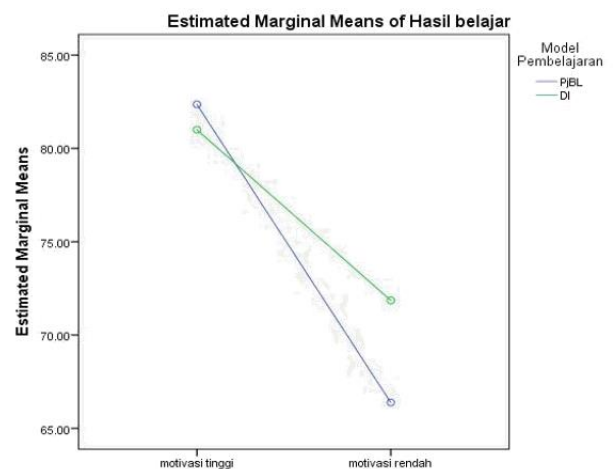
Based on Table 8 it appears that the mean result learning of students who use the PjBL learning model and are highly motivated at 83.72 for highly motivated student participants when using DI is 74.00. While students who use the PjBL learning model with low motivation mean a value 65,72 and a learning model of 79,71.

Based on the 2 line Anava test obtained F count = 10.23 with a significance of 0.02 < 0.05, then H0 is

rejected and Ha is accepted. Thus it can be concluded that there is an interaction between the use of learning models and students' learning motivation. The interaction between learning models and student motivation can be seen in Figure 1 and Table 8 Table 8. The interaction between learning models and students' motivation.

**Table 8.** The Interaction Between Learning Models and Students' Motivation

Model Learn. / Mot.	PjBL	DI	Informastion
High	83,72	74,00	PjBL > DI
Low	65,72	79,71	PjBL < DI



**Figure. 1.** Interaction Model Learning and Learning Motivation

**4. CONCLUSION**

Based on the results of the research that has been done, can be concluded are.

1. There are differences in student result learning between groups using the Project-Based learning model and the Direct Instruction learning model. Students who use the Project-Based Learning learning model have a higher mean value of 82.84 compared to students who use the Direct Instruction learning model with a mean value of 67.53.
2. There are differences in result learning of students who are highly motivated and low motivated in the basics of construction and survey engineering. The result learning of students who are highly motivated have a higher value of 83.72 compared to students who use the Direct Instruction learning model.
3. There is an interaction between the learning model and the learning motivation of students in learning the basics of building construction and survey engineering.

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