

# The Influence Of *Problem Based Learning Model* Toward Motivation and Physics Learning Outcomes Of Students SMA Negeri 1 Parangloe Gowa Regency

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**Abstract.** The Influence of Problem Based Learning Model Toward Motivation and Physics Learning Outcomes of Students SMA Negeri 1 Parangloe Gowa Regency. This research is true experimental design, with posstest only control group design that aim to determine how much motivation and learning outcomes of physics students of class XI IPA 3 as an experimental class that were taught using problem based learning model and class XI IPA 2 is a control class that were taught conventional learning model, as well as to determine whether there were signification differences in motivation and learning outcomes of physics students. Data were analyzed with descriptive and inferential statistics. Based on the results of the descriptive analisis showed that scores of motivation and learning outcomes of students who were taught the problem based learning model is at the high category. While taught using conventional learning models is at a low category. Analyses showed that it can be concluded that there are significant differences on motivation and learning outcomes of students who taught physics by using model problem based learning with students who are taught by using conventional learning models

## INTRODUCTION

Education is one of the factors that determine the progress of a country. The country's progress is supported by the quality of Human Resources (HR) as an educational product. Therefore, Physics as a subject has an important role in many aspects of life. Many problems and events in our lives that must be solved by using the application of physics such as counting, measuring, and others. Recognizing the important role of physics in life, then physics is a necessity and should be fun.

The results of observations carried out on the Monday, January 18, 2016 in class XI IPA at SMAN 1 Parangloe showed that in generally learners were less motivated and lack of curiosity in learning physics. This suggests that the motivation of students of class XI IPA at SMAN 1 Parangloe to learn physics still low. Besides, the results of formative tests are still more students who do not achieve specified KKM 70. Teachers in implementing the learning of physics shows the operational measures as follows: (1) teachers begins the learning with appercetion or question and answer problem of topics covered, (2) deliver learning objectives, (3) explain the material, (4) gives the example problems, ( 5) closes the learning. Learning step mentioned above is more suitable so-called direct learning model (direct instruction). In this study, direct instructional model called conventional learning models.

In addition, interviews with teachers of physics class XI IPA at SMAN 1 Parangloe, it is known that the school uses the curriculum in 2006, while the curriculum in 2013 only applied to the first semester for classes X and XI of the school year 2014/2015. According to the rules that have been established that in 2013 there were only four curriculum learning model that should be applied depending on the dimensions of knowledge of learning materials, and the example model is the model of Problem Based Learning / PBL (Problem Based Learning). Model PBL is considered appropriate because: (1) the basic competencies are selected according to the characteristics of the model, (2) the existence of an enabling environment, (3) characteristics of the knowledge developed by the category

of procedural knowledge. PBL model selection is also based on the Permendikbud No. 059 of 2014 states that: Results of interviews have known that in the subjects of physics, teachers using conventional learning models. Professional and pedagogical ability instrumental of teachers to bring learning model was to make the learning process becomes attractive and favored learners. Although many factors that lead to motivation and learning outcomes physics students less. The average value of physics learning outcomes of students of class XI IPA at SMAN 1 Parangloe still not reaching the KKM is 70. This is because the learning process in the classroom teacher more emphasis on the material to solve mathematical problems, monotonous learning process without learning activities interesting and learners are less actively involved in learning. Therefore, we need a model of learning which are learner-centered so as to make the increased motivation of learners in the learning process and will directly positive effect on physics learning outcomes.

Based on theoretical and empirical studies on the above background, it is important to do research that verifies the "Effects of Problem Based Learning Model to Motivation and Learning Outcomes Physics Learners". Two research questions. (1) Is there a significant difference in learning motivation among students that learned using PBL and conventional learning models, (2) Is there a difference physics significant learning outcomes among students that learned using PBL and conventional learning models.

## **CONTENT AND METHOD**

### **Type and Design Research**

The type of this research is an experimental research the of true experiment. This study was conducted to determine how much motivation and learning outcomes physics students using learning model of problem-based learning.

### **Location and Time Of Research**

This research was conducted in SMA Negeri 1 Parangloe at Jl. Malino KM. 40 Parang, District Parangloe, Gowa, South Sulawesi province

### **Population and Sample**

The population in this study were students of class XI IPA at SMAN 1 Parangloe Gowa in the academic year 2015/2016 which consists of three classes of class XI IPA1, IPA2 class XI and class XI IPA3 by the number of learners 105. The sample in this study was determined by simple random sampling technique. In this technique do random class in order not to interfere with the learning process of the school. After random grade then obtained XI IPA 3 as an experimental class and class XI IPA 2 as the control class.

### **Data Collection Technic**

Data collection techniques use the instrument test and non test. Mechanical test instruments in this study is a written test (multiple choice questions) to measure the learning outcomes of physics students in the cognitive before the treatment in the experimental class and control class, while the technique of non-test instrument using a questionnaire given motivation to learn physics after treatment.

#### *Motivation Questionnaire Analysis*

1. The validity of the motivation items questionnaire to learn physics  
Test of the construct validity of questionnaires is calculated using the formula product moment correlation with the following formula:

$$r_{hitung} = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}} \quad (\text{Siregar, 2014: 77})$$

Information:

n = number of respondents

X = score variables (respondents)

Y = the total score of the variables for all respondents.

2. Reliability item questionnaire motivation to learn physics

To determine the reliability of the questionnaire motivation to learn physics used Cronbach alpha formula with the following formula:

$$r_{11} = \left[ \frac{k}{k-1} \right] \left[ 1 - \frac{\sum \sigma_b^2}{\sigma_t^2} \right] \quad (\text{Siregar, 2014: 90})$$

Information

n = number of samples

$\sigma_t^2$  = Variant total

$\sum \sigma_b^2$  = Total variance grain

k = Number of items valid question

$r_{11}$  = coefficient of reliability of the instrument

*Analysis of Instruments Test Results of Learning Physics*

1. The validity of the test items of physics learning outcomes

To calculate the validity of physics achievement test items using the correlation coefficient formula biserial point. The formula is as follows:

$$\gamma_{pbi} = \frac{M_p - M_t}{S_t} \sqrt{\frac{p}{q}} \quad (\text{Arikunto, 2013: 93})$$

Information:

$\gamma_{pbi}$  = correlation coefficient point biserial

$M_p$  = mean score of subjects who responded well to the validity of the items sought

$M_t$  = mean score total

$S_t$  = standard deviation of the total score proportions

p = proportion of respondents who answered correctly

q = the proportion of students who answered incorrectly (q = 1 - p)

2. The reliability of test items physics learning outcomes

To calculate the reliability of the instrument used formula Kuder and Richardson (K-R 20) with the following formula:

$$r_{11} = \left( \frac{k}{k-1} \right) \left( \frac{V_t - \sum pq}{V_t} \right) \quad (\text{Siregar, 2014: 111})$$

Information:

$r_{11}$  = reliability of the instrument

k = the number of the questions

$V_t$  = total variance

p = proportion of respondents who answered correctly on each of the questions.

q = the proportion of respondents who answered incorrectly.

## Data Analysis Technic

### *Descriptive analysis*

#### 1. Frequency distribution

- Determining a lot of class interval (k) in a manner prescribed  $5 < k < 15$
- Determines the range of scores (r)  
 $r = \text{biggest score} - \text{score smallest}$
- Specifies the length of the class interval (p)  
 $p = r / k$
- Determining the deciding score (Score initial and final score on table)  
 $p * k = (r + 1) + X$

Information:

r = range

k = a lot of class

X = score decisive (initial score and the final score on the chart)

(Ali Sidin, 2012: 37)

#### 2. The average score

The average score obtained from the equation:

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i} \quad (\text{Sudjana, 2005: 70})$$

Information:

$\bar{x}$  = the average score

$x_i$  = class mark interval

$f_i$  = the frequency corresponding to the class mark  $x_i$

#### 3. Variance

Variance is obtained from the equation:

$$S^2 = \sqrt{\frac{n \sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)}} \quad (\text{Sudjana, 2005: 95})$$

#### 4. standard deviation

$$S = \sqrt{\frac{n \sum f_i x_i^2 - (\sum f_i x_i)^2}{n(n-1)}} \quad (\text{Sudjana, 2005: 95})$$

Information:

S = deviation standard

$x_i$  = class mark interval

$f_i$  = the frequency corresponding to the class mark  $x_i$

N = number of samples ( $n = \sum f_i x_i^2$ )

### *Inferential analysis*

#### 1. Normality Test Data

The formula used to test Chi Square were formulated as follows:

$$\chi^2 = \frac{(f_o - f_h)^2}{f_h} \quad (\text{Sugiyono, 2010: 82})$$

Information

$\chi^2$  = Value Chi Square

$f_o$  = Frequency / amount of data on the observation

$f_h$  = Number / expected frequency (wide percentage of each field multiplied by n)

$f_o - f_h$  = Difference Data  $f_o$  and  $f_h$

## 2. Homogeneity test

Testing the equality of two variances are used to determine whether the data will be correlated it meets the constancy of the variance is homogeneous.

$$F_{hitung} = \frac{S_B^2}{S_K^2} \quad (\text{Siregar, 2014: 169})$$

Information

$S_B^2$  = greatest variance

$S_K^2$  = smallest variance.

## 3. Hypothesis testing

For normally distributed data and has a homogeneous variance, the test is done by using t-test with statistical hypotheses are used:

$$t_{hitung} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}} \quad (\text{Siregar, 2014: 238})$$

Information

$\bar{X}_1$  = average score of the experimental group

$\bar{X}_2$  = average score of the control group

t = test comparison of two mean

$\mu_1$  = average score of the population experimental class

$\mu_2$  = average score of the population control class

$S_1^2$  = variance of the experimental group

$S_2^2$  = variance control group

$n_1$  = number of samples of the experimental group

$n_2$  = number of samples of the control group

# RESULT AND DISCUSSION

## Physics Learn Motivation

Table 1. Descriptive Statistics of Student's motivation in Experiment Class and Control Class in SMA Negeri 1 Parangloe

Statistics	Statistic value of learn motivation of physics	
	Experiment class	Control class
average	72,43	66,71
Ideal score (Maximum)	96	96

Ideal score (Minimum)	24	24
Maximum Score	88,00	84,00
Minimum Score	59,00	56,00
Range of Score	29,00	28,00
Deviation Standard	7,23	6,46
Varian	52,31	41,68

Table 2 Classification of Score Motivation of Students Studying Physics in Experiment Class and Control Class SMA Negeri 1 Parangloe

No.	Interval	Category	Frequency		Percentage (%)	
			Experiment Class	Control Class	Experiment Class	Control Class
1.	83 – 97	Very high	4	1	11,40	2,90
2.	68 – 82	High	19	18	54,30	51,40
3.	53 – 67	Moderate	12	16	34,30	45,70
4.	38 – 52	Low	0	0	0,00	0,00
5.	23 – 37	Very low	0	0	0,00	0,00
<b>Amount</b>			35	35	100	100

From the results of the descriptive statistics obtained score of motivation on learn physics in experimental class is 72.43, which means that it is in high category. While the control group obtained score of motivation on learn physics is 66.71 which means the middle category.

#### 1. Physics Learning Outcomes

Overview score of physics learning outcomes of students between the two classes of experimental class taught by a model problem based learning and control classes were taught with conventional learning models.

**Table 3** Descriptive Statistics Results of Students Studying Physics in Experiment Class and Control Class of SMA Negeri 1 Parangloe

Statistic	Statistic value of motivation study physics	
	Experiment class	Control class
Average	19,97	17,37
Ideal score (Maximum)	29	29
Ideal score (Minimum)	0	0
Maximum Score	27,00	24,00
Minimum Score	12,00	14,00
Range of Score	15,00	10,00
Deviation Standard	3,98	4,14
Varian	15,85	17,12

Based on Table 3, a picture that there are differences in learning outcomes between the experimental class and control class. Number of students in the experimental class and control class is 35 people who claimed the large number of samples or students who studied for the experimental class and control class. In this study of 35 of these

samples will be known amount of each individual score, the highest score, and the mean score for the experimental class and control class.

Table 3 demonstrated the highest score and the lowest score for each class. Score of physics learning outcomes here are the total scores in cognitive obtained high students in the experimental class and control class after the test is given in the form of test results in cognitive learning which refers to the indicators of achievement of learning outcomes in the form of multiple-choice tests. The number of multiple choice questions is 29. The highest score on a test of cognitive learning outcomes in this when answering 29 questions correctly then the score obtained is 29, with a value of 100, and the lowest score in the test results of this study, if there is no right answer then score obtained is 0 with a value of 0.

Based on Table 4 obtained the average score in the experimental class and control, respectively 19.97 and 17.37. From the mean score if viewed by categorizing classification score physics learning outcomes in table 4, the experimental class at the high category while the control class in middle category.

**Table 4** Classification Score Results of Students Studying Physics Experiment Class and Control SMA Negeri 1 Parangloe

No.	Interval	Category	Experiment class		Control class	
			frequency	Percentage (%)	Frequency	Percentage (%)
1	24 – 29	Very high	6	17,10	2	5,70
2	18 – 23	High	20	57,10	15	42,90
3	12 – 17	Moderate	9	25,70	15	42,90
4	6 – 11	Low	0	0.00	3	8,60
5	0 – 5	Very low	0	0.00	0	0.00
<b>amount</b>			35	100	35	100

Data obtained from this study were analyzed descriptively besides also inferentially analyzed by t-test at significant level  $\alpha = 0.05$ , which aims to test the hypothesis. The result of normality test score results learners learn physics experimental class and control class by using chi-square.

The result of normality test scores for the experimental class taught using problem based learning models obtained  $\chi^2_{hitung} = 3.47$  for  $\alpha = 0.05$  and  $df = k - 1 = 6 - 1 = 5$ , then the table is obtained  $\chi^2 = 11.07$ . Thus  $\chi^2$  count  $< \chi^2$  table ( $3.47 < 11.07$ ), which means a score of physics learning outcomes of students come from populations with normal distribution.

Similarly, the control class taught using conventional learning models obtained  $\chi^2_{hitung} = 2.12$  for  $\alpha = 0.05$  and  $df = k - 1 = 6 - 1 = 5$ , then the table is obtained  $\chi^2 = 11.07$ . Thus  $\chi^2$  count  $< \chi^2$  table ( $2.12 < 11.07$ ), which means a score of physics learning outcomes of students come from normally distributed population. Homogeneity test is performed to determine whether the experimental class and the control class is derived from a homogeneous population. In this test F-test was used to compare scores and scores the greatest variance smallest variance. From the data obtained by the calculation of the price of F for the motivation to learn  $= 1.25 = 1.88$  Ftable while scoring so Fcount  $< Ftable = 1.25 < 1.88$ . So even on the learning outcomes of learners physics obtained with Ftable Fcalculate  $= 0.92 = 1.88$  so Fcalculate  $< Ftable = 0.92 < 1.88$ . Based on these values, it can be concluded that the scores obtained both classes tersebut sample derived from a homogeneous population.

Test this hypothesis using t-test two parties and obtained t's motivation to learn of 3.48 while Ttable of 2.00 with a significance level  $\alpha = 0.05$ . While the results of the research hypothesis testing using t-test two parties obtained Tcount to the learning outcomes of 2.67 while Ttable is at 2.00 with a significance level  $\alpha = 0.05$ . So that's the motivation to learn because Tcount  $> t$  table then H0 and H1 accepted. Thus, it can be concluded that there are significant differences between the motivation to learn physics in the experimental class and control class. As for physics learning outcomes obtained  $t > t$  table then H0 and H1 accepted. Thus, it can be concluded that there are significant differences between the results of students studying physics experimental class and control class.

## Discussion on Learning Motivation and Learning in PBL Model Conventional

The first hypothesis testing results show that there are differences significant motivation to learn physics among students that learned using PBL and conventional learning models. PBL models give a higher mean value than the conventional learning. Results were in accordance with some other studies like. 1) The use of PBL will make the motivation of learners to be better (Anisaunnafi'ah. 2015). 2) Model PBL in learning have a positive impact on the motivation of learners (Nyoman. 2012).

The first factor that affects the higher motivation to learn the experimental class is located at the beginning of learning (stage 1). Problems arising from the real world problems that are authentic, while the control class issues raised by questions and answers. The problem is that contextual events so that learners are able to extract meaning from their knowledge. Some researchers such as Hull's and Sounder (1996); Komalasari (2010); Berns and Erickson (2001), revealed that contextual learning is the concept of learning where the teacher brings the real world into the classroom and encourage students to make connections between knowledge possessed by its application in everyday life. Teachers need to reconstruct the design of learning to provide real-world problems and situations (Wood, 2003)

The second factor affecting higher learning motivation in the experimental class lies in its core activities (stage 3) as a result of the first factor. Learners classroom experiment to experiment with delight. But students in the control class did an experiment. They are more motivated and more concentrated in completing the task than students of the control class, so the effect on each subsequent stage of learning. This is in accordance with the opinion of Darsono (2000), that people who have high motivation in learning it will cause a great interest in doing the task, to build attitudes and habits of a healthy learning through the development of learning schedule and execute it diligently.

## Discussion of Results Learning Physics in PBL and Learning Model Conventional

Results of testing the second hypothesis, indicating that there are differences in physics learning outcomes significantly between learners that learned using PBL and conventional learning models. PBL models give a higher mean value than the conventional learning. Results were in accordance with other studies such as 1) Model problem based learning using the experimental method has a higher learning outcomes (Hamidatun, dkk.2015). 2) There are differences in the ability of understanding the concepts of physics between the groups of students who followed the model of problem-based learning and students who take the direct learning model (Ward, N. 2010). 3) the application of problem-based learning model can improve learning outcomes physics (Kharida, dkk.2009).

The first factor that affects higher learning outcomes physics experimental class lies in its core activities (stage 3) that learners carry out experiments or other ways of solving the problems with the activities and observations were well organized at the time of collecting, analyzing and concluding data. The goal is to train ability to experiment.

The second factor affecting higher learning outcomes in grade physics experiment lies in closing activity (stage 5) in the form of test questions and answers, to evaluate the learning that has been done. This is consistent with the statement of Subrata (2007); Sabani (2008); and Ogunleye (2009); that teachers should provide motivation and problem-solving abilities train systematically to students. The use of the model PBL in teaching, real researchers see the motivation of learners can be generated as well as attention to the problem of learners and learning are given very good. learners more flexibility in the delivery of ideas and opinions as well as the cooperation of learners look very good in group work.

## CONCLUSION

The conclusions of this study were (1) there is a significant difference in learning motivation among learners that learned using PBL and conventional learning models. (2) there are differences in physics learning outcomes significantly between learners that learned using PBL and conventional learning models.



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