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PROBLEM-BASED LEARNING MODEL ON LEARNING OUTCOMES: QUASI EXPERIMENTAL STUDY

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Abstract. This research aims to determine the influence of the Problem Based Learning model on student learning outcomes on the sub-theme of energy resource wealth in Indonesia. This research uses a 2 group quasi-experimental design. The subjects of this research were students in class IV A and IV B, consisting of 78 students. The research results show that there is a significant influence of the Problem Based Learning model on learning outcomes for the sub-theme of energy resource wealth in Indonesia. The N-Gain result in the experimental class was 74, while in the control class it was 53. With the results of hypothesis testing, H0 was rejected and Ha was accepted because tcount (3.93258) > ttable (1.99167). Based on the research that has been carried out, it can be concluded that there is an influence on learning outcomes for the sub-theme of energy resource wealth in Indonesia through the Problem Based Learning modelostly in accordance with the standards. From these results, recommendations emerged that could be considered for the desired program.

Keywords: Learning Outcomes, *Problem Based Learning* Model

I. INTRODUCTION

Learning outcomes are very important for every human being, because learning outcomes are an indicator of achieving planned targets [1]–[3]. For a teacher, learning outcomes are not only an indicator of achievement in imparting materials to students but also the use of models, media and methods that can be used in the process learning and can determine students to achieve minimum completeness [4]–[6]. Learning outcomes can also be influenced by the quality of learning in class, one of the things that can determine the quality of learning is the use of learning models that are appropriate, interesting and appropriate to the material being taught. This is if the application of learning models that are less innovative can cause low learning outcomes because in reality there are still many schools that pay little attention to the use of learning models in every teaching [7].

Based on the results of observations that have been made, the problem that occurs in classes IV A and IV B at SDN Kedep is that students get grades that are not in accordance with the standards set by the school. This can be proven from data on the completeness scores of students in classes IV A and IV B at SDN Kedep, 33% of the total number of students is 78 people, namely 26 students have not reached the KKM (Minimum Completeness Criteria) which is 68. Factors causing low student learning outcomes among other things, because learning is still less innovative, learning is still always focused on the teacher, students are less involved during the learning process in class and students have difficulty understanding and concentrate less during learning, causing low student learning outcomes.

Overcoming this problem can be done with an interesting learning model that involves students to participate and be active in the learning process. One learning model that can be used for this problem is the Problem Based Learning learning model.

Based on the results of [8]–[13]) who used the Problem based learning model showed the results of the Independent Samples T-test, the sig (2-tailed) value was 0.009. The hypothesis test used is right-hand hypothesis testing, so that the significance value (2-tailed) is divided by 2 and a significance (1-tailed) is obtained of 0.000. The sig value is ≤ 0.05 so that H0 is rejected and Ha is accepted. This agrees with research by De Momando (2016) which states that there is a significant difference in higher level thinking abilities between experimental class students and control class students using the problem based learning model.

Learning outcomes can be used to determine the extent to which students can understand and understand the material presented which can be expressed in the form of sentence symbols or numbers. In the opinion of [14] say that learning outcomes are the achievement of forms of behavioral change that tend to persist in the cognitive, affective and psychomotor domains of the learning process carried out within a certain time. Learning outcomes and student activities can be optimized by providing active learning [15]. Problem Based Learning is one of the learning models recommended in the implementation of K13, an innovative learning model that can provide an active learning process for students.

II. RESEARCH METHOD

This research method uses a quantitative approach with a quasi-experimental research method. According to Abdurrozak and Jayadinata (2016: 875), quasi-experiment is experimental research that groups research subjects using purposive sampling. The data sampling technique is by making a comparison between the control class and the experimental class, which is to determine the effect of the Problem Based Learning model on student learning outcomes on the sub-theme of energy resource wealth in Indonesia.

This research design uses a quasi-experimental design of 2 groups with one experimental group (KE), namely the group that was given treatment (treatment) with the Project Based Learning learning model and one Control Group (KK), namely the group that was not given treatment, but applied a conventional learning

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model to learning process. The next step is that the experimental group and control group are given an initial test (pretest) and a final test (posttest) with the same test equipment.

This research was conducted at SD Negeri Kedep Gunung Putri, even semester of the 2020/2021 academic year, with 78 students in class IV, with 37 students in IV A as the control class and 41 students in IV B as the experimental class. The data collection technique used in this research is a multiple choice test instrument which covers Core Competencies and Basic Competencies. Through knowledge aspects and skills aspects with a total of 25 questions that have been tested for validity, reliability, level of difficulty and distinguishing power. With the initial test (pretest) which aims to determine the initial level of knowledge of students and the final test (posttest) aims to determine the extent to which improvements in student learning outcomes have been made.

Data analysis techniques include giving scores on the pretest and posttest to measure students' abilities in the form of knowledge, calculating N-Gain scores1, Normality Test2, Homogeneity Test3 and Hypothesis Testing4. With the following formula:

N-Gain (1)

$$\text{N-}Gain = \frac{S\ posttest - S\ pretest}{S\ \max - S\ pretest}$$

Normality Test (Liliefors Test): (2)

$\boldsymbol{L0 = F(Zi) - S(Zi)}$

Information:

$L0$: The largest absolute price

$F(Zi)$: Standard number probability

$S(Zi)$: Proportion of standard numbers

Homogeneity Test (Fisher's Test): (3)

$$S_t^2 = \left(\frac{n.\sum Y - (\sum Y)^2}{n\,(n-1)} \right)$$

Information :

$St2$: Variance

$\sum Y$: Total Student N-Gain value

$\sum Y^2$: Sum of Squares of Students' N-Gain values

n : Number of Students

Statistical Hypothesis Testing H0 and Ha: (4)

$$t = \frac{X1 - X2}{s \sqrt{\frac{1}{n_1} + \frac{2}{n_2}}}$$

Information :

X1 : Class average N-Gain value experiment

X2 : Class Control

s : Combined Standard Deviation

n1 : Number of experimental class samples

n2 : Number of control class samples

Normality and homogeneity tests were carried out using the Microsoft Excel 2013 program at a significance level of $\alpha = 0.05$ and hypothesis testing using ttest was tested using a quantitative scale.

III. FINDING AND DISSCUSSION

Results of research that has been carried out using the Problem Based Learning model shows that the influence on learning outcomes of the sub-theme of energy resource wealth in Indonesia increases after using the steps of the Problem Based Learning model. This can be proven from table data and histogram images which show that there are differences in learning outcomes for the sub-theme Wealth of Energy Resources in Indonesia in the experimental class, getting a pretest score of 63, posttest score of 89, and N-Gain score of 74, while in the control class they got a pretest score of 50. posttest 77, and N-Gain score 53.

Table 1 Summary of Mean Scores for Experimental Group and Control Group

Class Group	N	Mean		N-Gain average score	Completeness of Learning Outcomes (%)
		Pretest	Postest		
Experiment	41	63	89	74	78%
Control	37	50	77	53	68%

Table 1 shows a recapitulation of the average scores for class groups using the Problem Based Learning model and control model, so a histogram graph of differences in student learning outcomes for the sub-theme of energy resource wealth in Indonesia is obtained which can be seen in Figure 1.

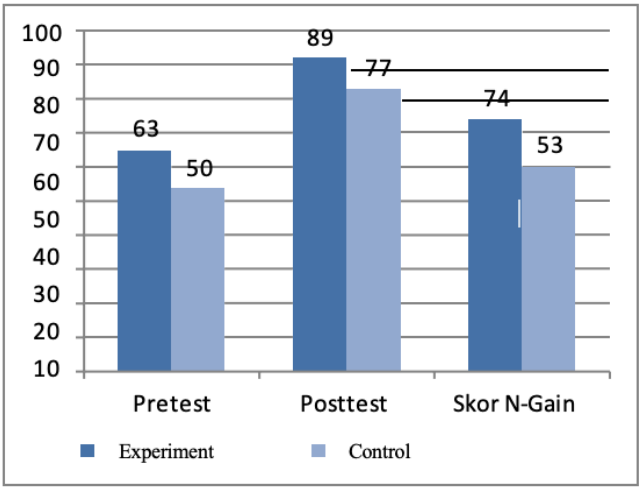

Figure 1 Histogram of Differences in Learning Results with the Experimental Group and the Control Group

According to the description above, from the table data and histogram images, it can be concluded that there are differences in student learning outcomes between the two classes in each pretest, posttest score and also the N-Gain score. The experimental class score was higher than the control class. So the conclusion is that the Problem Based Learning model influences the learning outcomes of class IV B students whose average score is higher than that of class IV A which only uses the conventional model.

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The normality test aims to determine whether the data distribution comes from a normal or abnormal population using the Liliefors test with the conditions:

H0 = Lcount>Ltable, : The sample comes from a population that is not normal.

Ha = Lcount<Ltable, : The sample comes from a normal population

Data from the normality test results of students' creative abilities are presented in table 2

Table 2. Normality Test Results (Liliefors)

No	Group Distribution Treatment	L_{hitung}	L_{tabel}	Conclusion
1	Learning outcomes for the Sub-theme of Wealth of Energy Resources in Indonesia through the Problem model Based Learning	0,096	0,138	Normal Distribution
2	Learning outcomes for the Subtheme Wealth of Energy Resources in Indonesia through the Conventional model	0,070	0,145	Normal Distribution

From table 2 above, it can be seen that in the experimental class, Lcount< Ltabel = 0.096< 0.138 and in the control class, Lcount< Ltabel = 0.070< 0.145 with a significant level equal to α = 0.05. So it can be concluded that the results of the normality test on the learning outcomes of the Energy Resources Wealth Sub-theme in Indonesia by applying the Problem Based Learning model and also the Conventional learning model are stated to have a normal distribution

This homogeneity test was carried out to analyze the learning outcomes of the subtheme Energy Resources Wealth in Indonesia which aims to determine whether the two sample population data have homogeneous or non-homogeneous variances. The test criterion is that Ha is accepted if X^2 count <X^2 table.

Table 3 Homogeneity Test Results

Treatment Group Distribution	F_{cout}	F_{table}	α (0,05)
Combination of the two treatments: Problem Based Learning Model and learning model conventional	1,689	1,99167	Homogen

In table 3 above, you can see the calculation of the homogeneity test for N-Gain, the results of studying the sub-theme Energy Resources Wealth in Indonesia obtained Fcount 1.689< F table 1.99167. Thus, it can be concluded that the learning results for the sub-theme of Energy Resources Wealth in Indonesia are homogeneous.

Next, the calculation is done using the t test at a significance level of 5% or 0.05, so the two-way test is **α**/2 = 0.05/2 = 0.025. It is in table 4.

Table 4 Results of the t test for the average N-Gain for the Experimental Class Group (Problem Based Learning) and the Control Class Group (Conventional)

Class Group	N	Dk	NGain	t_{hitung}	tt_{abel}
Problem Based Learning	41	76	74	3.93258	1.99167
Covensional	37		53		

The calculation results obtained tcount of 3.87811 with dk (degrees of freedom) of 76 (41 + 37 - 2), then obtained ttable at the significance level α/2 = 0.05/2 = 0.025 of 1.99167. Hypothesis testing that uses two-way testing means that the testing criteria is that H0 is rejected if -1.99167 > tcount > 1.99167. The research results, H0, were rejected and Ha was accepted. Obtained tcount > ttable (3.93258) > (1.99167), it can be concluded that there are differences in learning outcomes between students in the experimental class and students in the control class.

As a result of the research that has been carried out, it is known that the difference in the average score of N-Gain in learning outcomes for the Sub-theme Wealth of Energy Resources in Indonesia in the experimental class is higher than the control class, namely the experimental class got a score of 74 while the control class got a score of 53. After testing the hypothesis it was found that H0 is rejected so the alternative hypothesis Ha is accepted. The results of this research show that learning outcomes on the sub-theme Energy Resources Wealth in Indonesia using the Problem Based Learning model are better than conventional learning models.

In the learning process, it would be better if you use media or learning models that vary according to the material being taught. One learning model in the 2013 curriculum that can be used is the Problem Based Learning model. [10] states that the Problem Based Learning learning model is a learning model that presents contextual problems so that it stimulates students to learn. In classes that apply problem-based learning, students work in teams to solve real world problems.

The use of the Problem Based Learning model in the learning process makes students play an active role and can improve students' thinking abilities. Research on the problem based learning model was also researched by others [16], based on t-test calculations, tcount is 3.26530 or 3.27, while ttable at the significant level α 0.05 is 1.68595 or 1.69, so tcount > ttable (3.27 > 1.69). It can be concluded that there are significant differences between the two groups, it is proven that the Problem Based Learning (PBL) model has a positive effect on learning outcomes for Multiplication and Division of Fractions in Class V of SDN Gugus IV Tilatang Kamang, Agam Regency.

Apart from that, another research was also conducted by [17], this is based on a significance value of 0.000 < α = 0.05, which means that the value is greater than the value and sig value. (2-tailed) is smaller than the significance of α = 0.05, which means that H0 is rejected, so it can be concluded that there is a significant influence in the application of the Problem Based Learning (PBL) model on student learning outcomes on the theme Always Save

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Energy for class IV B SDN 92 Bombana.

There are also researchers from [18] based on the results of the t-test hypothesis, tcount (16.39) was obtained > ttable(2,093). From the results of the effect size calculation, it was obtained that it was 0.42. So it can be concluded that the results of the post-test data normality test calculations carried out by the researcher are significant, and the post-test data results are normally distributed. Other researchers [13], [19]–[21]have found findings that prove that the problem based learning model has an influence on learning outcomes. Thus, it can be concluded that there is an influence of the use of the problem-based learning model on science cognitive abilities in integrated thematic learning in Class V of SDN Gugus 1 Kec. Shadow. So the results of the t test carried out obtained tcount = 3.43 > ttable = 2.00, so H0 is rejected and H1 is accepted. It was concluded that there was an influence of the Problem Based Learning Model on science cognitive abilities in integrated thematic learning on the theme of our friends' environment. By using the Problem Based Learning model, researchers concluded that the Problem Based Learning model can improve student learning outcomes.

IV. CONCLUSSION

Based on the discussion of the results of the research that has been carried out, it can be concluded that there is an influence on the learning outcomes of the sub-theme Wealth of Energy Resources in Indonesia using the Problem Based Learning model on students in grades IV A and IV B, SD Negri Kedep, Gunung Putri District, Bogor Regency, Even Semester, Academic Year 2020 /2021: There is an influence on learning outcomes for the sub-theme Energy Resources Wealth in Indonesia through the Problem Based Learning model and the Conventional model. This can be seen from the N-Gain value in the experimental group of 74 while the control class group got an N-Gain of 53. The completeness of cognitive learning outcomes obtained by the experimental group was 78% while in the control class group it was 68%. This was obtained on the basis of two-way null hypothesis testing which shows that tcount (3.93258) > ttable (1.99167) which means the null hypothesis is rejected and the alternative hypothesis is accept.

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