

Effects of Learning Model, Assessment, and Independency towards Mathematics Learning Outcomes

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Abstract. This research aims to determine: (1) the differences effect of learning model of problem based learning of assessment portfolio based, learning model of problem based learning, and learning model of expository for mathematics learning outcome, (2) the differences effect of the level of independent learning for mathematics learning outcome, (3) the interaction between learning model and independent learning for mathematics learning outcome. The type of the research is experiment with quasi experimental design. The population of the research was all students of VIII Grade of SMP N 3 Sawit of second semester of academic year 2016/2017. The research sample consisted of three classes, experiment class I treated problem based learning of assessment portfolio based, experiment class II treated problem based learning, and control class treated expository. The sampling technique use cluster random sampling. Methods of data collection use documentation, questionnaire, and test. Data analyzed by using analysis of variance with two different cell lines with a significance level of 5%. The conclusion as follows: (1) there is differences effect of learning model of problem based learning of assessment portfolio based, learning model of problem based learning, and learning model of expository for mathematics learning outcome, (2) there is differences effect of the level of independent learning for mathematics learning outcome, (3) there is no interaction between learning model and the level of independent learning for mathematics learning outcome. It means that in preparing model teacher have to consider the level of independent learning.

PRELIMINARY

Mathematics learning outcomes is one of the important components, as the result of learning mathematics is a measure that determines the success rate of students in participating in mathematics. Susanto explained that the results of student learning is the ability gained after the student through the learning activities. Mathematics learning outcomes expected to be able to motivate the students to study harder so that it can have an impact on academic achievement. The low yield mathematics learning occurs several schools, especially State Junior High School 3 Sawit Boyolali Central Java Indonesia. This is evident from a mean value of Mathematics National Examination 2015/2016 academic year has decreased compared to the previous year.

Based on the results of preliminary observations in State Junior High School 3 Sawit, the learning model used by teachers, namely expository models where teachers spent time with the speech in front of the class and the learning process is only centered on the teacher. This resulted in a lot of students who do not understand the material presented by the teacher so that students cannot understand the material optimally. One alternative to overcome the weaknesses of the learning model used by teachers of mathematics in general is by applying the learning model of problem-based learning. Suyadi states that the strategy of problem-based learning is learning-oriented strategy on solving the problem openly. The learning model is the potential to develop students' independence through problem solving. In addition, this model will help students think creatively and actively involved in learning.

In addition, the assessment used by mathematics teacher at State Junior High School 3 Sawit derived from the value of daily tests, mid-term test and final test as well as the attitudes of the students during the learning process. But in fact, such assessment is not an objective assessment to assess the ability of the students and have not been able to contribute to the learning outcomes of mathematics. One alternative to overcome the

weaknesses of the valuation model used by teachers of mathematics in general is by applying the model portfolio assessment. Haryati states that portfolio assessment is a process of continuous assessment that is based on a collection of information that shows the development of psychomotor aspects in particular capability / performance of learners in a given period. Portfolio assessment is suitable to determine the development of psychomotor aspects of learners by assessing a collection of works / task they do.

One of the factors that affect the outcome of mathematics learning is student's independence in learning. Majid explained that self-learning is a teaching strategy that aims to develop individual initiative, self-reliance, and self-improvement. Based on the results of the initial observation, independent learning students of State Junior High School 3 Sawit is still low. This is evident from the many students who rely on friends when being asked to do mathematics. In addition, when given homework, there are still many students who work in the classroom and just cheating their home works.

This study aims to determine. (1) differences in the effect of problem based learning teaching model based portfolio assessment, learning model of problem-based learning, and the learning model expository the learning outcomes of mathematics, (2) differences in students' levels of independence influence on mathematics learning outcomes, (3) the interaction between learning model and the level of independence to the learning outcomes of students learning mathematics.

RESEARCH METHODS

This study is an experimental study with quasi-experimental designs. The research was conducted at State Junior High School 3 Sawit in the second semester of academic year 2017 in January 2016. The population in this study was all second semester of eighth grade students of State Junior High School 3 Sawit of academic year 2016/2017. The study sample consisted of three classes, the first experiment, the experimental class II, and control class. In the experimental class I was using a learning model problem-based learning based portfolio assessment, experimental class II using learning model of problem-based learning, and control class using expository teaching model. The sampling technique was using cluster random sampling. The independent variable in this study is a model of learning and independent learning. The dependent variable in this study is the result of learning mathematics.

Data collection techniques in this study using documentation, questionnaire, and test. The documentation method used to collect beginning capabilities data. The research instrument used validity tested with a questionnaire, questionnaire reliability; the test validity, and the test reliability. Data were analyzed using two-way analysis of variance with different cells in the model equations. Before conduct the computation of two ways analysis variance, researcher conducted the normality and homogeneity test.

RESULTS AND DISCUSSION

Before being treated, it must be ensured beforehand that the three classes in a state of balance. To find out all three classes in a state of balance or not, this research using anava test of oneway with different cells. The test results one way anava with different cells are shown in the following table.

TABLE 1. Balance Test Results

Class	N	mean		
experiment I	32	65.31	0.00039	3.09
experiment II	34	65.35		
Control	33	65.33		

Based on the table is obtained $F_{obs} = 0,00039 < F_{table} = 3,09$ then H_0 accepted. It can be concluded that the three classes have the balance ability. Before being tested in sample class, the instrument tested first. Instruments tested on 63 students. Test of the validity of the questionnaire using correlation product moment . Validity test results of questionnaire shows there are 25 statements have r_{xy} more than $r_{table} = 0,248$ ($r_{xy} \geq r_{table}$). It means that 25 statements are valid. Questionnaire reliability test using the equation Cronbach's alpha. Reliability test results on 25 of the questions indicates that the value $r_{11} = 0,669 > r_{table} = 0,248$ which means that 25 of the questions are reliable. Items that have a valid and reliable can be used to collect research data.

Test of the validity using moment product correlation. Validity test shows that there are about 23 items more than $r_{table} = 0,248$ ($r_{xy} \geq r_{table}$), which means that 23 items are valid. Reliability test items using the equation KR matter. 20. Reliability test shows that the value $r_{11} = 0,768 > r_{table} = 0,248$ which means that the 23 question is reliable. Item that has a valid and reliable can be used to collect research data.

Before conducting two ways variance analysis, requirements analysis test done first. Normality Test by using methods Lilliefors. Based on computation obtained $L_{obs} < L_{table}$ means H_0 acceptable. This means that all three samples derived from normal distributed population. The summary of the normality test results are in the following table.

TABLE 2. Results of Normality Test

Source	class Test	L_{hitung}	L_{tabel}	Conclusion
Learning outcomes Independence level	experiment I	0.142	0.157	Normal
	experiment II	0.107	0.152	Normal
	Control	0.106	0.0154	Normal
	High	0.107	0.159	Normal
	Moderate	0.132	0.150	Normal
	Low	0.114	0.154	Normal

Homogeneity test using test Bartlett with a statistical test Chi Square. It is said to be homogeneous if $x_{0bs}^2 \leq x_{table}^2$ and not homogeneous if $x_{0bs}^2 > x_{table}^2$. Results of homogeneity test results of studying mathematics obtained $x_{0bs}^2 = 0,847$ because $x_{0bs}^2 < x_{table}^2 = 5,991$ as H_0 is received. It can be concluded that the samples come from a homogeneous population.

Data were analyzed using two-way analysis of variance with different cells with significance level of 5%. The results show that there are differences in the influence of the learning model of problem-based learning -based portfolio assessment, learning model of problem-based learning , and the learning model expository towards learning outcomes of mathematics, there are differences in the effect of the level of independence of student learning to the learning outcomes of mathematics, and there is interaction between learning models and the level of independence to the learning outcomes of student learning mathematics. The results of two ways analysis served in the following table.

TABLE 3. Summary of Analysis of Two Way Variance

Source	JK	dk	RK	F_{obs}	F_a
Learning Model (A)	3882.138	2	1941.07	13.41	3.10
Independence level (B)	4734.871	2	2367.44	16.36	3.10
Interaction (AB)	795.6	4	198.9	1.37	2.47
Error	13026.684	90	144.741		
Total	22439.293	98			

Based on two-way analysis of variance test with different cells got that H_{0A} and H_{0B} were rejected. It means that multiple comparison test is required to determine the effect of the mean difference between the rows and columns. Summary of inter-cells average and average of marginal can be seen in the following table.

TABLE 4. Inter-Cell Average and Marginal Average

Learning model	Independence level			Marginal mean
	high	moderate	low	
Problem Based Learning -Based Portfolio Assessment	88.261	77.47	66.403	77.378
Problem Based Learning	74.309	69.566	65.613	69.829
Conventional	69.566	66.668	49.802	62.011
Marginal mean	77.378	71.234	60.606	

Based on the calculation of variance analysis test two different cell indicates that H_{0A} rejected means that there are differences in the influence of the learning model of problem-based learning -based portfolio assessment, learning model of problem-based learning , and the learning model expository mathematics on learning outcomes. Results of mean comparison test between lines can be presented in the following table.

TABLE 5. Comparison Test Results Mean Interlinear

H_0	H_1	F_{hitung}	$2F_{tabel}$	Decision
$\mu_1 = \mu_2$.	$\mu_1 \neq \mu_2$.	6,49	6,20	H_0 rejected
$\mu_1 = \mu_3$.	$\mu_1 \neq \mu_3$.	26,504	6,20	H_0 rejected
$\mu_2 = \mu_3$.	$\mu_2 \neq \mu_3$.	7,07	6,20	H_0 rejected

In comparison the first, second, and third H_0 was rejected. This means that the learning model of problem-based learning -based portfolio assessment and learning model of problem-based learning gives a different effect on the result of learning mathematics, learning model of problem based learning based portfolio assessment and learning model expository different effects on learning outcomes of mathematics, as well as learning models problem based learning and expository models give different effects on mathematics learning outcomes. Based on Table 4, the marginal average of learning model of problem-based learning is based on a portfolio of 77.378, average of marginal learning model of problem based learning amounted to 69.829, and the average of marginal expository teaching model at 62.011. It can be concluded that learning model of problem based learning based portfolio assessment is better than learning model of problem-based learning and expository teaching model and teaching model of problem-based learning is better than learning model expository.

This is consistent with research conducted by Ariyanti, Martini, and Agustina states that by using model problem based learning based portfolio assessment can enhance the activity and student achievement because students can give a good response to the teacher in presenting the material.

In this case in line with research conducted Argareta concluded that problem-based learning model is better than the expository teaching model. It is seen from the mean differences in mathematical ability of students to use problem-based learning model is better than the average differences in mathematical ability of students using expository teaching model.

Based on the calculation of variance analysis test of two different cells indicates that H_{0B} rejected means that there are differences in the effect of the level of independence of learning on mathematics learning outcomes. Results of mean comparison test between lines can be presented in the following table.

TABLE 6. Comparative Test Results Mean Between Columns

H_0	H_1	F_{hitung}	$2F_{tabel}$	Decision
$\mu_1 = \mu_2$	$\mu_1 \neq \mu_2$	4,287	6,20	H_0 accepted
$\mu_1 = \mu_3$	$\mu_1 \neq \mu_3$	31,067	6,20	H_0 rejected
$\mu_2 = \mu_3$	$\mu_2 \neq \mu_3$	13,257	6,20	H_0 rejected

In the first comparison is obtained $F_{1-2} = 4,287 < F_{tabel} = 6,20$ then H_0 accepted. This means that students who have a high level of independence and students who have a moderate level of independence give a similar effect on learning outcomes of mathematics.

In the second and third comparison is H_0 rejected. This means that students who have a high level of independence and self-reliance of students who have low levels have different effects on mathematics learning outcomes, as well as students who have a moderate level of independence and students who have a lower level provides different effects on mathematics learning outcomes. Based on Table 4, the marginal average of high level of independence of 77.378, the marginal average level of independence was 71.234, and the average marginal of low level of independence at 60.606. It can be concluded that students who have high level of independence and students who have moderate level of independence are having mathematics learning outcomes better than students who have a low level of independence.

This is consistent with research conducted by Aini and Garden, which explained that independent learning is very influential on student achievement. In the case according to research conducted by Mulyaningsih, explained that the higher independence in learning, the higher the learning results. With independent learning dependence on others can be avoided so as to have a high confidence in learning. Based on the calculation of variance analysis test of two different cell shows that the H_{0AB} accepted means there is no interaction between the learning model and the level of independence of learning on mathematics learning outcomes. Means on each model of learning, mathematics learning outcomes in students who have a high level of independence as well as students who have a moderate level of independence, as well as students who have a high level of independence and were better than students who have a low level of independence. In addition, at each level of independent learning, mathematics learning outcomes in learning model of problem-based learning -based portfolio assessment is better than learning model of problem-based learning and expository, as well as the teaching model of problem-based learning is better than learning model expository.

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