

The Effect of Guided Discovery Learning Strategy using Students' Worksheet (LKS) to the Learning Outcomes on IPA Physics of Grade VIII Students in SMP N 24 Padang

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Abstract: The student's achievement which is low on IPA Physics competency is predicted as the result of the less effective of learning strategy used in learning process. One of learning strategies which is considered effective is Guided Discovery Strategy using LKS. This research aims to know the effect of the strategy on the learning outcomes on IPA Physics of Grade VIII students in SMP N 24 Padang. Research design used is Quasi Experiment Research using Randomized Control Group Only Design. The population is all the Grade VIII students in the academic year 2012/2013 except the VIII-A students as the excellence class. Purpose Sampling Technique is used in defining the sample. Data are collected by using written test for cognitive aspect, observation sheet for affective aspect, and scoring rubrics for psychomotor aspect. *T-test* of 0,05 is used to analyse the data. The results show that the average scores of experiment class for cognitive aspect are 70,5 and of control class 62,58; of class experiment on affective aspect 77,93 and of control class 70,45; and, of experiment class for psychomotor aspect 77,13 and of control class 72.96. Hypothesis is tested using *t-test*, which for cognitive aspect obtained $t_{count}=2,51$, for affective aspect $t_{count}=7,69$, and for psychomotor aspect $t_{count}=4,27$, and $t_{table}= 1,67$ on the level of 0,05. It means that $t_{count}>t_{table}$, so H_0 is rejected. The conclusion of this research is that there is an effect of the implementation of Guided Discovery Strategy using LKS to the learning outcomes on IPA Physics of Grade VIII students in SMP N 24 Padang.

1 INTRODUCTION

Qualified Education is the vision of the government for education aspect. Qualified education will also produce a qualified output. The output can be seen on the high level of academic and non academic learning competencies. In the education aspect, the quality of the graduates assesses based on the compatibility of student's ability as stated in the curriculum. The curriculum implemented now in Indonesia is Level of Educational Curriculum (KTSP) which demands mastery learning based on Minimum Mastery Criteria (KKM). The efforts done in meeting the requirements of KTSP in increasing qualification process and learning outcomes on IPA Physics are increasing the qualification of the teachers through upgrading sessions, maximalizing the learning process in the class by providing supportive tools such as learning materials procurement, learning tools improvement, and also learning facilities and infrastructure improvement.

Although many efforts have been done, the achievement of learning outcome of Natural Sciences (IPA) in SMP is still not optimal. This can be based on the result of second semester Final Test (UAS) on IPA of Grade VIII students in SMP N 24 Padang in academic year 2011/2012 which are generally less than the KKM of the subject which is 75, as in Table 1 below.

Table 1: The Average Scores of Second Semester Final Test (UAS) of IPA of Grade VIII Students in SMP N 24 Padang.

No	Class	Average Score
1	VIIIA	65,80
2	VIIIB	55,75
3	VIIIC	58,48
4	VIIID	63,40
5	VIIIE	55,60
6	VIIIF	53,43
7	VIIIG	54,71
8	VIIIH	50,01

Based on Table 1, it can be seen that the achievement of IPA competency of the students is low. The average score of Final Test on IPA of the students is under KKM, 75. The cause predicted is there is uncentered-learning process to the students, which results the low competency achievement of the students.

The low basic competency achievement of the students relates to the less of students involvement in learning process. The less of involvement is caused by unvaried learning strategy used. Therefore the learning strategy implemented by the teacher must be varied so the student desires to be active in learning process especially Physics.

Based on the problems faced in learning Physics above, a strategy in learning effectively to solve a problem is needed. Learning strategy implemented must be able to involve the students in every learning activity. It can be realized if the teacher is able to implement various learning strategies such as expository, cooperative, and discovery learning strategies.

Discovery Learning Strategy is a strategy which strives the students to be able to assimilate a concept or a principle. Students are able to observe, to absorb, to understand, to categorise, to hypothesise, to explain, to estimate, and to conclude, etc. The strategy lets the students find out the solution or experience the problem themselves. Teacher only guides and gives instruction.

The implementation of discovery strategy is the way to teach which involves the students in a mental activity through sharing idea process, discussing, reading or trying out themselves, in order to make the students to be able to learning by themselves (Roestiya, 2008, p. 20). The implementation of discovery strategy can assist the teachers in increasing the involvement of the students in learning process. Thus, the researcher is interested to implement the discovery strategy in learning process using Student's Worksheet (LKS). LKS is papers which contain a guidance for students to do programmed activities (Depdiknas, 2008, p. 100)

The implementation of Guided Discovery Strategy using LKS can direct the students' activities in the class and also can make the students pay more attention to the teacher's explanation. Students must work on their own ways to find out a concept by answering the question in the LKS given. Through the strategy students are trained to learn more themselves. (Suherman, 2003: 214). Teacher gives a general problem to the students to be solved. The student starts to solve the problem by observing

a complex or specific example to get a general principle.

Learning process using discovery strategy must pay attention to the knowledge of prerequisites had by the students before doing discovery (Siriyosubroto, 1997, p. 199-200). Using correct steps the teacher can assist the students to discover the result as expected.

The goal of this research is to know the effect of guided discovery learning strategy using LKS on the learning achievement of IPA Physics of VIII students in SMP N 24 Padang. Subject of lesson discussed is the materials of second semester of VIII students about vibration, frequency, and sound.

2 RESEARCH METHOD

The research method used is Quasi Experiment Research with Randomized Control Group only Design. See Table 2 below.

Table 2: Method Framework.

Class	Pretest	Treatment	Postest
Experiment	-	X	T ₂
Control	-	-	T ₂

The X in the table is the treatment given to the experiment class that is the implementation of Guided Discovery Strategy using LKS. T₂ is the final test given to the experiment class and control class in the final of the learning process.

Population is generalizational area which consists of object or subject which has certain quality and characteristics which stated by the research to be learnt. Population of this research is all the Grade VIII students registered in academic year 2012/2013 except VIIIA students which is the excellence students. See Table 3 below.

Table 3: The amount of VIII students in SMP N 24 Padang in academic year 2012/2013.

No	Class	Amount
1	VIIIA	31
2	VIIIB	29
3	VIIIC	29
4	VIIID	30
5	VIIIE	30
6	VIIIF	31
7	VIIIG	29
8	VIIIH	30
Total amount		239

Sample is part of population taken as data source and represents the population. Sample is taken by using Purposive Sampling Technique. Purposive Sampling Technique is a sampling technique based on some goals and considerations (Sudjana, 2002, p. 168).

A research has variable. Research variable is an object or activity which has certain variation stated by the researchers to be learnt and then to be concluded. Research variables consist of free variable, bound and control variables. This research has the implementation of Guided Discovery Strategy using LKS as free variable, and student learning outcome on cognitive, affective and psychomotor aspects as bound variable, and teacher, learning materials, curriculum, and equal time allocation as control variable.

A research results data or information obtained by using instruments. The instruments used in this research are written test for cognitive aspect, observation sheet for affective aspect, and scoring rubrics for psychomotor aspect. For cognitive aspect, before taking the data, the instrument of the test is tried out first, then is analysed to obtain valid test tools, reliability, to get difficulty level, and also to get good distinguishing power of the questions.

Validity process is need to be done to know the test quality in the relation to the thing must be measured. A question is valid if has been measured the things to be measured (Arikunto, 2009: 57). Reliability is the accuracy of a tes if it is tested on the same object (Arikunto, 2009: 100). For determining the reliability of a test, Kuder Richaderson (KR-20) equation below can be implemented.

$$r_{11} = \left(\frac{n}{n-1} \right) \left(1 - \frac{M(n-M)}{nS^2} \right) \quad (1)$$

$$M = \frac{\sum x}{N} \quad (2)$$

r_{11} in the equation is the instrument of reliability, n number of questions, M mean, N test participants, and S deviation standard.

Reviewed for difficulties level, a good question is not a too easy or too difficult questions (Arikunto, 2009: 208). The difficult or easy of a question is shown by the difficulty level of the question. It can be counted using the following equation.

$$P = \frac{B}{J_s} \quad (3)$$

P in the equation 3 is the proportion of correct answers or difficulties level. B is the total amount of

participants answer correctly, and J_s is total amount of participants.

A good question also can differentiate students of high group or low group (Arikunto, 2009: 211). The number showing the amount of distinguishing power is called discrimination index or D which can be counted by the following formula.

$$D = \frac{B_A}{J_A} - \frac{B_B}{J_B} \quad (4)$$

D , in the equation, is distinguishing index, B_A the total amount of high group participants answer correctly, B_B total amount of low group participants answer correctly, J_A total amount of high group participants, and J_B total amount of low group participants.

On the research procedure, how the research steps managed to be a procedure beginning with the planning or activity preparation done for research is elaborated. The steps are arranging the research schedule and research materials, defining population and sample, preparing Lesson Plans (RPP) for experiment class and control class, and preparing research instruments and LKS. Research steps are done based on RPP. On the final steps, the activities of analysing the data obtained from the two classes, concluding the result obtained from the two sample classes, and concluding the result obtained in line with data analysis technique used are done.

Data of this research are the achievement of the students on 3 aspects; cognitive aspect which assessed from the final test result, affective and psychomotor aspects from observation result of students attitude along the learning process. Then, data obtained are analysed. Data analysis aims to test the validity of hypothesis proposed in the research. The normality and homogeneity of the data are tested first. Normal and homogeneous distributed data will be tested its hypothesis uses two average equality test.

Normality test aims to know whether the sample comes from the population which normally or not distributed. Thus, Liliefors test which consist of some steps are used. First, data X_i obtained orders ascending the convert to be Z_i raw number using the equation 5 below.

$$Z_i = \frac{x_i - \bar{x}}{S} \quad (5)$$

X_i , in the equation above, is the score obtained by student i , \bar{x} is the average score, and S is

deviation standard. The chance of $F(Z_i) = P(Z < Z_i)$ is obtained using deviation standard list. Furthermore, proportion is stated using $S(Z_i)$ which is obtained using the equation 6 below.

$$S(Z_i) = \frac{\text{number of } Z_1, Z_2, \dots, Z_n \text{ which } \leq Z_i}{n} \quad (6)$$

By counting the deviation of $F(Z_i) - S(Z_i)$ with absolute price, which is the greatest price among the the absolute prices, the deviation obtained is called L_o . After obtaining L_o and L_{table} on the real rate $\alpha = 0,05$, the two values is compared. The criteria is if $L_o < L_{table}$, the sample comes from the population which normally distributed. And if $L_o > L_{table}$, the sample comes from unpopulation which normally distributed.

Homogeneity test aims to know whether two samples have homogeneous variance or not. F-test is done to test the homogeneity as the equation 7 below.

$$F = \frac{S_1^2}{S_2^2} \quad (7)$$

F , in the equation 7 above, is data group variance, S_1^2 is the variance of achievement of experiment class students, S_2^2 is the variance of achievement of control class students. If F_{count} obtained is lower than F_{table} , the two data groups have homogeneous variance, vice versa.

Hypothesis test is done using *t-test* as the equation 8 below.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad (8)$$

\bar{X}_1 , in the equation above, is the average score of experiment class. \bar{X}_2 is the average score of control class. S is joining deviation standard. n_1 is the number of students of experiment class. n_2 is the number of students of control class. Test criteria is that H_o is accepted if $t > t(1-\alpha)$ at 0,05 and H_o is rejected if t has other prices. t_{table} is obtained from distribution list of t with degree of freedom (DoF) = (n_1+n_2-2) and chance $(1-\alpha)$.

3 RESULT AND DISCUSSION

The research had been conducted on 15 January to 5 March 2013 in SMP N 24 Padang and obtained data of learning outcomes on IPA Physics of Grade VIII students. The assessment of learning outcome was reviewed for three aspects those are cognitive, affective and psychomotor. The data of cognitive aspect was obtained through written test in the form of 20 objective questions. Post test was done to the two sample classes in the end of research. Meanwhile, data of affective and psychomotor aspects were obtained along learning process through affective and psychomotor assessment format.

Data of Physics learning outcomes on cognitive, affective, and psychomotor aspects can be seen at the Table 4 below.

Table 4: The Average Score of Sample Classes on Cognitive, Affective and Psychomotor Aspects.

Class	Average Score (\bar{x})		
	Cognitive	Affective	Psycho motor
Experiment	70,5	77,93	77,13
Control	62,58	70,45	72,96

Table 4 above shows that the average scores of experiment class on cognitive, affective, and psychomotor aspects are higher than control class.

Statistic analysis of equation test of two averages is needed to know whether the difference of Physics learning outcome of the students on the three aspects has meaning or not.

At cognitive aspect, the result of normality test using Lilefors test at sample class was obtained as the following table.

Table 5: The Result of Normality Test of Sample Class at Cognitive Aspect.

Class	N	α	L_o	L_t
Experiment	30	0,05	0,1214	0,161
Control	29	0,05	0,1349	0,161

Table 5 above shows that $L_o < L_t$ which means that the data of the two sample classes comes from population which normally distributed. Moreover, homogeneity test is done.

Homogeneity test is done using F test. The result obtained is as in the Table 6 below.

Table 6: The Result of Homogeneity Test of Sample Classes at Cognitive Aspect.

Class	α	F_{count}	F_{table}
Experiment	0.05	1,125	1,87
Control			

Table 6 above shows that $F_{count} < F_{table}$ which means that learning outcomes of students at each experiment class and control class have homogeneous variance.

Based on normality test and homogeneity test done for experiment class and control class, it is obtained that the data of learning outcomes of the two classes are normally distributed and have homogeneous variance. *T-test* is done to test the hypothesis.

The results of *t-test* obtain that $t_{count} = 2,51$ and $t_{table} = 1,67$. The acceptance of Null Hypothesis (H_0) criteria is if $t_{count} < t_{table}$. It is obtained that $t_{count} = 2,51$ is on the outside area of acceptance H_0 . The result shows that there is a significant difference on the learning outcome of students in experiment class and control class. It is proved with the average score of students in experiment class is higher than control class. It can be concluded that there is a significant influence of the implementation of Guided Discovery Strategy using LKS on the learning outcomes on IPA Physics of VIII students in SMP N 24 Padang at cognitive aspect.

At the affective aspect, the result of normality test using Liliefors test for sample class is obtained as table 7 below.

Table 7: The Result of Normality Test of Sample Classes at Affective Aspect.

Class	N	α	L_0	L_t
Experiment	30	0,05	0,1376	0,161
Control	29	0,05	0,1286	0,161

Table 7 above shows that $L_0 < L_t$ so that the data of the two sample classes comes from the population which is normally distributed. Furthermore, Homogeneity test is done.

Homogeneity test is done using F test. Table 8 below shows the result of homogeneity test.

Table 8: The Result of Homogeneity Test of Sample Classes at Affective Aspect.

Class	α	F_{hitung}	F_{Tabel}
Experiment	0.05	1,705	1,85
Control			

Table 8 above shows that $F_{count} < F_{table}$ which means that learning outcomes of the students of experiment class and control class have homogeneous variance.

Based on normality test and homogeneity test done on experiment class and control class, it is obtained that learning outcomes of the students of the two sample classes are normally distributed and have homogeneous variance. *T-test* is used to test the hypothesis.

The result of *t-test* obtains that $t_{count} = 7,69$ and $t_{table} = 1,67$. The acceptance of null hypothesis (H_0) criteria is $t_{count} < t_{table}$. The result shows that $t_{count} = 7,69$ is at the outside of the acceptance area of H_0 . The result shows that there is a significant difference of learning outcome of students at experimental class and control class which is proved with the average score of students at experimental class is higher than control class. By that significant difference, it can be concluded that there is a significant influence of the implementation of Guided Discovery Strategy using LKS on the learning outcomes on IPA Physics of VIII Students in SMP N 24 Padang at affective aspect.

At psychomotor aspect, the result of normality test using Liliefors test to the sample classes is shown in table 9 below.

Table 9: The Result of Normality Test of Sample Classes at Psychomotor Aspect.

Class	N	α	L_0	L_t
Experiment	30	0,05	0,1197	0,161
Control	29	0,05	0,1465	0,161

Table 9 shows that $L_0 < L_t$ which means that data of the two sample classes comes from the population which is normally distributed. Furthermore, homogeneity test is done.

Homogeneity test is done using F test. The result of the test is shown in Table 10 below.

Table 10: The Result of Homogeneity Test of Sample Classes at Psychomotor Aspect.

Class	α	F_{hitung}	F_{Tabel}
Experiment	0.05	1,034	1,85
Control			

Table 10 shows that $F_{\text{count}} < F_{\text{table}}$ which means that learning outcomes of the students at experiment class and control class have homogeneous variance.

Based on normality and homogeneity done for experiment class and control class, it is obtained that learning outcome of students at experiment class and control class is normally distributed and have homogeneous variance. *T-test* is implemented to test the hypothesis.

The result of *t-test* shows that $t_{\text{count}} = 4,27$ and $t_{\text{table}} = 1,67$. The acceptance criteria of null hypothesis (H_0) is $t_{\text{count}} < t_{\text{table}}$. The result shows that $t_{\text{count}} = 4,27$ is out of the acceptance area of H_0 . It means that there is a significant difference to the learning outcome of the students at experiment class and control class which the average score of the students at experiment class is higher than those at control class. For that reason, it can be concluded that there is significant effect of the implementation of Guided Discovery Strategy using LKS on the learning outcomes on IPA Physics of Grade VIII students in SMP N 24 Pada at psychomotor aspect.

Learning Physics which implements guided discovery strategi from the observation at experiment class obtains that the students are active and have desire to solve the problem given by the teacher. Student's activity in finding the concept and also the principle makes the students active to find the solution of the problem from source book and to do exercise or try out. According to Bruner in Oemar (Bruner in Oemar, 2011, p. 117), "student's discovery on the concept and also on the principle gives them stimulus to study through their own active involvement". Suherman (Suherman, 2003, p. 214) states that this learning makes the students active in learning activity and trains the students to study more themselves.

Using LKS as the aids in the implementation of Guided Discovery Strategy will make the students more active and more directed than the students at control class who do not use LKS. This is in line with Depdiknas (Depdiknas, 2004, p. 23) which states that LKS supports the students in developing and finding concept based on the description of observation result of the data obtained in the experiment activity.

The implementation of Guided Discovery Strategy using LKS effects the student's competency achievement on IPA Physics. It is proved by the average score of students at experiment class which is higher than those at control class. This result shows that students who implement this strategy in their learning process many of them will reach the KKM set. So, the

implementation of Guided Discovery Strategy using LKS can increase students' learning outcome on IPA Physics.

4 CONCLUSION

The research result shows that learning outcomes of students at experiment class with average score 70,5 at cognitive aspect, 77,93 at affective aspect, and 77,13 at psychomotor aspect are higher than those at control class with average score 62,58 at cognitive aspect, 70,45 at affective aspect, and 72,96 at psychomotor aspect. Hypothesis is tested using *t-test*. *T-test* result shows that $t_{\text{count}} = 2,51$ at cognitive aspect, $t_{\text{count}} = 7,69$ at affective aspect, and $t_{\text{count}} = 4,27$ at psychomotor aspect, and $t_{\text{table}} = 1,67$ at 0,05, which means that $t_{\text{count}} > t_{\text{table}}$ so that H_0 is rejected. The results show that there is significant difference on the learning outcomes of the students at experiment class and control class. For that, it can be concluded that there is a significant effect of the implementation of Guided Discovery Strategy using LKS to the learning outcomes on IPA Physics of VIII students in SMP N 24 Padang.

The implementation of Guided Discovery Strategy using LKS will assist the teachers in increasing students involvement in learning process. In the strategy students are let finding the solution of the problem themselves or experiencing themselves. Teacher only guides and gives instruction. Guided Discovery Strategy using LKS can be used as an alternative strategy to solve the problem in learning Physics in the class.

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