

# The Effect of *Group Investigation* and *Learning Cycle* Models Towards Students Science Process Skill on Environmental Pollution Topics for Grade VII Students MTs Nurul Huda Medan Academic Year 2016/2017

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**Abstract** — This study aims to determine the effect of *Group Investigation*, *Learning Cycle* and conventional models of students science process skill on environmental pollution topic for grade VII students MTs Nurul Huda Medan academic year 2016/2017. This research is a quasi experiment research. Sampling was done by cluster random sampling technique. The instrument used is pretest and posttest in the form of a description of 20 questions. Data were analyzed by using ANACOVA technique at significance level alpha 0.05 then continued with Tukey test. The result showed that there is effect of learning model towards the students science process skill with value of significant ( $p = 0,000$ ). The average value of science process skills that was taught by *Group Investigation* model was 79.96 higher 9.5 % from *Learning Cycle* and 16.5 % from conventional model. The average value learned by *Learning Cycle* is 74.80 5.9 % higher than conventional model. Based on the results of research indicated that there is effect of learning models (*Group Investigation*, *Learning Cycle* and conventional) of students science process skill. The *Group Investigation* model is still more influential than the *Learning Cycle* and conventional learning model.

**Keywords** : *Group Investigation*; *Learning Cycle*; *Science Process Skill*

## I. INTRODUCTION

Schools are one place to learn and have a large role to improve human resources through the learning process. There are five variables that play a role in teaching and learning process: learning objectives, subject matter, teaching methods and techniques, teachers, students and logistics [1].

In studying Science (Biology) students not only learn the product, but also learn aspects of processes, attitudes, and technology so that students can really understand the science as learning completely. in preparing the learning experience for

the students, the teacher is not only merely emphasizes the product but also on its aspects of the process, attitude and relation of their daily life.

So through these three components students are trained to achieve material products by applying a scientific attitude and requires supportive process skills. It is expected that students can solve their own problems, and be able to take the right decisions by using scientific concepts that make them think and act scientifically. As Ahmad and Ruba point out that process skills are the cognitive skills scientists use as a systematic approach to problem solving [2]. There are eight indicators of process skills: observation, classification, prediction, asking questions, hypothesis, applying concepts, communicating and experimenting [3].

Lack of students' concern for the environment because there is no direct practice at the time of learning and the lack of awareness of students to care about the environment. Meanwhile, the object of learning Biology related to living creature and nature, therefore, they are not only about the fact, principle or concept but also a discovery [4]. So that, students are expected to develop their ability in their selves. In learning, teachers have not been effectively provide the stimuli toward students to train themselves to think critically.

Consequently, students's science process skills have not been formed. Students are more often passive, giving less ideas or opinions, listening, recording, memorizing material. This learning proces tend to ensue student's knowledge and understanding of the information provided by teachers limited. Based on this matter, it is important to do research that implements the proper learning model by biological learning

which close related to their everyday life to solve this learning problems. One of the alternative solution is to use group investigation model and learning cycle model.

The Group Investigation learning model is a cooperative learning model that requires students to be active and participative in the learning process by digging/finding information/material that will be studied independently with the available materials. The Group investigation learning model is a cooperative learning strategy where students work in a small group to research (investigate) a learning topic.

According to [5] stated there are six stages in group investigation learning: (1) determining the topic and group of students, (2) planning assignments, (3) investigating, (4) preparing the results of the presentation, (5) presenting, (6) evaluation, where students and teachers collaborate in evaluating learning.

Thus, Learning Cycle is a learning model based on constructivism view, where knowledge is built on their own mind. Students become independent learners and critically thinker in solving of learning problem.

Learning Cycle is either one of the learning models that provide opportunities for students to optimize the way of learning and develop the power of reason. According to [6] in his research that the science process skills of students with high initial concept understanding taught by Group Investigation models are better than those with low-comprehension concepts taught by Direct Instruction. Group investigation, learning with this cycle model can also improve students' science process skills. According to [7] that there is an improvement of students' science process skill which is taught by 7E learning cycle model with conventional model.

Santyasa in [8] stated in his research about the application of investigation group learning model in learning oriented to the development of students thinking skills, activating students' knowledge, learning how to learn, learning about the real world based on inquiry.

Based on the previous background, it is necessary to examine the use of both models of learning on the subject of environmental pollution material by using contextual problems towards their daily life so that they become more active and be more able to improve the skills of the science process.

## II. RESEARCH METHODOLOGY

This research was hold at MTs Nurul Huda Medan which is located at Jalan Letjend Jamin Ginting Medan second semester academic year 2016/2017 from April – June 2017. The population of this study was students of class VII in the

second semester in MTs Nurul Huda Medan academic year 2016/2017 amounted to 82 people divided three classes are VII A amounted 24 poeple for the first experimental class using group investigation learning, VII B amounted 30 people for the second experimental class using learning cycle and VII D amounted 28 poeple for control class using conventional learning. This research is a quasi experimental research.

Sampling was done by cluster random sampling technique. The data collection technique used to measure the science process skill. This test is done twice before the treatment that aims to determine the students' early ability (pretest) and after treatment to know the ability of students after the treatment (posttest). The instrument used to measure the science process skill is the test instrument proposed by [3] used to include pretest and posttest tests consisting of 20 questions.

## III. DATA ANALYSIS TECHNIQUE

Data were analyzed by using ANACOVA technique, significance level alpha 0,05.  $H_a$  is accepted if value of significance lower than 0,05 and  $H_0$  is rejected. If statistic test shows the effect, so the analysis continues with Tukey test. Data processing using SPSS version 24.0.

## IV. RESULT AND DISCUSSION

Before starting the learning activities, firstly the researcher gives pretest to the students to see the student's base ability and posttest after learning activities, which is obtained the following data. In order to test the hypotheses, normality and homogeneity tests were done as prerequisite test. The result of pretest, posttest, normality, and homogeneity test for science process skills are displayed.

### Pretest

Pretests were given to students before the treatment applied to find out the initial score of students' science process skill for the groups. The average score of students' science process skill pretests could be seen in Table 1.

TABLE 1. The average value of science prosses skill

Descriptive Statistics				
Group	N	Mean and Standard Deviation	Minimum Score	Maximum Score
GI	24	69,63 ± 6,01	55	80
LC	30	67,87 ± 6,27	50	78
Conventional	28	64,46 ± 6,82	50	75

From Table 1, it was clearly known that experimental group had an average score of 69.63, minimum score of 55, maximum score of 80, and standard deviation of 6.01 for group investigation class. An average score of 67.87, minimum score 50, maximum score of 78, and standard deviation of 6.27 for learning cycle class. The conventional class had an average score of 64.46, minimum score of 50, maximum score of 75, and standard deviation of 6.82. Subsequently, the data was processed by the normality test. The normality test could be seen in Table 2.

TABLE 2. Normality Test on Pretest Score

Group	Normality Test Kolmogorov-Smirnov		Description
	Significant	$\alpha$	
GI	0,150	0,05	Normal
LC	0,160	0,05	Normal
Conventional	0,109	0,05	Normal

From Table 2, it was clearly known that the data of the groups were normally distributed on the significance level of  $> 0.05$ . The result of homogenous average score of pretest could be seen in Table 3.

TABLE 3. The result of homogenous average score of pretest

Levene's Test of Equality of Error Variances <sup>a</sup>					
Dependent Variable: Science Proses Skill					
F	df1	df2	Sig.	$\alpha$	Description
0,338	2	79	0,714	0.05	homogenous

From Table 3, it was obviously known that the data of the groups had a homogenous average score of pretest, in which results of the test gave a value of 0.714.

### Post-test

Post-test were given to students after the treatment applied to find out the initial score of students' science process skill for the groups. The average score of students' science process skill post-test could be seen in Table 4.

TABLE 4. The average value of science proses skill

Descriptive Statistics				
Dependent Variable: Science Proses Skill				
Model	Mean and Standard Deviation	N	Minimum Score	Maximum Score
GI	79,96 ± 5,22	24	70	98
LC	74,80 ± 5,23	30	79	94
Conventional	71,36 ± 3,91	28	80	82

From Table 4, it was clearly known that experiment group had an average score of 79.96, minimum score of 70, maximum score of 98, and standard deviation of 5.22 for group investigation class. An average score of 74.80, minimum score 79, maximum score of 94, and standard deviation of 5.23 for learning cycle class. The conventional class had an average score of 71.36, minimum score of 80, maximum score of 82, and standard deviation of 3.908. Subsequently, the data was processed by the normality test. The normality test could be seen in Table 5.

TABLE 5. Normality Test on Post-test Score

Group	Normality Test Kolmogorov-Smirnov		Description
	Significant	$\alpha$	
GI	0,197	0,05	Normal
LC	0,133	0,05	Normal
Conventional	0,199	0,05	Normal

From Table 5, it was clearly known that the data of the groups were normally distributed on the significance level of  $> 0.05$ . The result of homogenous average score of post-test could be seen in Table 6.

TABLE 6. The result of homogenous average score of post-test

Levene's Test of Equality of Error Variances <sup>a</sup>					
Dependent Variable: Science Proses Skill					
F	df1	df2	Sig.	$\alpha$	Description
0,338	2	79	0,714	0.05	homogenous

From table 6, known the homogeneity test result showed that data of student's science process skills in group investigation, learning cycle and conventional classes are homogeneous. The value of science proses skill and student worksheet could be seen in Table 7.

**TABLE 7.** The value of science processes skill for post-test and student worksheet

No	Model	Student Worksheet	Science Processes Skill
1	Group Investigation	92,25 ± 8,31	79,96 ± 5,22
2	Learning Cycle	87,70 ± 8,06	74,80 ± 5,23
3	Conventional	83 ± 7,10	71,36 ± 3,91

From Table 7 were obtained the scores of science processes skill in group investigation 79.96, learning cycle 74.80, conventional 71.36 and the score of student worksheet in group investigation 92.25, learning cycle 87.70, conventional 83. Where the student worksheet scores are higher than science processes skill score. Based on the post-test results of science process skills that the average and standard deviation of the group investigation learning model significantly different from the learning cycle model and conventional models, but the average of the learning cycle model was not significantly different from conventional models. While the value of science process skills based on the Student Worksheet for group investigation, learning cycle and conventional classes showed that the average and standard deviation of the group investigation class were significantly different from the learning cycle and conventional classes. The value of the learning cycle class is not significantly different from conventional class. Meanwhile, the result of science processes skill based on indicators are displayed on table 8.

**TABLE 8.** The Result of science processes skill based on indicators

Indicators	Models		
	Group Investigation	Learning Cycle	Conventional
Observation	78,6 ± 15,4	82,1 ± 11,2	79,9 ± 12,4
Classification	81,9 ± 12	80,6 ± 11,6	76,8 ± 13,1
Prediction	90,6 ± 12,4	74,2 ± 15,4	74,1 ± 14,4
Asking Question	78,5 ± 12,5	73,3 ± 14,9	70,2 ± 10,5
Hypothesis	79,2 ± 19	68,3 ± 16	62,5 ± 14,4
Applying the Concept	78,5 ± 4,3	73 ± 16,7	73 ± 14,6
Communication	76 ± 17,3	66,6 ± 15,2	57,1 ± 16,5
Doing the Experiment	70,8 ± 29,2	61,7 ± 28,4	53,6 ± 33,1

From Table 7 and 8 were obtained the scores of science processes skill and student worksheet where the student worksheet score is higher than science processes skill test. It caused learning stages of group investigation and learning cycle the students practice several indicators of process skills directly during the practice. Based on results of [9] which states that each process skill indicator increased after applied

learning cycle model. Based on the results in Table 7 shows that of the three learning models, the value of Predicting indicators on the learning stages of group investigation is higher than other learning models that is 90,6. This denote that predicting skills is formed in students, and the syntax that appears more in group investigation learning is the process of planning tasks and conducting investigations because at this stage students have been able to make plans in groups and prove the predictions of the performed experiments. This case is appropriated to [10] which states that predicting indicators can be improved through learning that conducts investigations or direct problem solving in the field. Statistical analysis with Anacova technique using SPSS version 24,0 in Table 9.

**TABLE 9.** Summary of Anacova the Science Process Skill

Independent Variable	A Number of Squares	Average of Squares	Value of F account	Value of F table	Sig	Decision
Learning Model	961,337	480,69	20,524	0,12	,000	F <sub>account</sub> > F <sub>table</sub> H <sub>0</sub> is rejected and H <sub>a</sub> is accepted

**TABLE 10.** Summary of Tukey Test

Dependent Variabel	(I) Model	(J) Model	Mean Difference (I-J)	Std. Error	Sig.
Science Process Skills	GI	LC	5,16*	1,325	,001
		KV	8,60*	1,346	,000
	LC	GI	-5,16*	1,325	,001
		KV	3,44*	1,272	,022
	KV	GI	-8,60*	1,346	,000
		LC	-3,44*	1,272	,022

Based on tables 9 and 10 can be described that the value of  $F_{\text{account}} = 20.524$  and the value  $F_{\text{table}} = 0.12$ . Therefore  $F_{\text{account}} > F_{\text{table}}$  with significance 0,000 then  $H_0$  is rejected and  $H_a$  accepted that there is a significant influence in the learning model towards students' science process skills. Hypothesis results the learning model significantly influence the students' science process skill with value ( $F = 20,524$ ;  $P = 0,000 < 0,05$ ). From table 5 it shows that Tukey's test results for students' science-process skill score with group investigation 79,96 ± 5,22 are higher and it is different significantly classes which is taught by learning cycle model and conventional model 3.908 ( $P = 0,000$ ), and the value of students' science process skills which were taught by learning cycle model is also higher and it is significantly different with conventional class

( $P = 0.022$ ) and average of value science process as shown in the graph in Figure 1.

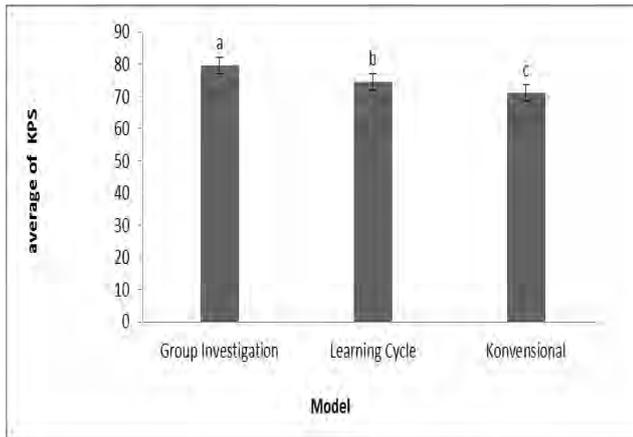


Fig 1. The Effect of learning model on science process skill. The different letters in diagram above describe it's significantly different.

Whereas the average value of science process skill students using Group Investigation model is higher and gives an effect of 9.5% compared to the learning cycle model and 16.5% higher than the conventional learning model. While learning cycle model gives an effect of 5.9% higher than conventional model. Skill of science process of student especially on subject of environmental pollution from result of data analysis which have been done which can be known that Group Investigation show result of skill of science process better. The results of this study accordinty with [11] research concluded that the Group Investigation model can improve the mastery of the concept and science processes skill of student. Learning Cycle can also improve science process skills in accordance with the research proposed by [7] that there is an increase in the science process skills of students who are taught by the model of Learning Cycle type 7E compared to conventional models.

## V. CONCLUSION

Based on the result and discussion of the research, it can be concluded that there is influence of group investigation model, learning cycle and conventional learning model towards students science process skill with value ( $P = 0,000$ ). The students science process skill which is learned by group investigation model with gives an effect of 9.5 % higher than the learning cycle model and 16.5 % higher than the conventional class. Learning cycle class with gives an effect of 5.9 % higher than the conventional class.

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