

The Effect of Cooperative Learning Model Type Group Investigation for Student's Conceptual Knowledge and Science Process Skills

Sri Handayani Parinduri¹, Makmur Sirait², Ridwan A. Sani²

¹(Department of Physics Education on Post Graduate Program, State University of Medan, Indonesia)

²(Lecturer in Department of Physics Education, State University of Medan, Indonesia)

Corresponding Author: Sri Handayani Parinduri, srihandayaniparinduri@gmail.com

Abstract : *The purposes of this research were to analyze the effect of cooperative learning model type group investigation for student's conceptual knowledge and science process skills in the temperature and heat subject. This research was a quasi experiment research. The population was all students of class X SMA Swasta Teladan Medan academic year 2016/2017. The sample selection was done by using random class technique of two classes. The first class was the class X-5 as an experimental class taught with cooperative learning model type group investigation and the second class was class X-4 taught by conventional learning. The instruments consisted of a conceptualized science test and a science process skills test with observation. The data in this research were analyzed by using independent t-test. The results showed that the conceptual knowledge of students who were taught using cooperative learning model type group investigation better than conventional learning. The science process skills of students who were taught using cooperative learning model type group investigation better than conventional learning.*

Keywords - *cooperative learning model type group investigation, conceptual knowledge, science process skills*

I. INTRODUCTION

Education is a very decisive process for the development of individuals and society because the progress of society can be seen from the development of education. The government has made efforts to improve the quality of education, one of them by improving the implementation of learning process in schools based on constructivism learning theory through Education Unit Level Curriculum (KTSP). The government gives authority to the school to be able to develop the learning process in accordance with the condition of the students [1].

Physics is a subject that studies natural phenomena and phenomena that occur in the universe. Students can develop knowledge about natural phenomena and can apply in everyday life by understanding the learning of physics.

An interview had given with one of the physics teachers at SMA Swasta Teladan Medan on Friday, November 5, 2016 revealed that the students' conceptual knowledge in physics lessons, especially temperature and heat materials was low. It can be seen from the result of student's daily physics test was still far from expected. When viewed from the lowest criteria to indicate the learner achieves a minimum completeness criterion (KKM) with a score of 75 on the physics course set in the school, only a few students in each class were able to achieve the above KKM score and the remainder was still below the KKM. When interviewed further, it turns out that the learning used was conventional learning where the teacher was the center of the information giver that causes students less active and less fond of physics lessons. Cooperative learning model type group investigation that should be implemented, was rarely done so that the science process skill (KPS) of the students was low then the students did not understand the lessons of physics because they were not directly involved in the experiment.

Based on preliminary study of researchers using questionnaire instruments has distributed to 40 respondents in the class X SMA Swasta Teladan Medan, it was found that 34.15% of students less interested in physics learning in the classroom, 19.51% of students less interested in learning physics and mathematics, respectively 9.76% stated that less fond arts of culture and sociology, each of 7.32% students less fond of math and German, for 4.88% of students less fond of the Indonesian language, each of 2.44% not like civic education, chooses others and does not exist.

The low achievement of the mastery of student's concepts and the majority of students were less fond of the learning of physics shows that the learning done so far has not been in accordance with the objectives. In response to the above problems, it was necessary for teachers to improve students' understanding of physics concepts so that the planned learning objectives can be achieved and conceptualization also increases.

II. LITERATURE

Cooperative Learning Model Type Group Investigation

Cooperative learning model type group investigation involves students in planning the topics to be studied and how to carry out their investigations. Students in Cooperative learning model type group investigation not only work together but also help plan the topics to be studied and the investigative procedures used [2].

The cognitive goals of the cooperative learning model type group investigation were academic conceptual knowledge and investigating skills. While the social objective of the cooperative learning model type group investigation was cooperation in groups [2].

Conceptual Knowledge

Conceptual knowledge is the knowledge of interrelationships among the basic elements [3]. Conceptual knowledge related to classification, category; principles, generalizations; theory, model and structure. An example of conceptual knowledge of principle and generalization was Boyle's law which explains the relationship between pressure and gas volume in enclosed spaces at the temperature and number of constant particles. The cognitive process dimension (way of thinking) contains six categories: remember, understand, apply, analyze, evaluate, and create [3].

Science Process Skills

Science process skills is a number of specific skills in students so that students are able to process information to obtain facts, concepts, and development of concepts and values [4]. Indicator of science process skills according to Tawil and Liliyasi [4], namely: a)observing, b)grouping / classification, c)interpret, d)predict, e)asking questions, f)formulating hypotheses, g)plan the study, h)using tools / materials, i)applying the concept, h)communicate.

III. RESEARCH METHODOLOGY

This research was hold at SMA Swasta Teladan Medan which is located at Jalan Pertiwi No. 95 Medan in the second semester academic year 2016/2017.

The population of this study was all students of class X in the second semester which amounted to five classes in SMA Swasta Teladan Medan academic year 2016/2017.

The sample in this study consists of two classes selected by cluster random sampling technique, each class of the population was entitled to have the opportunity to be a research sample. One class as an experimental class (a class applying a cooperative learning model type group investigation) and one class as a control class (a class that applies conventional learning).

Variable in this research consist of two variables that was independent variable and dependent variable with explanation as follows: a) The independent variable was the variable that influences or causes the change or the incidence of the dependent variable. The independent variables in this study were the cooperative learning model type group investigation and conventional learning. b) The dependent variable was the variable that was influenced or caused due to the independent variable. The dependent variable in this research was the conceptual knowledge and science process skills in the second semester of students in SMA Swasta Teladan Medan academic year 2016/2017 on temperature and heat subject.

The study involved two different treatment classes in which the experimental class was treated using the cooperative learning model type group investigation, while the control class was using conventional learning. The treatment was aimed at knowing the conceptual knowledge and science process skills of the students by giving tests and observations in both classes before and after treatment. The design of research was quasi experimental, by design: two groups pretest-posttest design. Thus the research design can be seen in Table 1.

Table 1. Two Groups Pretest-Posttest Design

Classes	Pretest	Treatment	Posttest
Experimental	Y_1	X_1	Y_2
Control	Y_1	X_2	Y_2

Information:

X_1 = treatment in the experimental class was the application of cooperative learning model type group investigation

X_2 = treatment in the control class was the application of conventional learning.

Y_1 = pretest given to the experimental class and control class prior to treatment.

Y_2 = postes given to the experimental class and control class after the treatment

IV. RESULTS

Student's conceptual knowledge on control class and experiment class shown in Table 2 below.

Table 2. Pre-test and Post-test Results of Student's Conceptual Knowledge

	Conceptual Knowledge	
	Control Class	Experiment Class
Pre-test	32.00	34.80
Post-test	56.69	74.74

Based on Table 2, the description of the average pre-test and post-test conceptual knowledge in experiment class and control class as follows: Pre-test on control class and experiment class were 32.00 and 34.80. Post-test on control class and experiment class were 56.69 and 74.74.

Analysis of Conceptual Knowledge Items on Control and Experimental Class

The implementation of the research took place four times each meeting in the experimental class and control class based on four learning implementation plan (RPP) which had been designed before the research was conducted. In the experimental class the researchers applied Cooperative learning model type group investigation while in the control class the researcher applied conventional learning. The application of cooperative learning model type group investigation was intended to see whether or not the model effect was applied to the students' conceptual knowledge and the student's science process skills in the experimental class and control class.

The application of cooperative learning model type group investigation in the experimental class begins by forming groups of students into six groups with each group consisting of six or five students. Teachers provide sub topics to be chosen by students from the topics to be studied. Teachers and students then plan the procedures and tasks according to which sub topics were selected. At the implementation stage, students carry out the planning made in the previous stage while the teacher monitors and offers help when needed. In the analysis and synthesis stage, students analyze and evaluate the information obtained during the experiment. In the final product presentation stage, the teacher appoints several groups to present the experimental results in front of the class. During the evaluation phase, teachers and students evaluate the contributions given by each group, some groups provided opinions and suggestions on the topic presented, what were the things that differentiate the results obtained by each group. Student experiments aim to improve and train student's conceptual knowledge and science process skills. Students conducted experiments in groups, each group making its own work procedure based on the agreement of the group. During the student's experiments, teachers were assisted by peers to observe the students' science process skills by using the prepared sections. It aim to look directly at the students' science process skills in addition to the postes at the end of the lesson. After the experiment was complete, students were asked to verify the results of their experiments and draw conclusions on each experiment that has been done. After each group presented the results of their discussion, the researcher then gave an explanation.

According to Arends [2], cooperative learning model type group investigation was a learning model that involves students in planning the topics to be studied and how to run the investigation. Students in cooperative learning model type group investigation not only work together but also help plan the topics to be studied and the investigative procedures used. The effect of this model was that cooperative learning model type group investigation will improve students' conceptual knowledge.

This study provided corroborating evidence that the conceptual knowledge of students increases, this may be due to group formation based on different levels of student knowledge in each group, encouraging higher-knowledge students to assist students with lower ability to get the maximum value.

The grade of postes for the classes using the cooperative learning model type group investigation was better than the postes in the class using conventional learning. This was in line with research conducted by Siregar and Harahap [5] which concluded that the student's conceptual knowledge on the subject matter of temperature and heat with cooperative learning model type group investigation was better than conventional learning. Research conducted by Suartika, et al. [6] concluded that there was a difference understanding of concepts between students who follow the cooperative learning model type group investigation and students who follow conventional learning. In line with Ernawati's research, et al. [7] explained that the difference in the mean value of learning outcomes using cooperative learning model type group investigation was higher than the use of conventional learning. In addition, research of Dewi, et al. [8] states that the cooperative learning model type group investigation could be applied to improve learning outcomes and student activities on the chemicals in food substances in SMP Negeri 4 Temanggung. Wahyuni's research, et al. [9] concluded that cooperative

learning model type group investigation effectively improve the results of physics learning in grade XI MA Akhairaat Kalangkangan.

Cooperative learning model type group investigation had made the student's physics conceptual knowledge better than conventional learning. This was in line with research conducted by Sahyar and Maris [10] which concludes that with the same initial ability of students, there was an effect of applying cooperative learning model type group investigation to conceptual knowledge learning outcomes.

When observed from both classes, it was found that students in the experimental class play an active role in conducting the experiments provided. At first the students had difficulties when asked to join the group, but in the next meeting the students were more alert when the teacher instructed the students to join the group. Students can find and develop their own knowledge, conduct an inquiry from what he or she knows, search from various sources and do practicum and share knowledge with fellow classmates will improve students' understanding of a topic thoroughly so as to reduce the impact of knowledge gaps among students .

Student's science process skills on control class and experiment class shown in Table 3 below.

Table 3. Pre-test and Post-test Results of Student's Science Process Skills

	Science Process Skills	
	Control Class	Experiment Class
Pre-test	22.86	22.97
Post-test	42.34	58.00

Based on Table 3, the description of the average pre-test and post-test science process skills in experiment class and control class as follows: Pre-test on control class and experiment class were 22.84 and 22.97. Post-test on control class and experiment class were 42.34 and 58.00.

Analysis of Science Process Skills Items on Control and Experimental Class

The influence cooperative learning model type group investigation would improve the student's science process skills, student's science process skills could be increased due to the trained students doing the investigation applied to the cooperative learning model type group investigation in the learning phase. In this study, there was reinforced evidence that the science process skills of students who treated the cooperative learning model type group investigation turned out to be better than the students who received the conventional learning treatment. The cooperative learning model type group investigation had a significant effect on student's science process skills. This research was in line with Siregar and Motlan's research [11] explains that there was a difference of student's science process skills taught by using cooperative learning model type group investigation with direct instruction model. The science process skills of students taught by using cooperative learning model type group investigation better than direct instruction model. This study was also in accordance with research conducted by Wiratana et al. [12], concluding that there were differences in science process skills between students studying with cooperative learning model type group investigation with students learning to use conventional learning model.

Increased science process skills of students mainly on the indicator to ask questions because during the learning and while the experiment took place students dare to ask what had not been understood about learning. This was in line with the research undertaken by Delismar et al. [13] which concludes that there was a difference between high-creativity students which using cooperative learning model type group investigation when compared to high-creativity students which using conventional learning.

When observed from both classes, it was found that the students in the experimental class were more active in doing the experiments than the students in the control class. In the beginning students experience difficulties when performing experiments, but at the next meeting students was more accustomed to experimenting with their respective groups. The influence of this social group turns out to be an effective way of providing quick solutions for students to complement their ignorance of the subject matter learned.

Physical learning not only helped students acquire knowledge, skills, and attitudes, but more importantly was to help students learn about how to learn the knowledge, skills and attitudes it gained. The process of physics learning was not enough to simply transfer teacher knowledge to students, but it must be through a dialogical experience that was characterized by a learning atmosphere characterized by real experience or directly involved.

The learning model applied to the two sample groups gave better effect to the student's science process skills. But in the implementation there were still obstacles that was when students were not used in using cooperative learning model type group investigation so that the value obtained by students mostly still under the KKM although overall the student's science process skills increased. Observational data obtained during the

learning process still there were weaknesses that students were less accustomed to working with groups that were divided based on the level of knowledge they have also made the students work longer.

The data obtained was normal and homogeneous distributed, then the data were tested assumption using the similarity of variance and the average of pretest value done by Independent sample t test. Independent t-test was used to test experimental research that was to verify whether there was influence of cooperative learning model type group investigation and conventional learning to conceptual knowledge and student's science process skills. Test Independent sample t test using SPSS 17.0.

In the condition to see the influence that was used t test (sig 1-way) was significant obtained was ½ of significant 2-way that was 0.000, because the value significance less than 0.05 then the accepted H_a or conceptual knowledge of the experimental class students was better than the conceptual knowledge of the control class students.

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V. CONCLUSION

Conceptual knowledge of physics students used cooperative learning model type group investigation was better than conceptual knowledge of physics students using conventional learning. This can be shown from the research data showing that the conceptual knowledge of physics students using cooperative learning model type group investigation equal to 74.74 and on the conceptual knowledge of physics students using conventional learning of 56.69.

Science process skills of physics students used cooperative learning model type group investigation was better than the students' science process skills using conventional learning. Based on data from the average score of students using cooperative learning model type group investigation of 58.00 for students using conventional learning amounted to 42.34.

Students should be guided by providing sufficient training to improve student's conceptual knowledge and science process skills. The next researchers should use a longer period of time because the time available in the implementation of learning by using cooperative learning model type group investigation and by using conventional learning is still lacking, because adjusted to the school schedule in question. Teachers should choose the learning model in accordance with the purpose of learning. Viewed with the character of the students, the students are not yet accustomed to using cooperative learning model type group investigation, so the students should to be trained to conduct the investigation through simple experiments while studying physics so that students have a fast response in implementing cooperative learning model type group investigation.

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