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"The Effect of Inquiry Training Learning Model Using PhET Media and Scientific Attitude on Students' Science Process Skills"

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Abstract: *The aim of this study were : to analyze if the result of students' science process skill with using inquiry training learning model better than conventional learning, to analyze if the results of science process skill of students who have high average of scientific attitude better than students who have low average of scientific attitude, to find out interaction between inquiry training learning model and scientific attitude of physics students' science process skill. This research is a quasi-experimental design with two group pretest-posttest design. The research population is all students of class X SMA Negeri 19 Medan in second semester of the 2016/2017 academic year. The sampling define by random cluster sampling with two classes consist of 66 students. X-2 class as experimental classusing scientific inquiry learning model consists of 33 students, X-1 classas control class using conventional learning consiste of 33 students. This research instrument used essay tests of science process skill and scientific attitude that each tests consists of 10 questions and has been valid and reliable. Result of the data analyzed by using two ways Anava.The results showed that: the science process skill of students using inquiry training learning model better than conventional learning, The science process skill of students who have high average of scientific attitude better than students who have the low average of scientific attitude, and there was interaction between the inquiry training learning model and conventional learning with scientific attitude to improve physics students' science process skill.*
Keywords: *Inquiry Training Learning Model, Conventional Learning, Scientific Attitude ,Science Process Skill.*

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I. Introduction

Physics as a basic science has characteristics that include concepts, concepts, principles, laws, postulates, and theories as well as scientific methodologies [1]. One of the important things in physics learning is the low learning result of physics. Data International Education Achievement (IEA), Indonesia said on the order of 40 of 42 countries in terms of achievements in the field of natural science. Indonesia lags far behind the average of neighboring countries. Many students are only able to solve concrete problems with low cognitive categories. Internationally, natural science problems students who solve abstract problems and have the ability to analyze, synthesize, and suppress [2]. The development of science learning is still lacking in students' ability in inquiry, concept concept is a concept that can easily be obtained through inquiry activities [3]. Student learning outcomes have the ability to think and ability based on knowledge of science it has through the sense of science [4].

Based on information from one of the teachers of physics at SMAN 19 Medan obtained the results of physics learning students in general is still low ie 61.73 seconds Minimum Exhaustiveness Criteria (KKM) must reach is 75 scale 0 - 100 (List of Exam Values). Average uneven average does not meet the expected criteria. This is due to the implementation of learning on the mathematical approach and rarely perform laboratory activities. In classroom learning, students are translated into receiving lessons and student activities in learning [5]. In addition, from the observations made in SMA Negeri 19 Medan, woke teachers who rarely apply a variety of learning. Physics Learning using conventional learning model [6]. This is what is then. Students are not facilitated in developing their skills in the science process. The process of learning science [7]. Another factor that is experiencing an increase in learning outcomes is the attitude of students in learning [8]. The attitude that students must have in learning physics is a scientific attitude [9]. The essence of science [10] is a science whose object of observation is nature with all things including earth, plants, animals and humans. Science is a science that is produced by using method based on observation. Science is concerned with how to find out about nature systematically, so science is not just mastery of the collection which is the facts, concepts, or principles-the process of inquiry and discovery. Research [11] found in the attitude of scientific attitudes held by students is still low.

Physics is one of the subjects in a science family that can develop an inductive and deductive analytical thinking ability in solving problems related to natural events and can develop knowledge, skills and self-confidence [7]. The learning model suggested in the 2013 curriculum is an inquiry model, this model is very well used in the learning process. This model leads learners to find problems and vice versa. The model inquiry on constructivism theory, learning is an active process in which learners build new ideas or concepts based on previous experience and knowledge [12]. This shows that by using this inquiry training model, the students' scientific attitude and PPP will also increase [13].

The concept of physics that is being developed is an abstract concept, so for the real needs (concrete) needed aids learning. The tool is a PhET learning medium. Physics Education Technology (PhET) is one example of virtual simulation [14]. For PhET media students can make physics lessons easier for students to understand [4]. Learning with inquiry training model is more effective in improving the ability of formal thinking with direct learning. [2]. This is done by several studies that show an effective discovery-model in learning [15] [16]. The concept of the invention (discovery) is expected to reduce the misconception of Science among students [17].

II. Literature

Inquiry Training Learning Model

The Inquiry Training learning model was developed by a character named Suchman [18]. Convinced that children are curious individuals of all things. The Inquiry Training learning model is designed to bring students directly into the scientific process through training and can condense the scientific process into a short period of time. The effect is that the inquiry training model will increase the understanding of productivity science in creative thinking and skills in acquiring and analyzing information, but this exercise is as efficient as the repetition and teaching model undertaken with laboratory experiences. The training model of inqury training gives more emphasis on developing awareness and mastering the process of inquiry.
The inquiry training learning model is important to bring students to the attitudes and principles that all knowledge is tentative (not passive). Suchman Theory [18] about the inquiry training model is:
1. Students research scientifically when they are facing problems
2. Students can be aware and learn to analyze their thinking strategies
3. New strategies can be taught conventionally and can be added to strategies that previous students have had
4. Cooperative research can enrich research and help students learn about unworthiness, the nature of ever-evolving knowledge and appreciate alternative explanations

Science Attitude

One of the goals of the Physics subject is to cultivate a scientific attitude that is honest, objective, open, tenacious, critical and can cooperate with others. From these objectives shows the importance of scientific attitude for students. This is due to the fact that attitudes affect student learning outcomes [19].
Scientific attitudes are defined as one's general assessment of an object that has a typical science or that is related to science, besides that attitude is the facilitator and product of the cognitive learning process [20].

Media PhET

Selection of one particular teaching method influences the appropriate type of instructional media. The main function of the media in learning is as a teaching aid that influences climate, condition and environment [21]. PhET simulation can be used for free both online and offline so it is quite easy to use in class. The simulation is written in java and flash form so it can be run with standard web browser as long as java and flash program is installed on the used computer. To ensure the effectiveness of the teaching and its benefits, all simulations have been tested and evaluated. Through simulations in the PhET media students can see clearly the abstract physical phenomena. Short video footage of interesting events or situations that illustrate real-life problems that are motivational. The important thing here is that the orientation of the problem situation set the stage for further investigation. Thus, his presentation should be able to captivate students and arouse their curiosity and passion to investigate [22].

Science Proses Skill

Scientific process skills are special skills that simplify learning science, enable students, develop students' sense of responsibility in their own learning, improve learning decisions, and teach them research methods. In other words, two important aspects of science are the processes of science and products of science. Knowledge of concepts and principles can only be obtained by the student if he has certain basic skills that are the scientific process skills needed to use and understand science. The skills of the process of science are observing, communicating, classifying, measuring, summarizing, and predicting [23].

III. Research Methodology

This research was conducted at SMAN 19 Medan. The time of the research is done in the second semester of class X Year Learning 2016/2017. Population in this research is all student of class X SMAN 19 Medan Year Learning 2016/2017. The total population is 6 parallel classes with the total number of students 220 students. From 6 classes, this research sample is taken 2 (two) class of student. Sampling is done by cluster random sampling. One class was taken as an experimental class taught with an inquiry training model using PhET, and another class for control classes taught by conventional learning. Variables This study consists of three types of independent variables, moderator variables and dependent variables. In this study, the free variable is the learning model, the moderator variable is the scientific attitude, while the dependent variable in this research is the students' science process skill. Types This study uses quasi experiment (quasi experiment), which aims to determine whether there is a result or something imposed on the subject students ie students. This study aims to see the effect of independent variables on the dependent variable.

The design of this research is Two Group Pretest-Postes Design. The study involved two classes of control classes and experimental classes treated differently. In the experimental class were treated in inquiry training model and in the control class were given the conventional learning treatment. The research design is shown in Table 1 below:

Tabel 1. Two Group Pretes-Postes Design

	Pre-tes	Treatmen	Pos-tes
Eksperimen Group	Y_1	X_1	Y_2
Control Group	Y_1	X_2	Y_2

IV. Results

Science Proses Skill on control group and experiment group shown in Table 2 below.

	Conceptual Knowledge	
	Control Group	Experiment Group
Pre-test	46,06	45,15
Post-test	57,15	67,03

Based on Table 2, pre-test on control group and experiment group were 46,06 and 45,15. Post-test on control group and experiment group were 57,15 and 67,03.

1. Data Analysis of Science Proses Skill on Level of Scientific Attitude

The results of science proses skill on student post-test in control group and experiment group on above average scientific attitudes and below average were shown in Table 3 below.

Table 3. Faktorial Design 2x2 Anava

Scientific Atitude (B)	Science proces skill (A)		Average
	inquiry training learning model (1)	Convensional learning (2)	
Above average (1)	78,40	65,14	72,58
Below average (2)	57,55	51,26	51,25
Average	67,03	57,15	

Before testing the first hypothesis tested the prerequisite is the normality test, homogeneity, and test results of normal and homogeneous data distribution. After the prerequisite test, then continued with two-way ANOVA with SPSS 17.0

Table 3 shows the value of science proses skill of students who were taught by using inquiry taining model use PhET media and conventional learning related to students' scientific attitude.

To be more clearly seen as the interaction will be shown in Figure 1.

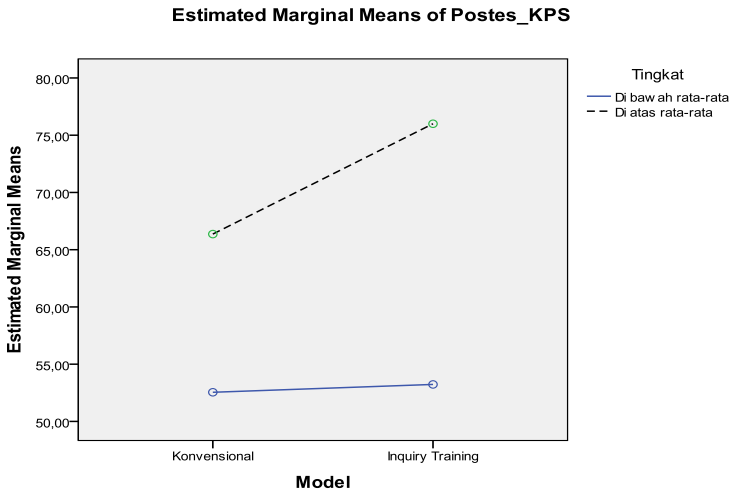

Figure 1. Interaction between learning model and scientific attitude

The graph shows that in the classroom which is taught by inqury training model with above average scientific attitude have science proses skill value better than below average scientific attitudes. In the control group, the science proses skill of students who have above average scientific attitudes was similar to that of the conceptual knowledge of students who have below average scientific attitudes. The graph showed that inquiry training model use PhET with above average scientific attitude had a positive influence in improving students' science proses skill.

2. Science Process skill Taught with Learning Inquiry Training Model Using PhET Better Than Conventional Learning

The results obtained in this study indicate that students' science process skills with inquiry training model using PhET is better than conventional learning. This is seen from the sig value. Of 0.000 <0.05. The average value of conceptual physics knowledge of experimental class students before treatment is given is 45.15 while the control class is 46.06. After being given different treatment in both classes, the average score of experiment class science process skill is 67,03 while control class is 57,15. There was an increase in the value of the students' science process skills in the class that were taught by the inquiry training model using PhET. Application of inquiry training model makes it easier for researchers to convey information to students so that the teaching and learning process becomes innovative and not boring for students [6]. This pattern of learning is more varied than conventional learning, because in the research students in the class inquiry training conduct joint discussion and sharing in solving problems with the group [7]. Learning activities such as observing, questioning, hypothesizing, predicting, finding patterns and relationships, communicating, designing and making, planning and conducting investigations and measuring and counting are done by students as learning progresses [5].

3. Scientific Process Skills of Students with Scientific Attitudes Above Average Better Than Students with Scientific Attitudes Below Average

Physical learning helps students acquire knowledge, skills and attitudes. The Process Skills Approach Science is an approach that allows students to discover facts, build concepts, through activities and / or experiences such as scientists [24]. Skills Process Sciences is a student's ability to apply scientific methods in understanding, developing and discovering science [25]. The learning model applied to the two sample groups gave the same effect to the students' scientific attitude. However, in the implementation there are differences in the level of students' scientific attitude during the learning takes place. The level of students' scientific attitudes is distinguished in categories of above average scientific attitudes and below average [26].

Based on the results of research conducted showed that there are differences in science process skills between groups of students who have above average scientific attitudes with groups of students who have below average scientific attitudes, where students who have above average scientific attitudes better The science process skills of students who have below average scientific attitudes. Based on two paths Anava test performed shows the test results of variance analysis obtained by the value of scientific attitudes significance of 0.015 because the value of sig 0.000 <0.05 so that the results of hypothesis testing rejected H_0 and received Ha level of 5% alpha means science process skills students who have a scientific attitude above average Better than students

who have below average scientific attitudes.

This is in accordance with previous research conducted by [27] which has the conclusion that there is a significant difference in the students' science proces skill between those treated with cartoon-based activity-centered attitudes with students treated conventionally. The application of inquiry supported by scientific attitudes affected the prospective science proces skill teachers of science in Turkey [28].

3. Interaction Between Inquiry Training Model and Scientific Attitude in Improving Student Science Process Skills

Based on the results of research conducted showed that there is interaction between the learning model with the scientific attitude in influencing the students' science process skills. Based on two paths Anava test showed the result of variance analysis test obtained by significance value of learning model of class * scientific attitude of 0.025, because sig value 0.025 <0.05 so that the hypothesis test reject Ho and accept Ha alpha level 5% means there is interaction between inquiry learning model Training and scientific attitude in improving students' science process skills. This is because the instructional model of inquiry training focuses on the activity of students in learning.

In learning with inquiry training, students tend to actively find out through the process of investigation that ultimately comes to the content of the knowledge itself so that either directly or indirectly students will have learning outcomes in the form of good science process skills [29]. Inquiry training model of learning as a learning model that involves the scientific attitude of learners to conduct an investigation and prove whether the claims and data filed can be used as evidence and give conclusion [7]. The investigation itself contains thinking activity by following scientific procedures such as skillful observation and measurement, hypothesis, prediction, finding patterns and relationships and communicating the findings. These activities are indicators of the science process skills. Inquiry training model and scientific attitude can make it easier for learners to engage in scientific research [12].

V. Conclusion

Skills of students' science process using inquiry training model using PhET with average score 67,03 is better than conventional learning with mean score 57,15.Scientific process skills of students who have above average scientific attitude with an average value of 72.58 is better than the group of students who have below average scientific attitudes with an average value of 51.25. There is an interaction between the inquiry training model using PhET and conventional learning with a scientific attitude toward the students' science process skills. In this research, the dominant students' science process skills in the inquiry training model using PhET in the group of students who have above average scientific attitude.

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