THE INFLUENCE OF INQUIRY TRAINING LEARNING MODEL ON SKILLS OF SCIENCE PROCESS USING PHET MEDIA IN SOUND WAVE MATERIALS IN CLASS XI SEMESTER II SMA NEGERI 14 MEDAN

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Abstract

This study aimed to analyze the effect of inquiry training learning models on science process skills using PhET media on the subject matter of sound wave in class XI semester II at SMA Negeri 14 Medan T.P 2018/2019. This type of research is quasi experimental with Two Group Pretest-Posttest Design. With the cluster random sampling tecnique obtained by class XI IPA-7 as the experimental class and class XI IPA-5 as the control class. The experimental class was treated with the inquiry training learning model using PhET media and the control class with conventional learning. Data collection techniques using essay tests form as much as 10 items which have been validated by the validator. From the results of the study, the average posstest of the experimental class was 76.46 and the control class was 69.27. The results of data analysis using the t test of one party shows a difference namely $t_{count} = 4.314$ and $t_{table} = 1.637$. This research was concluded that there was effect of inquiry training learning model on skills of science process using PhET media in sound wave materials.

Keywords: *Science Process Skills, Inquiry Training Learning Models, Sound Waves*

Education is a process of teaching and learning between teachers and students that takes place effectively and efficiently. Education plays a very important role in improving human resources, in other words the quality of human resources is also influenced by the quality of education. The high quality of human resources makes a person able to face and solve the life problems he faces and is also able to compete with the times that are increasing.

Education in Indonesia can be said to be still low. The main problem of the low education in Indonesia lies in the absorption of students, especially in the field of science. This is supported by data from the Organization for Economic Cooperation and Development (OECD) to publish the results of international studies known as the Program for International Student Assessment (PISA) in 2015 where Indonesia is a country that is at 62nd out of 70 countries in the fields of science, reading and mathematics (OECD, 2016).

Physics which is part of science is related to how to find out about natural phenomena systematically, so that the learning process that is carried out should be with the process of discovery through investigation or experiments that can train students to acquire science process skills. Physics learning needs to instill values such as work skills and think regularly and systematically according to the steps of the scientific method, skills and skills in making

observations, using experimental tools to solve problems, and have the scientific attitude needed to solve problems both in relation with lessons in science and in life (Trianto.2011: 141).

Based on the results of a preliminary study conducted by researchers at SMA Negeri 14 Medan on February 4, 2019, from the results of a questionnaire distributed to 24 students in class XI IPA, researchers obtained data that physics was still considered a difficult and less interesting subject. Based on the results of student questionnaires obtained that 33% said physics lessons were difficult and less interesting, 25% stated normal physics lessons, 13% stated physics lessons could not be understood, 21% stated other reasons and who states that physics is easy and fun is only 8%. The difficulty of physics lessons raises the desire of students to learn so far from expectations and will have an impact on the lack of student skills and learning outcomes obtained by students.

Based on the results of the questionnaire the tendency of student learning patterns in physics as much as 42% tendency of student learning patterns with practicum and demonstration, as much as 33% with other learning patterns, as much as 13% tendency of learning patterns with group discussion, as much as 8% tendency of learning patterns by listening to the teacher's explanation, and only 4% of students who tend to read and take notes. Because more students like practicum and demonstration and also by using this model can improve science process skills, then one way that can be done so that learning involves students is to apply the inquiry training learning model.

According to Joyce, the inquiry training learning model is designed to bring students directly into the scientific process through exercises that can condense students in the scientific process into short periods of time. Inquiry learning model is learning that emphasizes the development of cognitive, affective, and psychomotor aspects in a balanced way, so that learning through this model is considered to be more meaningful (Joyce, 2009: 198).

The use of media when learning activities such as power points is relatively rare. This statement was seen in the student questionnaire, where 63% answered never, never used (17%), sometimes (17%), and no one answered always. The use of media also has an important role in the delivery of learning. Learning media functions to carry information between a source and a recipient (teacher to students). Media are printed and audiovisual forms of communication and equipment. Media should be able to be manipulated, can be seen, heard and read (Tanjung, 2014: 5).

One suitable simulation media used in physics learning is Physics Educational Technology or commonly called PhET. PhET is a simulation media released by the University of Colorado and has proven its truth. By using this simulation media students can carry out activities to obtain data and

facts such as in a real laboratory so that it can improve student physics learning outcomes in both the cognitive and KPS domains.

This study is in line with previous studies as examined by Situmorang (2019), Silitonga, et al (2016) and Nababan & Sirait (2016) about the influence of Inquiry Training learning models. Situmorang (2019) concluded an increase in science process skills after the Inquiry Training learning process on dynamic electric material. Silitonga et al (2016) concluded that students 'science process skills taught by Inquiry Training learning were better than students' science process skills taught by conventional learning. While Sirait (2016) concluded that there was an influence of Inquiry Training model assisted by PhET media on student learning outcomes on static fluid material.

Based on the background of the problem and the best possible assessment, the researcher intends to conduct research under the title "The Effect of Inquiry Training Learning Models on Science Process Skills Using PhET Media on Sound Wave Material in Class XI Semester II of SMA Negeri 14 Medan T.P 2018/2019"

METHODS

This type of research is a quasi experiment. The population in this study were all students of class XI IPA SMA Negeri 14 Medan consisting of 7 classes. The research sample was taken 2 classes that were determined by cluster random sampling technique, namely class XI IPA-7 with 26 students as the experimental class and class XI IPA-5 with 29 students as the control class. The experimental class was treated with the inquiry training learning model using PhET media and the control class with conventional learning.

In the study, the researcher gives a pretest in the experimental class dan control class. The instruments used in this study as data collectors were student questionnaires and teacher interviews as initial data collectors (preliminary studies), observation sheets of student activities and scientific process proficiency tests in the form of test essays as much as 10 items. Before the instrumental is used, it is first will be validated by three validators namely two physics lecturers and physics teachers. After the pretest data is obtained, data analysis is done with the normality test namely Liliefors test, the homogeneity test, and the variance similarity test. After that the two parties t test hypothesis is tested to determinethe students initial ability in both groups of samples in the case the initial abilities of the two samples must be the same. Then the researcher teaches the subject matter by using the inquiry training learning model using PhET media in the experimental class

and conventional learning in the control class. Differences in the final results can be known by doing a posttest using one party t test to determine the effect of inquiry training learning models on science process skills using PhET media.

RESULTS AND DISCUSSION

Pretest Data for Experiment Class and Control Class

The initial stage of research in both classes is given an initial ability test (pretest) which aims to determine the initial ability of students in both classes. Based on the research data obtained the average value of student pretest in the experimental class before being treated using a inquiry training learning model with a PhET media of 39.30 with a standard deviation of 11,44 while in the control class the average value of 37.37 with a standard deviation 11.62.

Based on data obtained from the study and to see in more detail the results of the pretest in both classes can be seen in the following diagram:
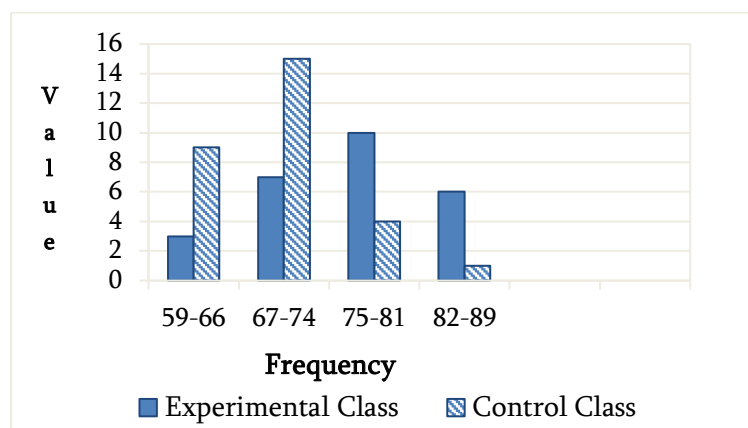

Figure 1. Pretest Data Bar Diagram of Experiment Class and Control Class

From the picture above it can be seen that the pretest values for the experimental class and the control class were carried out by the two-party t test. This means that the initial capabilities in both classes are the same.

Posttest Value Data Experiment Class and Control Class

Posttest score data obtained from test scores given to each class of samples after being given different treatments. To see in more detail the results of the posttest in both classes can be seein in the following diagram:
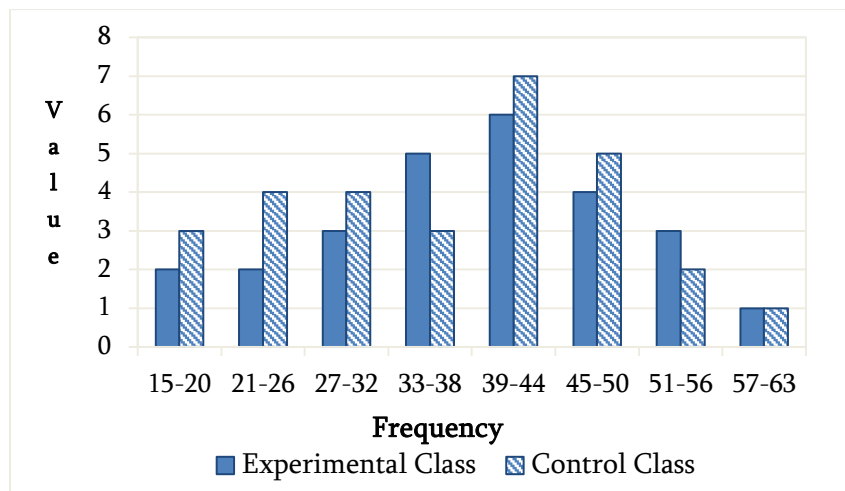
Figure 2. Posttest Data Bar Diagram of Experiment Class and Control Class

From the picture above the acquisition of posttest scores in the experimental class taught by the inquiry training learning model with the PhET media is higher than the conventional learning. Based on the results of the study obtained an average posttest score of students in the experimental class of 76.46, while in the control class obtained an average of posttest students of 69.27. This shows that the application of inquiry training learning models assisted by PhET media can improve students' science process skills better.

Student Science Process Skills Activity

Observation is intended to observe the activities of students' science process skills during learning with the inquiry training learning model using PhET. This observation was carried out during three meetings by an observer (observer) who had been equipped with an observation sheet. The observed activities are in accordance with indicators of science process skills, among others: observing, formulating hypotheses, predicting, finding patterns and relationships, communicating effectively, designing experiments, measuring and calculating.

The average KPS activity at the first meeting of 55.86 was quite Active. At the second meeting there was an increase to 66.12 in the Active category. Furthermore, at the last meeting III there was also an increase in KPS activity to 79.49 namely in the Active category. In detail the improvement of students' science process skill activities is shown in the picture below:
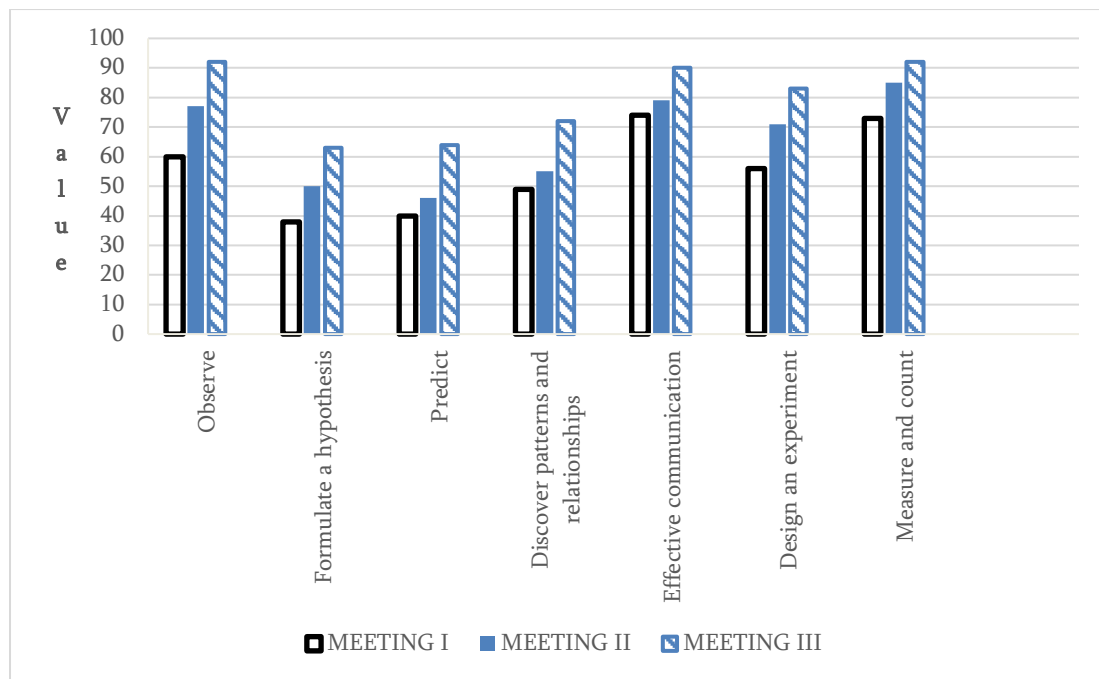
Figure 3. Improvement of the Science Process Skills Indicator for Each Student

Discussion of Research Results

After a field study and consultation with a physics teacher at SMA 14 Medan, a pretest was conducted. After the pretest data is analyzed then the data is tabulated. Based on table 4.1 obtained an average value of the experimental class of 39.30 and the average value of the pretest of the control class of 37.38. From the results of calculations show that none of the students who have achieved the complete score is probably due to the fact that learning has not been done and students have not fully studied the material that will be studied for the next meeting. After the pretest data is obtained, a two-party t test is conducted to determine the similarity of the initial ability of the class. Can be seen from table 4.1 shows that the initial ability of the experimental class and the control class are the same. then the next step the researcher gave treatment to both classes, namely the experimental class taught with Inquiry training learning models using PhET and the control class taught with conventional learning for 3 meetings.

After researchers give treatment to both classes, then students are given posttests. In accordance with table 4.2 shows the results of posttest data analysis in the experimental class of 26 students there were 16 students whose grades were complete, while 10 students whose grades were below completion. As for the causes of students in the experimental class obtaining grades below completion, among others, the lack of students' interest in physics so they do not really study physics. Secondly, students are still unfamiliar with inquiry training learning models using PhET

media. Third, the position of group division is not evenly distributed due to random group distribution. While the results of the posttest data analysis in the control class showed that of 29 students there were 5 people whose grades were completed and 24 students who were under completion. One of the reasons students get under-completed grades is because conventional learning rarely illustrates science process skills, because usually learning only uses lecture methods and assignments to work on problems, students are also less active in learning physics so students cannot develop science process skills in learning physics.

Based on the data of the results of the pretest and posttest in the experimental class and the control class, the average value, standard deviation, and variance were made. This can be seen in table 4.3. After the students' posttest results data from the experimental class and the control class were obtained, a normality test was performed. This can be seen in table 4.4. Based on the table it can be seen that $L_{count} < L_{table}$, so that the data for both classes is normally distributed. Then a homogeneity test is performed to determine whether the two samples used are homogeneous or not. Based on table 4.5 shows that the homogeneity test results in the experimental class and the control class are homogeneous. The next step is testing the hypothesis, namely by one party's t test. Hypothesis test data shows that $t_{count} > t_{table}$, then Ha is accepted in other words that the science process skills in the experimental class are greater than the control class science process skills, meaning the science process skills with inquiry training learning models using PhET are better than the science process skills with using conventional learning on the subject matter of sound waves in class XI semester II of SMA Negeri 14 Medan TP 2018/2019. This can be seen in table 4.7. The difference in science process skills is also due to using the PhET media which gives a picture that the material delivered more clearly and more closely can attract students' attention to participate in learning in class and students not only imagine abstractly about the concept of sound wave material, but students can see firsthand the sound wave material concepts taught by the teacher. This is supported by a statement (Aunurrahman, in Nurhayati, 2014: 6) which states the use of PhET software animation media can also provide interesting experiences to students during the learning process, educating students so that constructivism thinking patterns, making learning more interesting because students can learn while playing in the simulation and can visualize the concepts of physics. therefore the learning process must provide a good learning experience to students.

During the learning process, researchers observe student activities. The results of observations of students' science process skill activities carried out at each meeting are three

meetings in the experimental class by an observer. there is a meeting I 55.86 classified as quite Active this is because students still look confused by the application of the inquiry training learning model using PhET, because they are not accustomed to and are not yet familiar with the learning model, there are still many students who are afraid to ask questions and are reluctant to be actively involved in learning , then the researcher tells students to study the next material for other meetings. At the second meeting there was an increase to 66.12 in the Active category, students had begun to dare to ask questions. Furthermore, at the last meeting III there was also an increase in KPS activity to 79.49 namely in the Active category, although there was no significant change in the observations of student activity data during the three meetings, but it can be seen that student activity showed an increase. The average activity observation is 67.16 in the Active category. The results of an increase in the activity of science process skills using the Inquiry Training learning model using PhET in accordance with Situmorang, T. A (2019) study stated that students' science process skills after the learning process using the Inquiry Training learning model had an increase, this was seen from the average pretest which initially only 26.34 increased to 83.69.

The inquiry training learning model using PhET has improved science process skills better than conventional learning according to the research of Silitonga, et al (2016) and the research of Nababan, E.A and Sirait (2016). Silitonga, et al (2016) 's research concluded that students' science process skills taught by Inquiry Training learning were better than students' science process skills taught with conventional learning while Nababan, EA and Sirait, M (2016) research stated that the average scores Average student learning outcomes in the experimental class and control class respectively 68.5 and 61.1 and there are differences due to the influence of the Inquiry Training learning model assisted by the PhET media on student learning outcomes in fluid material. However, during learning there are still obstacles to be faced, aside from the fact that the researcher is the first to do research. So there are still many shortcomings in conducting research that is the presence of some students who are difficult to understand the steps of learning due to conventional student learning habits, from the first obstacle causes researchers are less able to control the class when carrying out group discussions so that classroom conditions are less conducive. In addition, researchers also carry out the syntax when the implementation of learning is still less effective because it has not been maximized in managing time. From the obstacles faced by researchers, it is expected that future researchers make learning more interesting and researchers also pay more attention and guide students during the experiment, namely by using methods that stimulate students to be more active and the use of time must be made as effective as possible, so that each

the stages in the inquiry training learning model are going well.

Based on the discussion above, it can be concluded that there are differences due to the influence of the inquiry training learning model on the science process skills using PhET on the subject matter of sound waves in class XI Semester II of SMA Negeri 14 Medan TP.2018 / 2019.

CONCLUSION

Based on the results of the analysis and statistical tests as well as the discussion, it is concluded the science process skills on the subject matter of Sound Wave in class XI semester II at SMA Negeri 14 Medan T.P 2018/2019 as follows:

1. The results of science process skills using the inquiry training model using PhET media before being given an average pretest treatment of 39.30 and after being given the average posttest treatment of students of 76.46.

2. The results of science process skills using conventional learning before being given an average pretest treatment of 37.37 and after being given an average posttest treatment of students amounted to 69.27.

3. There is an influence of inquiry training learning model using PhET media on science process skills on the subject matter of sound waves in class XI semester II of SMA Negeri 14 Medan, the results of hypothesis testing $t_{count} > t_{table}$ is 4.314 > 1.637.

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