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THE EFFECT OF SCIENTIFIC INQUIRY LEARNINGMODEL TO SCIENCE PROCESS SKILLS ON ELASTICITY AND HOOKE'S LAW TOPIC

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ABSTRACT

This research have purpose to know the effect of scientific inquiry learning model on student's science process skills and student's learning activity on elasticity and Hooke's law topic. This research is a quasi experiment using control group pre-test-post-test design. The sampel of theses research consisted of two classes, each contains 30 students. By using total sampling, one class is made as experiment class that uses scientific inquiry learning model, and one class is as control that uses conventional learning model, so class XI science -1 as experiment class and class XI science -2 as control class. The instrument used was a test of science process skills in the form of student's science process skills in the form of 7 essay test. In the experimental class the average activity of students in the three meeting, are 60.19, 77.59 and 86.67. The learning activity have increase during three times meeting and have average value 74.81 and have good category. The data obtain so scientific inquiry learning model can increase learning activity on elasticity and Hooke's law topic of SMA Swasta Santa Maria Medan grade XI odd semester A.Y. 2018/2019. The value of the average post-test experimental class was 76.31 and control class was 70.83. Hypothesis with t-test shows the result there was a significant effect of scientific inquiry learning model on student's science process skills on elasticity and Hooke's law topic of SMA Swasta Santa Maria Medan grade XI odd semester A.Y. 2018/2019.

***Keywords**: Scientific inquiry learning model, conventional learning model, science process skills, quasi experiment, learning activity.*

INTRODUCTION

Education is one of the efforts to achieve the life of the nation and is an important key to achieve the ideals of a nation. Education is believed to be able to push maximize students' potential as a candidate a reliable resource to be able to be critical, logical, and innovative in the face and resolve any problems faced. Education requires continuous improvement. Education emphasizes the mastery of the material and mastery of skills are balanced. The world of education has the goal to be achieved in the learning process. Education is not only focused on the mastery of the material, but also emphasis on mastery of skills.

In this modern era, the development of education has influenced the development of science and technology. The rapid development of science and technology is inseparable from the advancement of physics as shown by new findings in the fields of science and technology.

Physics is one of the branches of natural science (IPA) that studies natural phenomena and interactions within them. Physics lessons emphasize direct learning to increase competence so students are able to think critically and systematically in understanding physics concepts, so that students gain a correct understanding of physics. Physics is not easily accepted procedurally without understanding and reasoning. Knowledge cannot be moved from someone's brain (teacher) to the minds of others (students). Students themselves must interpret what has been taught by adjusting to everyday experiences. Important factors in the success of achieving educational goals are teacher factors. As a facilitator, the teacher has a role to facilitate students in the learning process activities.

The learning process in children is not encouraged to develop thinking skills. The learning process in the classroom is directed at the child's ability to memorize information, the child's brain is forced to remember and hoard various information without being required to understand the information he remembers to connect it to everyday life. Learning becomes meaningful for students, if the teacher can provide certain skills in physics learning activities. One of the skills in physics learning is science process skills (SPS) (Sanjaya, 2013).

To overcome these problems it is necessary to change the approaches, methods, and learning models in such a way as to generate interest and interest in students to learn in the real sense and improve science process skills from students. Science process skills (SPS) are skills that must be developed in students. Some of the reasons why SPS must be owned by students are that the first science (especially physics) consists of three aspects, namely product, process, and attitude. By developing SPS students will understand how the existing laws, theories and formulas were formed through experiments. Second, science (physics) changes with the times. Therefore, the teacher is no longer possible to teach all concepts and facts to students from so many subjects. Students need to be equipped with skills that can help students explore

and find information from various sources, not just from the teacher. Third, students will better understand complex and abstract concepts if accompanied by concrete examples. And finally, students will have a deep understanding of the subject matter that encourages students to be more active in learning.

Based on the problems described above, the researcher intended to create an environmental system that teaches students. One alternative learning model that can be applied to improve the quality and results of student physics learning as a means of research is the scientific inquiry learning model. As one of constructivism reference learning models, this model focuses on the process of inquiry, where students are faced with a problem area, identify problems, conceptual or methodological in the area of inquiry and invite students to design ways to overcome the problems they face. The *scientific learning* model of inquiry is very suitable to use because in its implementation the teacher provides extensive guidance or guidance to students.

Based on the description of the background above, a study was conducted to determine the effect of Scientific Inquiry learning models on science process skills on elasticity and hooke's law topic.

METHOD OF RESEARCH

This research will be held in SMA Swasta Santa Maria Medan at Medan city, North Sumatra, for academic year 2018/2019 class XI Science. The population in this research is all students class XI cience of SMA Swasta Santa Maria Medan academic year 2018/2019 which consists of 2 classes that is class XI science -1 and class XI science -2. Sample in this research consists of two classes. By using total sampling, one class is made as experiment class that uses scientific inquiry learning model, and one class is as control that uses conventional model. So, class XI science -1 as experiment class and class XI science -2 as control class.

Design research in the form of *two group pre-test-post-test* design as shown on Table 1.

Tabel 1. *Control Group Pretest-Postest Design*

Class	Pre-test	Treatment	Post-test
Experiment	T_1	X_1	T_2
Control	T_1	X_2	T_2

Note:

T_1 : Pre-test is given to experiment class and control class before treatment

T_2 : Post-test given to experiment class and control class before treatment

X_1 : Treatment for scientific inquiry learning models

X_2 : Treatment for conventional learning model

Data have obtained tested of normality to know data of both sample was normal distribution used Liliefors test. Then homogenity test to know what is both of sampel homogen used same varians test. Hypothesis test used t tail one test. If $F_{count} > F_{table}$, so can concluded that both of sample have not homogen varians with $\alpha = 0{,}05$ (α significant level).

In this research, the sample is also 2 classes of XI grade. This sample is taken by simple random sampling. Simple this means that of the 3 classes of the population will be taken 2 class because randomly sampled by using raffle way. One of the class will be taken as the class experiment and the other class will be taken as the control class. The experiment class will be taught with scientific inquiry and class control will be taught by conventional learning in Elasticity and Hooke Law's.

The instruments used in this study were essay tests totaling 7 questions for pretest and posttest which had been validated by two validators. In addition to students' science process skills, the instruments used are activity observation sheets developed by the researchers themselves by matching the scientific inquiry phases with the activities proposed by Joyce at all.

According to Joyce (2016) inquiry scientific phases consist of (1) Orientation to the problem; (2) Formulating problems and hypotheses; (3) Data collection and data analysis; (4) Formulate an explanation.

RESULT AND DISCUSSION

Result of Research

The result of research doing in SMA Swasta Santa Maria Medan show that the average pretest value in experiment class was 49.76 and control class was 48.81. According the normality test and homogenity test obtained that the population have normal distribution and homogen. Data of both sampel is normal and homogen so that wortly do hypothesis test and the result show on Table 2.

Table 2. Initial ability of students

Class	Average	T_{count}	t_{table}	Conclu-sion
Experi-ment	49.76	0.299	2.002	There is no signifi-cant effect
Control	48.81			

Based on Table 2 can concluded that $t_{count} < t_{table}$ so, t_{count} on area H_0 so H_0 accepted it means initial ability of students on experiment class have the same with control class on elasticity and Hooke's law topic.

Table 3. Result of hypothesis test

Class	Average	T_{count}	t_{table}	Conclusion
Experi-ment	76.31	1.751	1.671	There is significant effect
Control	70.83			

Based on Table 3 can concluded that $t_{count} > t_{table}$ that 1.751 >1.671 it means H_0 accepted so the value of science process skills of students on experiment class greater than control class it means there is the effect of scientific inquiry learning model on student's science process skills on elasticity and Hooke's law topic of SMA Swasta Santa Maria Medan class XI odd semester A.Y. 2018/2019. Distribution data of average results of student's science process skills for experiment class by using scientific inquiry learning model show on Table 4.

Table 4. Average results of student's science process skills for experiment class

Meeting	Average Result
Meeting I	60.19
Meeting II	77.59
Meeting III	86.67

Based on table 4 for experiment class activity of student's science process skills meeting I 60.19, meeting II have increase was 77.59, and meeting III also have increase 86.67.

Data increase of student's activity of science process skills using scientific inquiry learning model show for experiment class from meeting I to meeting III, activity of student's science process skills using scientific inquiry learning model have increase.

Discussion

Based on the result of data analysis using independent Sample t-test obtained that student taught by Scientific Inquiry Learning Model is different than student taught by conventional learning.

Average score in pre-test in experiment class is 49.76 and had increasing in average score of post-test class become 76.31 whereas average score of pre-test in control class is 48.81 and had increasing in average of post-test class becomes 70.83. It can be seen that the experiment class that taught by Scientific Inquiry Learning Model had increasing the Science Process Skill higher than conventional learning class increasing. Its means that the Scientific Inquiry Learning Model makes the Science Process Skill of student is different with the conventional learning on Elasticity and Hooke's Law in grade XI odd Semester SMA Swasta Santa Maria Medan.

This gives meaning that there is an influence given by the learning with Scientific Inquiry model. This is because the Scientific Inquiry model brings students directly by engaging students in truly original research problems by confronting students in the field of investigation to help students identify conceptual or methodological issues in a field and invite students to design ways to solve problems. In the experiment class the researcher begins by giving apperception to the students. In accordance with the phase of Scientific Inquiry to bring students to the problems encountered in everyday life.

In accordance with the first phase, orientate students to the problem. The researcher presents a problem to the student observes. So students can connect the understandings that have been made in life to the knowledge that will be given by the researcher. By using the experimental students are also faced with the facts presented so that more deeply the students understand the phenomenon of Elasticity and Hooke's Law.

Then the second phase, researchers guide students in solving problems and formulate hypotheses that have presented researchers in worksheet. In this case, students participate in experiments related to using the experiment. In Scientific Inquiry, students are really involved with research methodologies including experiments to bring students in more tangible research.

The third phase, collecting data and analyzing. At this stage students have been working on experiments conducted by practicing materials about Elasticity and Hooke's Law. So with the data obtained, students can relate the data to the theories discussed. Even students can prove the results of data obtained with the theory obtained from books or researchers. After that the students are asked to speculate the difficulties involved in the research as well. Thus, at the next meeting the learning activities will take place even better.

The last phase is to communicate the results obtained by the students. Here students will express their opinions according to the data and analysis they have obtained. From the data collection students can also communicate the results in the form of graphs and tables. Students are trained to speculate on problems encountered by communicating with a friend to be assisted by the researcher.

According to the results of previous studies conducted by Hussain, et al (2011) concluded that it may be concluded that guided, unguided, and the combination of scientific inquiry method of teaching is a significantly better than traditional lecture method of teaching for the subject of physics. The difference with current research is that in previous the physics knowledge in real life situations by researchers were learning methods while in this study the researchers assessed or considered student's science process skills.

Researcher Safarati (2017) concluded that the scientific inquiry learning model uses PhET media with critical thinking influencing science process skills, while direct instruction learning with critical thinking has no effect on science process skills. The difference with this study is that in previous studies using this learning model using PhET media assistance which was reviewed by

critical thinking had an effect on science process skills, while in this study using this learning model did not use media assistance and was directly reviewed using instruments according to students' scientific skills.

Researcher Sahyar and Nasution (2017) concluded that based on hypothesis testing, it was obtained that student's science process skill (SPS) using scientific learning inquiry models on conceptual change was better than using conventional learning. The difference with this study is that in the previous study concluded that the average value of science process skills of students using scientific inquiry learning model was 72.79, while in this study the average science process skills of students using the scientific inquiry model were 76.31 higher than previous research.

The use of scientific inquiry learning models can improve students' science process skills, but during learning there are still obstacles faced, namely ineffective and inefficient use of time. This is caused by several factors, namely at the data collection stage some students do not understand the use of experimental tools and instructions on the student worksheet so that much of the time is taken at this stage because the researcher gives more instruction and direction, the effort is before starting this stage the researcher first introduces the tools and how to use them and explains the experimental steps contained in the student worksheet. Other efforts can also be done by presenting several fellow students as observers to facilitate students if they experience difficulties during data collection and group discussions.

Another obstacle, namely during group discussions there are some students who are less participating or silent and less active in completing group assignments. Therefore, the effort taken is to pay more attention to providing better motivation by conveying the competition that must be achieved by students. It can also be overcome by recognizing students who first ask the teacher in the field of study by dividing the group when doing the discussion method so that the researcher can do a better group division.

Obstacles from the researchers themselves are the lack of ability to master classes and time management that is not yet right in the learning process. The effort that can be done is that researchers must prepare themselves better so that the learning process goes according to what has been planned beforehand.

The efforts made by researchers in this study to slightly improve the constraints of previous researchers, among others: 1) Researchers divide students into groups by asking students who are close to 1 group and limit the number of students in groups of 5 people per group. 2) In conducive to the condition of the class the researcher asks the teacher to study as an observer. 3) Experimental equipment needed is available at the school where the researcher conducts research. 4) Besides that, researchers did a little variation in the scientific inquiry learning model by applying the pattern of competition between students by giving awards to students who had met the specified criteria. 5) Researchers use student worksheets. Thus, the scientific inquiry learning model is expected to further enhance the expected science process skills.

The Scientific Inquiry learning model turns out not only to improve student learning outcomes, but also to improve the skills of the science process. From the results of worksheet assessment that has been done by the researchers and also the observer obtained that students' science process skills have a positive improvement. At the first meeting, students are not used to using the model used by the researcher. The 3nd meeting, all activities in all aspects increased. There are several ways that researchers do to improve every aspect of worksheet. Before the second meeting took place, the researcher provided feedback by providing corrections and included comments and warnings on worksheet paper.

The scientific inquiry learning model is a learning model that involves students in investigating the real problem and maximizing all students' ability to search and investigate systematically, critically, logically, and analytically so that students can formulate their findings with confidence.

The inquiry scientific learning process is characterized by problems encountered in everyday life, then students deepen their abilities about what is known and how to solve problems in groups to help each other so that they are able to collaborate in solving problems. This allows students to exchange ideas and work together to solve problems.

Expose students to investigation, help them identify methodological or conceptual problems in the investigation and invite them to design ways to overcome the problem. Through such treatment, students can find out how knowledge is built in the scientific community. At the same time, students will also appreciate knowledge, as a result of a tiring research process and learn about the limitations and advantages of current knowledge (Joyce, et al. 2009).

The implementation of the scientific inquiry learning model using worksheets with pictures also requires the use of laboratories that facilitate researchers in conveying information to students while inviting students to play an active role in learning, so that the learning process becomes innovative and not boring Fakrunnisyak and Sinuraya (2016) also said that there is a significant influence of the inquiry scientific inquiry model on

student learning outcomes, compared to conventional learning models. This is because scientific inquiry learning is accompanied by student worksheets illustrated, so that it can increase activity during the learning process.

In the classroom given the conventional approach, students listen more to the teacher's explanations in front of the class, recording teacher-centered learning and teaching activities. This resulted in few students active in the learning process and the students became less enthusiastic. This is what affects the visible ability of students from physics science skills that are low. Sometimes using demonstration demonstrations is not enough to support student learning. Inquiry's inertial learning model positively affects students, this learning model is able to provide opportunities for students to become more active in the learning process, through the application of phases in this inquiry scientific learning model, students are directly involved in problems, finding principles and answers through trial. However, the scientific inquiry model has been able to improve students' science process skills.

But during the learning is still found obstacles encountered, namely too narrow classroom that limits the student's movement in the practice of experiments and the existence of students who do not take the role in practice activities resulting in a commotion. This is because each group consists of 5 people so that there are members of the group who do not take part. To overcome this, the effort should reduce the number of groups to 5 people only. And also less time in running lesson plan. Hopefully the obstacles faced by researchers, researchers expected for further research to make learning more interesting to be able to stimulate students to become more active again and use more effective time againan.

CONCLUSION

Based on the result of the analysis and discussion, it can be concluded that the application of the scientific inquiry learning model can improve student's science process skills and the level of activity of students with an average of 74.82 with fairly active category during the learning process.

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