THE INFLUENCE OF SCIENTIFIC INQUIRY MODEL ON SCIENCE PROCESS SKILLS IN ELASTICITY AND HOOKE LAW LEARNING MATERIAL

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Abstract

This study aims to determine the effect of the scientific inquiry model to improve students' science process skills on the subject matter of elasticity and hooke's law. This type of research was a quasi experiment with a control group design pre-test post-test. The population of this study were all Eleven (XI) class Senior High School 18 Medan in 2019/2020 academic years. The research sample was taken by using cluster random sampling technique which took 2 classes from 4 classes, namely class XI MIPA 1 as the experimental class and XI MIPA 4 as the control class with 26 students each. The instrument used was a cognitive question in the form of an essay with 7 questions that had been validated first. Before learning was carried out pretest, based on the results of pretest data processing, the average value of the experimental class was 15.49 and the control class was 12.09. The results of the pretest conducted by hypothesis testing with t-test at a significant level = 0.05, it was found that the initial abilities of the two samples were the same in terms of science process skills. Furthermore, learning was carried out using the scientific inquiry learning model in the experimental class and conventional learning in the control class. After being given a different treatment model, the two classes conducted a postest to see the students' final abilities. The average value of the experimental class was obtained 78.24 and the control class was obtained 69.67. Based on the hypothesis test with the t-test, it was found that there was a significant difference, which means that there was a significant influence from the scientific inquiry model on science process skills accompanied by an assessment of students' science process skills activities.

Keywords: scientific inquiry, science process skills, activities.

Introduction

Education for a developing nation like ours today is an absolute necessity that must be developed in line with the demands of development step by step. Education that is managed in an orderly, effective and efficient manner (efficient and effective) will be able to accelerate the process of national civilization which is based primarily on the creation of general welfare and the intellectual life of the Indonesian nation. Education in Indonesia can be said to be still low. The main problem with the low level of 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) publishing the results of an international study known as the Program for International Student Assessment (PISA) in 2015 where Indonesia is a country that is located in ranked 62nd out of 70 countries in science, reading and mathematics (OECD, 2016).

Good education depends on good learning too. Learning can be interpreted as the teacher's efforts as a facilitator to help students carry out learning activities. The objectives in learning can be achieved if the teacher is able to realize effective and efficient learning activities for students (Hosnan, 2017). The role of the teacher in the learning process is very important, as Slameto (2010) states that: "the role of the teacher has increased from being a teacher to becoming a learning instructor director".

The results of a preliminary study conducted by researchers in the form of distributing questionnaires to 27 students at Senior High School Negeri 18 Medan showed that 29.62% (8 people) of students did not like physics lessons and 37.03% (10 people) considered physics a difficult and less interesting subject. . The results of the questionnaire also showed that 44.44% (12 people) of students did not read the physics manual before learning took place. Students tend to only hear and record existing material, so the learning process like this has a negative impact on students' science process skills because the learning process activities do not train students in observing, asking, making hypotheses, predicting, finding patterns and relationships, communicating, designing and making , plan and conduct investigations, and measure and quantify.

The involvement of students in obtaining information was obtained from the results of interviews by researchers with several students at the school, students said they rarely did practicum in the laboratory, even though there were laboratories in schools. This is reinforced when students do practicum, students look confused in following the steps in the student worksheet given by the teacher. Students are less able to observe the phenomena that occur during practicum, are less able to communicate with group friends, are not serious, are unable to make correct conclusions and tend to ask the teacher every time they do an experiment. This has an impact on students' science process skills that do not develop because students rarely do practicum and are less trained in science process skills. According to the results of the researcher interview with one of the physics teachers at Senior High School Negeri 18 Medan, Mr. Sapta Rosnardi, said that the students' interest in learning physics was very less evident from the lack of student activity during the teaching and learning process.

Process skills can run well if there is control from the teacher, who directs students through designing learning activities. A learning model is a framework for teachers to design learning. Responding to the problem, it is necessary to have a model that involves active student learning to improve science process skills and student learning outcomes, one of which is the scientific inquiry learning model. The scientific inquiry learning model in the book Joyce, et al. (2009) is designed to involve students in truly original investigation problems by exposing students to investigations, helping students identify conceptual or methodological problems in the field, and inviting students to be able to design ways to solving problem. According to Dimyati and Mudijono (2006), science process skills are a vehicle for the discovery and development of facts, concepts, principles of science for students, facts, concepts and principles of science that students find and develop also support the

development of process skills in students, interaction and the development of process skills with facts, concepts, and scientific principles will ultimately develop scientists' attitudes and values in students. Science process skills are physical and mental abilities related to the basic abilities possessed, mastered and applied in a scientific activity, so that scientists succeed in discovering something new.

Inquiry is a general process by which humans seek or understand information. Gulo in (Trianto, 2009) states that an inquiry strategy means a series of learning activities that maximally involves all students' abilities to search and investigate systematically, critically, logically, analytically, so that they can formulate their own findings confidently.

The scientific inquiry learning model is designed for learning research systems from a discipline, and also has effects in other domains; social methods can be taught to increase social understanding and social problem solving). In the scientific inquiry learning model, students are guided by the teacher in understanding concepts through a series of experiments (Joyce, et al, 2009). Through the scientific inquiry model, students are expected to actively ask questions why something happened then look for and collect and process data to determine answers to questions. The application of the scientific inquiry learning model in teaching and learning activities aims to develop a deeper understanding of scientific concepts and form students' scientific knowledge. Through experimental activities, students can try various ways to complete the experiments being carried out so that they can develop their thinking skills. Students are expected to be responsible for carrying out investigations in identifying problems, hypotheses, designing methods to prove hypotheses, analyzing them and making final conclusions. The scientific inquiry learning model is a learning model that involves students in truly original research problems by facing students in the field of investigation, helping to identify conceptual or methodological problems (Joyce, et al, 2009).

Scientific inquiry is a learning model based on inquiry (investigation) of problems, questions and materials or supporting materials determined by the teacher. These problems and questions encourage students to investigate to determine the answers.

Research on the scientific inquiry learning model has been studied by previous researchers. Based on research conducted by Anggraini and Sani (2015), the results showed that the scientific inquiry learning model was better than conventional learning in improving students' science process skills, having high creative thinking skills. Furthermore, by Debi, et al (2018) with the results of research showing that students 'science process skills with the application of the scientific inquiry model using PhET media were better than students' science process skills with the application of conventional learning.

The difference between this study and previous research is the place of research, the research sample, the time of the study, and the material used which in this study uses the elasticity material and Hooke's Law in high school.

Research Method

This type of research was a quasi experiment. The population in the study were all students of class XI Senior High School 18 Medan. The sample in this study consisted of two classes, namely class XI MIPA-1 as the experimental class, and class XI MIPA-4 as the control class, each of which consisted of 26 people who were taken using cluster random sampling technique. The experimental class is the class that receives the scientific inquiry learning model while the control class is the class that receives conventional learning treatment. The research design used was a control group design pre-test post-test. The research design is shown in Table 1.

Table 1. Control Group Pre-test-Post-test Design

Class	Pretest	Treatment	Postest
Experiment	T_1	X_1	T_2
Control	T_1	X_2	T_2

Information :
X_1: Scientific inquiry learning model
X_2: Conventional learning model
T_1: Pretest (before being given treatment)
T_2: Postest (after being given treatment)

The researcher gave a pretest to the experimental class and the control class. The instrument used in the study was an essay test totaling 7 items that had been declared valid by the expert team and the science process skills observation sheet. The science process skills test was standardized first by using the content validity test by two lecturers and according to the expert experts. After the pretest data were obtained, data analysis was carried out using the normality test, namely the Lilliefors test, homogeneity test and variance equality test. After that, the two-party t-test hypothesis testing was conducted to determine the students' initial abilities in the two sample groups, in this case the initial abilities of the two samples must be the same. Furthermore, researchers teach subject matter using the scientific inquiry model in the experimental class and conventional learning in the control class. The difference in the final results can be seen by posttesting using one-party test to determine the effect of the scientific inquiry model treatment on students' science process skills.

Result and Discussion

a. Result

The results of this study indicate that the pretest average value for the experimental class is 15.49 and the pretest average value for the control class is 12.11. Details of the pretest scores for the experimental class and control class are shown in Figure 1.
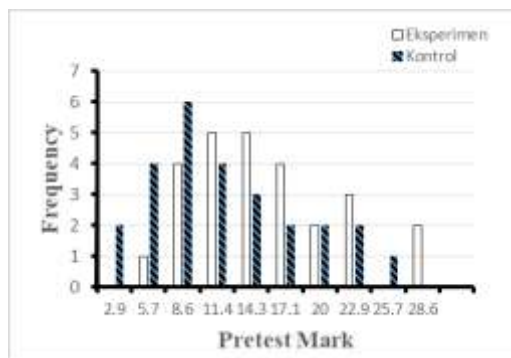

Figure 1. Pretest Data Bar Diagram

Based on the data from the pretest students of the experimental class and the control class, the normality test and the pretest data homogeneity test were carried out first. The results of the calculation showed that the pretest data were normally distributed and homogeneous, so the data hypothesis was tested using the t test. In summary, the data hypothesis test using the t test can be seen in Table 2.

Table 2. Summary of the results of t-test calculations for pretest data

Pretest Data	Average	t_{hitung}	t_{tabel}	Conclusion
Experiment	15,49			The students' initial abilities are the same
Control	12,09	2,02	2,01	

Based on the results of the calculation of the t test, obtained $t_{count} < t_{table}$, it is concluded that the initial abilities of students are the same in the experimental class and the control class. The next step taken by the researcher was to provide treatment using the scientific inquiry learning model in the experimental class and conventional learning in the control class. After the two classes were given different treatment, the two samples were given a posttest to see the students' final abilities. The postest results obtained are shown in Table 3.

Table 3. Postest Data for Experiment Class and Control Class

Nilai	Frequency	
	Experiment Class	Control Class
60-64	0	8

42

65-69	2	3
70-74	8	11
75-79	4	2
80-84	7	2
85-89	4	0
90-94	1	0
Jumlah	26	26
Rata-rata	78,24	69,67
Standar Deviasi	6,42	6,47

Based on the results of the posttest of the two classes, the normality test and homogeneity test of the post-test data were carried out first. The results of the calculation show that the post-test data is normally distributed and homogeneous, so the post-test data hypothesis is tested using the t test to determine the effect after being given different treatments to the two classes. The results obtained are shown in Table 4.

Table 4. Summary of the results of t-test calculations for post-test data

Pretest Data	Average	t_{hitung}	t_{tabel}	Conclusion
Experiment	78.24	5,032	1,675	There is influence
Control	69.67			

Based on the results of t-test calculations, obtained $t_{count} > t_{table}$ (5.032 > 1.675), it can be concluded that there is an influence from the scientific inquiry learning model on science process skills of class XI semester I students on the subject matter of Elasticity and Hooke's Law at Senior High School 18 Medan.

An observer also made observations of student activities based on the observation sheet of science process skills during learning, this was done in order to see the development of student activity in the experimental class during the practicum and the results were obtained as shown in table 5.

Table 5. Development of Science Process Skills Activities of Experimental Class Students

Pertemuan	Rata-Rata Aktivitas	Kriteria
I	55,11	Not Enough
II	69,60	Enough
III	78,57	Active

b. Disscusion

Based on the hypothesis test with the t test, it was found that there was a significant difference, which means that there was a significant influence from the scientific inquiry model on science process skills accompanied by an assessment of students' science process skills activities.

Suggestion

Based on the discussion of the research results, several things are suggested as follows:
1. To the next researcher who wants to examine the scientific inquiry learning model in order to manage time properly, so that learning activities, especially the investigation section and presenting the results of the investigation, can go as desired.
2. To the next researchers to make plans as clearly as possible, really prepare the tools and materials to be used, can conducive the class when learning takes place in a more assertive way in directing students.
3. To further researchers who want to research the same problem, it is suggested to propose problems that are more intriguing to students so that they are motivated to conduct experiments to find answers to problems.

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