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THE EFFECT OF GUIDED-INQUIRY MODEL ON SCIENCE PROCESS SKILLS INDICATORS

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Abstrak. The aims of this research is to know the effect of Guided-Inquiry model on the indicators of science process skills, especially on Vibration and Waves Material. This research is done because of the importance of mastering indicators to identify the variables for students in experimenting. The research design which applied in this study was One-group Pre-test Post-test on 90 students of SMAN 1 Pasuruan. Data analysis technical using N-gain. For Class XI IPA 1 has an average N-Gain was 0,44. Ro Class XI IPA 2 has an average N-Gain was 0,47. Meanwhile for Class XI IPA 3 has an average N-Gain was 0,48. N-Gain was calculated based of pre-test and post-test results using the Science Process Skills Test, the results showed that there was a significant improvement of the students' science-process skill indicator for all three classes with N-gain score was 0.49. So, Guided-Inquiry model provide a good effect on the science process skill indicator on Vibration and Waves Material.

Keywords: Science Process Skills, Guided-Inquiry.

INTRODUCTION

Characteristics of learning in every educational unit closely related to the Graduate Competency Standards and Content Standards. According to Permendikbud No. 22 on the Standard Process of Primary and Secondary Education indicates the need for a learning process guided by scientific or scientific approaches. One of the appropriate lessons is the science lesson.

The 2013 curriculum has two approaches: a scientific approach and a process skill approach to be applied in science learning in schools aimed at achieving the vision of the Curriculum 2013. The scientific approach provides a learning experience for students to observe, ask questions, collect information, reason, and communicating related learning materials. Wasis (2015, p.17), however, demands a higher learning experience for students by stating that science learning should actually be not only 5M, but includes skills called science process skill. The importance to train science process skill to students in science learning because of not only conforms to the science characteristics of *"a systematic and structured knowledge on a regular basis, generally accepted and a collection of data from observation and experiments"* (Sukarno et al, 2013, p 79) but these skills also make it easier for individuals to solve daily problems. In the field of MIPA, the quality of education in Indonesia is also low. The results of the TIMSS (Trends in International Mathematics and Science Study) survey that measured the scientific inquiry ability showed that the average score of Indonesian students' science achievement in 1999 was 435, making Indonesia 32nd from 39th, 2003 was 37th of 46th and the average score is 420, as well as the results of 2007 are on the order of 35 out of 49 with an average score of 427, and the results of the 2011 survey also showed a relatively similar score that is on the order of 39 of 41 with an average score of 406 while the average the international score has already reached 500 (Yuliati, 2016). The low quality of education can be proven in the results of the Program for International Student Assessment (PISA) study. In 2003 an overview of learning in Indonesia for Literacy of Science and Mathematics, 15-year-olds are ranked 38th out of 40 participating countries (Tjala, 2009). While PISA 2012 Indonesia reached rank 64 of 65 Countries, ranked 38th of 42th in TIMSS 2011, ranked 40th of 42th at TIMMS 2012, and ranked 41th of 45th in PIRLS 2011 (OECD, 2015).

Based on observations and interviews in SMA Negeri 1 Pasuruan, students get knowledge only from reading or listening to teachers only, so students become passive and the knowledge gained is only limited to what is in the textbook or only information obtained from the teacher only. Learning is also rarely done practicum activities based on student activities, so the students' science process skills such as formulating problems, determining variables, formulating hypotheses, creating and analyzing data tables, and formulating conclusions do not develop. The statement is supported by the data of student learning outcomes that are still low, especially on the material vibration and wave with the average score is still under KKM.

Therefore, science learning not only gets knowledge from the activity of listening to information, then stored in the memory of the brain within a certain period. Science learning should focus on providing a hands-on learning experience with the use and development of process skills and scientific attitudes. Based on the 2013 Curriculum requirement that science learning should be conducted in scientific inquiry to foster thinking ability, work, and be scientific and communicate it as an important aspect of Life Skills (Lampiran III Permendikbud, 2014, p.433).

The guided inquiry learning model is a learning model that trains students in finding problems and conducts investigations until they come to the conclusion of the outcome of the problem (Wenning, 2010). In addition, states the implementation of guided inquiry learning model in the research proved to affect the understanding of the concept of science and science process skillS Sabahiyah (2013). In addition, the inquiry is built on the understanding that the essence of science learning is that which includes content, processes and attitudes because through inquiry learning the students are trained to develop the ability to solve a problem (Darwis & Rustaman, 2015).

METHOD

2.1 General Background of Research

This research is conducted in State Senior High School 1 Pasuruan (SMAN 1 Pasuruan, Indonesia). The research's scope is the senior high school

students of 11th grade who took physics subject in school year 2017/2018. The aim is to know the effect Guided-Inquiry model on the indicators of science process skills before and after using the Inquiry Learning Model to be determined based on: 1) a significant increase (statistically) on the score between pre-test and post- test the students' science process skills on the "identify variable" indicator of high school physics and 2) The average N-Gain indicator is determined at least on the low improvement criteria.

2.2 Sample of Research

The samples of the research were 90 students of State Senior High School 1 of Pasuruan (SMAN 1 Pasuruan, Indonesia) using purposive sampling technique in academic year 2017/2018.. Those students have homogeny of science process skills. The test of learning device developed in this research using One Group Pretest-Postest Design design with the following design formula:

O_1 x O_2

(Sugiyono, 2013)

Information:

O1 = Initial test (pre test), to measure students' prior ability before given the treatment that includes ability of science process skills.

X = Treatment (treatment), with using guided inquiry model

O2 = Final test (post test), to measureability aspects of process skills science students after being given treatment

2.3 *Instrument dan Procedures*

The students' science process skills were measured by using Science Process Skills Assessment Sheet which had been declared valid and reliable. Science Process Skills Assessment Sheet is formed based on the measureable science process skills indicator such as: a) Formulating general problems, b) Writing observations, c) Formulating specific problems, d) Formulating hypotheses and predictions, e) Identifying variables f) Writing operational definitions of variables, g) Writing tools and materials, h) Writing test procedures, i) Organize data of experimental results in the observation table, j) Analysis of experimental data, k) Make a conclusion (Sheeba, 2013). However, this study only focused on one indicator is identifying variables. Because the indicator can determine whether students are successful in doing experiments. The materials of physics subjectin this research were chosen according to Inquiry Teaching Model characteristics which are Vibration and Waves. This research used one group pre-test and post-test design, O1 X O2 (Sevilay, 2003). The initial learning has started with conducting the pre-test (O1). Every senior high school students are required to work Science Process Skills Assessment Sheet. After the pre-test, the teacher will apply Inquiry Teaching Model and physics learning devices (X). The implementation of Inquiry Teaching Model has been conducted in three meetings on physics subject. Inquiry Teaching Model in learning physics has 6 syntaxes such as: 1) Gain attention and explain inquiry process, 2) Present the inquiry problem of discrepant event.3) Have students formulate hypotheses to explain the problem or event, 4) Encourage students to collect data to test the hypothesis, 5) Formulate explanations and orconclusions, and 6) Reflect on the problem situation and the thinking processes used to inquire into it (Arends, 2013). Learning devices of physics consist of syllabus, lesson plan, student work sheet, students' textbooks, teachers' textbooks, Science Process Skills Assessment Sheet, model observation sheets, students' activity sheets, and questionnaires of respond (valid and reliable). Every phase of Inquiry Teaching Model is designedly to train the science process skill indicator on physics subject. After the implementation of Inquiry Teaching Model ended by conducting the post-test (O2) using Science Process Skills Assessment Sheet, every student was required to finish Science Process Skills Assessment Sheet on the post-test.

2.4 Data Analysis

The students' science process skills on senior high school physics subject is analysed based on a determined assessment before and after using Inquiry Teaching Model. The students' data on science process skills pre-test, post-test and n-gain were analysed advance using inferential statistic with the help of Excel. Score of students' science process skills is based on indicator: (a) Formulating common Problem, (b) Formulating hypotheses and predict, (c) Identifies variables, (d) Analysis of Experimental Data and (e) Making conclusions (Sheeba, 2013). N-gain was determined using this equation: n-gain = (score post-test - score pre-test) / (maximum score - pre-test score), with the criteria: (1) if n-gain $\geq$ .7 (high), (2) if .3 <n-gain < .7 (moderate), and (3) if n-gain $\leq$ .3 (low) (Hake, 1998).

RESULT AND DISCUSSION

Pre test and post test result of science process skill on indicator science procees skills is analyzed by

quantitative descriptive analysis by calculating the average score of pre test and post test, the average score of pre test and post test is used to calculate N-gain score. The results are shown in Table 1 with explanations as follows:

Tabel 1. The average score of pre-test, post-test and n-gain science process skills indicator on Class XI IPA 1

No	Indikator	Pre-Test		Post-Test		N-Gain	
		Skor	Ket	Skor	Ket		
1	Merumuskan masalah umum	33,33	TT	83,33	T	0,43	Sedang
2	Merumuskan hipotesis dan prediksi	26,67	TT	81,67	T	0,45	Sedang
3	Mengidentifikasi variabel	33,33	TT	88,33	T	0,47	Sedang
4	Mengorganisasikan data hasil percobaan pada table pengamatan	26,67	TT	81,67	T	0,45	Sedang
5	Membuat kesimpulan	30	TT	78,33	T	0,40	Sedang
	Rata-Rata	**24,67**	**TT**	**82,67**	**T**	**0,44**	**Sedang**

Table 1 shows the average score of pre-test, post-test and n-gain of students' science process skills on the indicator on science process skills with pre-test score was 24,6; post-test score was 82,67. So, N-Gain is calculated from pre-test and post-test score was 0,44.

Tabel 2. The average score of pre-test, post-test and n-gain science process skills indicator on Class XI IPA 2

No	Indikator	Pre-Test		Post-Test		N-Gain	
		Skor	Ket	Skor	Ket		
1	Merumuskan masalah umum	26,67	TT	81,67	T	0,45	Sedang
2	Merumuskan hipotesis dan prediksi	23,33	TT	85	T	0,49	Sedang
3	Mengidentifikasi variabel	26,67	TT	86,67	T	0,49	Sedang
4	Mengorganisasikan data hasil percobaan pada table pengamatan	23,33	TT	85	T	0,49	Sedang
5	Membuat kesimpulan	26,67	TT	78,33	T	0,42	Sedang
	Rata-Rata	**25,33**	**TT**	**83,33**	**T**	**0,47**	Sedang

Table 2 shows the average score of pre-test, post-test and n-gain of students' science process skills on the indicator on science process skills with pre-test score was 25,33; post-test score was 83,33. So, N-Gain is calculated from pre-test and post-test score was 0,47.

Tabel 3. The average score of pre-test, post-test and n-gain science process skills indicator on Class XI IPA 3

No	Indikator	Pre-Test		Post-Test		N-Gain	
		Skor	Ket	Skor	Ket		
1	Merumuskan masalah umum	16,67	TT	78,33	T	0,46	Sedang
2	Merumuskan hipotesis dan prediksi	16,67	TT	80	T	0,47	Sedang
3	Mengidentifikasi variabel	16,67	TT	85	T	0,51	Sedang
4	Mengorganisasikan data hasil percobaan pada table pengamatan	16,67	TT	81,67	T	0,49	Sedang
5	Membuat kesimpulan	16,67	TT	80	T	0,47	Sedang
	Rata-Rata	16,67	**TT**	**81**	**T**	**0,48**	Sedang

Table 3 ahows the average of pre-test, post-test and N-Gain of indicator science process skills with pre-test score was 16,67; post-test score was 81. So, N-Gain is calculated from pre-test and post-test score was 0,48.

This data arises because students still have many difficulties and do not understand yet about the indicators science process skills. The findings fit well with the results of preliminary studies conducted by researchers that the students' science-process skills are still below standard. Contrary to the post-test score after applying the Guided Inquiry Learning Model, Class XI IPA 1, 2 and 3 respectively obtained a score of 82,67; 83,33 and 81. Despite being in the moderate category but indicating that the score has improved and obtained N-Gain respectively for Class XI IPA 1, 2 and 3 of 0.46; 0.47 and 0.48. The results of this study show that the application of Inquiry Learning Model proved effective to train students' science process skills in high school physics. This exists because the Guided Inquiry Learning Model has been developed to meet the validity (content and construction), the practicality and effectiveness of improving students' science process skills in High School Physics (Griffin, 2015).

CONCLUSION

Guided Inquiry Teaching Model is affects the students' Science Process Skills Tests especially on one of the "Identifying Variables" indicators. Research results include: 1) There is an improvement in the students' Science Process Skills Tests; 2) Average score of N-Gain indicator "Identify Variables" on Science Skills Process Test has a medium category with 0,49..

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