



Application of Guided Inquiry Learning Model to Improve Junior High School Students' Science Process Skills

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Abstract

The low level of science process skills at SMPN 2 Semen causes students to be less trained to find their own facts or concepts in science learning. This is because in the process of learning science, students have never done experiments. One of the lessons that can train and improve science process skills is the guided inquiry learning model. Therefore, research was conducted that aimed to describe the improvement of students' science process skills towards the guided inquiry learning model of class VIII at SMPN 2 Semen. The method used in this research is descriptive quantitative with the type of research used quasi experiment using one treatment class, namely class VIII-E totaling 35 students. The research design used one group pretest posttest design. The data collection technique in this study used the test method. Science process skills after applying the guided inquiry learning model on the vibration and mechanical wave sub-material have increased. The percentage of completeness for post-test scores was 80%. Class VIII-E obtained an N-Gain score of 0.6 in the medium category. Thus it can be concluded that the guided inquiry learning model can improve students' science process skills.

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INTRODUCTION

Science learning must be adjusted to the policies that apply as one of the subjects at school. Changes in the curriculum from the 2013 revised curriculum to the independent curriculum make changes in approaches, strategies, methods and learning models. Science process skills receive special attention in the learning and evaluation process as seen in the independent learning curriculum document which categorizes learning outcomes based on 2 elements, namely understanding and science process skills (Jayali, 2022). Science is not only the mastery of a collection of knowledge in the form of facts, concepts, or principles but also a process of discovery or inquiry (Iswatun, 2017). Carin (1993) defines Science as Knowledge that is systematic and regularly arranged, generally applicable (universal), and in the form of a collection of data from observations and experiments. Science learning should not only be product-oriented (results), but also pay attention to aspects of process, attitude and application. This is so that students can understand science well, because in preparing learning experiences, teachers not only emphasize product aspects but also emphasize aspects of the process, attitude and its connection to everyday life (Astuti, 2016).

Students in learning science are required to be able to understand and have science process skills in carrying it out. This is related to science materials, most of which are natural phenomena with investigation and discovery (Aji et al., 2017). According to Prihatiningtyas (2013) that knowledge about science, scientific concepts and ideas are obtained from a series of experiences carried out by constructing the phenomena in it. The concept construction process is based on the science process skills possessed by students. The more science process skills that are owned, the better the concept structure obtained, and the more science process skills that are owned, the narrower the concept structure obtained.

Based on the description of the importance of science process skills and finding concepts for students by doing scientific activities independently. But the reality in the field turns out that students' science process skills are still relatively low. Based on the results of pre-research conducted at SMP Negeri 2 Semen, it is known that 76% of students were unable to formulate problems, 79% of students were unable to formulate hypotheses, 93% of students were unable to identify variables, 82% of students were unable to interpret data, and 78% of students were unable to make conclusions. Based on the results of the pre-study, it can be concluded that students' KPS is still low, while KPS plays an important role in understanding difficult concepts in science learning.

Vibrations and waves are one of the concepts in science that is classified as a complicated concept and this concept is often applied in students' daily lives. The results of interviews with science teachers at SMPN 2 Semen stated that vibration and wave material has been difficult for students to understand, this is also in accordance with the results of daily tests that the learning outcomes of about 70% of the 8th grade students have not reached the minimum completeness criteria of 77. The low learning outcomes are caused by the low understanding of concepts and KPS of students, because the learning model used so far has not improved these aspects.

The learning model that is suitable for this problem is a model based on constructivism. Constructivism theory emphasizes that students must find and remember knowledge so that the learning process is more meaningful (Sagala, 2017). One of the learning models based on constructivism is guided inquiry. Guided inquiry is a learning activity in which students are encouraged to learn through their own active engagement with concepts and principles, and teachers encourage students to have experiences and conduct experiments that allow students to discover principles for themselves (Aris, 2013). The process will result in students being able to think broadly, being able to learn from experience (namely by conducting experiments or experiments) and being able to learn from discussions with friends related to the concepts being studied (Rosdiana & Sari, 2017). The selection of this model aims to give students the experience of learning scientifically. This is evidenced in previous research related to getting positive or successful results.

Mahrnun's research (2017) shows that practicum-based guided inquiry learning on the topic of measurement can improve students' mastery of concepts and science process skills. The results of Irmi's research (2019) state that by using the guided inquiry learning model, experimental class students have very good science process skills with an average percentage of 90%, while the control class is still in the sufficient category, namely 43%. As well as the results of Asdianti's research (2020) concluded that science learning on the subject matter of Light and Optical Instruments taught using the guided inquiry learning model experienced an increase in students' science process skills and teacher activities.

Based on this description, the researcher conducted a study that aims to improve the science process skills of junior high school students after applying the Guided Inquiry problem learning model. Indicators of science process skills used in this study are integrated science process skills integrated science process skills include formulating problems, making

hypotheses, identifying variables, interpreting data, and concluding. The improvement of science process skills was measured using the normalized N-gain test based on students' pretest and posttest results.

METHODS (12pt)

This research is quantitative research. The type of research used is Pre-Experimental. The research design used was one group pretest posttest design. The research began with giving pretest questions, then continued with giving treatment in the form of learning by applying the guided inquiry model and ended with giving posttest questions. The research design scheme can be seen in Figure 1 below. (Sugiyono, 2016)

$$O1 \rightarrow X \rightarrow O2$$

O1 = observations made before the experiment (pre-test)

O2 = observations made after the experiment (post-test)

X = treatment given

The research subjects were students of class VIII E at SMP Negeri 2 Semen in the academic year 2022/2023, totaling 35 students. The data collection method used was the test method in the form of pretest and posttest. Data analysis techniques on the results of science process skills using the N-Gain test to determine the increase in pretest results.

N-Gain or symbolized $\langle g \rangle$ is defined as the ratio between the actual gain ($\% \langle G \rangle$) and the The maximum gain possible ($\% \langle G \rangle_{max}$). The formalization to calculate N-Gain is :

$$\langle g \rangle = \frac{\% \langle G \rangle}{\% \langle G \rangle_{max}} = \frac{(\% \langle Sf \rangle - \% \langle Si \rangle)}{100 - \% \langle Si \rangle}$$

(Hake, 1999)

Description :

$\langle Si \rangle$ is the initial score (pretest)

$\langle Sf \rangle$ is the final score (posttest)

$\% \langle Si \rangle$ is the initial score (pretest)

$\% \langle Sf \rangle$ is the final score (posttest)

After obtaining the N-Gain value, it can be seen through the category of improvement through the following table:

Table 1. N-Gain Category

N-Gain Score	Improved Category
$\langle g \rangle \geq 0,7$	High
$0,7 > (\langle g \rangle) > 0,3$	Medium
$\langle g \rangle \leq 0,3$	Low

(Hake, 1999)

RESULTS AND DISCUSSION (12pt)

Students' science process skills are measured using pre-test and post-test regarding the sub-material of the concept of mechanical vibrations and waves. The following are the results of the comparison of the pre-test and post-test scores of students.

Table 2. Completeness of Pre-Test and Post-Test scores of students' Science Process Skills

CPS Value	Pretest		CPS Value	Posttest	
	Total number of students	Percentage (%)		Total number of students	Percentage (%)
≥ 74	0	0	≥ 74	27	80
< 74	35	100	< 74	8	20

In the table above, as many as 35 students were not complete in answering the science process skills pre-test questions. The completeness for the pre-test regarding science process skills is 0%. These results indicate that students have not mastered science process skills, because students have never been trained to improve science process skills in the learning process at school. In the post-test score, there was an increase in the value and completeness of students. There are 27 students who are complete and 8 students who are not complete. Based on the results of the data, it shows an increase because students have received information about science process skills during the learning process. The incompleteness of these students is because in the learning process students who are not complete in posttest activities are less active in the learning process, students tend to be silent, passive and do not pay attention to the learning process. This is in accordance with the opinion of Dimiyati and Mudjiono (2013) that learning is only possible if students are active and experience it themselves.

In an effort to clarify the achievement of science process skills, an analysis of the achievement of each aspect of science process skills indicators is carried out, namely formulating problems, formulating hypotheses, identifying variables, and drawing conclusions. The results of the recapitulation of the achievement of science process skills indicators are presented in Table 2.

Table 3. Recapitulation of Achievement of Pre-Test and Post-Test Indicators of Science Process Skills.

Science Process Skill Indicators	Percentage of Indicator Achievement (%)	
	Pre-test	Post-test
Formulate a problem	35,7	87,1
Formulate a hypothesis	25,0	67,9
Identifying variables	40,0	85,0
Interpreting data	42,1	72,1
Drawing conclusions	48,6	78,6

The lowest indicator percentage in the post-test score is Formulating hypotheses, the same as the indicator with the lowest percentage in the pre-test score. Although the results on this indicator have increased from 25% in the pre-test score to 67.9% in the post-test score, the indicator formulating the hypothesis still gets the lowest percentage. This is because students are still often reversed in placing manipulating variables and responses in providing temporary conjectures. Formulating a hypothesis is often expressed in an "if-then" statement. Hypotheses in addition to showing the causal relationship also show the relationship between two or more variables (Suryanti, 2013). This is reinforced by the research of Kartimi, Gloria, & Aryani, (2013) the skills of formulating hypotheses get a low percentage.

Based on the pre-test and post-test scores of science process skills, it can be seen the magnitude of the increase in science process skills after being analyzed using the normalized gain test. The results of the normalized gain test analysis of students' science process skills are presented in Table 3.

Table 4. Normalized N-Gain Calculation Results for Science Process Skills of Learners

N-gain (g)	Category	Total number of students
$0,70 < g \leq 1,00$	High	9
$0,30 < g \leq 0,70$	Medium	23
$0,00 \leq g \leq 0,30$	Low	3

Based on the normalized N-Gain score obtained by students, it shows three categories, namely low, medium, and high. In Table 4.3 it is known that 3 learners got a low gain category, 23 children obtained a medium category, and 9 obtained a high category. The difference in improving science process skills in each learner is due to the ability of students to absorb information differently. According to Suyono (2011) teachers must adjust the learning style of all students in the classroom, but this will be difficult to realize because the number of students in one class is very large so that the teacher must choose the most dominant learning method and can cause minority groups to be less able to adjust the learning method chosen by the teacher.

Overall, students experienced an increase in science process skills, indicating that the delivery of material by researchers was well absorbed by students. This shows that the application of the guided inquiry learning model in learning science vibration and wave material has succeeded in training students' science process skills. Good inquiry learning will be proportional to the results it will achieve (Wardoyo, 2013). The application of learning by using the inquiry learning model is not only centered on concept acquisition, but also trains the science process skills used in each learning phase, so that learning by applying the guided inquiry learning model is meaningful learning, because students are actively involved in the learning process by training their science process skills.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the science process skills after applying the guided inquiry learning model on the vibration and mechanical wave sub-material have increased. The percentage of completeness for post-test scores is 80%. Class VIII-E obtained an N-Gain score of 0.6 with a medium category.

SUGGESTION

Based on the research that has been done, there are several suggestions, including that the practicum tools that we will use during the data collection process at the school should adjust to the tools available at the school. Adjusting the management of learning time with the planning that has been made by previous researchers, so that the time used becomes more effective during the learning process. Teachers should create a calm and supportive classroom atmosphere during the learning process so that students are interested in participating in the learning process and minimizing noise in the classroom during the learning process.

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