Description of students' science process skills on density material

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Abstract: Physics is one of the subjects related to various scientific concepts in which some of its applications can be found in everyday life. Thus in the learning of physics required special skills, namely science process skills. Science process skills have two categories, basic science process skills and integration of science processes. The researcher conducted research that aims to measure the ability of students' science process skills on static fluid material by using an observation sheet that matches the indicators of science process skills. The research method used is a mixed-method (mix methods), while the design used is sequential explanatory, which combines quantitative and qualitative research in a sequence using the quantitative method and then the quantitative method. From the results of interviews and observations, it can be seen that the science process skills of students at Adhyaksa 1 Junior High School in Jambi are classified as good.
Keywords: Physics; Skills; Science process skills

INTRODUCTION

Education can be a conscious effort to shape human potential as the participants do by teaching and facilitating student learning activities (Astalini, Kurniawan, & Sumaryanti, 2018). Education is an activity carried out by someone to gain knowledge, skills, and habits in life (Asrial et al., 2019). Important activities in the learning process are parts of education (Darmaji, Kurniawan, Astalini, & Nasih, 2019). Education in Indonesia has progressed well and still needs more development (Astalini, Kurniawan, & Putri, 2018). To advance and develop students' abilities can be done by guiding, paying attention, and providing learning activities (Astalini, Kurniawan, & Putri, 2018). Informal education, science is an important study. Science is not only mastery of a collection of knowledge in the form of facts, concepts, or principles, but also is a process of discovery (Rosa, 2015). Natural Sciences consists of several fields of learning, one of which is Physics.

Physics is one of the subjects related to various scientific concepts in which some of its applications can be found in everyday life (Putra et al., 2019). physics is also a branch of science that studies matter and energy and how they interact with each other (Yediarani et al., 2019). Physics is one branch of natural science that is fundamental for students to understand the natural phenomena that occur around them (Sambada, 2012: 38). There are still many weaknesses to learning physics in developing the ability to reason and think inductive and deductive analysis using physics concepts and principles (Halim, 2012, p. 143). Physics does not only learn theories or facts about natural phenomena, but also physics needs to understand how to find physical concepts. Thus in the learning of physics required special skills, namely science process skills.

Science process skills are all abilities needed to acquire, develop, and apply scientific concepts, principles, laws, and theories in mental, physical, and social abilities (Yuliati, 2016). Science process skills are thinking skills that help students learn through knowledge to solve problems and find solutions (Darmaji, Kurniawan, Suryani, et al., 2018). Science process skills have two categories, basic science process skills and science process integration skills (Hırça, 2012). Process skills consist of basic skills, where these basic skills will be the basis for further skill development (Darmaji, Kurniawan, & Lestari, 2018). Basic science process skills consist of observing, classifying, predicting, measuring, inferring, and communicating (Raj & Devi, 2014). Integrated science process skills can be mastered after mastering the basic process skills. Integration science process skills include: identifying variables, making data

tables, making graphs, describing relationships between variables, collecting and organizing data, analyzing experiments, making hypotheses, defining variables operationally, designing experiments, conducting experiments (Chabalengula et al., 2012).

One of the causes of the learning process's success is influenced by the quality and way of teaching teachers. The research results by (Maison et al., 2019) found students and teachers who had not yet mastered the science process skills, so it was necessary to develop science process skills in education. Teachers teach using conventional methods to eat students only know the physics concepts alone without knowing how to obtain these concepts (Ningsi & Nasih, 2020). Teaching using traditional methods makes students learn passively and can not build knowledge independently (Aydın, 2013). This way of thinking can lead to a low level of students' science process skills when teachers can only explain theories with monotonous teaching methods such as lecture methods and not with scientific approaches that affect students who do not have the skills in experimentation because they are taught only about theory (Darmaji, Kurniawan, Parasdila, & Irdianti, 2018). When the teaching process of physics is done conventionally, students tend to only master physics concepts without knowing the process of the occurrence of these concepts (Ningsi & Nasih, 2020). Learning systems that do not provide students with opportunities to understand the concept of science that are essential will cause misunderstanding or misconception (Margunayasa, 2014). Such learning can lead to weak students' science process skills. For this reason, teachers need to teach using the right method so students can understand the concepts of physics, namely using the experimental method. It is also important for the teacher to know the students' science process skills to improve the teacher's way.

Knowledge about static fluid material is not enough for students to only learn theories or concepts, but students need a skill. Learning will be more meaningful if students are allowed to know and are actively involved in finding concepts from existing phenomena from the environment with the guidance of the teacher(Rizal, 2014). Thus to learn these concepts, science process skills are needed. Process skills and scientific attitudes can be developed by providing direct experience to students. One of them is through practical activities or experiments (Hartono & Oktafianto, 2014). Practical learning physics activities have a motivational role in learning, provide opportunities for students to develop some skills, and improve the quality of student learning (Mustika & Murniati, 2011). Practicum has three functions: training, giving feedback, and increasing motivation, which in practice requires information processing skills information (Kustijono, 2018). Teaching and learning process with this experimental method, students are allowed to experience themselves or do it themselves, follow a process, observe an object, analyze, prove and draw their conclusions about an object, situation, or process of something (Kurniawati et al., 2015). Practical activities become one of the learning activities for students to develop the ability to think, analyze, solve problems, prove and draw conclusions of an object from the material being studied (Royani et al., 2018). Based on the presentation that science process skills can be measured through practical activities.

Physics learning aims to develop students' scientific inquiry (Sukarno et al., 2013). The skills needed to develop scientific concepts are the skills of the scientific process. Basic science process skills are all actions taken while experimenting (Darmaji, Kurniawan, Astalini, Kurniawan, et al., 2019). Because the beginning of all experimental activity comes from observation, where observation is part of the basic process skills (Monhardt & Monhardt, 2006). Basic science process skills help students develop learning through direct experience. These basic skills will be the basis for further skill development (Darmaji, Kurniawan, & Lestari, 2018). If physics students do not master basic learning skills, it will be difficult to develop higher abilities, which will impact student learning outcomes. Based on these considerations, the researcher researched to measure the ability of students' science process skills on static fluid material by using observation sheets that were following indicators of science process skills.

METHOD

The research method used is a mixture method (mix methods), while the design used is sequential explanatory, which combines quantitative and qualitative research in a sequence using the quantitative method and the quantitative method (Sugiyono, 2006). The use of a sequential explanatory design begins with collecting and analyzing quantitative data followed by the collection and analysis of qualitative data qualitative (Creswell, 2016). In this method, quantitative data is preferred. Quantitative research

emphasizes numerical assessment and is descriptive (Machmud, 2005). while the qualitative method serves to prove, deepen, and expand quantitative data. The research procedure carried out in this study is to analyze quantitative data first and then to continue to use quantitative data.

Data collection techniques in this study used science process skills observation sheets and interview sheets. Quantitative data collection techniques are using science process skills observation sheets using 16 indicators of science process skills. On the observation sheet, there are 46 statements. Interviews were conducted with two students per class and two teachers teaching physics materials. This study sample were students of grades IX.1, IX.2, IX3 in Adhyaksa 1 Junior High School in Jambi City, which totaled 58 students.

The instrument used in this study was the observation sheet of the science process skills adopted from the thesis Indrawati (2018). What was observed in this study was the process skills students had while conducting practicum activities in the laboratory. Ten observer players assisted this observation. Data on the observation sheet will be analyzed using descriptive statistics. Descriptive statistics display general trends in data to describe one variable (Creswell, 2016). the percentage for each indicator sought is then stated in several categories, namely the Very Not Good (VNG), Not Good (NG), Good (G), Very Good (VG) categories. Science process skills that are focused in this study are divided into two categories, namely basic science process skills and integrated science process skills consisting of 16 indicators, namely basic process skills (Observation, Classification, Measuring, Prediction, Communication, Concluding) integrated science process skills (Identify variables, compile data tables, make graphs, obtain and process data, describe the relationships between variables, define variables operationally, make hypotheses, analyze experiments, devise investigations, conduct experiments). The data obtained are searched for intervals for each indicator then expressed in several categories, such as in the table below. The data obtained are searched for intervals for each indicator then expressed in several categories, such as in the Table 1.

Table 1. The range of Student Science Process Skill in all indicators.

Science process skills	Indicator	Interval			
		VNG	NG	G	VG
Basic	Observation	5.00 - 8.75	8.75 - 12.50	12.51 - 16.25	16.26 - 20.00
	classification	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	Measure	4.00 - 7.00	7.01 - 10.00	10.01 - 13.00	13.01 - 16.00
	Prediction	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	Communication	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	Conclude	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
Integrated	Variable identification	3.00 - 5.25	5.26 - 7.50	7.51 - 9.73	9.76 - 12.00
	Table data compiled	3.00 - 5.25	5.26 - 7.50	7.51 - 9.73	9.76 - 12.00
	Make a graph	3.00 - 5.25	5.26 - 7.50	7.51 - 9.73	9.76 - 12.00
	Accessing and processing data	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	Describe the relationship between variables	5.00 - 8.75	8.75 - 12.50	12.51 - 16.25	16.26 - 20.00
	Define variables operationally	5.00 - 8.75	8.75 - 12.50	12.51 - 16.25	16.26 - 20.00
	Make a hypothesis	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	Experiment analysis	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	Designing Investigations	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00
	conduct experiments	2.00 - 3.50	3.51 - 5.00	5.01 - 6.50	6.51 - 8.00

RESULTS AND DISCUSSION

Data analysis results on mastery of science process skills in students of inert fluid material that is already classified as good. The results of the minimum and maximum values obtained by students that are seen as in Table 2. Table 2 also displays the results of a descriptive statistical analysis of overall student science process skills.

Table 2, which came from 58 respondents from Adhyaksa 1 Junior High School, students in Jambi City had a Mean value of 2,810, a maximum value of 4.00, and a Minimum Value of 1.00. Of the 58 student respondents who were categorized very poor as 4 people with a percentage of 6.9% for the wrong category, as many as 7 students with a percentage of 12.1% for the good category, as many as 43 students with a percentage of 74.1% for the very good category as many as 4 students with a percentage of 6.9%.

The results of the analysis of mastery of students 'science process skills showed that students' science process skills were already classified as good. This is shown from the results of the largest percentage in the good category.

Table 2. Results of descriptive statistical analysis of overall student science process skills

Range	Category	f	%	Mean	Median	Modus	Min	Max
46.00 - 80.50	STB	4	6.9					
80.51 - 115.00	TB	7	12.1	2.810	3.00	3.00	1.00	4.00
115.01 - 149.50	B	43	74.1					
149.51 - 184.00	SB	4	6.9					

Table 3. Mastery of the Science Process Skills of students on a density experiment

Science process skills	Indicator	Category			
		NVG (%)	NG (%)	G (%)	VG (%)
Basic	Observation	1.7	6.9	29.3	62.1
	classification	12.1	41.4	19.0	27.6
	Measure	3.4	17.2	37.9	41.4
	Prediction	5.2	27.6	20.7	44.8
	Communication	8.6	41.4	22.4	27.6
	Conclude	8.6	34.5	27.6	29.3
Integrated	Variable identification	37.9	22.4	17.2	22.4
	Table data compiled	10.3	15.5	37.9	36.2
	Make a graph	29.3	31.0	22.4	17.2
	Accessing and processing data	1.7	31.0	10.3	56.9
	Describe the relationship between variables	5.2	25.9	56.9	12.1
	Define variables operationally	3.4	15.5	50.0	31.0
	Make a hypothesis	10.3	31.0	20.7	37.9
	Experiment analysis	0	17.2	8.6	74.1
	Designing Investigations	8.6	12.1	17.2	62.1
	conduct experiments	8.6	22.4	8.6	60.3

In Table 3 is a table of mastery of students' science process skills in all indicators, 16 indicators are divided into two, namely basic sains process skills (Observation, Classification, Measuring, Prediction, Communication, conclude) and integrated science process skills (Integrative variables, Table data compiled, Make graphs, Accessing and processing data, Describe relationships between variables, Define variables operationally, Make hypotheses, Analyze experiments, Design Investigations, conduct experiments).

Table 2 shows that the results of students' basic science process skills in the observation indicator are quite good. The observation indicator has a percentage of 62.1% included in the very good category, 29.3% included in the good category, 6.9% included in the not good category, and 1.7% included in the very not good category. Classifieds indicators are classified as not good because, in this category has the highest percentage. Thus the calcific indicator has a percentage of 27.6% included in the very good category, 19.0% included in the good category, 41.1% included in the not good category, and 12.1% included in the very not good category. In measuring indicators classified as very good, because in this category has the highest percentage. For measuring indicators, have a percentage of 41.1% included in the category of very good, 39.7% included in the good category, 17.2% included in the not good category, and 3.4% included in the very not good category. The prediction indicator is classified as very good because in this category has the largest percentage. The prediction indicator has a percentage of 44.8% included in the very good category, 20.7% included in the good category, 27.6% included in the not good category, and 5.2% included in the very not good category. In the communications, the indicator is not good, because this indicator has the largest percentage. This communication category as a percentage of 27.6% included in the very good category, 22.4% included in the good category, 41.4% included in the not good category, and 8.6% included in the very not good category. The indicators concluded are not good because in this category has the largest percentage. This category has a percentage of 29.3% included in the very good category, 27.6% included in the good category, 34.5% included in the not good category, and 8.6% included in the very not good category.

The results of science process skills integrated with students in the variable identification indicator are not very good because this category has a percentage. The identification variable has a percentage of 22.4% included in the very good category, 17.2% included in the good category, 22.4% included in the not good category, and 37.9% included in the very not good category. In the indicator compile the data table is quite good because in this category has the highest percentage. The data table has a percentage of 36.2% included in the very good category in the indicators compiled, 37.9% included in the good category, 15.5% included in the not good category, and 10.3% included very not a good category in the indicator to make a graph quite good because in this category has the highest percentage. The indicator has a percentage of 17.2% included in the very good category in the chart, 22.4% included in the good category, 31.0% included in the not good category, and 29.3% included in the very not good category. In the indicator of obtaining and processing data classified as very good, this category has the highest percentage. In the index compile the data table has 56.9% included in the very good category, 10.3% included in the good category, 31.0% included in the not good category, and 1.7% included in the very not good category. The indicator describes the relationship between variables classified as good because in this category has the highest percentage. The indicator describing the relationship between variables has a percentage of 12.1% included in the very good category, 56.9% included in the good category, 25.9% included in the not good category, and 5.2% included in the very not good category. The indicator defines variables operationally is classified as good, because in this category has the highest percentage. In the indicator defining operational variables have a percentage of 31.0% included in the very good category, 50.0% included in the good category, 15.5% included in the not good category, and 3.4% included in the very not good category.

The indicators making hypotheses are classified as very good because in this category have the highest percentage. The indicator defines variables operationally with a percentage of 37.9% included in the very good category, 20.7% included in the good category, 31.0% included in the not good category, and 10.3% included in the very not good category. The indicator analysis of the experiment is classified as very good because it has the highest percentage in this category. The indicator defines variables operationally with a percentage of 74.1% included in the very good category, 8.6% included in the good category, 17.2% included in the not good category, and% included in the very not good category. The indicators of designing an investigation are classified as very good because this category has the highest percentage. The indicator defines variables operationally with a percentage of 62.1% included in the good category, 17.2% included in the good category, 12.1% included in the not good category, and 8.6% included in the very not good category. The indicators of conducting experiments are classified as very good because this category has the highest percentage. The indicators of conducting experiments have a percentage of 60.3% included in the very good category, 8.6% included in the good category, 22.4% included in the not good category, and 8.6% included in the very not good category. Experiments are the highest skills available in integrated science process skills (Aydın, 2013).

Science process skills are important process skills to be possessed by students (Yadaeni, Kusairi, & Parno, 2018). Sain process skills can be used by students to solve physical problems in daily life (Zeidan & Jayosi, 2015). Process skills are acquired skills and basic skills. Where these basic skills will develop higher skills. Linking previous experiences carried out through practical activities is one of physics's characteristics that requires science process skills (Mulhall & Gunstone, 2012). Science process skills are divided into two parts, namely basic science process skills and integrated science process skills (Turiman et al., 2012). Description of science process skills of junior high school students on static fluid material is presented in table 2 and table 3 with one activity of 16 indicators, namely basic process skills (Observation, Classification, Measuring, Prediction, Communication, Conclude) and integrated science process skills (Integrative variable, Arranging variables Data Tables, Make graphs, Obtain and process data, Describe relationships between variables, Define variables operationally, Make hypotheses, Analyze experiments, Design Investigations, Perform experiments). The importance of science process skills for junior high school students is that students learn meaningfully by knowing and actively discovering concepts from existing phenomena in the environment. Meaningful learners are learning that involves students directly, and learning will be easy to remember. Students who can form science process skills will help students master the next skills (Rubin & Norman, 1992).

From the results of this study, it can be seen that middle school students' science process skills vary. Ranging from students who are skilled to unskilled. In basic science process skills have 6 indicators, the observation indicator students have the largest percentage of 62.1% and this is a very

good category and shows that students are skilled enough in observing. FurtheThey is ranging the classification indicator of students with the largest percentage of 41.4%, which is not good. These results indicate that students' skills on this indicator are low because students have not been able to classify experimental data characteristics. On the indicator measuring, students have a 41.4% percentage, which is in the very good category. This means that students are already skilled in this indicator because students can measure the length of objects in an experiment student are interested in experiments, so they tend to be active in measurement activities (Ambarsari et al., 2013). In the prediction indicator, students have the largest percentage of 44.8%, and this is in the very good category and shows that students can express the density of objects during the experiment. Prediction is a skill used to predict the consequences of changing circumstances based on the whole (Wiwin & Kustijono, 2018). Following the communication indicator, students have the largest percentage of 41.4%, which is not good. This means that students are not yet skilled in this indicator and show that students are less discussing the measurement results with friends. The indicator concluded that students had the largest percentage of 34.5%, which was not a good category. This shows that students have not been able to express data in a table to be a conclusion in this indicator.

In addition to basic science process skills, this research also focuses on integrated science process skills. In the experiment, determine the density of objects obtained that the ability to identify variables has a percentage of 37.9%, which is not very good. This means that students have not been able to determine the variables in the experiment. The indicator of compiling the data table has the largest percentage of 37.9%, which is in a good category. This means that students can already create experiment table data. In the graph-making indicator, students have the largest percentage of 31.0%, and this is in the category of not good, meaning that students cannot graph the relationships between variables in this indicator. The indicator of obtaining and processing students has the largest percentage of 56.9%, which is in the very good category. This means that in this indicator, students can display data in the form of experimental table results.

The indicator describing the relationship between student variables has the largest percentage of 56.9%, which is in a good category. This means that in this indicator, students can criticize the use of equations in experiments. The indicator defines variables operationally. Students have the largest percentage of 50.0%, and this is in the very good category. It means that in this indicator, students can measure all the variables in the experiment. Defining variables operationally determines the independent variable, the dependent variable, the control variable (Duruk et al., 2017). On the indicator of making hypotheses, students have the largest presence, which is 37.9%, and this is in the very good category. This means that in this indicator, students have adjusted the design of the experiment with the hypothesis. In the experimental analysis indicator, students have the largest percentage of 74.1%, which is in the very good category. This means that on this indicator, students can take the tools and experimental material. In the indicators of designing experiments, students have the largest percentage of 62.1%, and this is in the very good category. This means that in this indicator, students can determine the tools and materials for the experiment. Furthermore, the last one, the actor, experimented with students who had the largest percentage of 60.3%, which was in the very good category. This means that on this indicator, students can carry out experimental activities.

In this experiment using 16 indicators of process skills. There are 6 indicators of basic science process skills. In the observation indicator, measuring predictions fall into the excellent category. This means that in these 3 indicators, students are already skilled. At the same time, the integrated science process skills are 10 indicators. The indicators compile data tables, make graphs, obtain and process data, describe relationships between variables, define variables operationally, make hypotheses, analyze experiments, design investigations, conduct experiments included in either category. This means that on these indicators, students are already selected. Observation skills are the most basic skills that support the mastery of different skills, namely, integrity process skills. (Zeidan & Jayosi, 2015) basic process skills support the developing other skills, namely integrated process skills. When students are already skilled in basic science process skills, the integrated science process skills will be good.

Researchers also conducted interviews with two students to see students' science process skills. From the interviews, it can be seen that, through the curriculum's activities, it can be seen that the science process skills of Adhyaksa 1 Junior High School students in the city of Jambi have been classified as good. In understanding concepts, students not only memorize formulas without regard to understanding the concept or understanding the physical meaning of the formula correctly.

Researchers also conducted interviews with teachers to see science process skills. Teachers often hold practicum activities but not all material. When practicum activities occur, students follow each activity, so they are already skilled in using practical tools. Thus when practicum activities take place, most of the students actively participate in measuring and concluding activities. To support practicum activities, laboratory rooms and equipment must be complete. From the results of interviews and observations, it can be seen that the science process skills of students at Adhyaksa 1 Junior High School in Jambi are classified as good.

CONCLUSION

The research aims to measure the ability of students' science process skills on static fluid material by using an observation sheet that matches the indicators of science process skills. The research method used is a mixed-method (mixed methods). In contrast, the design used is sequential explanatory, which combines quantitative and qualitative research in a sequence using the quantitative method and then the quantitative method. From the results of interviews and observations, it can be seen that the science process skills of students at Adhyaksa 1 Junior High School in Jambi are classified as good. Basic science process skills classified as good are found in indicators (observation, measuring predictions).

In contrast, integrated science process skills are found in indicators (compile data tables, graphs, obtain and process data, describe relationships between variables, define variables operationally, make hypotheses, experimental analysis, planning investigations, conducting experiments). The importance of science process skills for junior high school students is that students learn meaningfully by knowing and actively discovering concepts from phenomena in the environment. Meaningful learners are learning that involves students directly, and learning will be easy to remember.

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