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Profile Analysis of Basic Science Process Skills for Grade 8 Junior High School Students at SMP Negeri 2 Sembawa

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Abstract

Students benefit from science process skills when they try and re-try to solve problems from the instruments disseminated through this research. To overcome students' problems that occur in the classroom during the learning process, they must acquire adequate science process skills. Teachers must be able to understand the skills well so that students can get the needed needs. This study aims to determine the profile of science process skills of VIII grade junior high school students at SMP Negeri 2 Sembawa. The results of this study are expected as a guide for science teachers at SMP Negeri 2 Sembawa in overcoming students' difficulties in mastering science concepts in schools. This quantitative research was conducted by testing using the Basic Skill Process (BAPS) instrument. The research sample consisted of 81 junior high school students in class VIII at SMP Negeri 2 Sembawa. Researchers obtained learning data based on the results of the Science Process Skills (SPS) test. The SPS test consists of 25 understanding of SPS concepts. The results of the study revealed that the percentage results of students' process skills for each indicator were observing 28.39%, communicating 63.20%, classifying 61.23%, predicting 49.91%, and inferring 40.74%. Based on these percentages, the highest indicators achieved by students are indicators of communication and classification, while the lowest indicators achieved by students are indicators of observation and data inference. The category of mastery of science process concepts for SMP Negeri 2 Sembawa students is included in the medium category. the quality of learning to improve the ability to observe students by increasing the ability of the five senses. Learning that involves a lot of students' sensory abilities is also needed to stimulate science process skills to be achieved properly.

Keywords: Skills, Science Process, BAPS, Abilities

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INTRODUCTION

Natural Sciences has special ways of observing, thinking, experimenting and validating that represent fundamental aspects of the nature of science and reflect how science is different from mere knowledge. According to Paolo and Marten (Putri et al., 2021) for children and adolescents, science is defined as observing what is happening; trying to understand what is being observed; use new knowledge to predict what will happen; and testing predictions under conditions to see if they are correct. Therefore Permendiknas No. 22 states that science learning in elementary school emphasizes providing direct learning experiences through the use and development of process skills and scientific attitudes (Kartimi et al., 2013; Susanti et al., 2018). At the school level, teachers act as curriculum planners and implementers. The spirit of autonomy in curriculum management must be able to be answered by teachers with the ability to carry out a quality learning process. As a guarantee, Law Number 14 of 2005 concerning Teachers and Lecturers requires teachers to have academic qualifications, competencies, educator certificates, and be physically and mentally healthy (Rauf et al., 2013).

Educational Personnel Education Institutions are very interested in realizing this mandate, especially related to the possession of academic qualifications and competence of prospective teachers who are their products. Based on the form of learning and the scope of science set by the Content Standards, elementary science teachers are required to master science concepts as well as be able to teach them. The desired form of science learning is through the provision of direct experience that develops students' scientific process skills and attitudes. The quality and performance of teachers has always been considered a determining factor for the success of educational change (Leonard, 2016; Novitasari & Leonard, 2017). Since the 1980s, the decline in teacher quality has become an issue of concern to the education sector (Ali, 2018; Rahayu et al., 2021). The success of schools and colleges in meeting the need to prepare students to meet intended social change depends on new patterns of teacher training. However, poor qualifications and limited abilities along with low levels of education personnel, shortages in numbers and low professional morale are common in many low-income countries. This condition will indeed weaken the role that teachers can play in providing quality education in particular and the development community in general. Basic education is important for nation building (S, Frafti Rejeki, Usman, 2020).

The scientific research process can be described as identifying problems, collecting data, analyzing data, and interpreting the collected results (Dumitrescu et al., 2014). Scientific research develops students' higher order thinking skills, such as asking questions, conducting research, solving problems and communicating affectively (Samsudin, 2020). Science Process Skills are among the most frequently used thinking skills. and they are one of the most important goals of Science teaching. Therefore, everyone should acquire these skills, not only scientists. Ward & Lee (2002) emphasizes that individuals who cannot use SPS will have difficulty succeeding in everyday life. Because the development in science process skills allows students to gain the skills needed to solve everyday problems. These skills are not only used during education, they are also used in everyday life. According to Opateye (2012), individuals who use science process skills have a positive attitude towards science. Research emphasizes that Science process skills are very important for Science literacy. Scientific literacy is very important in terms of the sustainability of modern society. Diella & Ardiansyah (2019) reports that if Science process skills are not acquired, students may not be able to acquire Science literacy since Sciences literacy is not limited to reading and listening

but rather requires efficient use of science process skills. Therefore, these skills affect the personal, social, and global lives of individuals (Kastawaningtyas & Martini, 2018). Therefore, it is necessary to carry out an investigation to find out how the ability profile of Science Process Skills (SPS) students of SMP Negeri 2 Sembawa, Banyuasin Regency, South Sumatra.

The procedure carried out by scientists to conduct investigations (inquiry) in an effort to gain knowledge about nature is commonly known as the scientific method. According to Asna dan Sugianto (2014) the basic skills possessed by scientists in carrying out scientific activities are known as science/science process skills. According to Funk (Yuliati, 2016a), science process skills (Science Processes Skills) include the things that science experts do in their learning and conducting investigations (inquiry). While Oliver (Yuliati, 2016b) emphasizes process skills on thinking skills. Process skills can develop in students if they are given the opportunity to practice using their thinking skills. With this process skill students can learn science according to their wishes. According to Gagne (Lestari & Diana, 2018) science process skills are certain basic abilities needed to use and understand science. Each process skill is a unique intellectual skill, which is used by all scientists, and can be applied to understand any phenomenon. Harlen (Pambudi et al., 2013) describes process skills as activities or various student activities carried out in learning to achieve certain goals, and all activities become an inseparable whole. For example, in investigation activities, starting from making observations, interpreting the results of observations and subsequent skills.

Overall, each of the process skills involved are part of all skills in the investigation process. Science Process Skills (SPS) are defined as tools that individuals use to acquire information about the world and order this information. (Samsudin, 2020) defined SPS as identifying problems, formulating hypotheses about these problems, making valid predictions, identifying, and defining variables, designing experiments to test hypotheses, collecting, and analyzing data, and presenting rational findings that support the data. These skills are addressed in the related literature in two categories: basic SPS and integrated SPS. Basic science process skills form the basis of integrated science process skills. Basic SPS includes skills such as observing, classifying, communicating, measuring, using space/time relationships, using numbers, inferring, and predicting; Integrated skills include skills such as identifying problems, identifying, and controlling variables, formulating hypotheses, interpreting data, operationally defining, reading and graphing, and experimenting. Generally, basic science process skills can be acquired from the preschool period onwards while integrated skills can begin to be acquired in secondary (grade). Students are in the concrete operational stage while in elementary school (grades 1-4) while the formal operational stage begins in secondary school. A study conducted by Puspita et al (2021) found that there was a high and positive correlation (r=0.73) between students' integrated SPS and formal operational skills. In this context, when students go to secondary school, they are expected to acquire integrated SPS. SPS acquisitions are deeper at a higher stage. However, in order to students to acquire basic and integrated skills at the desired level, teachers should understand cognitive skills.

Erlida Amnie (2018) reports that the acquisition of a SPS at the desired level is very important for students, because students who are unable to sufficiently acquire these skills cannot understand the world and cannot build the necessary connections. For this reason, teachers should develop students' SPS reason, it can be assumed that SPS and science content are complementary (Utami et al., 2020). It is known that teachers must have the knowledge, understanding and materials needed to teach SPS (Rahayu et al., 2021). However, several studies have found that the SPS of science teachers and primary school teachers is generally insufficient/low and teachers rarely

use these skills in their classrooms. (S, Frafti Rejeki, Usman, 2020)found that teachers did not have sufficient conceptual understanding of SPS. Juhji (2016) emphasize that teachers must understand cognitive SPS, to get their students to acquire these skills at the desired level.

METHODS

The type of research used is research with the type of mix method which is research that combines qualitative and quantitative research types. This research was conducted in July 2022 at SMP Negeri 2 Sembawa. The population used in this study were all eighth-grade students of SMP Negeri 2 Sembawa. The sample used in this study was class VIII, totaling 81 students at SMP Negeri 2 Sembawa. The sampling technique used purposive sampling technique. The research design in this study used an explanatory sequential design mixed methods which were dominant-less dominant. The following is a modified research design from (Rauf et al., 2013)

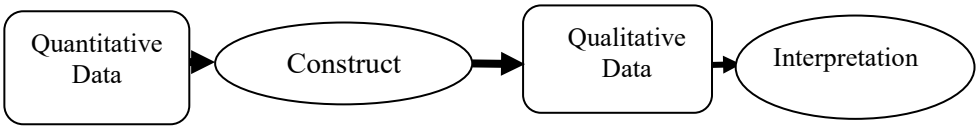

Figure 1. Research Design

The Basic of Process Skill (BAPS) test (Sunyono & Meristin, 2018) was applied to measure science process skills for the Junior High School level. From the reliability analysis conducted by Twiest (2014), it was determined that the reliability values obtained from the items in the test ranged between 0.89 and 0.94. Based on a meta-analysis study that examines students' science process skills, it is stated that the Basic of Process Skills Test (BAPS) is the test that best predicts science process skills. In its application processing time is limited to 30 minutes. The test is assessed by considering five indicators of science process skills, namely observation, classification, communication, interference, and prediction. The test instrument used consists of tests and interviews, the test given consists of 8 items of description. In this description test, it will clearly show how students' ability to answer questions is in accordance with the context of the questions. The description test includes indicators of students' science process skills. The indicators of students' science process skills used are observing, predicting, planning experiments, interpreting data, concluding and communicating. This science process skill test is conducted on students who have obtained the material of vibration, waves, and sound. While the interview sheets were conducted to support the results of the science process skills test that had been done by the students. The data analysis technique consists of validity test using Aiken's formula and reliability using Borich formula and there is quantitative and qualitative data analysis, quantitative data using students' science process skills test aims to determine students' science process skills after getting the material. While the qualitative data uses data analysis model Miles and Huberman which includes 4 stages, namely, data collection (data collection), data reduction (data reduction), data display (presentation of data), conclusion/verification (conclusion/analysis). To find out the results of the student's science process skills test, it can be calculated by formula 1 (Samsudin, 2020).

$$Percentage = \frac{R}{SM}\ X\ 100\% \quad (1)$$

Descriptions:
P = Persentage
R = Student's Scors
SM = Maximum Scors

The calculation results are interpreted using the criteria according to Table 1.

Table 1. Science Process Skills Assessment Criteria

Percentage (%)	Criteria
75,05 < X	Very High
58,83 < X ≤ 75,05	High
41,65 X ≤ 58,83	Moderate
24,95 < X ≤ 41,65	Low
X ≤ 24,95	Very Low

(Lutfa Asna, Sugianto, 2014)

Ability to use KPS (25 items). The complete distribution of questions is shown in the Table 2.

Table 2. Distribution of SPS Questions given to Students

Aspects/Competencies	Sub Competency	Amount	Question Number
Use of Science Process Skills (SPS)	Observing	5	1,2,10,16,18
	Communicating	5	9,12,13,14,15,
	Classifying	5	3,7,8,11,19
	Predicting	5	4,5,6,22,24
	Interfering	5	17,20,21,23,25

Table 3 presents the indicators of science process skills described in this paper.

Table 3. Science Process Skills Indicators and their Sub-Indicators

Indicator	Science Process Skills Sub Indicator
Observation	Using as many senses as possible, gathering/using relevant facts
Predictions	Using patterns of observations, reveals what might have happened to the situation before it was observed.
Classification	Record each observation separately, look for differences, similarities, control for characteristics, compare and seek the basis of grouping and classification
Communication	With graphs or table diagrams, compiling and submitting reports systematically, explaining the results of experiments or research, reading graphs or tables or diagrams, discussing the results of activities dealing with a problem or an event
Inference	Connecting the results of observations, finding patterns in a series of observations and concluding

RESULTS & DISCUSSION

Results

Understanding of science process skills in this study includes knowledge regarding the concept of Science Process Skills (SPS) and the use of SPS. The depth of the respondents' knowledge of SPS concepts is indicated by their ability to describe SPSs and their ability to identify types of SPSs. Meanwhile, the SPS measured by the ability to use, including observation, communication, classifying, prediction and inference. The instrument used is a valid instrument from Test of Basic Process Skills (BAPS). BAPS instruments that have been adjusted to the indicators to be achieved.

The science process skills test was conducted on 81 eighth grade students in SMP Negeri 2 Sembawa Students take the online test through the google form link and then their respective answers are sent directly. The test given after the test results were obtained, the data was then analyzed quantitatively, grouped into high, medium, low categories and two subjects from each of these categories were selected as resource persons for interviews. The selection of subjects for each group was based on the answers in each group category and good enough communication skills so that the subjects were able to understand and answer interview questions well. It can be seen that the science process skills of class VIII students are divided into three groups. The groups include the high group, medium group, and low group. The frequency and percentage of each group can be seen in Table 4.

Table 4. Percentage of each group category

Group Category	Frequency	Percentage
High	23 students	28 %
Moderate	29 students	36 %
Low	29 students	36%
Total	81 students	100 %

Table 4 shows that of the 81 students of class VIII there are 23 students who are included in the high group with a percentage of 28%. 29 Students belong to the low group with a percentage of 36%. The science process skills of grade VIII students are still not maximized so that there are still many students who are included in the medium and low categories. According to David Ausubel about the theory of meaningful learning explains that learning is a process of connecting new information with relevant concepts and contained in one's knowledge structure (Ali, 2018; Susanti et al., 2018). Class VIII students have acquired science concepts but are still unable to connect their knowledge with new information to be able to connect them with science process skills. Therefore, the science process skills of class VIII students are dominated by the middle and low groups. The percentage of each indicator shows how much achievement each indicator of science process skills has achieved by class VIII students at SMP Negeri 2 Sembawa. The following percentage of indicator data as a whole can be seen in Table 5.

Table 5. Percentage of SPS for Each Indicator

No	Indicators	Percentage (%)
1	Observing	28,39 %
2	Communicating	63,20%
3	Classifying	61,23 %
4	Predicting	49,91 %
5	Interfering	40,74 %

Discussion

Table 4 explains that class VIII students have different percentages on 5 indicators of science process skills. It can be seen that the one with the highest value for all indicators is the communication indicator with a percentage of 63.20%. This finding is different from the results of research by (Putri et al., 2021) which states that the highest aspect of students' science process skills is the observing aspect and (Kartimi et al., 2013) findings which show that the observing aspect has the highest score very well. Then the science process skills of students who have the lowest score of all indicators, namely the indicator of observing data with a percentage of 28.39%. The first indicator is observing with a percentage of 28.39%. The results of the percentage analysis indicate that students have not been able to observe the given problem. In the observing indicator, students are asked to observe illustrated images related to science process skills with the aim that it is easier for students to answer the questions that have been given. However, students still have difficulty observing and analyzing information that can be heard, touched, and felt. From the data above, it can be seen that the observing indicator has the lowest percentage, the importance of science process skills for observing indicators in the teaching and learning process, namely students will be easily active and encouraged to use all the five senses possessed by students. In this aspect, students will use all their five senses to activate ongoing process skills.

This is in accordance with Rahayu et al (2021) that observing indicators are basic scientific skills and observing students must be able to use all their five senses including seeing, hearing, feeling, tasting and smelling. The second indicator is communication. Analysis of the percentage of communication indicators get a percentage value of 63.20%. The results of the percentage analysis indicate that the communication indicator has the highest value compared to other indicators. Communication indicators can be achieved by students well so that they can complete the questions that have been given and detail the questions so that they can answer the questions in their own way with the knowledge they already have after learning. This is in line with (Yuliati, 2016a) where students are encouraged to discover and construct their own knowledge in their minds through the use of scientific process skills and scientific attitudes, so that students are not just users or memorizers of knowledge, but as inventors and owners of knowledge.

The third indicator is classification. The percentage value of the classification indicator is 61.23%. The results of the percentage analysis show that the classification indicators are the same as the previous indicators that can be achieved by students so that the results of the classification indicators show that students are able to answer questions in detail based on their knowledge. In the matter of classification indicators, students are asked to classify or group objects according to the type and nature of the object correctly and to detail in the object according to the distinctive characteristics of the object. This is in line with the statement of Pambudi et al (2013) that the purpose of grouping in process skills is to provide opportunities for students to work with science, not only telling or hearing about the science, but grouping things according to

the similarity of the characteristics of the object. The fourth indicator is predicting. The percentage value of the predicting indicator is 49.91%. The percentage value obtained shows that science process skills make students able to predict events or events based on observations from problems that have been done. In predicting indicators, students are asked to predict and analyze the data obtained from the questions in detail. Students answer the questions with their own thoughts, but they are not sure about the answers. According to Amnie dan Abdurrahman (2014) the skill to predict observation results (predicting skills) is an aspect of basic KPS which is also related to students' skills in predicting events according to the data that has been obtained in the questions.

The fifth indicator is the last one is interpreting the data. The percentage analysis of the interpretation indicator gets a percentage value of 40.74%. The results of the analysis show that the data interpretation indicators are difficult to achieve by students after observing skills. In the interpretation indicator, students are asked to analyze a graph, determine the relationship between the mass of an object and the period and expand learning through experience and develop the knowledge gained. In line with the statement of Diella & Ardiansyah (2019) that in science, basic science process skills help children expand learning through experience. Students start with simple ideas, and progress to form new and complex ideas. The percentage value obtained shows that the inference indicator is the second low percentage after the data interpretation indicator. The indicator for concluding is classified as low, it can occur due to several factors, including students' unfamiliarity in concluding a lesson, lack of accuracy of students in working on questions and lack of seriousness of students when participating in the learning process. During the learning process, students may not listen and talk to themselves. The overall percentage of achievement for each indicator is presented in Figure 2.

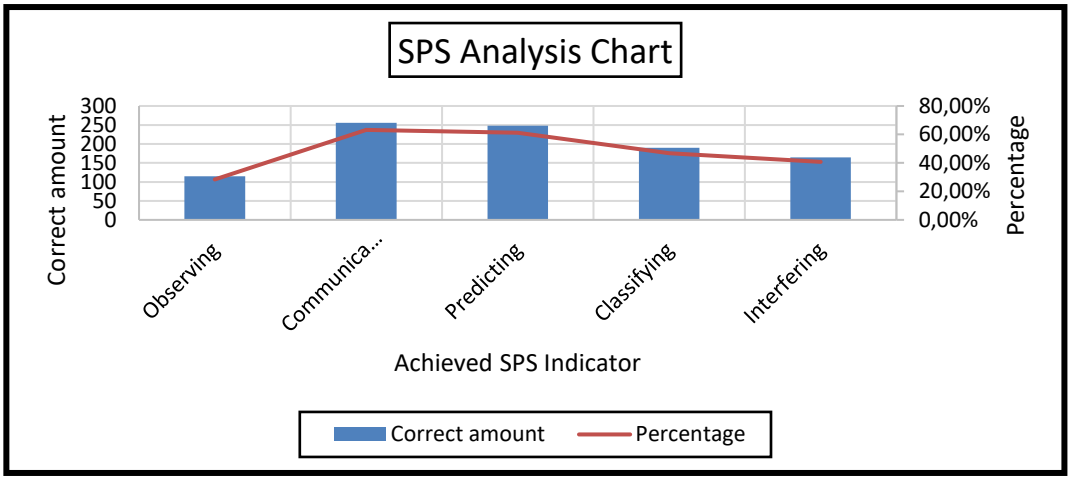

Figure 2. Graph of SPS Analysis per Indicator achieved

Based on the discussion, it can be shown that the VIII grade junior high school students at SMP Negeri 2 Sembawa mostly already have science process skills by being able to solve the given questions, only the skills of observing data that get the lowest percentage of 28.39%. Therefore, it is necessary to improve the quality of learning to improve the ability to observe by training students' five senses. Learning that involves a lot of students' sensory abilities is also needed to stimulate other science process skills to also increase. These students' science process skills require teachers to be able to develop, design and create a science learning process that can develop students' science process skills.

CONCLUSION

Based on the results of data analysis and discussion, the following conclusions are obtained: the results of the percentage of students' science process skills for each indicator, namely, observing 28.39%, communicating 63.20%, classifying 61.23%, predicting 49.91%, and inferring 40.74%. Based on these percentages, it can be seen that the highest indicators achieved by students are indicators of communication and classification, while the lowest indicators that are difficult for students to achieve are indicators of observing and inferring data. As for suggestions regarding this research, namely the analysis of science process skills only presents material for addictive substances and additives as well as material for pressure on substances and their applications so that it is hoped that further research can be made on other science learning materials that can improve students' science process skills.

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