



## Analysis of Junior High School Students’ Science Process Skills in Environmental Pollution Based on Ethnoscience and Local Wisdom

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### Abstract

Science process skills are skills in which student’s thinking skills are trained. The purpose of this study was to determine the level of science process skills at SMPN 2 Geger in terms of environmental pollution. The type of research used is descriptive quantitative non-experimental. The research population was all students of class VII SMPN 2 Geger. Sampling using a saturated sampling technique. The sample used in this study was 20 students of class VII SMPN 2 Geger. The instrument used was a test of students’ science process skills in the environmental pollution sub-material in the form of 12 essay questions. The research results obtained show that the average each student is included in the low category, with an average value of 32%.

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## INTRODUCTION

Education in Indonesia is a country where the value of the quality of education is still relatively low compared to other countries. Various kinds of technological advances have begun to be applied in the world of education as well as to support more efficient learning, such as the use of technology for distance learning and so on. Where in the field of education it has a big influence on 21st century learning. 21st century learning applies creativity, critical thinking, cooperation, problem solving, communication skills, community and character skills (Mardhiyah *et al.*, 2021). Muhali (2019) argues that in the 21st century, education is becoming increasingly important to ensure students have learning and innovation skills, skills in using information technology and media, as well as being able to work and survive using life skills. Annisa *et al* (2020) also explained that education is a conscious, planned effort to realize active learning activities and develop the potential of students. Education itself can be obtained through a learning process carried out from an early age.

Science learning is learning that is designed, teaching science is not only about theoretical skills or foundations but also learning about findings. Where learning Natural Sciences places more emphasis on scientific investigation and provides direct and real experience (Rahayu *et al.*, 2021). According to Nosela *et al.* (2021) state that science subjects study a lot about phenomena and natural phenomena empirically, logically, systematically, and rationally which involve elements of scientific processes and attitudes. This agrees with the research by Husniyah *et al.* (2019) which states that science education is expected to help develop students' potential.

Science learning according to the results of Noviani's research (2019) states that students still think learning science is very difficult to learn, this is because learning science tends to focus more on memory or memorizing science concepts. This is what causes science process skills to be categorized as low. In addition, several other factors cause low students' science process skills. One of these factors is related to the learning process that is carried out, namely still using the lecture method. The implementation of learning carried out in schools focuses on learning science only as a product, memorizing material concepts, and theories. This makes students feel bored with the ongoing learning. Science process skills are one of the skills that train students' thinking skills and all the abilities needed to acquire, develop and apply science concepts in the form of mental, physical and social abilities (Gasila *et al.*, 2019).

Science process skills that train students' thinking skills need to be grown in students. This agrees with Ayu *et al.* (2019) which states that students' science process skills need to be grown from the students' souls because these science process skills can make students accustomed to discovering knowledge along with the development of science and technology. According to Fitriani *et al.* (2021) states that science process skills really need to be developed through direct experience, where in direct experience a person can better appreciate the processes or activities that are taking place. This agrees with Husniyah *et al.* (2019) which states that science process skills are skills that can be used by students in exploring or discovering a scientific discovery concept. Science process skills are skills that focus students on learning processes to generate skills in understanding concepts and generating realities and values in everyday life. Science process skills are divided into two, namely basic science process skills and integrated science process skills. Basic science process skills namely communicating, observing, measuring, classifying, predicting, and concluding, while integrated science process skills namely formulating hypotheses, interpreting data, controlling variables, defining operationally, and experimenting (Santiawati *et al.*, 2022).

Environmental pollution material is closely related to everyday life so that students can understand the material concepts and science process skills. Based on the results of research conducted by Putri *et al.* (2020) through the science process skills test the students tested using questions with indicators of science process skills to obtain data, namely formulating a problem of 19.17%, making a hypothesis of 15.12%, identifying variables of 16.12%, analyzing data of 15.62 %, and make a conclusion of 17.50%. These results indicate that students' science process skills still need to be improved.

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SMPN 2 Geger is one of the schools in the Bangkalan region which is located in the leafy and green highlands complete with the charm of its natural landscape and implements the adiwiyata program in the school curriculum (Sekolahloka, 2024). Seeing natural panoramas is supported by the Adiwiyata program, so this school is concerned with training students' science process skills in order to synergize school policies, curriculum and learning methods used by teachers. However, the science process skills of students at SMPN 2 Geger have not been revealed in several previous studies. This is a novelty for the research carried out. Therefore, research was conducted on science process skills with the title "Analysis of Science Process Skills of SMPN 2 Geger Students on Environmental Pollution Material". It is

hoped that this research can become a basis for teachers to implement learning that can empower students' science process skills in science learning.

**METHOD**

The type of research used is non-experimental quantitative descriptive research, where in this study there was no treatment of subjects or respondents (Sutrisno, 2021). This research was carried out in the even semester of 2022/2023. The location used as the research location was SMPN 2 Geger, Bangkalan in class VII. The design used in this study is descriptive quantitative. Quantitative descriptive is a process or way of finding information related to existing symptoms and events which are explained using numbers starting from data collection, interpretation of data, and drawing results (Jayusman & Shahab, 2020). The procedure in the research is data collection, describing the data that has been obtained, and then interpreting the data. The following is a form of research design that will be carried out which can be seen in the image below.



**Figure 1.** Research design

The population of this research was all students of class VII SMPN 2 Geger even semester. The sample in this study was class VII with a total sample of 20 students. The research sample was taken using a saturated sampling technique. Saturated sampling is a sampling technique when all members of the population are used as samples (Rosyidah & Fijra, 2021).

The test is an activity of giving assignments or assignment designs in the form of questions that must be done by students. A test is a research tool used to obtain information in the form of someone's knowledge or skills whose results are described through a numerical scale or system based on certain categories (Wibawa, 2019). The science process skills test in this study aims to determine students' science process skills in mastering environmental pollution material. The test used was in the form of a description of science process skills which totaled 12 questions. Documentation aims to prove that research activities are actually taking place in accordance with the existing activity plans (Mufidah & Zaitun, 2021). Retrieval of documentation in the form of photos of activities while working on students' science process skills tests.

**Data Analysis Technique**

**Expert Validity Test**

Validity is a level measure that shows the validity of an instrument. An instrument is said to be valid if it can measure what the researcher wants, meaning that the instrument can reveal data from the variables studied carefully (Islami *et al.*, 2020). Expert validity is carried out to obtain advice from experts regarding the instruments and materials used. Testing the validity of this study used Aiken's statistical test (Aseptianova, *et al.*, 2019), namely:

$$V = \frac{\sum s}{[N(c-1)]} \dots\dots\dots 3.1$$

Information:

S = r – lo

lo = the lowest validity rating score

c = the highest validity rating score  
 r = number assigned by an appraiser  
 N = number of validators

**Table 1.** Criteria of validity

Results of Validity	Criteria of Validity
$0,80 < V \leq 1,00$	Very High
$0,60 < V \leq 0,80$	High
$0,40 < V \leq 0,60$	Enough
$0,20 < V \leq 0,40$	Low
$0,11 < V \leq 0,20$	Very Low

(Aseptianova *et al.*, 2019)

**Reliability Test**

Reliability is the level or degree of consistency of an instrument (Aseptianova *et al.*, 2019). Reliability is used to be able to determine the level of reliability of the instrument for essay questions using the Cronbach alpha formula as follows:

$$R = \left[ 1 - \frac{A-B}{A+B} \right] \times 100\% \dots\dots\dots 3.2$$

Information:

- R = reliability
- A = the highest score from the validator
- B = the lowest score of the validator

**Table 2.** Interpretation of the reliability of the questions

Reliability Interval (100%)	Criteria
$80 < R \leq 100$	Very good
$60 < R \leq 80$	Good
$40 < R \leq 60$	Enough
$20 < R \leq 40$	Bad
$R \leq 20$	Very Bad

(Geovana, 2023)

Quantitative data analysis was carried out to measure the percentage and level of students' science process skills at SMPN 2 Geger. Student science process skills (KPS) used in research are basic KPS, not integrated. There are 6 indicators of basic science process skills, namely observing, communicating, grouping, measuring, concluding and predicting. These six indicators are because basic KPS is used as a basis for obtaining new information simply in gaining first experience of learning activities regarding environmental pollution material through practicum activities as a condition for obtaining extensive and in-depth research data using integrated KPS. The following is the formula used to calculate the results of the science process skills test which can be seen in formula 3.3

$$\text{Science process skill test} = \frac{(\text{student's score})}{(\text{smasimum set score})} \times 100\% \dots 3.3$$

(Fitriana *et al.*, 2019)

Each indicator of science process skills is calculated using the average formula, as in formula 3.4

$$\text{Average of each indicator} = \frac{\Sigma \text{total score}}{\text{number of students}} \times 100\% \dots\dots\dots 3.4$$

(Santiawati *et al.*, 2022)

If the results of the science process skills test are known, then determine the criteria for students' science process skills test results. The criteria for the results of science process skills can be seen in table 3.3 below

**Table 3.** Criteria for Science Process Skill Results

Score (%)	Criteria
$75,05 < X$	Very high
$58,83 < X \leq 75,05$	High
$41,65 < X \leq 58,35$	Medium
$24,95 < X \leq 41,65$	Low
$X \leq 24,95$	Very low

(Rahayu *et al.*, 2021)

**RESULTS AND DISCUSSION**

Based on the students' science process skills test that was carried out on 20 grade VII junior high school students at SMPN 2 Geger, data on the percentage of students' science process skills was obtained according to the formula in Table 4. as follows.

**Table 4.** Results of the average percentage of students' science process skills

Respondent	Category	Number of students	Percentage
S2	Low	7	35%
S10			
S11			
S13			
S14			
S17			
S18			
S4	Very low	7	35%
S7			
S8			
S9			
S12			
S15			
S20			
S1	Medium	5	25%
S5			
S6			
S16			
S19			
S3	High	1	5%

The classification of students' science process skill levels is categorized into five levels, namely very high, high, medium, low, and very low categories. As for the test scores and the level of students' science process skills on environmental pollution material after recapitulating the results of the students' answers working on 12 test questions with a total of 20 students.

Based on Table 4.1 it can be seen that class VII students of SMPN 2 Geger have different science process skills. In the tests carried out there were no students who were included in the very high category, only 1 student was included in the high category, in the science process skills of students on environmental pollution with a percentage of 5%. Students who are included in the low category in science process skills are 7 students with a percentage of 35%. Students who belong to the very low category are 7 students with a percentage of 35%. Students who belong to the medium category have 5 students with a percentage of 25%. This disagrees with research conducted by (Misa et al, 2023) which was conducted at SMPN 1 Bajawa Utara which had an average level of science process skills in the very good category.

Several factors influence the low value of students' science process skills. Based on the research conducted, students' science process skills were classified as low, presumably because the learning process was still monotonous or using the lecture method so students were less able to develop concepts that had been studied previously. Based on previous research (Noviani, 2019) one of the factors is related to the learning process carried out, namely still using the lecture method, which causes students' science process skills to be categorized as low.

The results of the students' science process skills test at SMPN 2 Geger are also supported by the percentage per indicator. The percentage of science process skills per indicator can be seen in Table 5.

**Table 5.** The results of the percentage of science process skills for each indicator

<b>Science process skills indicator</b>	<b>Percentage</b>	<b>Description</b>
<b>Observing</b>	33%	Low
<b>Predicting</b>	23%	Very low
<b>Measure</b>	29%	Low
<b>Communicating</b>	28%	Low
<b>Summing up</b>	23%	Very low
<b>Classify</b>	56%	Medium
<b>Average</b>	<b>32%</b>	<b>Low</b>

Based on the percentage of students' science process skills indicators, the percentage of all indicators is in the low category with a percentage of 32%. Very low percentages are found in predicting indicators with a percentage of 23% and indicators concluding with a percentage of 23%. The low category includes observing indicators with a percentage of 33%, measuring indicators with a percentage of 29%, communicating indicators with a percentage of 28%, and classifying indicators with a percentage of 56%.

The first indicator is observing, for observing indicators students can use the five senses to observe objects, events, and patterns resulting from observations. Based on Table 4.3, the observing indicator is classified as very low with an average percentage value of 13%. This shows that students have not been able to master well in observing marked by students answering incorrectly by the existing concepts in environmental pollution material. This does



not agree with the research conducted (Misa et al, 2023) that students have very good observing abilities.

The second indicator is predicting, predicting is done so that students can predict the possibility that an event will occur. Based on Table 4.3, the predicting indicator is included in the very low category with an average percentage value of 9% which indicates students do not yet have science process skills in predicting indicators. This is not in line with the research conducted (Syazali et al, 2021) where in his research predictive indicators were included in the good category. This low category shows that students still have difficulty in predicting everything. In questions, students are required to predict by calculating to get possible answers, but most students are wrong in answering.

A prediction is a prediction of something that will happen in the future that might be observed. For the meaning of prediction itself is predicting something that could happen in the future, according to estimates of certain trends, or the relationship between reality, design and the principles of science. Based on the theory explained, students still have difficulty in making estimates from the data obtained with factors that will influence pollution and calculations in experiments. This is also proven by the fact that there are still many students' mistakes in estimating the relationship between data and factors that influence pollution and the task of calculating experimental results given by the teacher. This is also because teachers cannot guide and teach students directly. This result is supported by Hardianti & Permatasari (2023) who stated that prediction skills are more abstract than others, making it difficult for students to answer.

The third indicator is measuring. Based on Table 4.3, the measuring indicators are included in the very low category with an average percentage value of 12% which indicates students do not yet have science process skills in measuring indicators. This is not in line with the research conducted (Gasila et al, 2019) where in his research the measuring indicators were included in the good category. Measuring indicators in the low category show that students still have difficulty knowing appropriate measuring instruments and how to use them to measure experimental results on the influence of environmental pollution on the activities of living things.

The low measuring indicators are because students are given less practice in using measuring instruments and how to use measuring instruments appropriately in the learning process. Another cause is the absence of direct practicum carried out by students resulting in low students' measuring abilities. Practicums in learning have an important function because they teach students to carry out direct studies with personal experience in order to improve problem-solving abilities (Walil et al., 2021). This experience causes students not to have high-level thinking skills during learning, such as problem-solving, analysis, and interpretation. Students are not trained to read observation data in tabular form or describe observation data obtained from test results.

The fourth indicator is communicating. Communicating is done so that students are able to explain either orally or in writing. Based on Table 4.3, the communicating indicator is included in the very low category with an average percentage value of 11% which indicates students do not yet have science process skills on the communicating indicator. The low category communication indicator shows that students have not been able to answer correctly and have not been able to convey the experimental results obtained through graphs and data tables.

Communicating can be defined as the activity of expressing concepts, and views, orally and in writing clearly in various formats (tables, graphs, diagrams, pictures) (Oktavia *et al.*, 2021). In this skill, the communication indicator is realized in the problem, where students are presented with a data table of experimental results on the effect of environmental pollution on the activities of living things. With this data, students need to convey it in

graphic form. In the learning process, students are not used to explaining material through pictures, graphs, or tables. Based on the research results of Hasanah *et al.* (2023), good communication skills are having the skills to convey something orally, in writing, or through pictures.

The fifth indicator is concluding. Concluding is done so that students can make conclusions from data that has been obtained. Based on Table 4.3, the concluding indicator is included in the very low category with an average percentage value of 9% which indicates students do not have science process skills on the concluding indicator. This is not in line with research conducted by (Pamudiah & Setiawan, 2023) where research it was shown that the indicators concluded were included in the very good category. The low category concluding indicator shows that students have not been able to conclude from the results of generalizing data and explaining discussions based on existing theory.

Concluding is explaining or interpreting the results of observations, and concluding the experiments/observations carried out (Saleh *et al.*, 2020). In the analysis of concluding skills on the question, students are presented with a table of experimental results on the effect of pollution from living things on the activities of living things to conclude. According to Hardianti & Setiawan (2023), students are more likely to make conclusions by searching on the internet. According to previous research, students' mistakes in writing conclusions were that they were still not by the aim of the experiment, and the conclusions recorded also contained many concepts that were interpreted incorrectly, and students also lacked understanding in conveying conclusions.

The sixth indicator is classifying. Classifying is done so that students can form new concepts based on similarities and differences. Based on Table 4.3, the classifying indicator is included in the very low category with an average value of 22%, which indicates that students still do not have science process skills on the classifying indicator. This is not in line with research conducted (Choirunnisa' & Rosdiana, 2023) that students can classify in the sufficient category. The low category classification indicator shows that students have not been able to group objects according to the characteristics of their similarities and differences.

In this research, students' classification skills are realized in classifying types of environmental pollution based on their characteristics and effects. Based on the results of the research, students have difficulty identifying the characteristics of environmental pollution and its influence on the activities of living things. According to Lestari and Diana (2018), indicators in classifying are describing observations obtained separately, determining differences and similarities, determining characteristics, comparing, looking for the core in the grouping, and connecting the results of observation. In science learning, teachers do not give tasks to students to group things based on students' abilities and classify things based on existing characteristics. In this way, students' classification skills become low. Apart from that, according to Zeidan and Jayosi (2014), basic science skills are skills that support the development of integrated process skills, where this classification skill is one of the supports for basic process skills.

Based on the results of the presentation of the percentage of 6 indicators of basic science process skills, namely observing, predicting, communicating, concluding, and classifying. Based on the research results, it was found that the results of the percentage values were not included in the very high, high, and medium categories. This is caused by science process skill which focuses more on high-level thinking so students have difficulty answering questions, besides that students also only learn by the lecture method, and learning only in class. This is in line with research (Rani *et al.* 2019) which states that the learning used is still teacher-centered so students are less independent in learning, teachers rarely ask students to explain material through pictures/graphics so students' science process skills are



low, it is necessary to be upgraded. This statement is also by J. Piaget's cognitive learning theory where according to J. Piaget learning will be maximized if it is adjusted to the stages of students' cognitive development. Students should be allowed to experiment with physical objects supported by interactions with peers. So that students can develop their knowledge in understanding of a concept (Nurhadi, 2020).

## CONCLUSION

This study concludes that the seventh-grade students of SMPN 2 Geger on average have a low level of science process skills on environmental pollution. The percentage of students' science process skills in each indicator, namely observing indicators percentage of 33%, indicators predicting with a percentage of 23%, indicators measuring with a percentage of 29%, indicators communicating with a percentage of 28%, indicators concluding with a percentage of 9%, and indicators classifying with a percentage of 56 %.

## SUGGESTION

It is hoped that future researchers will be able to measure science process skills with material that is different from the basic and integrated types of science process skills and make improvements to learning to be able to improve students' science process skills.

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