JPPIPA (Jurnal Penelitian Pendidikan IPA)

Vol.8 No.2 2023

http://journal.unesa.ac.id/index.php/jppipa

SCIENCE PROCESS SKILLS ANALYSIS OF CLASS IV STUDENTS OF KANISIUS SENGKAN YOGYAKARTA ELEMENTARY SCHOOL IN SCIENCE LEARNING CONTENT

Barnabas Ginting[1] *, Kintan Limiansih*[2] *, Agnes Herlina Dwi Hadiyanti*[3]
[1,2,3]Elementary School Teacher Education, Faculty of Education, Sanata Dharma University, Indonesia

Abstract

This study aims to determine the level of proficiency in science process skills of fourth grade students at Kanisius Sengkan Elementary School, Yogyakarta. This type of research is descriptive quantitative. The subjects of this study were 4th grade students of Kanisius Sengkan Elementary School, Yogyakarta. The research method used is an investigative method using simple statistical analysis techniques. The population used was fourth grade students at Kanisius Sengkan Elementary School, Yogyakarta. The sample was obtained using voluntary sampling method, so that the sample obtained was 82 students. Data collection using a test engine with a total of 25 multiple choice questions. The results showed that the science process skills (SPS) of the 4th graders of Kanisius Sengkan Primary School Yogyakarta in terms of the content of scientific learning were very high, because the science process skills of each school were mostly high with an overall score of 66%. The science process skills (SPS) that are best mastered by students in each school are grouping, interpreting, predicting, using tools and materials, asking questions, and communicating. The science progress skills (SPS) of the 4th grade students of Kanisius Sengkan Primary School Yogyakarta in terms of learning science content are relatively high. However, some scientific process skills (competencies) have not been mastered optimally by students in each school, such as observation, planning experiments, conducting experiments and forming hypotheses.

Keywords: Science Learning Process Skills, Fourth Grade Students

Article History: Received: June 06, 2022. Revised: July 04, 2022. Published: December 28, 2023

[1] **Correspondence Address:**
Elementary School Teacher Education, Faculty of Education,
Sanata Dharma University, Indonesia
E-mail: barnabasginting99@gmail.com

p-ISSN: 2527-7537
e-ISSN: 2549-2209

INTRODUCTION

The 21st century curriculum in elementary schools refers to the 2013 curriculum, emphasizing the method of inquiry and discovery, as well as hands-on experience. This shows the importance of the competency-process approach applied in learning activities. According to Semiawan (1985, pp. 14-16), four important reasons for the process capability approach; 1) the development of science is so fast that the learning process also needs to adapt to developments, 2) the concepts are easy for students to understand if they conduct experiments directly, 3) scientific findings bring predictability, meaning that they can change based on new facts and data, so learning needs to instill thinking skills analytical and critical. 4) concept development cannot be separated from students' attitudes and values, so that students are intellectually and socially capable. Based on these four reasons, process skills are an alternative to get a complete understanding of the object. For this reason, we can know that process skills are one of the skills that must be trained since elementary school. The importance of science process skills in science learning to instill and develop scientific attitudes in students (Yafie & Sutama, 2019).

Education in Indonesia in terms of science is still not comparable to developed countries because it is still relatively low, which can be seen from the results of the PISA survey. In 2015, Indonesia was ranked 62 out of 70 countries in the world with a score of 403 in science subjects. In 2018, Indonesia was ranked 71 out of 79 countries in the world in science subjects with a score of 396 (OECD, 2019). Furthermore, according to the Ministry of Education and Culture (2019) based on the *Trends in Mathematics and Science Research* (TIMSS) survey by the International Association for the Assessment of Educational Achievement (IEA) in 2018, Indonesia's science level score was around 396, very different from China and Singapore in the rankings. with a score of 569. The survey results show that the level of science learning of Indonesian students is still relatively low. In scientific learning there are scientific processes, scientific products and scientific attitudes that affect the success of scientific learning. The PISA test aims to measure the level of scientific culture. In scientific understanding there are scientific abilities, scientific concepts, and scientific methods. Scientific process skills are related to the scientific method and are part of scientific knowledge. Therefore, it can be assumed that students' scientific procedural skills affect the PISA test results. This inspires researchers with scientific process research skills, especially in grade IV.

Based on previous research by Rahayu (2014) and Dewi (2020) conducted in elementary schools in Depok district, several facts attracted the attention of researchers when conducting this research, especially in the teacher learning process; a) Still fixated on textbooks and not yet developed, b) The methods used by teachers are still traditional, such as lectures, so that students' processing skills have not been developed, practicing, c) Teachers explain and students listen, so students don't participate as much. the learning process, d) the learning process that occurs is seen as not using learning media as a support for the delivery of material, e) the use of a learning model that is less attractive causes students not to understand the material as a whole. In addition, students also saw the weight of the material by rote, summarizing the material and the lack of learning material in the content of science lessons, so that students were less enthusiastic about taking lessons and students still had difficulties. way to solve the problem. exist in everyday life. This fact shows that processing skills affect students' abilities. Based on the problems described above, the formulation of the problem in this study is to determine the level of science process skills of Kanisius Sengkan Elementary School Yogyakarta students in terms of science learning content.

This study aims to determine the level of science process skills of fourth graders at Kanisius Sengkan Yogyakarta Elementary School in Science Learning Content and to describe the extent to which the application of science process skills to fourth grade students of Kanisius Sengkan Elementary School Yogyakarta in Science Learning Content.

METHOD

The type of research used in this research is descriptive quantitative with survey method. The subjects of this study were fourth grade students of Kanisius Sengkan Elementary School, Depok District, Sleman Regency, Yogyakarta, in the odd semester of the 2020/2021 school year. The object of this research is the science progress skills of fourth grade students at Kanisius Sengkan Elementary School, Yogyakarta on science material. This research was conducted at Kanisius Sengkan Elementary School, Depok District, Sleman Regency, Yogyakarta. This research was conducted from October 2020 to January 2021.

The population in this study were fourth grade students at Kanisius Sengkan Elementary School, Yogyakarta, Sleman Regency. The researcher uses a voluntary sample because the sample used by the researcher includes students who are willing to take the test questions and who have a computer or smartphone to access Google Forms. Based on the number of students who are willing to take the test, the sample is 82 fourth grade students.

The variables in this study were science process skills in class IV science learning. Data collection techniques to obtain data related to scientific process skills are test questions. The data obtained from students' SPS test scores were analyzed using simple statistical analysis techniques and categorized according to the following table.

Table 1. Rating Category

Score	Category
0-5	Very low
6-10	Low
11-15	Currently
16-20	Tall
21-25	Very high

The 4th grade student test form is multiple choice, the total time to take the test is 25, lasts 60 minutes via google form. The results of data collection with this technique are data in the form of the number of correct answers or numbers called quantitative data. Instruments are measuring, observation, or documentation tools that can produce quantitative data (Sugiyono, 2017).

Before the researcher distributed the device to the respondents, the researcher conducted a validation test of the device with two teachers and three professional trainers of scientific process skills. After the tool is validated by specialist teachers and trainers, the next researcher will modify the tool so that it can be used and is suitable for use in research. The results of the modifier are used by researchers to conduct research.

The data obtained from the students' SPS test results were analyzed using simple statistical analysis techniques and classified according to Table 1.

Quantitative data analysis using the formula assessment proposed by Ngalim (2012:102) with the following formula:

$$NP = \frac{R}{SM} \; x \; 100\%$$

Information:

NP : Percentage value sought or expected
R : Raw score obtained student
SM : The ideal maximum score of the test in question
100 : Fixed number

The percentage values obtained are then categorized based on table 2.

Table 2. Category Student Science Process Skills

Score (%)	Category
0-20	Very low
21-40	Low
41-60	Currently
61-80	Tall
81-100	Very high

RESULTS AND DISCUSSION

The first analysis is done by counting the number of correct answers by students and grouping students according to the results of the correct answers according to predetermined categories. For more details, the results of the Science Process Skills (SPS) grade 4 students of Kanisius Sengkan Elementary School can be seen in Table 3.

Table 3. Profile of Each Aspect of Student SPS

No	SPS Aspect	True Average	Percentage (%)	Category
1	Observe	44	54	Currently
2	Grouping	59	72	Tall
3	Interpret	64	78	Tall
4	Predict	65	79	Tall
5	Asking question	61	74	Tall
6	Hypothesize	39	47	Currently
7	Planning an experiment	37	46	Currently
8	Using tools and materials	72	88	Very high
9	Communicate	59	72	Tall
10	Carry out experiments	41	50	Currently
Amount		**540**	**659**	
Average		54	66	Tall

Based on the table, it can be seen that Kanisius Sengkan Elementary School has Science Process Skills (SPS) above Overall Science Process Skills (SPS).

The next analysis is to analyze the student's correct answers and classify them into each aspect of the SPS. To find out how far the SPS of Kanisius Sengkan Elementary School students, Depok District, Sleman Regency, Yogyakarta for each SPS aspect can be seen in table 3. This shows that the Kanisius Sengkan Elementary School students' SPS for each aspect as a whole

is in the high category with an average the average student answered correctly as much as 66% of each indicator tested.

Based on table 3 and figure 1, it can be seen from the ten aspects of Science Process Skills (SPS) tested in the test questions, there is one aspect in the very high category, five aspects in the high category and four aspects in the medium category. Here are the aspects in science process skills:

a. Observation (observing)

Observation (observing) is the skill of collecting data or information through application using the senses of sight, smell, hearing, taste, and touch, in developing other process skills such as communication, inference, prediction, measurement and classification. Aspects of observing there are two indicators, namely using as many senses as possible and collecting or using relevant facts. From these two indicators, science learning should collect information using the five senses (sight, smell, hearing, taste, and touch) and contextually with the situation or using relevant facts. In line with Samatowa (2011, p. 94), science learning must pay attention to the ability to observe an object.

b. Classification (group)

Classification (grouping) is the skill to classify certain objects, events, concepts, values, or interests into logical groups. Classification Aspects There are three indicators, namely 1) finding similarities and differences, 2) contrasting/comparative characteristics, 3) finding the basis for grouping or classification. In the three science learning indicators, the teacher in delivering the material needs to show similarities and differences through characteristics so that students can relate well.

Grade 4 students are in a stage of cognitive development known as concrete activity, where students can put things together (Yusuf, 2017). This is indicated by the highly rated classification aspect.

c. Interpretation (interpret)

Interpretation (interpreting) is a process skill that is gathered through observation, calculation, research, or experimentation. Aspects of interpretation there are three indicators, namely 1) connecting the results of observations, 2) finding patterns in a series of observations, 3) concluding. Of the three indicators, science learning is in line with the K13 curriculum which emphasizes direct and contextual experience so that students can understand the material, not just memorizing.

d. Predict (predict)

Prediction (predicting) is the skill of proposing an estimate about something that has not happened based on a trend or from the results of existing experiments. Aspects of prediction there is one indicator, namely stating what might happen in circumstances that have not been observed. From these indicators in learning science in elementary schools, teachers should before conducting experiments or experiments invite students to estimate what will happen in the experiments to be carried out, so that students are accustomed to predicting the results of an experiment.

e. Asking question

Asking a question is asking for an explanation of what, why, and how. Aspects of asking questions there are two indicators, namely 1) asking what, how, and why to ask for an explanation, 2) asking questions with a hypothetical background. From these two indicators, science learning in elementary schools should be interactive between students and teachers, in line with the opinion of Trianto (2010) so that science learning is more meaningful with the interaction of students and teachers.

f. Hypothesis (temporary guess)

A hypothesis (temporary assumption) is a reasonable estimate to explain a particular event or observation. Aspects of the hypothesis there are two indicators, namely 1) knowing that there is more than one possible explanation of an event, 2) realizing that an explanation needs to be tested for truth in obtaining more evidence or doing problem solving methods. From these two indicators, science learning in elementary schools should be conducted by experimenting teachers and students to collect as much information as possible so that tentative guesses can be tested through the information collected, in line with Rosnawati (2013)'s opinion, namely that in solving problems it is necessary to collect a lot of information.

Based on table 3. and figure 1. the hypothetical aspect belongs to the medium category with a percentage of 47%. This shows that students' knowledge is still low in making temporary guesses. The low score can be hypothesized to be caused by a lack of student knowledge, so that it refers to at least students who are able to make temporary guesses on what the teacher has instructed (Kartimi et al, 2013). Science process skills in hypothetical aspects can be trained by inviting students to formulate hypotheses before carrying out practical activities. Trianto (2012, p. 143) said that science learning should be emphasized on the process skills approach so that it fosters a scientific attitude and in learning must be presented in an attractive manner.

g. Planning an experiment

Experiment planning is the skill of planning experiments including determining the tools and materials to be used, objects to be studied, factors or variables that need to be considered, success criteria, work methods and steps, and how to record and process data to draw conclusions. Aspects of planning the experiment there are four indicators, namely 1) determining the tools/materials/sources to be used, 2) determining the variables or determinants, 3) determining what will be measured, observed, recorded, 4) determining what will be carried out in the form of work steps. Of the four indicators of science learning in elementary schools, students need to be guided in planning an experiment so that students in carrying out the experiment understand the things that must be prepared and carried out in the experiment, in line with the opinions of Rusman (2016, p. 42) and Sugiyono (2015, p. 22) that with learning that activates students foster meaningfulness.

h. Using tools and materials

Using tools and materials is the skill in using the right tools and materials with the correct usage procedures that can support the accuracy of the results and work safety during scientific activities. Aspects of using tools and materials, there is one indicator, namely using tools and materials. From these indicators, science learning in elementary schools will be effective when teachers guide students in using tools and materials to conduct experiments. In line with Samatowa's opinion (2011, p. 94) that science learning does not only convey information and understanding of the material, but also must pay attention to the development of other abilities such as using tools and materials.

i. Communicate

Communicating is the ability to convey the acquisition or learning outcomes to others in the form of writing, pictures, motion, action, or appearance in science learning or orally. There are five indicators of communicating aspects, namely 1) changing the form of presentation, 2) describing empirical data from experimental or observational results with graphs or tables or diagrams, 3) compiling and submitting reports systematically, 4) explaining the results of experiments or research, 5) reading graphs or table or chart. Of the five indicators, science learning in elementary schools should be able to develop students' ways of communicating, in line with Samatowa's opinion (2011, p. 94) that science learning does not only convey information and understanding of the material, but also must pay attention to the development of other abilities such as the ability to communicate and students' ability to conclude the results of observations or experiments.

j. Carry out experiments

Carrying out experiments is the ability to carry out scientific activities in accordance with the planned activity activities that have been made. Aspects of carrying out experiments there is one indicator, namely conducting experiments. From these indicators learning science in elementary schools should students be able to conduct experiments, this is in line with the opinion of Samatowa (2011, p. 94) namely learning science not only conveys information and understanding of the material, but also must pay attention to the development of other abilities such as conducting experiments so that students can experience for themselves or get direct experience.

The aspect that appears in the very high category is the use of tools/materials. Aspects that appear in the high category are grouping, interpreting, predicting, asking questions, and communicating. Aspects that appear in the moderate category are observing, hypothesizing, planning experiments and carrying out experiments. Science process skills, the medium aspect is skills in hypothesizing. The low score can be hypothesized due toby the lack of student knowledge, so that it refers to at least students who are able to make temporary guesses on what is instructed by the teacher (Kartimi et al, 2013). Science process skills in hypothetical aspects can be trained by inviting students to formulate hypotheses before carrying out practical activities. Trianto (2012, p. 143) said that science learning should be emphasized on the process skills approach so that it fosters a scientific attitude and in learning must be presented in an attractive manner. A learning process that is able to grow and develop students' SPS, where teachers are required to be able to design and create a science learning process with tools or new ways that can be visualized in front of students. This is in accordance with the opinion of Rustaman (2003) in Lestari (2016) which states that process skills need to be developed through direct experiences as learning experiences. Because through direct experience, a person can better appreciate the process or activity that is being carried out.

Based on table 3 and figure 1, it can be seen from the ten aspects of the SPS tested in the test questions, there is one aspect in the very high category, five aspects in the high category and four aspects in the medium category.

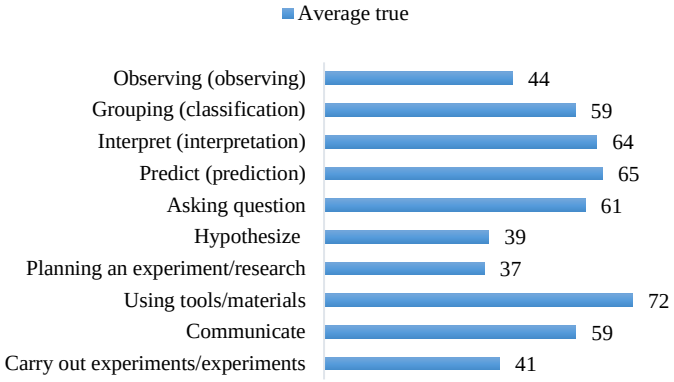

Figure 1. Graph of Student Science Process Skills for Each Aspect of SPS

CONCLUSIONS AND SUGGESTIONS

Conclusion

The Science Advancement Skills (SPS) of the fourth grade students of Kanisius Sengkan Elementary School, Yogyakarta, on science material were highly rated. Science Process Ability (SPS) for each school at Kanisius Sengkan Elementary School Yogyakarta mostly high with an overall percentage of 66%. The science process skills (SPS) that are best mastered by students in each school are grouping, interpreting, predicting, using tools and materials, asking questions, and communicating. The optimized scientific process skills (SPS) which are fully mastered by students of each school are observing, planning experiments, carrying out experiments, and hypothesizing.

Suggestion

Based on the weaknesses and limitations encountered by the researcher, the researcher will submit suggestions as input and improvement for further research, it is better to make direct observations to get more information about SPS students and conduct interviews with teachers and students.

REFERENCES

Budiyono, A., & Hartini, H. (2016). Pengaruh Model Pembelajaran Inkuiri Terbimbing terhadap Keterampilan Proses Sains Siswa SMA. Wacana Didaktika, 4(2), 141–149. https://doi.org/10.31102/wacanadidaktika.4.2.141-149

Hutagalung, A. M. (2013). Efek Model Pembelajaran Inquiry Training Berbasis Media Komputer terhadap Keterampilan Proses Sains dan Kemampuan Berpikir Kritis Siswa. *Jurnal Pendidikan Fisika*, 2(2), 9. https://doi.org/10.22611/jpf.v2i2.3473

Kemdikbud. (2013). *Permendikbud Nomor 67 Tahun 2013 tentang Kerangka Dasar dan Struktur Kurikulum Sekolah Dasar/Madrasah Ibtidaiyah*. Jakarta: Kemdikbud.

Kemendikbud. (2018). Peringkat dan Capaian PISA Indonesia Mengalami Peningkatan. http://www.kemdikbud.go.id/main/blog/2018/12/peringkat-dan-capaian-pisa-indonesia-mengalami-peningkatan

Manu, T. S. N., & Nomleni, F. T. (2018). Pengaruh Metode Pembelajaran Karya Kelompok terhadap Keterampilan Proses Sains dengan variabel Kemampuan Berpikir Kreatif Siswa pada Mata Pelajaran Biologi. Scholaria: *Jurnal Pendidikan dan Kebudayaan*, 8(2), 167–179. https://doi.org/10.24246/j.js.2018.v8.i2.p167-179

R. Rosnawati. (2013). *Enam tahapan aktivitas dalam pembelajaran matematika mendayagunakan berpikir tingkat tinggi siswa*. Yogyakarta: Universitas Negeri Yogyakarta.

Rahardini, R. R. B., Suryadarma, I. G. P., & Wilujeng, I. (2017). The effect of science learning integrated with local potential to improve science process skills. AIP Conference Proceedings 1868, 080008. https://doi.org/10.1063/1.4995192

Rusman, R. (2016). *Model-model pembelajaran: Mengembangan profesionalisme guru.* Jawa Barat: PT Raja Grafindo Persada.

Samatowa, U. (2010). *Pembelajaran IPA di sekolah dasar*. Jakarta: Indeks.

Santrock, J. W. (2010). *Psikologi pendidikan*. Jakarta: Kencana.

Semiawan, C. (1985). *Pendekatan keterampilan proses bagaimana meningkatkan siswa dalam belajar.* Jakarta. PT Gramedia.

Sugiyono, S. (2015a). *Metode penelitian dan pengembangan*. Alfabeta.

Sugiyono. (2017). *Metode penelitian kebijakan*. Bandung: Alfabeta.

Trianto. (2012). *Model pembelajaran terpadu, konsep, strategi, dan implementasinya dalam kurikulum tingkat satuan pendidikan (KTSP).* Jakarta: PT Bumi Aksara.

Trianto. (2012). *Model pembelajaran terpadu*. Jakarta: PT Bumi Aksara.

Werang, B.R. (2013). *Belajar dan pembelajaran*. Merauke: FKIP Universitas Musamus Merauke.

Werang, B.R. (2015). *Pendekatan kuantitatif dalam penelitian sosial*. Yogyakarta: Calpulis.

Wulaningsih, S., Prayitno, B. A., & Probosari, R. M. (2012). Pengaruh Model

Pembelajaran Inkuiri Terbimbing terhadap Keterampilan Proses Sains Ditinjau dari Kemampuan Akademik Siswa Science Process Skills Viewed From Student's Academic. Pendidikan Biologi, 4(2), 33-43. https://doi.org/10.1161/RES.0b013e31821e0b53

Yafie, E & Sutama, I. W. (2019). *Pengembangan kognitif (sains pada anak usiadini).* Malang: Universitas Negeri Malang.

Yusuf, S. (2017). *Psikologi Perkembangan anak dan Remaja.* Bandung: PT Remaja Rosdakarya.