JPPIPA 10(5) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Analysis of Science Process Skills of Junior High School Students

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Received: February 10, 2024
Revised: March 29, 2024
Accepted: May 25, 2024
Published: May 31, 2024

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DOI: 10.29303/jppipa.v10i5.7194

Abstract: Natural Sciences (IPA) emphasizes students' science process skills in every learning process. However, looking at the facts in the field when studying science, students still tend to memorize concepts, theories, and principles without understanding the discovery process. This has an impact on the ongoing learning process being uninteresting so that students become bored and ultimately causes students' understanding of science concepts to become low. This research aims to determine the quality of science process skills of class VII students at Kanda Middle School. The research method used is quantitative. The population is all class VII students at Kanda Middle School, totaling 46 people, while the sample in this study was 23 students taken by random sampling. The instruments used are performance that assesses practicum activities as well as interview guidelines used to gather information from science teachers. Data were analyzed using the percentage value formula. This research concludes that the science process skills of class VII Kanda State Middle School students have a percentage of 70.01% in the skilled category.

Keywords: Junior high school students; Science; Science process skills

Introduction

Natural Sciences (IPA) emphasizes students' science process skills in every learning process. Science learning emphasizes students' direct experience in developing their competence to find out about the natural surroundings through the process of discovery (Fauziah & Kuswanto, 2020; Winarto et al., 2022). However, looking at the facts in the field when studying science, students still tend to memorize concepts, theories, and principles without understanding the process of discovery. This has an impact on the learning process which is not interesting so that students become bored and ultimately causes students' understanding of science concepts to be low. Based on the results of interviews with Kanda Middle School science teachers, it is known that students' interest in learning is very low. This can be seen from the frequent absence or absence of students from school, and students' lack of concentration during the learning process, apart from that, students also appear not to be serious about carrying out the tasks given by the teacher which has an impact on low learning outcomes.

This is supported by Baah et al. (2023), and Daskalovska et al. (2012) who stated that interest is a strong source of motivation in learning. Armstrong added that concentration exists if there is sufficient interest, someone will not carry out an activity if they do not have interest. So, if students have a great interest in learning, this will indirectly encourage their learning achievement (Wang & Eccles, 2013; Mappadang et al., 2022). One way to increase students' interest in learning science is by implementing a learning approach that suits the characteristics of science subjects (Weinstein et

How to Cite:
Rophi, A. H., Megawati, R., Aiboy, Y. T., Citraningrum, M., & Raunsay, E. K. (2024). Analysis of Science Process Skills of Junior High School Students. *Jurnal Penelitian Pendidikan IPA*, *10*(5), 2294–2299. https://doi.org/10.29303/jppipa.v10i5.7194

al., 2018; Markula & Aksela, 2022). Various approaches can be applied, one of which is the process skills approach. The process skills approach aims to develop students' scientific work abilities so that students have curiosity, excitement, or feelings of pleasure toward science lessons which can ultimately increase students' interest in learning (Savitri et al., 2017; Sumanti et al., 2023).

The process skills approach is a learning approach that focuses on understanding scientific concepts based on the process of concept formation, through scientific methods by prioritizing the thinking process. Science process skills play an important role as an approach to learning science and biology (Cannady et al., 2019; Strat et al., 2023). Mushani (2021) and Hutapea et al. (2021) stated that science process skills influence science education because they help students develop intellectual skills, manual skills, and social skills. To measure a student's KPS, it can be done using written, oral, or observation tests. According to Senisum et al. (2022) and Septiani et al. (2017), science process skills consist of indicators: observing, grouping, interpreting, predicting, communicating, asking questions, proposing hypotheses, planning experiments, using tools, and carrying out experiments.

Factors that influence science process skills are facilities and infrastructure, teachers (teaching methods and teacher creativity), students' potential such as experience or knowledge they already have, and students' habits and motivation (Haleem et al., 2022; Coman et al., 2020). Furthermore, Dwivedi et al., (2023) and Wola et al. (2023) identified factors that influence the low level of science process skills namely: lack of laboratory infrastructure, books being the only guidelines for learning, school administration not initiating contextual learning and only emphasizing textual mastery, and learning activities that have not explored skills science process.

Based on the background above, it is necessary to carry out an in-depth analysis of the quality of students' science process skills to determine the actions needed to train or improve students' science process skills.

Method

This research is quantitative research with a descriptive approach. Where the research results will later describe what is true about the variables studied. Population and sample the population in this study was all class VII students at Kanda Middle School, totaling 46 people, while the sample in this study was 23 students, where the sample was taken by random sampling. The research instrument is a performance assessment sheet adopted from (Susilaningsih et al., 2018) and an interview guide. The process skills data obtained were processed using the percentage formula P = F/N X 100.

Information:

P : number of percentage figures

F : total score of students who perform the skill (based on sheet criteria performance observation)

N : number of aspects multiplied by score weight

The percentage obtained is converted into a success indicator according to Arikunto, 2011 according to Table 1.

Table 1. Indicators of Research Success

Percentage (%)	Criteria
0- 20	Unskilled
21 - 40	Less skilled
41- 60	Quite skilled
61 - 80	Skilled
81 - 100	Very skilled

Result and Discussion

Aspects of students' science process skills measured in this research include planning, using tools and materials, making observations, communicating, concluding, and making practical reports. The results of the assessment of scientific process skills in using a microscope to observe cells are presented in Table 2.

Table 2. Percentage of Students' Science Process Skills

Observed aspects	Total score	Percentage (%)	Category
Planning an experiment	15	76.25	Skilled
Using tools and materials	28	92.08	Very skilled
Carrying out observations (observations)	21	85.50	Very skilled
Communicate	7	68.75	Skilled
Conclude	2	47.50	Enough
Make practical reports	3	50	Enough
Average Percentage		70.01	Skilled

Based on Table 2, students' science process skills in the aspect of planning experiments have a percentage of 76.35% in the skilled category, the aspect of using tools and materials with a percentage of 92.08% in the highly skilled category, the percentage of the aspect of making observations (observations) is 85.50 % in the highly skilled category, the communication aspect with a percentage of 68.75% in the skilled category, in the concluding aspect the percentage obtained was 47.40% in the sufficient category, and the percentage in the aspect of making practicum reports was 50% in the sufficient category. From the table above, it can also be seen that the aspect of using tools and materials received the highest percentage in the highly skilled category, while the concluding aspect received the lowest percentage in the sufficient category. Overall, the average percentage of students' science process skills is 70.01% and is in the skilled category.

This research was carried out in one class, namely class VII B, with a total of 26 students, but on the day of the research, there were 16 students present. Based on the results of interviews with teachers, it is known that this is thought to be due to the location of the school on a cross-district road, where public transport vehicles very rarely or have a limited schedule operate across this route. Apart from that, the majority of students also live quite far from school, so students only need a ride from private transportation, usually in the form of a truck or pick-up truck that happens to pass by their house and has a destination in the same direction as the school. If they don't get a ride, students are forced to not go to school. However, it is not uncommon for students to want to walk if the distance from home is not too far, however, this causes students to come to school very late.

Data on students' science process skills (KPS) was taken during observations in practical activities using a microscope to observe cells using student performance sheets. In its implementation, the observer consists of 4 people who will provide assessments, namely 2 researchers, 1 teacher, and 1 colleague. Before conducting the assessment, the researcher conducted a briefing with the observers regarding the assessment rubric and its mechanism to ensure the validity of the scoring. To find out students' responses in carrying out the practicum, a student response questionnaire was used which was distributed to students to be filled in after the practicum activities. So that students' answers are not biased, the researcher is first assisted by the teacher in explaining how to fill in and the meaning of each statement item.

From table 2, it is known that aspect 2, namely using tools and materials, has the highest percentage because the skill aspect assessed in it is a basic (easy) skill that does not require special training to master. Meanwhile, the skill assessed is how students place the microscope in the place they want. feeling safe, making an incision on the preparation, placing the incision on the slide, dripping the object with distilled water, closing the preparation, and positioning it on the preparation table. Even though when making the incision the students experienced a few problems in getting a very thin layer, with several trials the students were able to make the desired incision. This result is in line with research by Manfaat et al. (2021) and Stuart et al. (2023), where the indicator of using tools is classified as very good (83.33%). Furthermore, Parmar et al. (2016) and Tang et al. (2022), stated that this indicator was in the very good category because students were accustomed to using laboratory equipment and knew the function of each tool used (based on observation results).

Aspect 5, namely concluded that getting the lowest percentage was because students were not used to or trained in seeing the main idea of the activity. Students have difficulty formulating conclusions based on practicum objectives. According to Dunlosky et al. (2013) and Ndruru (2020), to improve students' ability to conclude, it is necessary to look for methods that can directly guide students in concluding. Added by Vincent- Lancrin (2023) and Haryanto et al. (2019), inquiry learning methods such as practicum will teach students how to learn to use rational thinking skills, processes, attitudes, and knowledge. Furthermore, it is explained that the inquiry method is a way of delivering lessons by examining something in a critical, analytical, and argumentative (scientific) manner using certain steps towards a conclusion.

Another factor that is also thought to cause this aspect to have a low percentage is that some students have poor literacy skills, especially in basic reading and writing literacy. This can be seen when students are asked to re-read the steps that must be taken in the practicum, where students are not fluent and often spell quite easy words and make mistakes in mentioning scientific terms and foreign terms. Apart from that, when writing conclusions, there are many errors in the use of letters and sentence structures, which can cause miscommunication. This opinion is in line with the statement of (Masluha, 2021), that literacy skills are an important basis, with good literacy skills, children can ask questions and construct ideas so they can be conveyed to other people. This is reinforced by the results of interviews delivered by the biology teacher in this class where he often had difficulty teaching difficult biological terms.

To overcome these difficulties, biology teachers often replace certain terms with other terms that are commonly known by students. This was also confirmed through the students' LKPD sheet on the question of identifying microscope parts (Jeronen et al., 2016; Darling-Hammond et al., 2020). Where most students can answer correctly for parts that use terms that are related to the position or function of parts of the microscope such as the arms and legs of the microscope. Meanwhile, for the parts that use unfamiliar terms, the average student answers incorrectly.

Overall, the average percentage of students' science process skills is 70.01%, which is in the skilled category. KPS being in the skilled category can be caused by several factors, namely (Ningrum et al., 2022; Yenitha et al., 2019). Theory explanation by the teacher the day before the practicum (Hornstra et al., 2023), because the students had first been taught the theory of microscopes by the teacher so during the activity the students just had to practice what they had learned the previous day. This opinion is in line with Dwi (2016), who stated that the briefing before practicum activities is very supportive as a basis and initial understanding of practicum implementation; the availability of LKPD, the LKPD presented helps students to prepare themselves for the practicum.

Practical instructions are presented very clearly and the researcher even explains each written procedure and confirms if there are activity steps that are not understood. Muhafid et al. (2013), stated that practical instructions are very helpful for developing science process skills. This reason is also strengthened by Dwi (2016) who states that the thing that most determines the success of practicum is the existence of practicum instructions. Commonly used tools and materials, most of the tools and materials used are already familiar to students so it is very helpful for students to use them in practical activities. This is in line with Soetarto's opinion in Juvitasari et al. (2018) who stated that one of the important factors that supports practicum activities in schools is knowledge about practicum tools.

It was further explained that students will be skilled in carrying out practicums if students know practicum tools, including tool names, functions, how to use them, and basic skills in using practicum tools; enthusiasm, based on the results of interviews with biology teachers and students, information was obtained that practicum activities are very rarely carried out so that these activities become very interesting which causes students to become enthusiastic and motivated to carry out practicum seriously (Väätäjä, 2023). According to Munfaida et al. (2022), one of the reasons why science practicum activities are important is that they can generate motivation to learn science. Apart from that, in (Soykurt, 2010; Ni Kadek Nilawati et al., 2023), research, the results of student responses in carrying out practicum were also found to be in a good category. Practicum activities make students more active, motivated, and happy (Boonekamp et al., 2021).

Conclusion

Based on the research conducted, it can be concluded that the science process skills of class VII Kanda Middle School students in aspect 1, namely planning experiments, obtained a percentage of 76.25%, aspect 2 using tools and materials had a percentage of 92.08%, from aspect 3 making observations obtained a percentage of 85.50. %, aspect 4 communicating has a percentage of 68.75%, aspect 5 concluding gets a percentage of 47.50%, and the aspect of making reports has a percentage of 50%. Overall Science Process Skills has a percentage of 70.01 and is in the skilled category.

Acknowledgments
Thanks are expressed to the Principal and the board of teachers at SMP Negeri 8 Kanda who have facilitated the collection of data for this research as well as the LPPM of Cenderawasih University who have provided support through research grants.

Author Contributions
Conceptualization; A. H. R., R. M., Y. T. A., M. C., E. K. R.: methodology; A. H. R., validation; R. M.: formal analysis; Y. T. A.: investigation; M. C; resources; E. K. R: data curation: A. H. R.: writing—original; R. M: draft preparation; Y. T. A: writing—review and editing: M. C.; Visualization: E. K. R. All authors have read and agreed to the published version of the manuscript.

Funding
This research was independently funded by researchers.

Conflicts of Interest
The authors declare no conflict of interest.

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