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SCIENCE PROCESS SKILLS: ANALYSIS OF STUDENTS' OBSERVATIONAL ABILITY ON MATERIAL CHANGES IN SUBSTANCE FORMS

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Abstract :
The research aims to determine how students' ability to observe material changes in the state of matter. This research was conducted using classroom action research methods divided into three cycles. This research was conducted at MTS Al-Hidayah Kebon IX, Sungai Gelam District, Muaro Jambi Regency. This research was conducted in the even semester of the 2022/2023 academic year. The population in this study were all students of class VII MTS Al-Hidayah Kebon IX class XI, totaling 68 students consisting of 3 classes. The sampling technique in this study used the Random Sampling technique, so the samples in this study were 23 students in class VII Nurul Bukhari and 19 students in class VII Muslim. As for the results obtained after the researchers conducted the research, it can be concluded that the students' science process skills on the indicator of observing ability were included in the good category. This was evidenced by increased students' observing abilities from cycle I to cycle III.

Keywords: Observing Ability, Science Education, Science Process Skills

INTRODUCTION

The quality of education is still the most prominent problem in every effort to reform the education system. The quality of education is essentially how the teaching and learning process carried out by the teacher runs optimally (Rahmadhani, P., & Wirayuda, RP 2023). To achieve optimal learning outcomes, teachers are needed who are creative and innovative and always have the desire to improve the quality of their learning (Rohmahtika, A., & Wirayuda, R. P. 2023 ; Misastri, M., et al, 2023). In order to achieve the quality of learning activities, each teacher is required to understand the learning strategies that will be implemented (Muslim, F., et al 2021) . In this regard, a teacher needs to think about strategies and approaches to be used in the learning process.

Science learning includes studies of biology, chemistry and physics which are subjects that can instill and develop scientific skills, attitudes and values in students (Fatonah, U., et al 2020). This statement is in line with the implementation of the nature of science which is embodied in science learning which is structured through a curriculum that emphasizes science learning on giving direct experience by not letting go of concepts from scientific work (Wirayuda, RP, 2022). The implementation of science education must emphasize providing direct experience to students, students need to be assisted to develop a number of Science Process Skills (KPS) to explore the natural surroundings and understand them in order to improve their quality in science.

Science process skills are adaptations of skills used by scientists to be able to develop a concept, investigate a problem and draw conclusions about the problem (Wirayuda, RP, 2022). Science process skills are a set of skills used by scientists in carrying out a scientific investigation by using thought, reason and action efficiently and effectively to achieve success. Science process skills, namely the ability of students to be able to apply a scientific model in order to understand, develop and discover

knowledge. Science process skills are also skills that become drivers, develop facts and concepts, grow and develop scientific attitudes and values.

the importance of science process skills that every individual must have is first, in practice what is known or meant in science is inseparable from the method of inquiry (Maison., et al 2022). the importance of process skills for students as provision or initial capital to use scientific models in developing science and is expected to be able to acquire new knowledge and develop the knowledge they have (Aldila, FT, et al 2020) . Besides that, the importance of process skills is to acquire provisions in an investigation of natural phenomena to be able to find concepts or facts using existing scientific methods, as a basis for students to continue to the next level (Wulandari, M., et al 2020).

Observation is a part of Science Process Skills (SPS) which is considered the first step in carrying out a scientific activity or solving a problem (Darmaji., et al 2022 ; Tanti, T., et al 2020). Information obtained through observation will lead to find out more, question, think, interpret and investigate. The collection of relevant facts in a problem is strongly influenced by the accuracy in observing. To study science, especially physics, mastering observation skills is very important as capital for students, considering that there are many objects and phenomena that require observation skills to study them (Wirayuda, RP 2022). Observation skills are a part of process skills which are the basis for the development of other process skills. Through observation of all natural objects and phenomena, it can be known by using the five senses, namely sight, hearing, taste, smell and touch.

One of the physics concepts that asks students to find answers with their own efforts based on true facts is the concept of matter and its changes (Wirayuda, RP, et al 2020). Through the experimental method applied to the concept of matter and its changes, students not only learn about concepts, but also learn how a concept is obtained through the scientific method (Nurfadhillah, S., et al 2021). Students are also expected to have greater opportunities to take initiative and be able to develop their observational abilities. The material on the subject matter of matter and its changes is one of the materials that is closely related to everyday life (Nur, FM, & Jannah, R. 2017). This material requires skills in using the senses, skills in collecting relevant facts and skills in finding similarities and differences which are indicators of observational abilities.

Based on the background described above, the authors are interested in researching "Science Process Skills: Analysis of Student Observational Ability on Material Concepts of Substance Forms and Their Changes". As for the purpose of this study was to find out how the students' ability to observe material changes in the state of matter.

RESEARCH METHOD

This research was conducted using classroom action research methods which were divided into three cycles. Each cycle consists of four stages of activity, namely the stages of planning (planning), action (action), observation (observation), and reflection (reflection) (Arikunto, S. 2011).

This research was conducted at MTSs Al-Hidayah Kebon IX, Sungai Gelam District, Muaro Jambi Regency. This research was carried out in the even semester of the 2022/2023 school year which was adjusted to the science class schedule. The population is a generalized area consisting of objects or subjects that have certain qualities and characteristics determined by researchers to study and then draw conclusions (Moleong, Lexy J. 2019) . The population in this study were all students of class VII MTSs Al-Hidayah Kebon IX class XI, totaling 68 students consisting of 3 classes. The sampling technique in this study used the Random Sampling technique. According to Sugiono (2019) Random Sampling is a random sampling technique. The reason for using random sampling is that the ability and number of samples used are almost equal. So that the samples in this study were class VII Nurul Bukhari totaling 23 students, and class VII Muslim totaling 19 students.

The data obtained in this study are quantitative data and qualitative data consisting of data on science process skills Observation Indicators, and data on students' cognitive learning outcomes . Data collection carried out in this study is a non-test technique. Non-test techniques through observation of observation sheets, questionnaires and worksheets.

Observation sheets and worksheets in this study were used to determine students' observation abilities(Wisudawati., et al 2015). The observation sheet is used to obtain the data desired by the researcher. The instrument used is the observation sheet for assessing Student Observational Ability(Lexy J. Moleong. 2017). Each assessment item is made to see Student Observational Ability

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towards one of the indicators. The observation sheet is given to the observer when the teacher is carrying out the lesson to be filled in by writing a checklist (√) according to the conditions observed.

Table 1. Grid Observation sheet science process skills

Indicator	Statement
Ability to observe students	The ability to use as many senses as possible
	find relevant facts

Data analysis is the process of organizing and managing or managing data into patterns, categories and units whose descriptions are basic so that we can find themes and can formulate ideas suggested by the data (Nurdin., et al 2019) . The data analysis technique that will be used in this study is descriptive quantitative. To provide a description of the subject to be studied and not included by the examiner in a hypothesis or conjecture.

RESULTS AND DISCUSSION

Research results are presented in the form of graphs, tables, or descriptive. Analysis and interpretation of these results is necessary before they are discussed. Things to do before carrying out learning by applying the experimental-based STAD type cooperative learning model are the preparation of instruments in the form of: Student Activity Sheets (LKS), attitude scale questionnaires for students' social skills, observation sheets, and evaluation questions. Evaluation questions are given at the end of each cycle, this is intended to determine the group's ranking in each cycle.

The second activity is the teacher divides students into small groups and one group consists of five people. The teacher distributes LKS to each student in the group, then the teacher guides students to carry out experimental activities according to the instructions in the LKS. Students complete the LKS by discussing. Worksheets are then collected, this is intended so that the teacher can directly assess students' science process skills, in addition to preventing data modification.

The third activity after the LKS was returned to students, then students led by the teacher conducted class discussions. The teacher gives an opportunity to one of the groups to convey the results of their discussion in front of the class, and the other groups respond. The teacher together with students discuss the results of class discussions to then conclude the material they have learned.

In the fourth activity, students work on practice questions in groups. Furthermore, the class is led by the teacher discussing the questions, then students work on cognitive test evaluations individually. The activity ended by discussing evaluation questions in front of the class. Students must be responsible for the good of the group by helping each other when understanding the material, working on practice questions, and working together when conducting experiments and during discussion activities.

The learning steps as mentioned above can train students' science process skills because in experimental activities students are directly involved in the learning process. This is in accordance with the opinion of Roestiyah (2008: 80), experimentation is a way of teaching that involves students to conduct an experiment about something, observe the process, and write down the results of the experiment, then the results of the observations are made a report and submitted to class and evaluated by the teacher .

After conducting research by applying experimental-based STAD-type cooperative learning to the material Physics subject to the refraction of light, obtained data on students' Observational Ability in cycle I, which is written in Table 1.

Table 2. Descriptive Statistical Data on Students' Observational Ability in Cycle I

Cycle	Value Intervals	Category	F	Percentage (%)
I	2.0 – 3.5	Not good	6	14,3
	3.6 – 5.0	Enough	12	28,6
	5.1 – 6.5	Good	6	14,3
	6.6 – 8.0	Very good	18	42.8

The ability to observe students in cycle I is still in the poor category, at least there are 6 students who are in the bad category or 14.3%. Furthermore, in the sufficient category it was 28.6%, in the good category it was 14.3%, and in the very good category it was 42.8%. Students still have difficulty in distinguishing the types of changes in the state of matter. In addition, the absence of pictures of a series of tools in the LKS resulted in students not understanding the experimental instructions so that in order to be able to understand the process of changing students' substance it took longer than expected. When making observations students have not been able to use and read the measuring instrument scale correctly, this causes the data obtained to be inaccurate. The absence of division of tasks results in students scrambling when making observations, this results in the observation ability, namely the ability to use as many senses as possible and find relevant facts, not finding the desired results.

Seeing the obstacles above, the teacher made several improvements, including: in the LKS included a picture of a series of tools and clarified the experimental instructions. LKS is distributed the day before learning is carried out, this is so that students can study the LKS. The teacher gives an example of how to use and read the measuring instrument scale correctly, besides that the teacher asks the group to distribute tasks to each of its members when carrying out the experiment. In addition, the teacher also gives knowledge to students how to make observation tables and how to write down the correct observations. LKS also added questions that lead students to conclude the experiment that has been done.

Table 3. Descriptive Statistical Data on Students' Observational Ability in Cycle II

Cycle	Value Intervals	Category	F	Percentage (%)
II	2.0 – 3.5	Not good	2	4,7
	3.6 – 5.0	Enough	9	21,4
	5.1 – 6.5	Good	10	23,8
	6.6 – 8.0	Very good	21	50

Observation ability of students in cycle II has increased and is included in the pretty good category. Where in the very good category it was 50%, in the good and sufficient category it was 23.8% and 21.4%, while in the bad category it was 4.7%. This is because students are able to understand changes in the form of substances obtained in tabular form, this makes the data obtained easy to analyze. Obstacles during the learning process in cycle II, namely students did not understand the experimental instructions so that they still needed a lot of guidance from the teacher. The teacher fixes the obstacles encountered in cycle II by giving directions so that before the experiment the students read the experiment instructions first. The LKS was distributed the day before the lesson started, besides that the teacher also asked about parts of the LKS that students had not understood.

Table 4. Descriptive Statistical Data on Students' Observational Ability in Cycle III

Cycle	Value Intervals	Category	F	Percentage (%)
III	2.0 – 3.5	Not good	0	0
	3.6 – 5.0	Enough	6	14,3
	5.1 – 6.5	Good	12	28,6
	6.6 – 8.0	Very good	24	57,1

Observation ability of students in cycle III has increased and is included in the very good category. Where in the very good category was 57.1%, in the good category was 28.6%, in the sufficient category was 14.3%. This increase was caused by experiments in cycle III which were almost similar to cycle I. Students were already familiar with the tools and materials used, this resulted in students being more skilled in using them.

Observation ability is one of the basic process skills that is carried out by using the senses, namely sight, smell, touch, taste and listener. If students are trained to observe objects carefully, awareness and sensitivity to the surrounding environment will develop. The ability to observe using only the senses is called qualitative observation, while the ability to observe using measuring

instruments is called quantitative observation. Through the process of observing carefully students are expected to be able to use the right words to describe what is seen, heard, felt (Kurniawan, DA, et al 2023). Students are also encouraged to be able to find special characteristics attached to the object being observed, separate the object into its parts, and draw and label according to the name of the part of the object of observation(Darmaji., et al 2022).

The process of implementing the experimental-based STAD type cooperative learning model begins with students being divided into small groups consisting of five people. They jointly carried out experimental activities guided by LKS, continued to discuss questions in LKS to then conclude the experimental results. The results of the discussion are then presented in front of the class to get responses from other groups. Students then work on practice questions in groups and the results are discussed in class discussions. At the end of learning students are given questions to work on individually and the results are used to determine group scores.

The results of this study regarding one of the students' science process skills, namely the ability to observe, where the ability to observe is the initial ability in science process skills. Based on the results of the study it is known that the ability to observe students at MTS Al-Hidayah Kebon IX is in the very good category. A research that has been carried out in an educational environment, the conclusions drawn certainly have implications in the field of education and also further research. In connection with this, the implication of the research conducted is that the ability to observe is an initial ability in students' science process skills where with this ability students have the provision to be able to have good science process skills(Kurniawan, W., et al 2020). Therefore, it is necessary to make efforts to maintain the quality of students' abilities so that they are able to have science process skills in accordance with educational attainment standards.

This study has several limitations that can be taken into consideration for future researchers in order to obtain better results. Overall, the variables used by the researcher in the study only explain the ability to observe students from students' science process skills. Where there are still 15 indicators of science process skills that can be examined by the next researcher(Ernawati, M. D. W., et al 2022).

Recommendations that can be given by the author as material for consideration in further research in order to develop topics that examine science process skills more broadly. Trying to collect more supporting theories that can be used as a comparison in the framework of drawing conclusions so that the results are maximized (Ekasari, A., & Maulidinah, M. 2023). Adding other variables into further research. An example of a variable that can be used is critical thinking skills (Darmaji., et al 2022), and Attitudes toward Science (Zeidan, A. H., & Jayosi, M. R. 2015). And student cognitive learning outcomes (Nasir., et al 2019).

CONCLUSION

Based on the research objectives and discussion in this study, it can be concluded that the students' science process skills in the indicator of observing ability are included in the good category through the STAD type cooperative learning model. This is evidenced by an increase in students' observing abilities from cycle I to cycle III. As many as 100% of students are said to have completed in cycle III for the learning outcomes of science process skills as an indicator of observation ability.

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