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EXPERIMENTAL METHOD TO INCREASE SCIENCE PROCESS SKILLS MATERIALS FOR CHANGING OBJECTS CLASS V SDS PLUS AL MUBAROKAH

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ABSTRACT

This study aims to improve science process skills in science learning the material of changing the shape of objects in fifth grade students of SDS Plus Al Mubarokah through the experimental method. This type of research is collaborative classroom action research with the research design of the Kemmis & McTaggart model consisting of 4 stages including planning, action, observation, and reflection. The subjects of this research were 4 students of class V. This research was conducted in 2 cycles, each cycle consisting of 2 meetings conducted by applying the experimental method. The technique of collecting data in this research is through interviews, observation, documentation, and worksheets. Data collection instruments in the form of interview sheets, observation sheets, documentation sheets, and worksheets. In this study, the data analysis technique used was descriptive qualitative and quantitative data analysis. The results of this study indicate that the application of the experimental method can improve students' science process skills by 25%. The average score of students' science process skills in the first cycle was 62.5% and in the second cycle it was 87.5%. In conclusion, the application of the experimental method can improve the science process skills of the fifth grade (Five) SDS Plus Al Mubarokah students in learning the science of changing the shape of objects.

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A. INTRODUCTION

Natural Sciences are those that study natural phenomena which include living and non-living things, life, and the physical world whose truth has been tested for truth through a series of activities in the scientific method (Rahayu et al., 2012). In the opinion of science education and learning experts, it is stated that in science learning students must be involved in various domains, both cognitive, affective, and psychomotor domains. This is reinforced in the science curriculum which provides recommendations regarding the implementation of science learning in schools to involve students in conducting inquiry-oriented investigations, and involving interactions between students and teachers as well as interactions between students with one another. Therefore, the science learning process in schools emphasizes direct experience for students to develop their competencies in order to explore and understand the nature around them scientifically.

The results of the interviews with the fifth grade teacher (Five) that the researchers have conducted show that the learning methods that have been applied by teachers in science learning are still conventional in the form of lectures in delivering learning materials to students. Students are less actively involved in learning because they only listen to the teacher's explanation and occasionally students provide answers to the questions given. In addition, the teacher has never implemented experimental or practical activities in science learning. This is because the school does not yet have laboratory facilities or tools that can be used for practicum. Therefore, students are less enthusiastic in participating in learning and the ability of students' science process skills is still low.

Based on the results of interviews conducted by researchers with teachers of class V (Five) that the learning method that is considered the most effective by researchers in science learning is the experimental method. With the application of this experimental method, students can conduct experiments or practicum directly on objects in the surrounding environment in accordance with the material changes in the shape of objects. This experimental method is expected to improve the science process skills of students who are still lacking in class V (Five) SDS Plus Al Mubarokah students.

Previous research conducted by Soni Bernadus Masus and Fadhilaturrahmi entitled "Improving Science Process Skills by Using

Experimental Methods in Elementary Schools". It can be concluded that the use of experimental methods can improve science process skills (Masus et al., 2020). Subsequent research conducted by Sabirin, Rosnita, and Sugiyono entitled "Improving Process Skills with Experimental Methods in Science Learning in Class V Elementary School", that also show an influence on student learning outcomes in the form of improvements achieved by using the inquiry approach in science learning in class V SDN 40 North Pontianak (Sabirin et al., 2018).

Based on the above background, the researchers are interested in conducting classroom action research entitled "Efforts to Improve Science Process Skills through Experimental Methods in Learning Science on Material Changes in Objects in Class V SDS Plus Al Mubarokah". This action research describes the application of the experimental method to improve the science process skills of grade V (Five) SDS Plus Al Mubarokah students. The purpose of this study was to improve science process skills in science learning the material of changing the shape of objects in fifth grade students of SDS Plus Al Mubarokah through the experimental method.

B. METHOD

The type of research used in this research is collaborative classroom action research, where the researcher collaborates with the fifth grade teacher. The research design is the Kemmis & Mc Taggart model. In essence, the model proposed by Kemmis & Mc Taggart is a set of devices or strands with one device consisting of 4 components, including planning, action, observation, and reflection (Susilo et al., 2022). The time of this action research was carried out from March 2022 to May 2022. This research was conducted in class V (Five) SDS Plus Al Mubarokah with the research subject of 4 students, and the research location was in Panggul Melati Kepanjen Village, Gumukmas District, Jember Regency, Java Province East. The technique of collecting data in this research is through interviews, observation, documentation, and Student Worksheets. Data collection instruments in the form of interview sheets, observation sheets, documentation sheets, and student worksheets. In this study, the data analysis technique used is descriptive qualitative and quantitative data analysis.

C. RESULT AND DISCUSSION

Science Process Skills

Process skills are skills that scientists use in conducting scientific investigations (Mardiyana et al., 2020). Science process skills are an approach that assumes that science is formed and developed through a scientific process (Septantiningtyas et al., 2020). According to Usman in (Fatimah, 2017) explains that the indicators of science process skills include: a) Observing, b) Proposing hypotheses, c) Interpreting data, d) Planning experiments, e) Conducting experiments, f) Drawing conclusions, and g) Communicating results. Furthermore, in Permendikbud no. 59 of 2014, it is explained that the indicators of science process skills include: a) Observation (observation) skills, b) classifying (classification), c) interpreting (interpretation), d) predicting (prediction), e) asking questions, f) formulating hypotheses, g) planning experiments, h) using tools/materials, i) applying concepts, and j) communicating. From these references, the researchers raised the aspects of students' science process skills consisting of a) observing, b) using tools/materials, c) conducting experiments, d) asking questions, and e) communicating.

Experimental Method

The experimental method is a presentation of learning in which with an experiment students experience firsthand and prove for themselves something that is being studied (Wedyawati & Lisa, 2019). According to Moedjiono and Moh Dimyati, the procedure for using the experimental method has 3 steps, namely preparing for the use of the experimental method, carrying out the use of the experimental method, and following up on the use of the experimental method (Wedyawati & Lisa, 2019).

The experimental method has advantages and disadvantages in its use in learning activities. The advantages of the experimental method include: a) Making students believe about the truth or conclusions according to the experiment; b) Fostering students to be able to make various new breakthroughs through their discoveries from experimental results and benefits for human life; and c) The results of the experiments that students do can be valuable for the welfare of society. Furthermore, the shortcomings of the experimental method consist of: a) This experimental method is more suitable for the fields of science and technology; b) Requires maintenance facilities and materials which are not always easy to order; c) This method requires a person to be thorough,

tenacious, and persistent with teachers and students; and d) Experiments do not always produce what is expected, because of the possibility of certain factors and are beyond the scope of ability or control.

Elementary Science Learning

Learning science education in elementary schools requires a learning process that is not too academic and verbal (Muthmainnah et al., 2022). The opinion of science education and learning experts states that in science learning students should be involved in various domains, both cognitive, affective, and psychomotor (Hisbullah & Selvi, 2018). This is reinforced in the science curriculum which provides recommendations regarding the implementation of science learning in schools to involve students in conducting inquiry-oriented investigations, and involving interactions between students and teachers as well as interactions between students with one another. Therefore, the science learning process in schools emphasizes direct experience for students to develop their competencies in order to explore and understand the nature around them scientifically.

Material Change of Objects

Changes in the form of objects due to heat, consist of: a) Melting, is a change in the form of objects from solid to liquid; b) Freezing, is a change in the state of an object from a liquid to a solid due to a cooling; c) Evaporation, is the change of state of matter from liquid to gas; d) Condensation, is the change of state of matter from gas to liquid; e) Sublimation, is the change of state of matter from solid to gas; and f) Crystallizing (melting), is a change in the state of an object from gas to solid (Rumiyati & Tatang, 2019).

Implementation of Learning through Experimental Methods

This Classroom Action Research (CAR) was carried out for 2 cycles, where every 1 cycle consisted of 2 meetings and was carried out in 4 stages, consisting of planning, implementation, observation, and reflection. In the first stage, namely planning, the researcher and the collaborator compiled a Learning Implementation Plan (RPP), Student Worksheet (LKS), and Student and Teacher Observation Sheets. In the second stage, namely the implementation of this action, the researcher did of course by using the planning guidelines that had been contained in the RPP made, consisting of preliminary, core, and closing activities. In the third stage, namely observation, observers directly carry out observations of teacher and student activities during learning activities using this

experimental method which is guided by teacher and student observation sheets. In the fourth stage, namely reflection, the researcher and the observer discuss the implementation of the action, so that problems are found and formulate solutions to these problems.

Based on the results of the implementation of actions in both cycle I and cycle II along with analysis of the results of student worksheets (LKS), it can be obtained that the application of the experimental method in science learning can improve the science process skills of grade V (Five) SDS students. Plus Al Mubarokah. The implementation of learning using this experimental method has been carried out by researchers in 2 cycles which discuss the material changes in the shape of objects. Basically, science consists of 3 components, namely science as a product, science as a process, and science as a scientific attitude. As for this action research, the researcher focuses more on conducting research on science as a process.

Action Implementation in Cycle I

The implementation of the action in the first cycle has been carried out by the researcher in 2 meetings. Prior to the implementation of the action in cycle I, the researchers and collaborators had prepared lesson plans, teacher and student observation sheets, and worksheets. In the first cycle of meeting 1, students carried out experimental activities on the material of changing the shape of objects (thaw events).

Based on the results of observations, the activities of teachers and students have carried out the procedures in the experiment. The teacher has been able to prepare the tools and materials used in learning using this experimental method in the form of ice cubes, bowls, and hammers/hammers. Furthermore, the teacher also prepares worksheets, explains the purpose of the experiment to students, and provides guidance, assistance, and supervision to students while carrying out experimental activities. In fact, the teacher also discussed the obstacles and the results of the experimental activities and provided guidance to students in making conclusions about the experimental activities that had been carried out.

Similar to the teacher, students have also done learning according to the experimental method. Students can assist the teacher in preparing the tools and materials used in the experiment. Next, students listen to the teacher's explanation of the objectives and steps in the experimental activity. In addition,

students are also able to fill out worksheets, carry out experimental activities to change the shape of objects (thaw events). Although in the implementation of the actions in the first cycle of meeting 1, several problems were found, namely students were more engrossed in playing with the tools and materials used in experimental activities. The students are also mostly still shy and reluctant to present the results of their experiments in front of the class. Based on the results of the data evaluation in the first cycle of the first meeting, it was obtained that the students' science process skills were good at 50%.

In the first cycle of meeting 2, experimental activities were carried out on the material changing the shape of objects (evaporating events). Activities of teachers and students have carried out the procedures in the experiment. The teacher has been able to prepare the tools and materials used in learning using this experimental method in the form of a handkerchief and water in a bowl. Furthermore, the teacher also prepares worksheets, explains the purpose of the experiment to students, and provides guidance, assistance, and supervision to students while carrying out experimental activities. In fact, the teacher also discussed the obstacles and the results of the experimental activities and provided guidance to students in making conclusions about the experimental activities that had been carried out.

Similar to the teacher, students have also done learning according to the experimental method. Students can assist the teacher in preparing the tools and materials used in the experiment. Next, students listen to the teacher's explanation of the objectives and steps in the experimental activity. In addition, students are also able to fill out worksheets, carry out experimental activities to change the shape of objects (evaporating events). However, in the implementation of the actions in the first cycle of meeting 2 the teacher gave equal attention to all students and motivated students to be more confident and not shy when presenting in front of the class. The results of the science process skill scores of students who get a good minimum score are still 75%. Therefore, it is necessary to continue in cycle II to achieve a success indicator of 80%.

Action Implementation in Cycle II

The implementation of the actions in cycle II was carried out in accordance with the results of observations in cycle I. In this cycle, the researcher and the observers also took action in 2 meetings. Prior to the implementation of the action in cycle II, the researchers and collaborators had prepared lesson plans, teacher

and student observation sheets, and worksheets. Based on the results of the reflection in the first cycle, the researchers hope that in the second cycle there will be improvements that will later provide an increase in students' science process skills.

In the second cycle of meeting 1, students carried out experimental activities on the material of changing the shape of objects (crystallizing events). Based on the results of observations, the activities of teachers and students have carried out the procedures in the experiment. The teacher has been able to prepare the tools and materials used in learning using this experimental method in the form of bricks, candles, milk cans, and sea water or salt solution. Furthermore, the teacher also prepares worksheets, explains the purpose of the experiment to students, and provides guidance, assistance, and supervision to students while carrying out experimental activities. In fact, the teacher also discussed the obstacles and the results of the experimental activities and provided guidance to students in making conclusions about the experimental activities that had been carried out.

Similar to the teacher, students have also done learning according to the experimental method. Students can assist the teacher in preparing the tools and materials used in the experiment. Next, students listen to the teacher's explanation of the objectives and steps in the experimental activity. In addition, students are also able to fill out worksheets, carry out experimental activities to change the shape of objects (crystallizing events). In this cycle, students are no longer awkward to ask questions to the teacher and are able to carry out experimental activities in earnest. Even when reporting the results of the experimental activities, most of the students were brave and volunteered to submit themselves for presentations to the front of the class. Based on the results of the evaluation of the data in the second cycle of meeting 1, it was obtained that the students' science process skills were good at 75%. This shows that the results of the students' science process skill scores have not reached the research success criteria of 80%. Therefore, the research was continued in cycle II meeting 2.

In cycle II meeting 2, experimental activities were carried out on the material of changing the shape of objects (condensation events). Activities of teachers and students have carried out the procedures in the experiment. The teacher has been able to prepare the tools and materials used in learning using

this experimental method in the form of ice cubes and glass. Furthermore, the teacher also prepares worksheets, explains the purpose of the experiment to students, and provides guidance, assistance, and supervision to students while carrying out experimental activities. In fact, the teacher also discussed the obstacles and the results of the experimental activities and provided guidance to students in making conclusions about the experimental activities that had been carried out.

Similar to the teacher, students have also done learning according to the experimental method. Students can assist the teacher in preparing the tools and materials used in the experiment. Next, students listen to the teacher's explanation of the objectives and steps in the experimental activity. In addition, students are also able to fill out worksheets, carry out experimental activities to change the shape of objects (condensation events). In this cycle, students are not awkward to ask questions to the teacher and students are able to carry out experimental activities seriously. At the time of reporting the results of the experimental activities, all students had the courage and volunteered to submit themselves for presentations to the front of the class. The results of the science process skill scores of students have been able to get a good minimum score of 100%. In accordance with the success criteria of this study of 80% with a minimum score of good student science process skills, the application of the experimental method to improve students' science process skills can be said to be successful and this action research was stopped in cycle II meeting 2.

Improving Students' Science Process Skills through Experimental Methods

Based on the results of observations and student worksheets, it shows that students' science process skills have increased from each cycle. This can be seen from the average value of the students' science process skill scores from cycle I to cycle II. The following is an increase in students' science process skills scores in cycle I and cycle II:

Table 1. Students' Science Process Skills Scores in Cycle I and Cycle II:

No.	Stages	Average Score	Enhancement
1.	Cycle I	62,5%	-
2.	Cycle II	87,5%	25%

Based on the table above, it shows that there was an increase in students' science processes in cycle I and cycle II. The average score of students' science process skills in the first cycle was 62.5% and in the second cycle it was 87.5%. Therefore, the increase in students' science process skill scores was 25%.

D. CONCLUSION

Based on the research that has been carried out, it can be concluded that the application of the experimental method can improve the science process skills of class V (Five) SDS Plus Al Mubarokah students in learning science of material change of shape. The increase in students' science process skills in this study can be seen from the increase in students' science process skills scores from cycle I to cycle II. The average score of students' science process skills in the first cycle was 62.5% and in the second cycle it was 87.5%. Therefore, the increase in students' science process skill scores was 25%. Furthermore, the suggestion for further research is that before applying the experimental method in learning, it is better to first understand the existing procedures in the experimental method, so that the learning objectives can be achieved.

Reference

Fatimah, S. (2017). Analisis Keterampilan Proses Sains Siswa Kelas V pada Mata Pelajaran IPA. *Prosiding Seminar Nasional KSDP Prodi S1 PGSD*, 181–189.

Hisbullah, & Selvi, N. (2018). *Pembelajaran Ilmu Pengetahuan Alam di Sekolah Dasar*. Penerbit Aksara Timur.

Mardiyana, I. I., Pritasari, A. C., & Hakim, M. L. (2020). *Pembelajaran IPA SD: Konsep dan Penerapan*. Yayasan Citra Dharma Cendekia.

Masus, S. B., Tambusai, & Fadhilaturrahmi. (2020). Peningkatan Keterampilan Proses Sains IPA dengan Menggunakan Metode Eksperimendi Sekolah Dasar. *Jurnal Pendidikan Dan Konseling*, *2*(2), 161–167.

Muthmainnah, Munandar, H., Aminah, Fahmi, A., Maisura, Mutia, I., Yunita, I., HS, D. W. S., Haslia, H., Daulay, R. A., Hanum, A., Sari, N. P., Putri, R., Sitanggang, & Rahmi, P. (2022). *Pembelajaran IPA di Sekolah Dasar*. Media Sains Indonesia.

Rahayu, P., Mulyani, S., & Miswadi, S. S. (2012). Pengembangan Pembelajaran IPA Terpadu Menggunakan Model Pembelajaran Problem Base Melalui Lesson Study. *Jurnal Pendidikan IPA Indonesia*, *1*(1), 63–70.

Rumiyati, & Tatang. (2019). *Kreatif Tematik Peristiwa dalam Kehidupan Kelas V untuk SD/MI*. Penerbit Duha.

Sabirin, Rosnita, & Sugiyono. (2018). Peningkatan Keterampilan Proses dengan Metode Eksperimen pada Pembelajaran IPA di Kelas V SD. *Jurnal Pendidikan Dan Pembelajaran*, *1*(1), 1–11.

Septantiningtyas, N., Hakim, M. R. L., Rosmila, N., & Lahirdi. (2020). *Konsep Dasar Sains 1*. Penerbit Lakeisha,.

Susilo, H., Chotimah, H., & Sari, Y. D. (2022). *Penelitian Tindakan Kelas*. Media Nusa Creative (MNC Publishing).

Wedyawati, N., & Lisa, Y. (2019). *Pembelajaran IPA di Sekolah Dasar*. Deepublish.