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SCIENTIFIC LEARNING APPROACH: IMPROVING STUDENT LEARNING OUTCOMES ON THE CONCEPT OF MEASUREMENT IN ELEMENTARY SCHOOLS

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Abstract: The purpose of this study was to determine the improvement of student learning outcomes through a scientific approach. The method used is descriptive of the type of Classroom Action Research (CAR). This study involved 13 fifth-grade elementary school students as subjects and analyzed the improvement of learning outcomes using N-gain. The results of the study showed that in cycle I, 8 students, or 61.6%, did not complete the learning, and in cycle II, 13 students, or 100%, achieved learning completion. The improvement of student learning outcomes using a scientific approach was obtained such that in the high category, there were 5 students with an average N-gain of 0.78; in the medium category, 7 students with an N-gain of 0.52; and in the low category, 1 student achieved an improvement with an average N-gain of 0.20. This improvement is due to the effective use of the scientific approach. The scientific approach contributes to developing students' abilities to conduct experiments and observe directly with measuring instruments so that students gain real experience in learning mathematics.

Keywords: Scientific Approach, Mathematics Learning Outcomes, Measurement Material

PENDEKATAN PEMBELAJARAN SAINTIFIK: PENINGKATKAN HASIL BELAJAR SISWA PADA KONSEP PENGUKURAN DI SEKOLAH DASAR

Abstrak: Tujuan penelitian ini adalah untuk mengetahui peningkatan hasil belajar siswa melalui pendekatan saintifik. Metode yang digunakan adalah deskriptif dengan tipe Penelitian Tindakan Kelas (PTK). Penelitian ini melibatkan 13 siswa SD kelas V sebagai subjek dan dianalisis peningkatan hasil belajar menggunakan *N-gain*. Hasil penelitian diperoleh bahwa pada siklus I sebanyak 8 siswa atau 61,6% tidak tuntas dalam pembelajaran dan sikus II sebanyak 13 siswa atau 100% mencapai ketuntasan belajar. Peningkatan hasil belajar siswa dengan menggunakan pendekatan saintifik diperoleh bahwa dalam kategori tinggi sebanyak 5 siswa dengan rerata *N-gain* 0,78, kategori sedang 7 siswa dengan *N-gain* 0,52, dan kategori rendah 1 siswa mencapai peningkatan dengan rerata *N-gain* 0,20. Peningkatan ini dikarenakan efektifnya penggunaan pendekatan saintifik. Pendekatan saintifik berkontribusi dalam mengembangkan kemampuan siswa untuk melakukan eksperimen dan mengamati langsung dengan alat ukur, sehingga siswa memperoleh pengalaman nyata dalam pembelajaran matematika.

Kata Kunci: Pendekatan Saintifik, Hasil Belajar Matematika, Materi Pengukuran

INTRODUCTION

The scientific approach in elementary school learning is a learning design that can help students develop mathematical concepts. Al Ikhlas (2020; Zebua & Mendrofa) states that the scientific approach is a form of teaching that involves students actively creating concepts, laws, or principles through the steps of observation (to identify or find problems), problem solving, hypothesis formation, data collection using various techniques, data analysis, drawing conclusions, and communicating the concepts, laws, or principles discovered.

Scientific learning is a more student-centered form of learning, enabling students to be more active in both learning and seeking out their own learning resources. Students become accustomed to dealing with non-routine problems (Sani, 2016; Zahran et al., 2024). Nuralam & Eliyana (2018; Zahran et al., 2024) argue that the scientific approach allows students to build knowledge and skills in the scientific method. Therefore, teachers act more as facilitators and guides in problem-solving.

One of the advantages of the scientific approach is that it stimulates student engagement in mathematics learning. Dahliana (2019; Rachmawan, 2022) defines the scientific approach as an approach to the learning process that requires students to actively link concepts, laws, and principles through scientific stages. A scientific approach to classroom management increases active participation and positive interactions in the classroom (Hidayat, 2020; Setiawan, 2021; Farida et al., 2024). This approach is designed to enable students to actively construct concepts, principles, and laws through a series of scientific activities involving observation, questioning, data collection, analysis, and communication (Haryono, 2021; Farida et al., 2024).

Initial observations used to identify problems at the research location found that the learning process tended to be monotonous using the lecture method, where learning was still teacher-centered. Measurement concept material was often presented abstractly, without any connection to concrete problems with students' real lives; the process of solving mathematical problems was dominated by working on problems in books or worksheets without in-depth exploration. This had an impact on the achievement of learning outcomes that were not optimal. In mathematics learning, especially measurement material is often considered difficult because it requires an understanding of units, conversions, and their application in the context of students' real lives. A scientific approach can facilitate students to observe, ask questions, collect information, and process data, and students can communicate the results of solving the problems given. This process triggers students to be able to practice critical and creative thinking skills in understanding the concept of measurement well.

In light of these issues, it is necessary to provide learning that can stimulate students' critical thinking, analytical thinking, and problem-solving. The goal is to develop students' mathematical concepts independently. The scientific approach addresses the limitations of traditional learning and encourages students to actively engage in observing, reasoning, and communicating the problems they are learning. The thinking process must be given to students to understand things that cannot be understood by finding them directly through active involvement in the learning process, so that the process of constructivism of ideas can be developed well (Ritiauw, 2021). This process creates and delivers meaningful mathematics learning in elementary schools.

METHOD

The method used is descriptive with the Classroom Action Research (CAR) type using the Kemmis and Tanggart model. Kemmis (Putri et al., 2025) CAR applies a cycle consisting of planning a change, implementing (action) and observing the process, reflecting on the process, and then re-planning, and so on. This study involved 13 fifth-grade students at SD Negeri 341 Banda, Central Maluku, as subjects. Data collection techniques used were test results and observations of teacher and student activities during two meetings for two cycles. The collected test data were calculated using the following formula:

$$\text{Learning Outcomes} = \frac{Total\ Score\ Obtained}{Total\ Score} \text{ x } 100\%$$

The next step to analyze the improvement in students' learning outcomes in measurement material is to use N-gain with the formula (Meltser, 2002, Pattimukay et al, 2023).

$$N\text{-}gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Posiblle\ Score - Pretest\ Score}$$

The results of the N-gain value calculations obtained were then confirmed with the value criteria intervals in Table 1.

Table 1 N-gain Value Criteria

N-gain (<g>)	Classification
g ≥ 0,70	High
0,30≤g<0,70	Currently
g < 0,30	Low

RESEARCH RESULT

Implementation of Learning in Each Cycle

This research is classroom action research (CAR) because it is effective in analyzing improvements in students' mathematics learning outcomes. This research was conducted to improve learning problems with the aim of determining improvements in student learning outcomes through the scientific learning model in fifth-grade students of SD Negeri 341 Central Maluku. The results of the research implementation cycles 1 and 2 were carried out in two meetings each.

The test results for 13 students at the end of the first cycle of learning showed that 8 students (61.6%) did not complete the task and 5 students (38.4%) completed the task. After the learning process, the teacher and observer conducted a reflection and found that there were still students who did not understand the material explained by the teacher because they could not read fluently. It was also observed that most students were less active in exploring and transforming ideas in discussion groups. Students in the group also tended to be shy to provide answers to the problems being solved. When asked to ask questions about the objects being observed, students felt confused and afraid to ask, so that learning was less than optimal. It was also identified that the teacher had not optimally provided students with opportunities to communicate ideas in linking measurement concepts to the context of students' real lives. In the implementation of learning using a scientific approach, it appears that the teacher can apply it well, but it needs further optimization.

After improvements were made to the results of the reflection on cycle 1, the next step was to design learning tools for the implementation of cycle 2. Based on the results of observations, it was seen that students actively carried out measurements and were able to transform ideas well. During the implementation of learning, students were able to observe the objects presented by the teacher and pay close attention to what was demonstrated regarding how to use measuring instruments. The teacher also provided lead questions to encourage students to ask questions about measurement problems and students were actively involved in asking questions. It was also observed that in discussion groups, students were actively involved in conducting experiments according to the instructions contained in the LKPD and the teacher acted as a facilitator. The implementation of scientific learning was carried out according to the learning steps. In essence, the learning process of cycle 2 went as expected.

The results of the cycle 2 test showed that 12 students, or 92.31%, achieved learning completion, while 1 student or 7.69% did not achieve the set KKM of 60. To follow up on students who had not completed the test, remedial and active guidance were provided. The results showed that the scientific approach was effective in learning.

Improving Learning Outcomes Measurement

To analyze the improvement in student learning outcomes after using the scientific approach, the N-gain value was calculated. Figure 2 presents the results of the calculation.

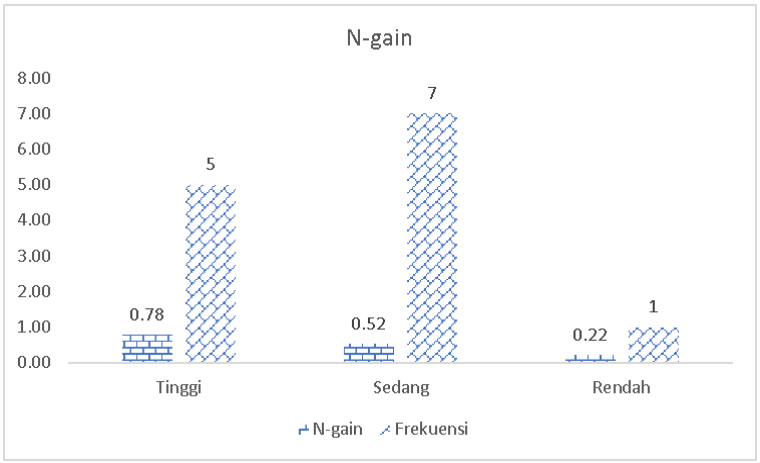

Figure 2 N-gain value

Figure 2 shows that the increase in student learning outcomes in the high category was 5 students with an average N-gain of 0.78, or an increase of 78%, and in the medium category 7 students with an average of 0.52 or an increase of 52%, while the increase in the low category was 1 student with an N-gain value of 0.22 or 22%. This increase is due to the effective use of the scientific approach in learning. The scientific approach encourages students to conduct experiments and observe directly with measuring instruments, so that students gain real experience in learning.

DISCUSSION

The implementation of a scientific approach is effective in improving students' mathematics learning outcomes, particularly in measurement, in fifth-grade elementary school. The results showed that improvements in the high category reached 78%, the medium category

52%, and the low category 22%. This improvement was due to the effective use of a scientific approach in learning.

The scientific approach is effective because it can train students to improve their thinking skills through the process of observing, asking questions, collecting information, processing data, and communicating the results of solved mathematical problems. Hosnan (2014; Br Bangun, 2022) scientific approach is a learning process designed in such a way that students actively understand concepts and understand laws or principles through the stages of observing, identifying or finding problems, and formulating problems or hypotheses, and also collecting data, drawing conclusions, and communicating concepts or principles that students find.

A scientific approach can encourage students to actively engage in learning and motivate them to discover and solve measurement problems. Arifuddin et al. (2021; Salsabila & Fajriani, 2023) found that a scientific approach significantly increases learning motivation. In the measurement process, students are actively involved in using specific teaching aids and procedures. This process trains students to improve their psychomotor skills.

The implementation of observation in solving measurement problems is that students are guided to observe and measure objects around them. After carrying out the observations, students are directed to ask questions related to the concept of measurement, and students conduct experiments to find solutions to the problems given. In the process, students use various measuring instruments to collect data. After the data collection process, the next step is to analyze the measurement data. The final stage that students need to do is communicate the results of their experiments and draw conclusions.

The scientific approach is a series of activities carried out by scientists in studying nature and conveying analytical results based on observed scientific evidence and facts (Hwang et al., 2012; Elvianasti et al., 2022). The scientific approach prioritizes student activity and participation so that students can develop basic skills such as communication, critical thinking, and problem-solving (Lazányi, 2012; Elvianasti et al., 2022).

CONCLUSION

Referring to the research results obtained, the following conclusions can be drawn:

1. The results of the first cycle showed that 8 students, or 61.6%, failed to complete the course, and 5 students, or 38.4%, achieved learning completion. Meanwhile, in the second cycle, 1 student, or 7.69%, failed to achieve learning completion, and 12 students, or 92.31%, achieved the minimum completeness criteria (KKM).
2. The scientific learning approach is effective in improving student learning outcomes in the concept of measurement in elementary schools. The increase in the high category was 5 students with an N-gain achievement of 0.78, or an increase of 78% and the medium category was 7 students with a gain value of 0.52, an increase of 52%, while the low category was 1 student with an increase of 22%.
3. Improved student learning outcomes are due to the effectiveness of the scientific approach to learning. Through this approach, students do not simply receive information passively, but are actively involved in the learning process through observation, questioning, collecting data, processing, and communicating mathematical problems, thus stimulating students to think critically.

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