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BASIC SCIENCE PROCESS SKILLS OF ELEMENTARY SCHOOL STUDENTS DURING THE CURRICULUM MERDEKA PERIOD

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Abstract
Science process skills reflect the learning abilities and character that students must develop within themselves to prepare themselves to face a dynamic society. However, in reality, the average science process skills for elementary schools are still low and the first step before practicing and teaching science process skills in schools, teachers must know and understand the profile of students' science process skills. On the other hand, it is not yet known to what extent the science process skills of elementary school students in implementing the independent curriculum. This study aims to determine the science process skills for elementary school students in implementing the independent curriculum. This study was conducted using a case study, a qualitative research approach. The sample in this study was 12 schools spread across Kuningan Regency. The time used to carry out this study from November 2023 – January 2024. Data collection used in this study includes various methods, including observation, interviews, and documentation. The results of this study are: 1) Each subject in the independent curriculum can facilitate the development of observation skills, 2) In the independent curriculum, grouping skills are improved according to the characteristics needed in each subject, 3) Science process skills, especially the ability to measure, develop optimally in mathematics and science subjects, although other subjects still provide room to hone measuring skills.
Keywords: *Science process skills; elementary; curriculum merdeka*

Abstrak
Keterampilan proses sains mencerminkan kemampuan dan watak belajar yang harus dikembangkan siswa dalam diri mereka untuk mempersiapkan diri menghadapi masyarakat yang dinamis. Meski demikian pada kenyataannya, rata-rata keterampilan proses sains untuk sekolah dasar masih rendah dan langkah awal sebelum mempraktikkan dan mengajarkan keterampilan proses sains di sekolah, guru harus mengetahui dan memahami profil keterampilan proses sains siswa. Di sisi lain, belum diketahui sejauh mana keterampilan proses sains siswa sekolah dasar dalam penerapan kurikulum merdeka. Penelitian ini bertujuan untuk mengetahui keterampilan proses sains untuk siswa sekolah dasar dalam menerapkan kurikulum merdeka. Penelitian ini dilakukan dengan menggunakan studi kasus, pendekatan penelitian kualitatif. Sampel dalam penelitian ini adalah 12 sekolah yang tersebar di kabupaten kuningan. Waktu yang digunakan untuk melakukan penelitian ini adalah November 2023 – Januari 2024. Pengumpulan data yang digunakan dalam penelitian ini mencakup berbagai metode, termasuk observasi, wawancara, dan dokumentasi. Hasil penelitian ini adalah: 1) Setiap mata pelajaran dalam kurikulum merdeka dapat memfasilitasi pengembangan keterampilan observasi, 2) Pada kurikulum merdeka keterampilan pengelompokan ditingkatkan sesuai dengan karakteristik yang dibutuhkan pada setiap mata pelajaran, 3) Keterampilan proses sains, khususnya kemampuan mengukur kembangkan secara optimal pada mata pelajaran matematika dan IPA, meski demikian mata pelajaran lain tetap memberikan ruang untuk mengasak kemampuan mengukur.
Kata Kunci: Keterampilan proses sains; sekolah dasar; kurikulum merdeka

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Introduction

In human life, education plays a significant role (Setiawati et al., 2025). The global world recognized how important to achieve quality education. It can be said that education is a fundamental tool for development, and its importance is perceived at both the individual and global levels (Fomba et al., 2023). A person's philosophy or "mindset" is influenced by what they learn, hence quality education is crucial (Donkoh et al., 2023). Furthermore, education affects the way one lives and the decisions one makes every day. The quality of education often requires education reform as a necessary process because it allows a country to revisit, revise, and appraise its education system and curriculum periodically (M'mboga Akala, 2021). The education reform in Indonesia especially in curriculum has happened 9 times from 1947, 1952, 1964, 1968, 1975, 1984, 1994, 2004, 2006, and 2013(Insani, 2019). The Indonesian government has initiated a new education revitalization movement called Curriculum Merdeka (Wang et al., 2023).

The Curriculum Merdeka is a recovery policy post-Covid 19. Globally, the COVID-19 pandemic has had a significant negative impact on child education (Okyere et al., 2024). For instance, Byrnes et al. (2020) exposed that the pandemic of COVID-19 has created tremendous changes in almost all aspects of society, negatively affecting students' learning. A negative impact especially for students mentioned before namely learning loss. A learning loss is a condition when students lose learned competencies previously, are unable to complete learning at grade level, and experience compound effects because it doesn't master learning at every level (Anggraena et al., 2021). These situations and conditions become the reason for the Curriculum Merdeka, which is used to restore learning from the impact of the COVID-19 pandemic in Indonesia (Pradesa & Rahma, 2023).

A curriculum Merdeka itself is a curriculum that is developed as a more flexible curriculum, focuses on essential material, and is one of the curriculum concepts that demands student independence(Made et al., 2023). Furthermore, the advantages of the curriculum merdeka compared to the curriculum previously are 1) the lesson content is simpler and more in-depth, 2) the learning that is carried out is more independent, where the teacher can provide teaching in accordance with the stages of achievement and learning of the students, so that learning becomes more in-depth in context not just textual, and 3) is more relevant and interactive (Priantini et al., 2022). Moreover, the curriculum merdeka is a curriculum with diverse intracurricular learning where the content will be more optimal so that students have enough time to deepen concepts and strengthen competencies (Kemendikbud, 2021). For specific in the implementation of Curriculum Merdeka emphasizes project-based learning with basic science process skills (Aditiyas & Kuswanto, 2024). Further, in the Curriculum Merdeka, science process skills are one of the science learning outcomes (Astuti et al., 2025). Science process skills in the Curriculum Merdeka reflected in learning activities such as essential questions, do it together, and let's reflect (Nugroho et al., 2024).

Science process skills reflect learning abilities and dispositions that students require to be developed in themselves to prepare for a dynamic society(Ahmed et al., 2023). As we know science process skills consist of two skills, namely basic science process skills and integrated science process skills(Darmaji et al., 2022). The integrated science process skills were classified into identifying and controlling variables, formulating hypothesis, experimenting, and interpreting data (Elfeky et al., 2020). Furthermore, basic science process skills consist of observing, classifying, and measuring (Mulyeni et al., 2019). Observation was carried out during the learning activity (Sumanti et al., 2023). Some activities that occur during observation are:

First, use the five senses, not only the sense of sight. Second, organizing objects according to certain characteristics; Third, identifying. Fourth, identifying the changes of an object. Fifth, conduct a quantitative observation. Six, conduct a qualitative observation (Kurniawati, 2021).

Classifying as a science process skill is important because it contributes to the extent to which students understand, conceptualize and attach meaning to scientific ideas (Ango, 2002). Measuring is qualitative presentation or assigning values for variables (Gizaw & Sota, 2023a). Unlike the basic science process skills that are easily learned and transferable to novel situations, the integrated science process skills require a series of consistent, multiple practical sessions that depend on the learning environments (Ongowo & Indoshi, 2013). The basic science process skills are emphasized and considered a fundamental tool for students to acquire information and characteristics of things being studied(Khamhaengpol et al., 2021).

The science process skills are integrated into the broader abilities of scientific inquiry such as "asking questions, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments" (Dow et al., 2000). Remember, for students to cope with an evolving society and work life, it is necessary to constantly adapt and learn new skills and competencies (Valtonen et al., 2021). These skills are fundamental for students to be competent in creating a scientific inquiry environment. Furthermore, success to develop this skill is closely related to teachers' Science Process skills and their usage of inquiry that promotes students' Science Process skills (Mumba et al., 2018). Seeing the important role of science process skills, we must ensure students show these skills in their learning activity.

But in the reality, the average of Science Process skills for primary schools seems low considering the fact that teachers are required to help develop the Science Process skills (Koomson et al., 2024). Because of this, the first step before practicing and teaching science process skills in school, teachers must know and understand the profile of students' science process skills(Sriwarthini et al., 2024). On the other hand, it is not known to what extent the science process skills of elementary school students in the implementation of curriculum merdeka. This research aims to determine science process skills for elementary school students in implementing the curriculum merdeka.

Research Methods

This research examined science process skills for elementary school students in implementing the curriculum Merdeka. This research is conducted using a case study, a qualitative research approach. The case study probes deeply and analyzes interactions between the factors that explain present status or that influence change or growth (Best & Kahn, 2006). Furthermore, using a case study methodology was very useful for the present study as case study research is richly descriptive, and can dig in-depth and varied sources of information(Shrestha & Bhattarai, 2022).

The subjects in this research were teachers in Kuningan Regency with a total of 12 school spread across various elementary schools in the Kuningan Regency area. The time used to carry out the research is from November 2023 – January 2024. Data collection that is used in this research encompasses a range of methods, including observation, interviews, and documentation (Sakti et al., 2024). Interview in this study being conducted using question in table 1.

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Table 1. Basic Science Process Skill Indicators

No	Indicators	Question
1	Observing	a. How do students conduct observations in each subject? b. How each subject develops students' observation skills?
2	Classifying	a. How is the ability to find similarities and differences in students in each subject? b. How is the ability to compare student characteristics in each subject? c. How is the ability to find the basis of groups, in each subject?
3	Measuring	How to measure ability in each subject?

The data analysis technique used uses the concept given by Miles and Huberman 1984 which is depicted in Figure 1 below:

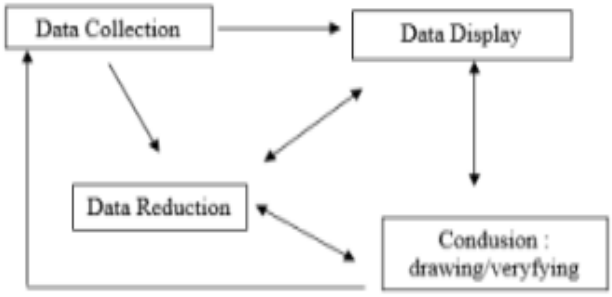

Figure 1. Miles and Huberman Data Analysis Components (Oktaviani & Wulandari, 2021)

Based on the figure 1 above, it can be said that analyzing the research data was carried out through four stages, namely:

1. Data collection, this stage contains efforts to collect data. In this research, data collection was carried out by observation, interviews and documentation studies and all three were carried out, which is called triangulation. Research researchers record all findings from observations, interviews and documentation studies to ensure that all information can be recorded properly.
2. Data Reduction, this stage is carried out by summarizing, sorting and selecting the main things and focusing on the important things that will be analyzed. At this stage the researcher focuses on data or information on the science process skills elementary school students in implementing the curriculum merdeka
3. Data Display, this stage is carried out by making brief descriptions, charts and relationships between categories obtained from the results of data reduction. This research will use narrative presentation of data on the science process skills elementary school students in implementing the curriculum merdeka
4. Data Conclusion, this stage is carried out by making initial conclusions which are then proven with valid and consistent evidence based on data obtained in the field. If this initial

conclusion is not supported by valid evidence, it is necessary to collect data as additional evidence for the final conclusion.

Result and Discussion

The most important point in learning is improving a wide range of skills that can be used to solve problems in real-life situations, such as science process skills (Siahaan et al., 2017). Science process skills are important skills that must be known and mastered by every student in the era of globalization and the 21st century (Astika et al., 2022). This is due by science process skills stimulate their learning curiosity and developing their content knowledge (Irwanto et al., 2019). Science process skills consist of basic and integrated science process skills (Maison et al., 2019). This research focuses on basic science process skills. Science process skills of elementary school students in implementing the curriculum Merdeka can be seen in these points below:

Observations are more than 'just looking' (Klofutar et al., 2022). Nevertheless, in the learning process, teachers often underestimate the importance of observation skills and consider them trivial and effortless and do not need major instructional attention (Tomkins & Tunnicliffe, 2007). Even though in implementation, observation will encourage students to ask questions (Wakhidah & Laelasari, 2022). This has an impact on scientific reasoning and contributes 35% (Klemm & Neuhaus, 2017). Therefore, it is necessary to consider to the extent to which students' observation skills need to be developed.

Based on the data obtained, it is known that 100% of schools state that student show their observation skills are in high condition. The most prominent observing skills are science and mathematics subjects. Students actually use their senses to gather/use relevant facts by means of identifying objects or concepts when they learn in every subject (Utami et al., 2021). In language subject science process skills encourage students to ask questions, observe, explore, explain, and engage in discussion with each other on specific issues, so students develop their conceptual understanding in inquiry science by using language functions such as estimation, explanation, and discussion (Celik, 2022). As a result, although science process skills being used in a language subject such as observation skills will be not considered vague in practice.

Based on the interview with the subject, an activity that often occurs during observation skills in every learning subject is "using the five senses, not only the sense of sight". For example, in science students use sight, taste, touch, hearing and smell. Meanwhile in math students use sight and touch. Furthermore, in language, students tend to use sight and hearing. Meanwhile, activities such as identifying changes in objects, and making quantitative and objective observations are the ones that are most rarely carried out when it comes to language subjects. Each subject that hones observation skills differently impacts the development of optimal observation skills for students. As we know observation skills determine the change in the critical thinking skills and argumentation abilities of students in their learning process (Demircioglu et al., 2023). So, when each subject in the curriculum merdeka can facilitate the development of observation skills, it is a valuable step in developing science process skills.

Classifying is grouping or categorizing or ordering of objects or events into groups or classes based on similarities, differences, and relationships in characteristics or defined criteria among the objects or events (Gizaw & Sota, 2023b). Classifying provided examples would be more beneficial to learning than reading provided examples or generating examples (*learning-by-classifying-examples hypothesis*)(Steininger et al., 2022). Classification aspects there are three indicators, namely 1) finding similarities and differences, 2) contrasting/comparative characteristics, 3) finding the basis for grouping or classification (Ginting et al., 2023).

Based on the data obtained in mathematics subjects, students can group the material into geometry, plane figures, lengths and short objects, units and tens. For this material, 100% of students can group objects based on the type of geometry, plane figures, or units and tens. Classification in mathematical disciplines; developed and implemented methodological guidelines for lessons of mathematics that contribute to developing students' creativity in the academic progress (Niyazova et al., 2022). Based on the data obtained, the Indonesian language subject focuses more on identifying text types, sentence structures, etc. Based on the data, it is known that 13% of students still have difficulty in identifying sentence structures. This is because students' understanding of the meaning contained in the sentence causes students to have difficulty in identifying sentence structures. This has an impact on students' ability to construct sentences. Composing sentences requires an understanding of sentence structure (Kristianingsih et al., 2023).

In science and social studies material, students are emphasized on their ability to group objects, classify types of living things based on food types, habitats, group types of jobs based on geographical conditions, functions and others. Students' ability to classify it based on their observation correctly suggests that the students did not follow a clear algorithm in their classification, in which they would have come from scientific observation targeted to observe specific clearly defined variables reflected in the described (Vojíř et al., 2024). Therefore, it can be said that in the curriculum merdeka in mathematics, science, social studies, and Indonesian language subjects, grouping skills are improved according to the characteristics needed in each subject. So that students' grouping skills can continue to be improved in the curriculum merdeka.

Measuring is recognizing and using simple measuring tools to determine magnitudes and sizes in appropriate units. (Özalp, 2023). Furthermore, measuring is a skill that develops intermediate skills in inquiry (Sa'adah et al., 2023). Measuring skill is when students are asked to compare the results of observations with relevant theories and concepts (Hardianti & Permatasari, 2023). Indicators of measuring in science process skills consist of calculating the quantity, measuring data precisely, using the correct measuring tool, giving the correct unit on the measurement reading, and identifying patterns from data tables (Karim et al., 2023).

Based on the data obtained, it is known that 80% of students' measuring skills are encouraged through Mathematics and Science subjects. However, other subjects such as Social Studies and Indonesian language subject only contribute 20% in improving students' measuring skills, this is because the material studied in these subjects is more text-based which does not allow for honing measuring skills. Measuring is one of the indicators in the problem-solving process in mathematics (Yantoro et al., 2022), therefore in mathematics learning the more often students are asked to solve problems in math, the more their measuring ability will improve. Not much different from mathematics, in subjects that contain elements of science, the ability to measure appears in experimental activities(Agustiani et al., 2022).

Therefore, it can be concluded that science process skills, particularly the ability to measure in general, are optimally developed in mathematics and science subjects. However, subjects other than mathematics and science still have an impact on developing students' measuring skills. Therefore, it can be said that in the curriculum merdeka in mathematics and science subjects. However, other subjects still contribute to improving measurement skills.

Conclusion

Each subject in the curriculum merdeka can facilitate the development of observation skills, it is a valuable step in developing science process skills. Futher, in subject as mathematics, science, social studies, and Indonesian language, grouping skills are improved according to the characteristics needed in each subject. So that students can continue their grouping skills to be improved in the curriculum merdeka. Different condition in the ability to measure, in general are optimally developed in mathematics and science subjects. However, subjects other than mathematics and science still have an impact on developing students' measuring skills. Based on the results of the study, it can be said that in the independent curriculum, all subjects have contribution to the development of science process skills. In addition, through this study, it is hoped that teachers can continue to improve their teaching skills that allow for the improvement of students' science process skills and not only focus on mathematics and science subjects.

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