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Examining Science Process Skills in Elementary Science Instruction: Practices and Challenges

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Abstract. This study analyzes the implementation of Science Process Skills (SPS) in elementary science instruction and identifies context-specific best practices and challenges. Adopting a qualitative case study design, data were collected through classroom observations, semi-structured interviews with teachers, and analysis of lesson plans and student worksheets in an elementary school in Bandung, Indonesia. Findings show that SPS are promoted through active learning strategies like group discussions, hands-on experiments, and the use of teaching modules and student worksheets. Observed SPS components include questioning, hypothesis formulation, variable identification, procedure design, observation, and scientific reporting. However, teacher-directed formats such as highly prescriptive task structures constrain students' autonomy and creativity in scientific reasoning. The study recommends strengthening inquiry-based pedagogy that expands opportunities for exploration, together with professional development focused on scaffolding and formative feedback. These measures can better cultivate students' independence and higher-order scientific thinking. The contribution of this study lies in detailing how micro-level pedagogical routines shape SPS enactment and in offering actionable levers for improving inquiry-rich elementary science classrooms in low-resource settings.

Keywords: Science Process Skills (SPS), Elementary Science Education, Inquiry-Based Learning.

INTRODUCTION

Science learning at the elementary school level plays a crucial role in fostering students' critical thinking skills, curiosity, and scientific competence from an early age. One of the key components in science education is the development of Science Process Skills (SPS), which include the abilities to formulate investigable questions, construct hypotheses, identify research variables, determine tools and materials, design experimental procedures, establish formats for presentation and inquiry, carry out predetermined steps, make observations, draw conclusions based on empirical data, and compile investigation reports (Khaeriyah, Suryani, & Taufik, 2022). SPS not only equips students with scientific knowledge but also trains them to think scientifically and apply science concepts in their daily lives (Azzahra & Suryandari, 2024).

In practice, the reinforcement of Science Process Skills (SPS) has become a primary demand in line with the implementation of the *Merdeka Curriculum*, which emphasizes competency-based learning and 21st-century skills such as critical, creative, and collaborative thinking (Yatni, Murtikusuma, & Setiawan, 2025). This aligns with the growing demands of an increasingly complex global context, where analytical ability and scientific problem-solving are essential skills to be developed from an early age (Taşdemir & Yıldız, 2024). Therefore, science learning in elementary schools should not merely focus on conceptual mastery but also on the scientific processes that form the core of science education itself. However, field realities reveal that the implementation of SPS in elementary science learning still faces various challenges. Several studies and classroom observations indicate that the enactment of SPS is often suboptimal. Teachers tend to emphasize content mastery rather than promoting inquiry and experimentation among students. Consequently, students are seldom actively involved in scientific processes such as designing experiments, posing questions, or identifying variables (Azzahra & Suryandari, 2024).

Based on observations and interviews conducted in one elementary school in Bandung City, it was revealed that although science lessons are regularly implemented, the practice of Science Process Skills (SPS) has not been fully realized. While students are actively involved in learning activities, teachers have not yet optimally trained their SPS, particularly in facilitating exploration and investigation. This situation highlights a gap between curriculum expectations and actual classroom practices, indicating that the implementation of SPS in elementary science learning still faces multiple challenges (Rahmadhani & Rohman, 2025).

First, teachers' competencies in applying SPS-based instruction—such as understanding and mastering strategies for active and innovative learning—need further improvement (A. N. Azzahra & Suryandari, 2024). Second, the time allocation required for SPS-oriented learning is often shortened or skipped, preventing scientific activities from being carried out as intended (Munawaroh & Wahidin, 2022). Third, students often demonstrate low motivation to engage in active and exploratory learning (Ramdani, Suryaningsih, & Nurwalidainidmawati, 2024). These conditions may contribute to the suboptimal development of students' scientific attitudes and Science Process Skills (Sholikhah & Subekti, 2025).

In fact, training and strengthening Science Process Skills (SPS) at the elementary level can enhance the quality of science learning and foster students' scientific character Sholikhah & Subekti, 2025). Learning models that emphasize investigation and experimentation have been proven effective in improving students' abilities to formulate scientific questions, conduct critical observations, and develop hypotheses (Rohmah, Ngazizah, & Anjarini, 2022). Therefore, efforts to build teacher capacity and provide adequate learning facilities should become priorities in addressing these issues.

In addition, students' motivation and understanding of the importance of Science Process Skills (SPS) also require attention. Learners with strong interest and curiosity tend to be more actively engaged in science learning and are able to continuously develop their scientific skills Sarbaitinil, Muzakkir, Yasin, Baresi, & Muhammadong, 2024). Therefore, teachers must be able to create engaging and intellectually stimulating learning environments that encourage students to think critically and creatively within the context of science education (Meilandari, Loliyana, Perdana, & Surahman, 2023).

This study is important because effective science learning not only contributes to improving academic achievement but also develops essential life skills required in today's digital and information era (Jamilah, Sadiqin Ikwan Khairu, & Zulkarnain, 2024). Strong Science Process Skills (SPS) enable students to scientifically understand natural phenomena and actively participate in evidence-based decision-making. Therefore, the findings of this study are expected to serve as a strategic foundation for enhancing the quality of elementary science education, particularly in the development of SPS.

This study also seeks to identify both the inhibiting and supporting factors in the implementation of Science Process Skills (SPS) within science learning, thereby providing a comprehensive understanding for educational stakeholders in formulating well-targeted

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teacher training policies and programs (Kanji & Nawir, 2020). The results of this study are expected to serve as a reference for improving science teaching practices that are oriented toward the optimal development of SPS. In line with this, the teacher's role in shaping students' character is highly significant and directly linked to how teachers create a positive learning climate within the school environment (Pius, Resi, & Peha, 2021). This study further reinforces the notion that without adequate infrastructure and appropriate teaching methods, students' abilities to carry out scientific processes will be difficult to enhance.

Based on the foregoing, the implementation of Science Process Skills (SPS) in elementary science learning is pivotal to overall instructional success and to the development of students' scientific competencies. Accordingly, this study aims to analyze the enactment of SPS in science instruction at one elementary school in Bandung City and to identify the factors that influence its implementation. The findings are expected to make a practical contribution to improving the quality of elementary science education and to strengthening teachers' competencies in SPS-oriented science instruction.

METHODOLOGY

This study employed a qualitative approach with a case study design to obtain an in-depth understanding of the implementation of Science Process Skills (SPS) in science instruction at one elementary school in Bandung City. Data were collected through (a) classroom observations to directly examine SPS-related learning activities; (b) semi-structured interviews with the classroom teacher to elicit perceptions, experiences, and challenges in implementing SPS; and (c) document analysis of teaching modules and student worksheets (LKPD) to complement the dataset (A. N. Azzahra & Suryandari, 2024). Data analysis followed three interrelated procedures data reduction, data display, and inductive conclusion drawing to produce a comprehensive account of the factors influencing SPS implementation in the observed setting (Sugiyono, 2015).

This study employed a qualitative approach with a case study design to obtain an in-depth understanding of the practices and challenges of Science Process Skills (SPS) in science instruction at one public elementary school in Bandung City. The participants comprised one Grade 5 classroom teacher, the school principal, and 29 students who were actively involved in the science learning process. Data were collected through (a) classroom observations using a structured observation sheet to record SPS-related activities; (b) semi-structured interviews with the teacher to elicit perceptions, experiences, and constraints in implementing SPS; and (c) document analysis of teaching modules and student worksheets (LKPD) to complement and triangulate the dataset (Sugiyono, 2015).

The collected data were analyzed using Miles and Huberman's interactive analysis technique, which includes data reduction, data display, and inductive conclusion drawing (Miles, Huberman, & Saldana, 2014). To enhance data credibility, technique triangulation was employed by cross-checking findings from observations, interviews, and document analysis. Accordingly, the study is expected to provide a comprehensive account of the practices and challenges in the implementation of Science Process Skills within elementary science instruction.

RESULTS AND DISCUSSION

In this study, the instructional content focused on the concept of ecosystems and the interrelationships among living organisms within food webs, aligned with the *Merdeka Curriculum* for Grade 5. The learning materials were designed in accordance with the curriculum's emphasis on contextual learning and the strengthening of 21st-century competencies, including critical and creative thinking (Noptario, Rizki, Nur'aini, & Ningrum, 2024). The instructional model employed was Cooperative Learning, which enables students to interact actively in groups to construct scientific understanding collaboratively (Sahriani, Darmawan, & Jus, 2024). This approach was supported by the use of varied learning media such as videos, student worksheets (LKPD), and role-play activities which have been shown to effectively enhance students' motivation and engagement in science learning (Lestari, Nahadi, & Solihati, 2021; Lestari et al., 2021).

Moreover, the implementation of inquiry-based learning is crucial for cultivating students' scientific competencies, including the ability to pose investigable questions, formulate hypotheses, and identify research variables (Intan Maharani, Dasna, & Utama, 2023). The success of such learning does not depend solely on the preparedness of materials and instructional models, but also on the teacher's active role in facilitating an engaging and intellectually challenging learning process so that Science Process Skills can develop optimally. Accordingly, the following analysis of results and discussion is intended to provide a comprehensive portrait of the practices and challenges in developing SPS in elementary classrooms, while offering relevant improvement recommendations grounded in field findings and the latest literature.

Formulating Investigable Questions

Based on analysis of the teacher interview instrument, the science lesson plans indicate efforts to employ a scientific approach and to pose Higher-Order Thinking Skills (HOTS) questions designed to stimulate students' curiosity and critical thinking. Instructional strategies such as group discussions, experiments, and role-play were used to encourage students to actively generate questions and seek scientific answers. However, the teacher acknowledged that limited instructional time and students' varying readiness constrained the consistent and optimal training of the skill of formulating investigable questions.

The classroom observations corroborated these findings, showing that the teacher actively trained students to pose investigable questions particularly during the lesson opening for example, by offering trigger questions and presenting relevant everyday phenomena. In this study, a "What If" role-play activity and small-group discussions were used to provide space for students to formulate contextual and meaningful investigable questions. Nevertheless, the observation instrument indicated that student participation in question-posing remained uneven, with variability across groups, largely because some students were passive during instruction.

The teaching module used in this study also supported the development of skills for formulating investigable questions by providing *trigger* prompts designed to spark curiosity and by offering student worksheets (LKPD) that systematically guided learners to identify and articulate learning questions. The materials integrated role-play and formative quizzes to iteratively exercise students' analytical and critical thinking. This aligns with the importance of inquiry-based activities and the use of open-ended questioning for developing Science Process Skills among elementary students (Oktaviani et al., 2023).

According to Angelia, Supeno, & Suparti (2022), the use of challenging and context-rich investigable questions in science instruction has a strong positive effect on students' ability to independently identify scientific problems. In addition, students' participation in group discussions and role-play activities has been shown to increase motivation and active engagement in inquiry-based learning. Therefore, despite constraints related to time and student readiness, the combination of instructional strategies and the teaching module employed in this study was sufficiently effective in developing students' skills in formulating investigable questions.

Formulating Hypotheses

The teacher implemented instruction that encouraged students to generate tentative explanations or hypotheses, particularly during inquiry-based lessons and through the use of student worksheets (LKPD). Concrete prompts were provided for instance, asking students to investigate the causes of ecosystem imbalances so that learners practiced predictive reasoning and articulated scientific assumptions based on initial observations. Nevertheless, the teacher's responses also revealed constraints such as limited instructional time and differences in student readiness, which prevented all students from optimally developing this skill. These findings suggest that, although hypothesis-formulation has been purposefully integrated into instruction, its classroom enactment continues to face practical challenges.

The classroom observations showed that the teacher systematically guided students through discussions and experiments that culminated in hypothesis formulation. However, several students still struggled to articulate clear, logically grounded hypotheses likely because they were not yet accustomed to a systematic scientific reasoning pattern. The teaching module supported this learning through activities such as role-playing and small-group discussions that prompted students to analyze potential impacts on ecosystems, thereby encouraging hypothesis construction. Even so, the module did not explicitly provide a step-by-step guide for developing hypotheses; incorporating such guidance could help students structure their scientific thinking more effectively.

The skill of formulating hypotheses is a pivotal stage in scientific learning that requires sustained guidance and practice (Jumiarti & dkk., 2023). Research indicates that inquiry-based instructional strategies accompanied by purposefully designed media and student worksheets (LKPD) can enhance students' abilities to construct valid and relevant hypotheses (Angelia et al., 2022). Moreover, teacher professional development in techniques that stimulate critical thinking and problem-solving is essential to address students' difficulties in hypothesis construction (Mulyadi, 2022). Accordingly, although multiple strategies were implemented in the present study, strengthening teacher capacity and developing more systematically structured modules would substantially support students' growth in hypothesis-formulation skills.

Identifying Research Variables

The skill of identifying research variables has received explicit attention in the science learning process. The teacher reported that students were trained to recognize types of variables independent, dependent, and controlled through discussions and simple case examples related to ecosystems. The teacher also utilized student worksheets (LKPD) containing explicit guidance to help students understand and identify relevant variables within the context of scientific inquiry. This practice aligns with inquiry-based learning approaches that emphasize understanding research components as a foundational step in the scientific process (Angelia et al., 2022). However, the teacher also noted challenges, particularly that some students found it difficult to grasp the abstract concept of variables, especially those who required repetition and more intensive guidance.

The classroom observations confirmed that the teacher actively guided students to recognize variables by posing targeted questions and providing concrete examples. The use of instructional media such as videos and role-play also helped students understand the role of each variable in the experiments they conducted. The teacher-developed module further offered structured activities that led students to accurately identify and categorize variables. Nevertheless, some students were not yet able to independently identify variables, indicating the need for more adaptive and repetitive methods in teaching the concept of research variables. Gradual reinforcement of variable concepts and the use of visualizations can enhance students’ understanding and effectiveness in identifying research variables (W. Azzahra, Inayah, Sirojudin, & Junaeti, 2023).

The development of the skill to identify variables is foundational to cultivating students’ critical and scientific thinking (Nugraheni, Dibia, & Margunayasa, 2021). Implementing instructional strategies that emphasize hands-on practice and small-group discussion can help students grasp the functions of, and relationships among, variables within a study (Sholihah & Amaliyah, 2022). Accordingly, strengthening teacher training in the use of varied, concept-focused pedagogies for teaching research variables will substantially improve this skill. Thus, while the present findings indicate that instruction in identifying variables has begun to take root, more robust strategies are needed to ensure that all students can master the concept in a deeper and more applicable manner.

Selecting Tools and Materials

The skill of selecting appropriate tools and materials has become an integral component of science instruction, particularly when preparing experiments and practical activities related to ecosystem content. The teacher reported that tools and materials were prepared comprehensively and aligned with the needs of the learning activities so that students could conduct experiments effectively. This approach is consistent with practice-oriented pedagogy, which underscores advance preparation of tools and materials as a foundation for successful scientific activity (Minarni, Kundera, Tangge, Sutrisnawati, & Ramadhan, 2024). However, the teacher also acknowledged that time and resource constraints sometimes limited students’ opportunities to participate actively and independently in choosing tools and materials.

The classroom observations showed that the teacher systematically provided explanations and demonstrations of the tools and materials to be used before students began the practicum activities. The teaching module also included a detailed list of required tools and materials, facilitating preparation for both teacher and students. Nevertheless, students’ involvement in determining and selecting tools and materials remained limited; they primarily acted as implementers of plans predetermined by the teacher. Developing students’ ability to

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independently choose appropriate tools and materials is crucial for fostering autonomy and a deeper understanding of the scientific process (Suwintara, 2022). Therefore, offering broader opportunities for active student participation in this phase is expected to enhance their practical skills and readiness to conduct experiments.

Overall, the instrument analysis indicates that the skill of selecting tools and materials in Grade 5 science instruction has been implemented well with respect to the provision and use of learning resources; however, greater improvement is needed in actively engaging students in the selection process. Optimizing instructional approaches that involve students directly in planning experiments will strengthen mastery of scientific skills while cultivating independence and responsibility within inquiry-based science learning.

Determining Procedural Steps

The skill of determining procedural steps is a crucial component in planning and implementing science instruction, particularly for experiments related to ecosystem topics. The teacher reported that the procedures were systematically organized in the teaching module and communicated clearly to students to ensure smooth lesson execution. This approach is consistent with inquiry-based models, which require students to understand and follow scientific procedures in a sequential manner (Nahdi, Ansori, & Khaerunisa, 2020). Nevertheless, the teacher acknowledged that some students still required intensive guidance to follow the steps accurately and to grasp the purpose of each stage.

Classroom observations confirmed that the teacher provided well-structured instructions on procedural steps, both through direct explanation and via the student worksheets (LKPD). Role-play activities and small-group discussions were also used to help students understand the correct sequence of procedures. The teaching module, which included detailed step-by-step guidance, supported students in conducting experiments systematically. Nevertheless, several students appeared insufficiently independent in determining procedural steps on their own, indicating the need to strengthen more interactive instruction and repeated practice so that this skill can develop optimally.

The skill of determining procedural steps is a key competency in inquiry-based instruction for cultivating students' systematic thinking and scientific process skills (Sari, Kristin, & Anugraheni, 2019). Employing pedagogies that emphasize hands-on practice and reflection on procedures effectively enhances students' understanding and independence in carrying out scientific protocols (Sholihah & Amaliyah, 2022). Therefore, although the teacher has implemented several supportive strategies, expanding the use of active learning methods and strengthening scaffolding are expected to further optimize students' mastery of determining procedural steps.

Determining Formats for Presentation and Inquiry

The skill of determining appropriate formats for presenting and reporting investigations received explicit attention in science instruction, particularly at the concluding stage of experimental activities. The teacher explained that students were directed to present their findings through written reports and group presentations, which included drafting conclusions, creating relevant diagrams or figures, and discussing results with peers. This approach is consistent with inquiry-based principles that emphasize systematic and communicative reporting as an essential component of the scientific process (Bless, Rahayu, & Asrul, 2024). Nevertheless, the teacher acknowledged persistent challenges in students' abilities to produce well-structured report formats, especially among those who are not yet accustomed to articulating research outcomes in written or oral form.

Classroom observations further showed that the teacher provided student worksheets (LKPD) containing explicit guidance on formats for presenting investigation results including tables, diagrams, and reflective prompts to help students compile reports systematically. However, because these formats were fully predetermined by the teacher, students were not trained to develop their own modes of presentation. Yet the ability to design presentation formats independently can stimulate critical and creative thinking and accustom learners to organizing and communicating findings without reliance on templates. Accordingly, it would be beneficial to allocate space for students to design their own presentation formats in order to strengthen the higher-order thinking skills that are central to inquiry-based science learning.

The skill of determining formats for presentation and inquiry is a crucial component of science process learning that supports the development of students' scientific communication abilities (Angelia et al., 2022). Instruction that repeatedly integrates scientific report writing and oral presentations can enhance students' understanding of report structure and improve their capacity to communicate research findings (Sholihah & Amaliyah, 2022). In addition, teacher training in delivering constructive feedback on students' presentations has been shown to increase the quality of outputs and students' motivation to learn. Therefore, although the teacher has provided media and format guidelines, sustained practice is essential to ensure that this skill develops optimally.

Carrying Out Procedural Steps

The skill of carrying out procedural steps was a central focus of science instruction, particularly when students conducted experiments and practical activities related to ecosystems. The teacher reported that students received direct guidance and instruction so they could follow scientific procedures sequentially and accurately, in accordance with the steps outlined in the teaching module. This approach is essential for building scientific discipline and sound practical skills, which are key competencies in inquiry-based learning (Angelia et al., 2022). However, the teacher also noted that some students still required intensive support to execute the procedures independently and meticulously.

Classroom observations indicated that the teacher facilitated students by providing step-by-step instructions and using student worksheets (LKPD) as guides for conducting experiments. Role-play activities and small-group discussions were also employed to reinforce students' understanding of the processes to be followed. The comprehensive and well-structured teaching module helped students grasp and implement procedural steps systematically. Even so, students should also be trained to devise procedural steps independently rather than relying exclusively on teacher-provided directions, so that they develop logical reasoning and a deeper understanding of experimental flow. Although most students were able to follow procedures appropriately, some still struggled to maintain consistency and precision at each stage, indicating the need for more frequent practice and the strengthening of scientific practical skills.

The skill of carrying out procedural steps is a fundamental component in developing science process competencies, helping students internalize the scientific method and think systematically (Sari et al., 2019). Instruction that emphasizes repeated practice, reflection on procedures, and constructive teacher feedback is effective in increasing students'

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independence and accuracy in executing scientific protocols (Widyastika & Wahyuni, 2022). Therefore, although various supportive methods have been implemented, enhancing the quality of practical learning through scaffolding and cooperative learning approaches is strongly recommended to further optimize students' proficiency in carrying out procedural steps.

Conducting Observations

The skill of conducting observations is a key aspect explicitly cultivated in science instruction. The teacher explained that observations were carried out both directly through experiments and indirectly through instructional media such as videos and demonstrations. This aligns with inquiry-based approaches that position observation as a fundamental step in the scientific process for collecting empirical data (Bless et al., 2024). Nevertheless, the teacher acknowledged that students' levels of observational skill varied, indicating the need for more focused and repeated instructional strategies to enable optimal development of this competency.

Classroom observations showed that the teacher provided clear guidance and facilitated students' observations through student worksheets (LKPD) containing detailed instructions on what to attend to during practical activities. Role-play and small-group discussions were also used to sharpen students' abilities to observe phenomena and to communicate their observational findings effectively. The teaching module supported this process by providing relevant observation examples and step-by-step instructions, helping students understand how to conduct observations systematically and accurately. Even so, students should be asked to conduct observations in accordance with procedural steps they have devised themselves rather than those supplied directly by the teacher, so that they become more independent in constructing scientific understanding. Observations further indicated that some students still struggled to interpret their results accurately, which remains a challenge for the development of scientific skills.

The skill of conducting observations is a crucial foundation of scientific thinking that must be continually developed through repeated practice and appropriate guidance (Widyastika & Wahyuni, 2022). Research indicates that inquiry-based instruction, supported by varied media and structured directions, can improve students' ability to observe and record data in a detailed and systematic manner (Sari et al., 2019). Moreover, constructive teacher feedback during the observation process helps students refine and strengthen this competency. Therefore, sustained instructional emphasis on observational skills is essential for cultivating scientifically proficient learners.

Drawing Conclusions

The skill of drawing conclusions has been an important component of science instruction. The teacher reported that students were guided to derive conclusions based on the data and observations they collected during experiments. This approach is consistent with inquiry-based principles that emphasize students' capacity to process and analyze data to generate scientific understanding (Nahdi et al., 2020). Nevertheless, the teacher acknowledged that some students still struggled to formulate accurate and logical conclusions, thereby requiring ongoing guidance.

Classroom observations indicated that the teacher provided guidance and exemplars for composing conclusions, both orally and in writing through the LKPD. Small-group discussions were also used to strengthen students' ability to articulate conclusions that are clear and aligned with the collected data. The teaching module offered systematic guidance for drawing conclusions, helping students understand the necessary steps. However, the observations suggested that this skill had not been fully mastered by all students, particularly in linking observational results to relevant scientific concepts.

The skill of drawing conclusions is an integral part of critical and scientific thinking that must be continuously refined through inquiry-oriented and reflective instruction (Sari et al., 2019). Research shows that pedagogies involving data analysis activities and collaborative discussion are effective in improving students' ability to draw accurate and well-reasoned conclusions (Ardhiyanti, Sitriyono, & Pratama, 2019). Moreover, teacher feedback during the learning process plays a crucial role in helping students improve the conclusions they formulate. Therefore, sustained instruction focused on developing analytical and reflective skills is essential for enhancing students' capacity to draw scientific conclusions.

Writing Investigation Reports

The skill of writing investigation reports has been an integral component of science instruction. The teacher explained that students were directed to compile reports based on the data and observations collected during experiments, both in written form and through oral presentations. This is consistent with inquiry-based learning principles that highlight scientific communication as a core element of the scientific process (Sari et al., 2019). Nevertheless, the teacher acknowledged ongoing challenges in guiding students to produce reports that are systematic, coherent, and compliant with scientific conventions, particularly among those less accustomed to writing activities.

Classroom observations revealed that the teacher provided LKPD with a clear, well-structured report format, giving students a concrete guide for compiling their investigation reports. The teacher also offered direct guidance and facilitated small-group discussions to strengthen students' understanding of key components of a scientific report such as background, methods, results, and conclusions. The teaching module, which included detailed instructions for report writing, proved helpful for gradually developing students' scientific writing skills. Even so, students should be encouraged to compose their investigation reports without a predetermined template so that they become accustomed to organizing information independently and can further develop critical thinking and scientific expression. Observations also indicated that some students still require repeated practice and more intensive feedback to optimize their report-writing skills.

The skill of writing investigation reports is a crucial competence in science education that not only enhances students' scientific writing abilities but also helps them organize and effectively communicate research findings (Sholihah & Amaliyah, 2022). Inquiry-based learning combined with routine report-writing practice and constructive feedback can significantly improve the quality of students' reports (Nahdi et al., 2020). Therefore, strengthening instructional strategies that focus on developing scientific writing and the communication of investigative results is essential to cultivate learners who are not only capable of conducting experiments but also able to communicate their work in a scientific and systematic manner.

CONCLUSION

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The implementation of Science Process Skills (SPS) in elementary science instruction shows promising efforts through the use of student worksheets (LKPD), teaching modules, cooperative discussions, and inquiry-based experiments. The observed SPS span a continuum of scientific competencies from formulating questions to producing investigation reports. Nevertheless, challenges persist, including limited instructional time, suboptimal student independence, and a tendency toward teacher-prescribed formats and procedures that constrain students' exploratory space. Accordingly, instructional strategies should be reinforced to foster critical and creative thinking by actively involving students in designing procedural steps, selecting presentation formats, and composing reports independently. Sustained support in the form of teacher professional development, scaffolding, and constructive feedback is also essential to ensure that SPS development proceeds more optimally and can be maintained over time.

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