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Analysis of Problems in The Science Learning Process at Elementary Schools

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Abstract

This study aims to examine the problems encountered in the science learning process among fifth-grade elementary school students in West Java within the context of 21st-century education, which emphasizes critical thinking, scientific attitudes, and practice-based learning experiences. The study employed a qualitative descriptive approach using closed-ended questionnaires distributed to students and in-depth interviews with science teachers and homeroom teachers. The findings reveal that science learning continues to face several interconnected challenges, particularly related to teachers' pedagogical competence and the utilization of instructional media. Low student participation and learning motivation were strongly influenced by the dominance of teacher-centered conventional teaching methods, resulting in limited opportunities for students to engage in exploratory and contextual learning experiences. In addition, available learning facilities had not been optimally utilized in experimental and hands-on learning activities. The study concludes that strengthening teachers' competencies in developing active, contextual, and experience-based science instruction is urgently needed. Therefore, continuous professional development programs focusing on innovative science teaching strategies and effective utilization of learning media are essential in elementary education.

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INTRODUCTION

Science education at the elementary school level plays a strategic role in developing students' logical, critical, systematic, and scientific thinking skills from an early age. Science is not merely understood as a collection of concepts and theories but also as a scientific process that emphasizes observing, classifying, predicting, experimenting, and drawing conclusions based on empirical evidence (Trianto, 2014). Therefore, science learning in elementary schools should provide direct learning experiences through exploratory activities that enable students to construct meaningful understanding.

Within the context of 21st-century education, science learning is expected to foster critical thinking, creativity, communication, and collaboration skills as essential student competencies (Partnership for 21st Century Learning, 2019). In line with this perspective, the implementation of the Merdeka Curriculum also positions students as active participants in the learning process through project-based learning, exploration, and contextual problem-solving approaches (Kemendikbudristek, 2022). However, the reality of science instruction in elementary schools still demonstrates a significant gap between curricular expectations and classroom practices.

Previous studies have shown that science learning at the elementary level remains dominated by lecture-based instruction and memorization-oriented activities centered on teachers. Such conditions contribute to low student engagement and limited opportunities for practice-based learning experiences (Susanto, 2016). Other findings indicate that some teachers experience difficulties in designing innovative science instruction due to limited pedagogical competence and insufficient use of instructional media (Samatowa, 2018). Consequently, science learning tends to become monotonous and less effective in fostering students' learning motivation.

These challenges become increasingly complex because science learning requires experimentation and observational activities supported by adequate learning facilities. In reality, not all schools are able to optimize the use of available facilities. In several cases, learning facilities are utilized merely for administrative purposes without being effectively integrated into classroom instruction (Fadlillah, 2019). This situation contributes to the low quality of students' learning experiences in understanding scientific concepts concretely and contextually.

From a psychological perspective, elementary school students are in the concrete operational stage, making them more capable of understanding concepts through direct experiences and manipulative activities rather than abstract verbal explanations alone (Piaget, 1972). Therefore, overly verbalistic science instruction potentially reduces students' interest and learning motivation. Learning motivation is an important factor influencing learning success because it is directly related to students' attention, engagement, and persistence during the learning process (Uno, 2021). Low motivation in science subjects may ultimately affect students' academic achievement and weaken their scientific thinking abilities.

In addition to motivational aspects, the quality of science learning is also influenced by teachers' ability to manage instruction effectively. Teachers' pedagogical competence includes understanding student characteristics, designing instruction, selecting appropriate strategies, utilizing instructional media, and conducting effective assessments (Mulyasa, 2017). Teachers who are unable to develop active and contextual learning environments tend to rely on conventional teaching methods that provide limited opportunities for student participation. In the long term, such conditions may hinder the development of students' critical thinking skills and scientific attitudes.

Based on these considerations, this study is important to conduct in order to identify and analyze various problems occurring in the science learning process at elementary schools, particularly among fifth-grade students in West Java. The study specifically focuses on learning challenges related to teacher competence, student motivation, the use of instructional media, and the utilization of supporting facilities in science instruction. The findings are expected to contribute both academically and practically to the development of more effective, active, and contextual science learning strategies in elementary education.

METHOD

This study employed a qualitative descriptive approach to analyze various problems encountered in the science learning process among fifth-grade elementary school students. A qualitative approach was selected because it enables an in-depth understanding of learning phenomena based on experiences, perceptions, and social interactions occurring within the school environment (Creswell & Poth, 2018). Through this approach, challenges in science instruction could be examined contextually according to the actual conditions experienced by teachers and students.

The study was conducted in several elementary schools in West Java involving fifth-grade students, science teachers, and homeroom teachers as research participants. Participants were selected purposively based on their direct involvement in the science learning process. Purposive sampling was applied to obtain informants considered capable of providing relevant information regarding the conditions of science learning in elementary schools (Sugiyono, 2022).

Data were collected through closed-ended questionnaires distributed to students and in-depth interviews with science teachers and homeroom teachers. The questionnaires were used to identify students' learning motivation, participation levels, learning experiences, and perceptions toward instructional methods used in science classes. Closed-ended questionnaires enabled the researchers to obtain more structured data that could be systematically analyzed based on response tendencies (Arikunto, 2021).

Meanwhile, in-depth interviews were conducted to explore information regarding instructional strategies, challenges in science teaching implementation, utilization of instructional media, and obstacles in conducting practical and experimental activities. In-depth interviews were chosen because they provide richer and more reflective data concerning teachers' pedagogical experiences in managing classroom instruction (Moleong, 2018). The interviews were conducted using a semi-structured format, allowing participants to explain learning conditions more comprehensively.

In addition to questionnaires and interviews, classroom observations were conducted to identify interaction patterns between teachers and students, the use of instructional media, student engagement levels, and learning activities during science instruction. Observation also functioned as a triangulation technique to strengthen the validity of questionnaire and interview data (Miles et al., 2014).

The collected data were analyzed using an interactive analysis model consisting of data reduction, data display, and conclusion drawing. During the data reduction stage, information obtained from interviews, observations, and questionnaires was selected based on its relevance to the research focus. The data were then presented in narrative form to facilitate interpretation of patterns related to science learning problems. Finally, conclusions were drawn gradually by examining relationships among the data to generate a comprehensive understanding of factors influencing the quality of science learning at the elementary school level (Miles et al., 2014).

Data validity was ensured through source triangulation and method triangulation. Source triangulation was conducted by comparing data obtained from students, science teachers, and homeroom teachers, while method triangulation involved comparing findings from questionnaires, interviews, and observations. These techniques were employed to ensure data consistency and credibility (Lincoln & Guba, 1985).

Ethically, the study considered participant confidentiality and informed consent from all informants. All collected data were used solely for academic purposes and for improving the quality of science learning in elementary schools. Therefore, this study is expected to produce objective, valid, and relevant findings in explaining problems within the science learning process in elementary education contexts.

RESULTS AND DISCUSSION

Low Student Participation and Learning Motivation in Science Learning

The findings revealed that low student participation remains one of the primary problems in the science learning process at the elementary school level. Most students tended to be passive during classroom activities and only became involved when directly prompted by the teacher. This condition was reflected in the limited interaction among students, low confidence in expressing opinions, and lack of enthusiasm during classroom instruction. Such circumstances indicate that the learning process has not fully created an educational environment capable of encouraging students' intellectual and emotional engagement. In fact, active student involvement is a fundamental indicator in science learning because scientific knowledge is not merely acquired through receiving information but also through questioning, observing, discussing, and directly examining natural phenomena. Consequently, low student participation causes the learning process to become mechanical and limits opportunities for developing students' scientific curiosity from an early age.

Based on questionnaire findings, several students perceived science as a difficult subject because it contains numerous abstract concepts and memorization-oriented materials. This perception reduced students' internal motivation to actively engage in classroom learning. Within the context of elementary education, negative perceptions toward a subject tend to emerge when students fail to obtain learning experiences that are relevant to their everyday lives. As a result, science is often understood as a body of theoretical concepts that must be memorized rather than as a process of understanding natural phenomena closely connected to students' empirical experiences. This finding is consistent with Uno (2021), who argues that learning motivation is directly related to student engagement in the learning process. Students with low motivation tend to demonstrate limited attention and passive learning behavior. Therefore, low motivation in science learning not only affects students' classroom participation but also influences their ability to develop deep and sustainable conceptual understanding.

Low student motivation was also influenced by the predominance of one-way instructional patterns. Teachers tended to dominate classroom explanations rather than providing opportunities for students to engage in exploration and discussion. Consequently, science learning became monotonous and failed to provide meaningful learning experiences for students. Under such conditions, students functioned more as passive recipients of information than as active learners constructing knowledge independently. In the long term, instructional practices that primarily focus on content delivery potentially hinder the development of critical thinking skills and science process skills. This finding supports Hake's (1998) study, which demonstrated that lecture-based instruction results in lower student engagement compared to active experience-based learning approaches. Therefore, the dominance of teacher-centered instruction in science learning indicates that classroom practices have not fully aligned with the characteristics of 21st-century education, which emphasize active participation, collaboration, and contextual knowledge exploration.

In elementary science learning, direct learning experiences play a crucial role because students are still within the concrete operational stage of cognitive development (Piaget, 1972). At this stage, students understand concepts more effectively through manipulative activities, observations, and empirical experiences than through abstract verbal explanations. Consequently, the dominance of lecture-based methods causes students to experience difficulties in understanding scientific concepts deeply. When instruction relies solely on theoretical explanations without involving concrete experiences, students struggle to connect scientific concepts with realities encountered in their daily lives. As a result, students' understanding of science concepts becomes superficial and easily forgotten because the learning process is not supported by meaningful empirical experiences. In science education, direct experience functions not only to strengthen conceptual understanding but also to develop observational skills, logical reasoning, and scientific attitudes among students.

Interview findings with teachers further indicated that low student participation was frequently influenced by limited variation in instructional strategies used in classrooms. Teachers acknowledged that science instruction remained heavily oriented toward completing curriculum materials rather than developing exploratory learning activities. This condition reflects administrative pressures and curriculum targets that encourage teachers to prioritize content completion over the quality of students' learning experiences. In addition, limited mastery of innovative instructional strategies led teachers to rely on methods considered practical and manageable within heterogeneous classroom settings. These findings suggest that the problems in science learning are not solely associated with students' motivation but are also closely related to teachers' pedagogical readiness in managing active and participatory learning environments. When instruction is excessively oriented toward curriculum completion, opportunities for student exploration become increasingly limited, and the contextual dimension of learning gradually diminishes.

These findings demonstrate that learning motivation is influenced not only by internal student factors but also by the instructional design implemented by teachers. According to Deci and Ryan (2000), learning motivation develops when students are provided opportunities to participate actively, explore curiosity, and feel involved in the learning process. In this context, instructional design plays a strategic role in shaping meaningful learning experiences capable of strengthening students' attachment to science learning. Learning activities that encourage experimentation, collaborative discussion, and problem-solving tend to be more effective in increasing students' motivation and engagement. Therefore, science instruction should be directed toward more participatory and contextual approaches in order to provide meaningful learning experiences for students. Such approaches are important not only for improving academic achievement but also for fostering scientific attitudes, curiosity, and critical thinking skills as foundational components of scientific literacy among elementary school students.

Dominance of Conventional Teaching Methods

Observation findings revealed that science instruction in classrooms remains predominantly dominated by conventional teacher-centered methods. Teachers relied more heavily on lectures and written assignments than on experiment-based or problem-solving-oriented learning approaches. In several classroom activities, students were merely instructed to take notes and complete exercises without engaging in scientific exploration involving direct observation. Such instructional patterns position students as passive recipients of information rather than active participants in the learning process. Consequently, science learning tends to emphasize content delivery rather than the development of inquiry skills and scientific reasoning.

This instructional model causes science to be understood merely as a collection of facts that must be memorized rather than as a scientific process that should be experienced directly by students. In fact, the essence of science encompasses scientific products, processes, and attitudes that should be developed in a balanced manner during instruction (Trianto, 2014). When learning focuses excessively on cognitive memorization, students' critical thinking abilities and science process skills become underdeveloped. As a result, students may achieve short-term conceptual recall while lacking the capacity to apply scientific reasoning in real-life contexts. This condition indicates that the instructional process has not yet fully supported the development of scientific literacy among elementary school students.

The dominance of conventional teaching methods also indicates that the transformation toward 21st-century learning has not been optimally implemented at the elementary school level. Twenty-first-century education requires instructional strategies capable of fostering collaboration, communication, creativity, and critical thinking skills among students (Partnership for 21st Century Learning, 2019). However, the findings demonstrate that science learning still tends to position students as passive recipients of information. Such practices contradict the contemporary educational paradigm, which emphasizes active knowledge construction and participatory learning environments. As a consequence, classroom interaction becomes limited, collaborative learning opportunities decrease, and students' exploratory capacities remain underdeveloped.

This condition is influenced by teachers' limited pedagogical competence in developing innovative instructional strategies. Several teachers admitted that they were not accustomed to designing project-based learning, simple experimental activities, or inquiry-based instruction. In addition, limited instructional time encouraged teachers to prefer lecture-based methods because they were considered more practical for delivering content efficiently. These findings are consistent with Darling-Hammond et al. (2020), who argue that educational transformation requires continuous pedagogical support and professional teacher development. The findings suggest that difficulties in implementing innovative learning are not solely caused by individual teacher limitations but are also related to institutional and systemic demands that prioritize curriculum completion over meaningful learning experiences.

From a pedagogical perspective, the continuous use of conventional instructional methods may hinder the development of students' scientific thinking abilities. According to Vygotsky (1978), effective learning should provide opportunities for social interaction and active experiences that enable students to construct understanding through knowledge-building processes. In science education, such interaction is essential because scientific understanding develops through dialogue, investigation, experimentation, and collaborative reasoning. Therefore, science instruction should be directed toward more interactive, collaborative, and experience-based learning strategies. Such approaches are important not only for improving academic achievement but also for fostering curiosity, scientific attitudes, and higher-order thinking skills among elementary school students.

Limited Utilization of Learning Media and Educational Facilities

The findings revealed that several schools actually possessed supporting facilities for science learning, such as simple teaching aids, visual media, and basic practical equipment. Nevertheless, these facilities had not been optimally utilized during classroom instruction. In practice, experimental and observational activities were still rarely conducted by teachers. This condition indicates a discrepancy between the availability of educational resources and their pedagogical implementation in classroom settings. Facilities that should function as instruments for active learning instead tended to become administrative complements that were not systematically integrated into science instruction. Consequently, classroom learning continued to be dominated by theoretical explanations without scientific activities that enabled students to construct knowledge through direct experience. These findings demonstrate that the mere availability of educational facilities does not automatically improve learning quality unless accompanied by effective and pedagogically oriented utilization strategies.

Interview findings further revealed that some teachers experienced difficulties integrating instructional media into classroom activities. Teachers tended to rely primarily on textbooks without developing additional contextual and engaging learning media for students. As a result, science instruction became less varied and failed to provide concrete learning experiences. Excessive dependence on textbooks caused science learning to focus more on information transfer than on scientific exploration. Under such conditions, students merely received finalized knowledge without opportunities to observe phenomena, conduct simple experiments, or connect scientific concepts with their surrounding environment. In fact, elementary science learning requires concrete, visual, and experience-based activities to facilitate deeper conceptual understanding. The limited variation in instructional media ultimately reduced the attractiveness of science learning and weakened students' active engagement during classroom activities.

In fact, instructional media play a crucial role in helping students understand abstract scientific concepts. According to Arsyad (2017), instructional media can enhance students' attention, motivation, and comprehension because information is presented more visually and interactively. In elementary science learning, instructional media also help connect theoretical concepts with real-life phenomena familiar to students. The use of instructional media does not merely function as a visual aid but also as a means of creating contextual and meaningful learning experiences. Through appropriate media utilization, abstract concepts such as changes in matter, respiratory systems, or the water cycle can be represented concretely and more easily understood by students. Furthermore, instructional media stimulate students' curiosity because learning no longer depends solely on reading and listening activities but also involves direct interaction with objects and simulations. Therefore, limited use of instructional media directly contributes to the low quality of students' science learning experiences.

The inadequate utilization of learning facilities indicates that the problems in science instruction are not solely related to the availability of resources but also to teachers' ability to manage and utilize them pedagogically. These findings suggest that providing facilities without strengthening teacher competence will not significantly improve instructional quality. In other words, the effectiveness of science learning is strongly influenced by teachers' capacity to design learning experiences that creatively utilize media and the surrounding environment. Within this context, teachers' pedagogical competence becomes a central factor determining whether educational facilities can be transformed into meaningful learning experiences or remain underutilized classroom equipment. Teachers who lack the skills to develop practice-based instruction tend to use media minimally or even avoid using them because such activities require additional preparation and time. Consequently, the problems in science learning are not merely material or infrastructural issues but are fundamentally associated with teachers' pedagogical capacity to transform educational resources into active, participatory, and contextual scientific learning experiences.

Furthermore, limited use of instructional media reduces students' opportunities to obtain authentic scientific experiences. Science learning with minimal practical activities makes it difficult for students to develop science process skills such as observing, measuring, classifying, and drawing conclusions. This condition potentially weakens students' ability to apply scientific concepts in everyday life. When students are not accustomed to conducting observations and simple experiments, science learning tends to stop at theoretical conceptual mastery without being followed by applicative understanding and scientific reasoning. In the long term, this situation may contribute to low scientific literacy because the knowledge acquired by students remains disconnected from empirical realities encountered in daily life. In fact, the essence of elementary science education lies not only in conceptual understanding but also in developing scientific thinking through direct experiences in exploring natural phenomena. Therefore, optimizing the use of instructional media and educational facilities becomes essential for creating more active, contextual, and science process-oriented learning environments for elementary school students.

Problems of Teachers' Pedagogical Competence in Science Learning

The findings revealed that teachers' pedagogical competence is a crucial factor influencing the quality of science learning at the elementary school level. Teachers experienced difficulties in designing active, creative, and experience-based learning activities. In several cases, instruction remained oriented toward completing curriculum targets rather than developing students' conceptual understanding in depth. This condition indicates that science instruction has not been fully directed toward creating learning experiences that enable students to actively construct knowledge through exploration, observation, and problem-solving activities. Consequently, classroom practices tend to emphasize administrative curriculum achievement rather than the development of students' scientific thinking abilities. This situation becomes problematic because elementary science learning should position students as active subjects who construct understanding through empirical experiences. When instruction merely focuses on content delivery, students tend to perceive science as conceptual memorization rather than as a scientific process closely related to everyday life.

Teachers' pedagogical competence includes the ability to understand student characteristics, design instruction, select appropriate strategies, utilize instructional media, and conduct effective learning assessments (Mulyasa, 2017). When these competencies are not optimally developed, instructional processes tend to become monotonous and less responsive to students' learning needs. In the context of science education, pedagogical competence is not limited to the ability to explain subject matter but also includes the capacity to create learning experiences that foster curiosity, science process skills, and active student participation. Teachers who fail to understand the developmental characteristics of elementary students tend to employ instructional approaches that are overly abstract and verbalistic, making scientific concepts difficult for students to comprehend concretely. As a consequence, science learning loses its exploratory dimension and becomes a rigid academic activity with limited opportunities for scientific inquiry. This condition demonstrates that weak pedagogical competence directly affects classroom interaction quality and instructional effectiveness.

The findings also showed that some teachers had not received intensive training related to practice-based science learning and scientific approaches. As a result, teachers felt more comfortable using conventional teaching methods that had long been familiar to them. This condition indicates that the professional development of teachers remains a significant challenge in improving the quality of elementary education. Dependence on conventional teaching methods demonstrates that many teachers still face difficulties translating curriculum demands into innovative and contextual instructional practices. Consequently, science learning tends to become repetitive, less varied, and insufficient in developing students' critical thinking skills. In addition, the lack of practice-oriented training reduces teachers' confidence in conducting simple experiments and project-based learning activities. In fact, effective science instruction requires teachers to manage learning activities that position students as the primary actors in scientific investigation processes. Therefore, limited pedagogical training directly contributes to the restricted implementation of instructional innovation in classrooms.

In line with these findings, Shulman (1986) emphasized that instructional quality is strongly influenced by pedagogical content knowledge (PCK), namely teachers' ability to integrate subject-matter mastery with appropriate instructional strategies. In elementary science education, mastery of scientific concepts alone is insufficient if teachers are unable to translate such concepts into contextual and easily understandable learning activities. PCK becomes particularly important because elementary school students require concrete, visual, and experience-based instructional approaches. Teachers who possess content mastery without adequate pedagogical skills tend to deliver scientific concepts theoretically and abstractly, causing students to experience difficulties in understanding concepts applicatively. In contrast, teachers with strong PCK are able to connect science content with everyday phenomena, simplify complex concepts into understandable learning activities, and create more interactive and meaningful classroom environments. Therefore, the quality of science instruction is determined not only by teachers' academic mastery but also by their pedagogical ability to transform knowledge into relevant learning experiences for students.

Therefore, improving the quality of science learning requires systematic strengthening of teachers' capacities through continuous training, pedagogical mentoring, and the development of professional learning communities. Such efforts are essential to enable teachers to develop science instruction that is more adaptive to the demands of 21st-century education and the developmental characteristics of elementary school students. Teacher capacity development should not be limited to short-term theoretical training but must also emphasize sustainable and practical pedagogical reinforcement. In this context, professional mentoring becomes important in helping teachers consistently implement innovative instructional strategies in everyday classroom activities. Furthermore, professional learning communities can function as reflective and collaborative spaces where teachers share experiences, instructional strategies, and solutions to various science learning problems.

Thus, strengthening teachers' pedagogical competence should not only aim at improving individual abilities but also at developing a more innovative, reflective, and student-centered learning culture.

Research Implications

The findings indicate that the problems in elementary science learning cannot be understood as a single issue but rather as a multidimensional condition involving pedagogical, psychological, and structural aspects within the educational process. Low student participation, the dominance of conventional teaching methods, limited utilization of instructional media, and weak pedagogical competence among teachers demonstrate an urgent need for transforming science instruction into a more contextual and experience-oriented learning process. Therefore, this study offers important theoretical and practical implications for the development of elementary education.

From a theoretical perspective, this study reinforces the constructivist view that positions students as active subjects in the learning process. The findings reveal that excessively teacher-centered instruction tends to inhibit student engagement and reduce opportunities for meaningful learning experiences. This condition aligns with constructivist theory, which emphasizes that knowledge is constructed through active interaction between individuals and their learning environments (Vygotsky, 1978). In the context of elementary science education, direct experiences through observation, experimentation, and simple practical activities become essential elements in developing students' conceptual understanding more deeply.

The study also demonstrates that the implementation of 21st-century learning at the elementary level still faces serious challenges, particularly in pedagogical practice. Although the national curriculum emphasizes the importance of developing critical thinking, creativity, communication, and collaboration skills, classroom practices have not fully supported the creation of participatory and exploratory learning environments. These findings reveal a gap between educational policy orientation and practical implementation in schools. According to Darling-Hammond et al. (2020), educational transformation cannot rely solely on curriculum reform but also requires strengthening teachers' capacities as the primary actors in the instructional process.

Practically, the findings provide important implications for the development of elementary school teachers' competencies, particularly in science instruction. Teachers need continuous capacity-building programs related to active learning strategies, scientific approaches, project-based learning, and innovative instructional media utilization. Teacher training should not merely focus on theoretical knowledge but also emphasize pedagogical practices relevant to real classroom conditions. In this way, teachers will not only understand innovative instructional concepts theoretically but also be capable of implementing them effectively in daily teaching activities.

In addition, the findings indicate that optimizing educational facilities does not always depend on sophisticated or expensive resources. Science learning at the elementary level can be enhanced through simple instructional media and the utilization of the surrounding environment as a contextual learning resource. This approach aligns with the characteristics of science learning, which emphasize empirical experiences and direct observation of natural phenomena (Samatowa, 2018). Therefore, teachers' creativity in utilizing local learning resources becomes an important factor in improving the quality of science instruction.

Another implication of this study concerns the importance of strengthening active learning culture in elementary schools. Low student motivation and participation indicate that science instruction has not fully succeeded in fostering curiosity and emotional engagement in learning activities. In fact, curiosity is a fundamental component of science learning because it encourages students to explore, question, and understand phenomena scientifically (Harlen, 2015). Therefore, science instruction should be designed to be more interactive and closely related to students' everyday experiences in order to foster intrinsic learning motivation.

Within the context of educational policy, this study highlights the importance of institutional support for improving science instruction in elementary schools. Schools need to provide collaborative spaces where teachers can share best practices in science teaching and develop professional learning communities. Support from school principals and institutional policies also plays an important role in creating innovative learning cultures within schools. According to Fullan (2016), sustainable educational change requires the involvement of the entire school ecosystem rather than relying solely on individual teacher responsibility.

This study also has implications for the development of science learning assessment at the elementary level. Assessment should not only focus on cognitive mastery of concepts but should also evaluate science process skills, critical thinking abilities, and students' scientific attitudes. Thus, science learning should no longer be viewed merely as a process of knowledge transfer but rather as an effort to develop scientific thinking abilities and scientific literacy from an early age.

Nevertheless, this study has limitations because the research scope was confined to several elementary schools in West Java, meaning that the findings cannot yet be generalized broadly within the Indonesian elementary education context. Therefore, future studies are recommended to involve wider research coverage and apply mixed-method approaches in order to obtain more comprehensive analyses regarding the relationship between teachers' competence, learning motivation, and students' science learning outcomes.

CONCLUSION

Science learning at the elementary school level continues to face various interconnected problems, particularly related to low student motivation and participation, the dominance of conventional teaching methods, limited utilization of instructional media, and insufficient pedagogical competence among teachers. Teacher-centered instructional practices reduce opportunities for students to engage in exploratory, contextual, and practice-based learning experiences, resulting in low student involvement during science learning activities.

Although several schools already possess supporting educational facilities, their utilization in experimental and practical activities remains suboptimal. This condition demonstrates that the quality of science learning is determined not only by the availability of facilities but also by teachers' ability to design active, creative, and developmentally appropriate learning experiences for elementary school students.

This study emphasizes that strengthening teachers' pedagogical competence is an urgent necessity for improving the quality of science instruction in elementary schools. Teacher capacity development through continuous training related to innovative instructional strategies, scientific approaches, and effective instructional media utilization should be implemented systematically to support students' learning motivation, critical thinking skills, and meaningful learning experiences. Furthermore, institutional support from schools is required to create a more participatory, contextual, and scientific literacy-oriented learning culture.

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