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Analysis of the Implementation of Science Learning Methods in the Merdeka Curriculum at SMP Negeri 1 Jember

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Abstract

This study was motivated by the low initial competence of students at the beginning of each new chapter in science learning. This situation often disrupts the teaching and learning process because teachers must repeat basic explanations before moving to the main material. If this continues, learning effectiveness will decline and objectives may not be achieved optimally. Therefore, it is important to understand how teachers respond to this issue through appropriate learning methods. The purpose of this study is to identify and describe the science learning methods used by junior high school teachers in addressing students' low prior knowledge. This research uses a qualitative approach with a case study design. The subjects are science teachers at SMPN 1 Jember selected for their direct experience in teaching and handling classroom challenges. Data were collected through observations, interviews, and documentation to obtain a comprehensive picture of instructional practices. The findings show that teachers choose learning methods based on the characteristics of the material. Conceptual topics are taught through group discussions to encourage peer interaction, while practical material is delivered through experiments to strengthen hands-on skills. Interactive lectures are also used to introduce new concepts clearly. However, several challenges occur, including human error in classroom management, restrictions on mobile phone use that limit digital resource access, and low student participation. These issues highlight the need for more adaptive and innovative science teaching strategies.

Kata kunci: Learning methods, Merdeka Curriculum, Science Learning

1. Introduction

Science learning at the junior high school level plays a very important role in forming the foundation of students' scientific understanding (Kwangmuang et al., 2021). Science not only functions to introduce basic concepts about the universe, living organisms, energy, and matter, but also aims to develop problem-solving skills (Wu et al., 2021). This is because science learning focuses on how students respond to and analyze scientific phenomena around them as well as provide solutions to existing problems, thereby sharpening their problem-solving abilities (Sururi et al., 2025). Through science learning, students are expected to understand natural phenomena logically and systematically, so that they can relate the knowledge learned to everyday life. In addition, science learning in junior high school also aims to develop scientific attitudes such as curiosity, objectivity, and openness to scientific updates. If these abilities are achieved, students' scientific literacy will also improve. With a high level of scientific literacy, students will be able to make informed decisions in solving problems (Aulia Oktaviana et al., 2023). Therefore, science learning becomes an essential foundation for fostering scientific literacy that benefits students as citizens in a modern era filled with technology and information.

Science learning at the junior high school level often faces a number of challenges that can hinder the achievement of learning objectives optimally (Anderman et al., 2012). One of them is the characteristics of science material which are often abstract and require higher-order thinking skills to understand (Ratno et al., 2024). For example, the concepts of force, energy, or cell structure are not easily seen directly, so students have difficulty imagining and relating them to everyday experiences. In addition, learning that is still teacher-centered, such as the lecture method and one-way explanation, tends to make students less actively involved in the learning process (Ulfa et al., 2024). The limitation in the use of learning media, such as teaching aids or laboratory experiments, is

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also a factor that makes students gain less meaningful learning experiences (Arafat, 2022). As a result, many students feel that science learning is boring and difficult to understand, which affects their low interest and motivation to learn.

The unresolved challenges in science learning themselves have many impacts (Jones & Burrell, 2022). This includes the use of less appropriate approaches, which causes students to have difficulty understanding the relationship between theory and real phenomena in everyday life (Sudiana et al., 2025). In addition, the limited availability of learning media and the lack of implementation of methods involving direct activities often worsen this condition, as students only receive verbal explanations without concrete experiences to support their understanding. As a result, students become passive, less engaged in the learning process, and tend to memorize concepts without deeply understanding their meaning (Farhan et al., 2025). In the long term, this can decrease students' interest and motivation in learning science, and even create a negative perception that science is a difficult and unenjoyable subject (Fortus & Touitou, 2021). This condition emphasizes the need for an analysis of the learning methods used by teachers so that the science learning process becomes more meaningful, interactive, and contextual for students.

The Indonesian government introduced the Merdeka Curriculum as a new policy in the national education system. This curriculum is designed to provide greater flexibility for schools and teachers in designing student-centered learning, with the aim of adjusting the learning process according to students' needs, interests, and abilities (Alfaeni et al., 2023). Although it is designed to offer flexibility and promote learner-centered education, its implementation carries certain implications that may pose challenges to the achievement of students' competencies (Limiansi et al., 2023). One of the key policies in this curriculum that has sparked debate is the class promotion system, which is not entirely based on mastery of subject content but rather on the continuity of the learning process (Mayangsari et al., 2024). Consequently, many students advance to the next grade level with insufficient basic competencies, particularly in Science subjects, which have a conceptual and hierarchical structure. This lack of mastery over foundational material causes students to experience difficulties in understanding more advanced concepts, leading teachers to frequently reteach basic material (Thames, 2021). Such conditions not only reduce the effectiveness of instructional time but also negatively affect the overall quality of competency achievement.

The learning method is a way or strategy used by teachers to deliver lesson material so that the objectives of the learning plan can be properly achieved (Wulandari et al., 2022). Methods are important for teachers (Rasulova et al., 2025), because they serve as a guideline for managing teaching and learning activities, ensuring that the learning process is structured, interactive, and meaningful for students. In the context of science learning, the selection of an appropriate learning method holds significant relevance (Alberts, 2022), because science emphasizes scientific processes, the discovery of concepts through direct experience, and the active involvement of students in observing, questioning, experimenting, reasoning, and communicating their learning outcomes. Therefore, the use of appropriate teaching methods Mollick E & Mollick (2023) can help students not only understand concepts theoretically but also develop critical, creative, and scientific thinking skills.

Based on observations at State Junior High School 1 Jember, it was found that many students still possess low basic competencies when beginning a new chapter in science learning. This condition requires teachers to reteach prerequisite material so that students can understand the upcoming topics. Such a situation highlights the importance of analyzing the learning methods used by teachers, particularly within the context of the Merdeka Curriculum, which emphasizes student-centered learning and competency-based development. Through this analysis, it is expected that a clearer understanding can be obtained regarding the effectiveness of the learning methods implemented in supporting the science learning process at State Junior High School 1 Jember.

2. Research Methods

This study employs a qualitative approach with a case study design. A qualitative case study is a research method used to explore and understand a phenomenon in its real-life context, focusing on detailed and in-depth analysis of a specific setting, event, or individual (Ilhami et al., 2024). This approach was chosen because it allows the

researcher to gain a comprehensive understanding of the implementation of science learning methods at SMP Negeri 1 Jember. The research was conducted on October 10 at SMP Negeri 1 Jember as the research site. The research procedure consisted of several stages, namely classroom observations of the learning process, interviews with science subject teachers, and documentation of the learning materials used. Through this approach, data were obtained directly from natural situations without manipulation, so the research results are expected to provide a realistic picture of science learning practices at the school.

The subject of this study is the Grade VII science teacher at SMP Negeri 1 Jember. The subject was selected purposively, based on the consideration that the teacher has direct experience in implementing science learning methods in accordance with the Merdeka Curriculum guidelines. The purposive sampling technique was chosen because it allows the researcher to obtain relevant and in-depth information from sources who are considered to have the most knowledge about the issues being studied. Through interviews and observations with the Grade VII science teacher, the researcher seeks to understand how learning methods are applied in the classroom, the challenges encountered, and the strategies used by the teacher to overcome students' difficulties during the learning process.

The instruments used in this study include observation, interviews, and documentation. The observation instrument was used to directly observe the science learning process in the classroom, particularly in terms of the teacher's application of learning methods and student engagement during learning activities. The interview instrument was employed to obtain more in-depth information regarding the teacher's considerations in selecting learning methods, the challenges faced, and the strategies implemented to enhance learning effectiveness. The interview guide was developed by the researcher and validated through consultation with education experts to ensure the clarity and relevance of the questions. Meanwhile, the documentation instrument was used to collect supporting data in the form of learning materials such as syllabi, lesson plans, and students' learning outcomes, which serve to strengthen and complement the data obtained from observations and interviews.

3. Results and Discussion

Results

Based on the results of observations and interviews, the teacher employs various teaching methods that are adapted to the Basic Competencies and the characteristics of the material being taught. For instance, the interactive lecture method is used when introducing new concepts such as force and energy to help students develop a strong foundational understanding. In addition, group discussions and question-and-answer sessions are implemented to encourage students to think actively and express their opinions. For practical topics, such as simple machines or energy transformation, the teacher applies experimental and simple demonstration methods so that students can directly observe the concepts being studied. In addition, documentation such as the Learning Practice Plan shows that the teacher is not limited to using a single method but also employs more complex approaches, such as project-based learning, for certain topics. This indicates the teacher's effort to develop students' creativity and critical thinking skills through more meaningful learning experiences. The variety of methods used also serves as a strategy to address differences in students' abilities and learning styles within the classroom.

Based on the results of observations and interviews, the teacher faced challenges in the form of low active participation among some students during the learning process, particularly during discussions or group work. Several students tended to be passive due to a lack of confidence, fear of making mistakes, or an incomplete understanding of the material being taught. To address this issue, the teacher implemented a peer tutoring strategy, in which students with better understanding were assigned to assist their classmates.

The implementation of peer tutoring has proven to create a more engaging and participatory classroom atmosphere. Based on the observations, students who were previously passive became more confident in expressing their opinions and asking questions when guided by their peers. Moreover, this strategy also helped foster a sense of responsibility, empathy, and communication skills among students. The teacher acted as a facilitator, monitoring the interactions to ensure they remained focused on the learning objectives. Thus, the use

of peer tutoring is not only a solution to enhance student activeness but also an effective means of fostering collaboration and mutual support within the learning environment.

In implementing learning methods, teachers face several significant challenges. One of them is human error in classroom management, such as difficulties in balancing time between delivering material and conducting practical activities that require intensive supervision. In addition, the prohibition of bringing mobile phones to school poses its own obstacle, as it limits both teachers' and students' access to digital learning resources, such as simulation videos or interactive science applications that could otherwise enhance conceptual understanding. Furthermore, the limited availability of science laboratory equipment also becomes a barrier to applying experiment-based methods, which ideally require sufficient tools and materials.

Discussion

Based on the research findings, teachers at SMP Negeri 1 Jember adapt their teaching methods to the characteristics of the material and the basic competencies that must be achieved, in line with the principles of the Merdeka Curriculum, which emphasize flexibility and contextual learning. This approach allows teachers to implement student-centered learning, where students are actively engaged in the learning process through discussions, question-and-answer sessions, and simple experiments. This is consistent with the findings of (Tang, 2023), who stated that adjusting teaching methods to the material and students' needs can enhance engagement and lead to a deeper understanding of concepts.

The diversity of methods used by teachers reflects adaptive efforts to accommodate differences in students' abilities and learning styles. Nevertheless, the effectiveness of these methods is still influenced by several factors, including students' readiness to receive the material and the availability of learning facilities in the classroom. This finding supports the previous study by (Yang & Wang, (2024), which indicated that a variety of methods is necessary to optimize science learning; however, their implementation still requires adequate infrastructure and resources. The practical implication of this finding is the need to enhance teacher training in managing adaptive teaching methods and to provide sufficient facilities to make science learning more effective and meaningful.

The research findings indicate that teachers at State Junior High School 1 Jember use a peer tutoring strategy to address the low level of active student participation in science learning. This strategy aligns with constructivist and social learning theories, which emphasize that students can build understanding more effectively through interaction and collaboration with their peers. By assigning more capable students to assist their classmates, teachers create a more participatory learning environment that encourages all students to take an active role in discussions and experiments.

Further analysis shows that the implementation of peer tutoring can help reduce gaps in understanding among students while also developing communication and collaboration skills. However, the effectiveness of this strategy greatly depends on the proper selection of tutors and teacher supervision throughout the learning process. This finding supports previous studies indicating that peer tutoring can enhance student engagement and conceptual understanding (Ruth & John, 2025). The practical implication is that teachers need to consider clear criteria for selecting tutors and continue to facilitate interactions to ensure learning objectives are achieved. Peer tutoring is not merely a temporary solution to increase participation but also contributes to the development of social and collaborative learning skills in science classes when implemented effectively.

Teachers at State Junior High School 1 Jember also face various challenges in implementing science learning methods. One of the main obstacles is human error in classroom management, such as difficulties in balancing time between delivering material and conducting practical activities. In addition, limited facilities pose another barrier, especially in carrying out experiments that require adequate tools and supporting materials. Another significant challenge is the prohibition of bringing mobile phones to school, which, although intended to maintain discipline, restricts teachers' and students' access to digital learning resources. This limitation affects the use of interactive learning media and simulations, which are aligned with the principles of the Merdeka Curriculum that encourage the integration of technology in active learning. This situation indicates a misalignment between

school policies and curriculum principles, which hinders the effectiveness of teaching methods. The practical implication of these findings is the need for school policy adjustments and improved facility support so that teachers can implement learning methods more effectively, thereby achieving science learning objectives in a meaningful and efficient manner.

The analysis of learning methods at State Junior High School 1 Jember indicates that the effectiveness of learning is not solely determined by the choice of method but is strongly influenced by the context of implementation, available facilities, and school policies. These factors affect the extent to which the applied methods can foster active student engagement and the achievement of expected basic competencies. For instance, limitations in laboratory equipment or the prohibition of mobile phone use can restrict the implementation of experiment-based or digital media-based methods, requiring teachers to adapt their strategies to remain effective.

These findings emphasize the need for continuous mentoring and training for teachers to optimize the implementation of the Merdeka Curriculum, particularly in science subjects that require active student engagement and deep conceptual understanding. Such support can take the form of workshops, training on the use of alternative learning media, or guidance in designing adaptive learning activities that align with students' conditions and available facilities. The practical implication of these results is that teacher professional development serves as a key factor in improving learning quality while supporting the achievement of curriculum goals that emphasize student-centered learning and optimal competency development. However, the availability of facilities and school policies still plays a significant role in determining the overall effectiveness of learning implementation (Yaro, 2023).

4. Conclusion

Based on the results of the research and analysis, it can be concluded that teachers at SMP Negeri 1 Jember implement a variety of science learning methods that are adapted to the characteristics of the material and the Basic Competencies (KD) to be achieved. The adaptation of these methods aims to support active student engagement in the learning process, whether through interactive lectures, discussions, or simple experiments. To address low student participation, teachers apply a peer tutoring strategy, which enables students to assist one another in understanding the material while also developing communication and collaboration skills. However, teachers face several challenges, such as human error, limited practical facilities, and the prohibition of mobile phone use, which restricts access to digital learning resources and affects the effectiveness of method implementation. This underscores the importance of analyzing learning methods to align strategies with classroom contexts, available facilities, and school policies so that science learning becomes more effective, interactive, and capable of optimally enhancing students' mastery of basic competencies.

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