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Differentiated Learning Strategies in Improving Science Learning Achievement in Elementary Schools

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ABSTRACT

This study aims to analyze the effectiveness of differentiated learning strategies in improving learning achievement in Natural Science (IPA) in elementary schools. Differentiated learning is important because each student has different needs, abilities, and learning styles. By implementing this strategy, it is expected to provide a more personal and effective learning experience, which in turn can improve students' understanding of science materials and their learning achievement. This study uses the Systematic Literature Review (SLR) approach to evaluate various previous studies that examine the application of differentiated learning in the context of elementary education. The results of the analysis show that differentiated learning has a positive impact on student learning achievement in science. The use of this approach allows teachers to adjust teaching methods and materials according to the abilities and needs of each student, which ultimately increases student motivation, engagement, and learning outcomes. This study also identified several factors that influence the success of implementing differentiated learning in elementary schools, such as teacher competence, learning facilities, and student readiness. Therefore, it is recommended that elementary schools implement this strategy adequately in order to improve the quality of science learning.

Keywords:*Differentiated Learning, Learning Achievement, Science, Elementary School*

INTRODUCTION

Education in Indonesia faces major challenges in improving the quality of teaching, especially in the field of Natural Sciences (IPA). One of the main challenges is the limited resources in many schools, especially in remote areas, which often do not have adequate laboratory facilities, practical equipment, and teaching materials (Fatimah, et al. 2024). This condition hinders students from understanding science concepts through experiment-based learning. In addition, teacher quality is also an important factor, because not all teachers have a strong background in science or receive training that is in accordance with curriculum developments (Ansya, YAU, & Salsabilla, T. 2024). Continuous training for teachers is often uneven, resulting in varying teaching abilities. Another challenge is the learning approach that still tends to focus on memorization rather than understanding concepts and practical applications (Sholeh, MI 2024). Therefore, comprehensive efforts are needed to improve the quality of science education through the provision of adequate facilities, continuous teacher training, and the implementation of more innovative and interactive learning methods. Although science is one of the important subjects in the elementary school curriculum, many students have difficulty understanding abstract and complex concepts. This can be influenced by various factors, one of which is the differences in abilities, interests, and learning styles of each student. Therefore, a more personal and responsive approach to the individual

needs of students is very important to create an effective learning experience (Nurlian, 2024).

One effective strategy in overcoming teaching challenges, especially in the field of Natural Sciences (IPA), is differentiated learning. This approach adapts methods, materials, and learning activities to the abilities, interests, and learning styles of each student (Suwartiningsih, S. 2021). In differentiated learning, teachers act as facilitators who understand the unique needs of each student and design activities that allow them to learn optimally. For example, students with a visual learning style can be given diagrams or videos to make it easier to understand concepts, while students with a kinesthetic learning style can be involved in hands-on experimental activities. This approach not only helps students who have learning difficulties but also encourages talented students to develop further. Thus, differentiated learning is able to create an inclusive, effective, and relevant learning environment, which can ultimately improve the quality of science education in Indonesia. In the context of science learning, this strategy allows teachers to provide various choices for students in understanding the material, either through varied assignments, the use of technology, or experimental activities that are appropriate to their ability level. Thus, each student can learn in the way that suits them best, which can increase their motivation and understanding of the material being taught (Abidin, 2021).

From a study conducted by Anik Nawati, Yulia Yulia, and Banun Havifah Cahyo Khosiyono entitled "The Effect of Differentiated Learning Model Problem Based Learning on Science Learning Outcomes in Elementary School Students The results of the study showed that the application of this learning model significantly improved students' science learning outcomes. Students who learned through this approach showed better conceptual understanding and higher problem-solving skills compared to students who followed conventional learning. These findings indicate that the combination of problem-based learning and differentiated strategies is effective in improving science learning achievement at the elementary school level (Nawati, et al. 2023). However, although the concept of differentiated learning has been applied in various countries and has produced positive results, its application in elementary schools in Indonesia is still limited. Many teachers do not fully understand how to implement differentiated learning effectively in the classroom. Most teachers still use a uniform teaching approach for all students, even though students have significant differences in terms of academic ability and learning style. Therefore, it is important to examine how this strategy can be implemented effectively to improve science learning achievement in elementary schools in Indonesia.

Differentiated learning is a teaching approach that is tailored to the needs, interests, and learning styles of each student. Although this concept has been successfully implemented in various countries and has produced positive results, its implementation in elementary schools in Indonesia is still limited. One of the main challenges is the lack of understanding of teachers regarding effective ways to implement differentiated learning in the classroom. Many teachers still use a uniform teaching approach for all students, even though students have significant differences in academic abilities, interests, and learning styles. This results in less effective learning, because it is unable to accommodate the diversity of student needs (Mursalim, et al. 2024). Therefore, it is very important to examine how this strategy can be better implemented in Indonesia, especially in science subjects, in order to improve student learning achievement at the elementary school level. The implementation of differentiated learning in Indonesian elementary schools is very necessary so that each student can learn according to their ability level. Given the diverse backgrounds and academic abilities of students, a uniform approach often cannot cover all of these needs. Differentiated learning offers a more

flexible approach, allowing teachers to adjust teaching methods, materials, and evaluation strategies according to the characteristics of each student (Lailiyah, F., & Istianah, F. 2020). However, to achieve effective implementation, teachers need a deeper understanding and skills on how to manage classes with a more individual approach. In addition, schools also need to provide supporting facilities, such as more varied teaching materials and regular training for teachers. With a better understanding of this strategy and adequate support, differentiated learning can be successfully implemented in Indonesia, especially in improving student learning achievement in science subjects in elementary schools.

Although the concept of differentiated learning has been proven effective in many countries, its implementation in Indonesia, especially in elementary schools, still faces significant obstacles. One of the main obstacles is that many teachers do not fully understand how to implement differentiated learning in their classrooms. Most teachers still tend to use uniform teaching methods, without considering the differences in students' abilities, interests, and learning styles (Yasir, M. 2024). In fact, students have varying levels of academic ability, which requires a more flexible teaching approach that is tailored to individual needs. Thus, the implementation of differentiated learning strategies in elementary schools in Indonesia is very important to consider, especially in efforts to improve students' science learning outcomes. This step can help maximize the potential of each student, create a more inclusive learning experience, and provide space for more equitable academic development (Huda, C. 2024).

The implementation of differentiated learning in Indonesian elementary schools is essential so that each student can learn according to their ability level. Given the diverse backgrounds and academic abilities of students, a uniform approach often cannot cover all of these needs. Differentiated learning offers a more flexible approach, allowing teachers to adjust teaching methods, materials, and evaluation strategies according to the characteristics of each student. However, to achieve effective implementation, teachers need a deeper understanding and skills on how to manage classes with a more individual approach. In addition, schools also need to provide supporting facilities, such as more varied teaching materials and regular training for teachers. With a better understanding of this strategy and adequate support, differentiated learning can be successfully implemented in Indonesia, especially in improving student learning achievement in science subjects in elementary schools (Abidin, 2021).

On the other hand, science learning in elementary schools is often faced with the challenge of limited resources, such as the lack of facilities that support experimental activities, as well as limited time available to teach various science concepts. Learning that is teacher-centered and does not provide students with the opportunity to explore the material directly often hinders students' understanding of the material being taught. Differentiated learning, by giving students the freedom to choose activities that suit their interests and abilities, can overcome some of these obstacles.

It is important to realize that the success of implementing differentiated learning depends not only on the teacher's ability to manage the class and design materials, but also on the readiness of students to engage in a more active learning process. Some students may be more comfortable with conventional methods, while others may be more interested in a more interactive approach. Therefore, adjustments between the method and the student's learning style are very necessary so that differentiated learning can run optimally.

With this background, this study aims to explore more deeply the application of differentiated learning strategies in improving science learning achievement in elementary schools. In this study, the author uses the Systematic Literature Review (SLR)

approach to analyze various relevant studies related to differentiated learning and its impact on science learning outcomes. It is hoped that the results of this study can provide useful insights and recommendations for educators and policy makers in improving the effectiveness of science learning in elementary schools.

METHODS

This study uses the Systematic Literature Review (SLR) method to analyze various research results that have been conducted on the use of audio-visual media in science learning (Adiputra, DK, & Heryadi, Y. 2021). The SLR method was chosen because it allows researchers to collect and evaluate relevant research results systematically and objectively, and provide a more comprehensive picture of the topic discussed. The first step in this study was to conduct a literature search using various academic databases, such as Google Scholar, JSTOR, ScienceDirect, and ERIC. Keywords used in the literature search included "audio-visual media," "learning motivation," "learning outcomes," and "Natural Sciences." Only journals published in the last five years were retrieved to ensure the relevance and quality of the information obtained (Wada, et al. 2024).

Next, the researcher selected the articles found based on the inclusion and exclusion criteria that had been set. The inclusion criteria included studies that discussed the use of audio-visual media in science learning at various levels of education, as well as studies that evaluated the impact of the use of such media on students' motivation and learning outcomes. Articles that did not match the topics or methods used outside the scope of this study were excluded from the list. After obtaining relevant articles, the researcher then analyzed the data contained in each study. This analysis was carried out by examining the main findings of each related study, as well as evaluating how audio-visual media was applied in science learning and how it impacted students' motivation and learning outcomes. This process also included identifying factors that influenced the success or failure of implementing audio-visual media in the context of science learning. Finally, the researcher synthesized the existing findings, to draw general conclusions regarding the influence of the use of audio-visual media on science motivation and learning outcomes. The results of this synthesis were also used to provide recommendations regarding best practices in the use of audio-visual media for science learning in Indonesian schools.

RESULTS AND DISCUSSION

Understanding Differentiated Learning

Differentiated learning allows teachers to adjust various aspects of teaching, including teaching materials, learning methods, and forms of evaluation, according to the abilities and learning styles of each student. In this case, teaching materials can be adjusted to the level of student understanding, where faster students can be given additional, more in-depth material, while students who need more time will be given simpler material or in a form that is easier to understand (Prasetyo, HA 2024). In addition, learning methods can also be adjusted to students' learning styles, such as visual, auditory, or kinesthetic. For example, students who prefer to learn with pictures or diagrams can be given material using visual media, while students who are more comfortable with discussions can engage in conversations or lectures. Evaluation is also adjusted to the way students demonstrate their abilities, with various forms of assessment such as written exams, projects, or presentations, to ensure a more comprehensive assessment. Thus, differentiated learning not only makes the learning process more relevant to each student, but also encourages motivation and improves their achievement (Ansya, et al. 2024). Several studies have reported that when teachers

provide materials that are tailored to students' ability levels, students' understanding of science concepts increases significantly. For example, students who grasp the material more quickly can be given more challenging tasks, while students who take longer get more detailed explanations and easier-to-understand materials. In addition, differentiated learning strategies have also been shown to be effective in increasing students' motivation to learn science. Several studies have shown that students tend to be more enthusiastic and interested in learning when they are given the freedom to choose how they learn. Learning that is based on individual needs makes students feel more valued and accepted in the learning process, which contributes to increasing their motivation. This is reflected in the increased involvement of students in discussions, experiments, and other learning activities (Jaya, BD, & Sutarto, S. 2021).

One of the main findings obtained in this study is that the use of technology as part of a differentiated learning strategy provides significant benefits in improving student learning achievement in science. Technology, such as learning applications, educational videos, and online simulations, allows students to learn in a more interactive and engaging way. Several articles analyzed noted that students who use technology in science learning not only improve their understanding of the material but also feel more involved and have a higher curiosity about the topics being studied. The use of digital devices also allows students to learn at their own pace, which is very helpful for students with varying learning abilities (Putri, Y., & Gumala, Y. 2024).

The Importance of Differentiated Learning in Elementary Schools

The importance of differentiated learning in elementary schools is very great because at this stage, students are in a very diverse developmental phase, both in terms of academic ability, interests, and learning styles. Each student is unique, and a uniform learning approach is often ineffective in meeting the needs of each student (Tanjung, et al. 2023). By implementing differentiated learning, teachers can adjust teaching methods, materials, and evaluations to be more relevant and appropriate to the needs of individual students, which in turn can improve their understanding and achievement. First, students in elementary schools have significant differences in abilities, both in terms of learning speed, level of understanding, and interest in the material. Some students may quickly grasp the subject matter, while others may take longer or find it easier to understand. With differentiated learning, teachers can provide materials that are appropriate to the ability level of each student, so that all students can learn in the way that is most effective for them. Second, differentiated learning allows for the accommodation of various learning styles of students. Some students learn more easily through visuals, such as pictures or graphs, while others understand material better through hearing or movement (Andriami, 2024). With this approach, teachers can adjust teaching methods to make them more interesting and effective for each student. In addition, differentiated learning also supports students' social and emotional development. When students feel that their learning style is appreciated and understood, they will be more motivated and confident in learning. It can also help create an inclusive classroom environment, where all students feel accepted and can develop in their own way. Overall, differentiated learning in elementary schools is essential to ensure that every student has an equal opportunity to learn and reach their full potential. With this approach, education is expected to be more effective, enjoyable, and lead to increased academic achievement, as well as students' personal development (Miqwati, et al. 2023).

Barriers to Implementing Differentiated Learning in Indonesia

One of the main challenges in implementing differentiated learning in elementary schools is the limited time teachers have to plan and implement learning that is tailored to the needs of each student. Differentiated learning requires teachers to prepare different materials according to the various levels of ability, interests, and learning styles of students. (Wahyudi, et al. 2023). This requires teachers to make more detailed plans, prepare various resources, and organize various activities. For most teachers, this task can be very time-consuming, especially if the available class hours are limited. In addition, in real conditions in the field, many teachers have to handle more than one class with a large number of students. To design different materials for each group of students or even individuals, teachers need extra time to prepare materials that suit their needs. This challenge becomes greater if teachers do not have enough time to evaluate and adjust learning continuously, which is very important in differentiated learning (Ansya, YAU, & Salsabilla, T. 2024).

However, despite these challenges, research shows that careful planning and support from the school can help overcome these problems. If teachers are given sufficient training on how to plan effective and efficient learning, and are given support in terms of time and resources, they will be better able to implement differentiated learning well. In addition, support from the school, such as collaboration between teachers to design joint materials, the use of technology to speed up the preparation process, and the allocation of special time for planning, can also be very helpful. With the right approach, time constraints can be overcome, and differentiated learning can be implemented effectively to improve student achievement. In addition, although differentiated learning has a positive impact on student achievement, the student's readiness to accept this approach also greatly influences the success of its implementation. Some students feel confused or even anxious when given tasks or learning methods that are different from their friends. Therefore, it is important for teachers to provide a clear explanation of the purpose of differentiated learning and how this approach can help them learn in a way that is more in line with their individual learning styles. This study also emphasizes the importance of good communication between teachers, students, and parents to support the differentiated learning process (Halimatussakdiah, H. 2024).

Differentiated Learning Strategies That Can Be Used

Differentiated learning strategies that teachers can use are very diverse and are designed to suit the needs, abilities, and learning styles of students. One strategy that can be applied is grouping students based on ability or interest, where teachers divide students into small groups with similar levels of ability or similar interests, so that they can learn in a way that is more appropriate to their individual characteristics. In addition, teachers can also give students choices about how they want to learn or how to demonstrate their understanding, for example through text, video, experiments, or creative projects. This gives students more control in the learning process, increasing their engagement (Magfirroh, A. (2024). Another strategy is to use a variety of teaching methods, such as visual, auditory, and kinesthetic, to ensure that each student can learn in the way that is most effective for them. Teachers can also modify teaching materials according to students' level of understanding, providing additional challenges for those who are faster or providing simpler materials for those who need more help. Constructive and regular feedback is also important, where teachers provide assessments that are tailored to students' needs, helping them to continue to develop. The use of technology in learning can also be very supportive, such as using digital applications or platforms to

provide diverse and flexible materials. Finally, assignments and assessments that are tailored to students' abilities can ensure that assessments are carried out in a way that best suits how students demonstrate their understanding, whether through exams, projects, or presentations. By implementing these strategies, teachers can create a more inclusive and effective learning experience, helping each student reach their full potential (Rabiudin, R. 2023).

Benefits of Differentiated Learning in Improving Science Learning Achievement

Differentiated learning has various benefits that can help improve student learning achievement, especially in science subjects. One of the main benefits is helping students understand science concepts in a way that is more in line with their learning style. Each student has a different way of receiving and processing information. Some may find it easier to understand science concepts through practical experiments (kinesthetic), while others do better when given visual explanations or listening to teacher explanations (auditory) (Amelia, 2024). With differentiated learning, teachers can adjust teaching methods to suit individual needs, so that each student can learn in the way that is most effective for them. In addition, differentiated learning also allows for the adjustment of materials to the student's ability level, which can prevent students from feeling stressed or bored. For students who have a faster understanding, teachers can provide more in-depth material or additional challenges, while for students who need more time, the material can be simplified or given in a more structured way. This allows all students to achieve a better understanding of science concepts, without feeling left behind or overwhelmed (Siswani, et al. 2024).

Another benefit is increased student motivation. When learning is tailored to students' needs and interests, they tend to feel more engaged and motivated to learn. In science subjects, which are often considered complicated by some students, relevant and enjoyable learning can make them more interested in exploring and understanding the material. Students who feel valued and understood in the way they learn will be more motivated to try harder and be active in learning. Differentiated learning also provides opportunities for students to learn at their own pace, which can help them overcome obstacles in understanding science material. Students who need more time can learn without rushing, while faster students can move on to more challenging materials. With this approach, teachers can facilitate more inclusive learning and ensure that all students have an equal opportunity to succeed in science lessons. Overall, differentiated learning can improve science learning achievement because it accommodates student diversity, helps them understand concepts that may be difficult to understand in traditional ways, and provides a more enjoyable and effective learning experience (Ansya, YAU, & Salsabilla, T. 2024).

Evaluation and Reflection in Differentiated Learning

Evaluation and reflection in differentiated learning are very important to ensure that the learning implemented is effective and can optimally meet students' needs. Evaluation functions to monitor student development, while reflection helps teachers to evaluate the strategies that have been used and make adjustments for further learning. Evaluation in differentiated learning is not only carried out through formal tests or exams, but also through various forms of assessment that can include observations, portfolios, projects, presentations, and student self-assessments. Evaluations that are carried out in a formative and ongoing manner allow teachers to monitor students' progress regularly and adjust the learning approach according to their needs. For example, if a student has difficulty understanding a science concept, the teacher can

provide timely feedback and redesign the learning strategy to help the student understand the material better (Halimatussakdiah, H. 2024). In addition, different evaluations for each student, based on their abilities and learning styles, allow teachers to obtain a more accurate picture of students' understanding and progress. Reflection is an important step for teachers to evaluate the effectiveness of the learning strategies that have been implemented. This reflection involves teachers reflecting on the methods they have used, whether they have successfully met students' needs, and how better methods can be implemented in the future. The reflection process allows teachers to identify areas of instruction that need to be improved or revised, as well as to acknowledge successes that have been achieved. In the context of differentiated learning, reflection also includes consideration of how materials, methods, and assessments can be adjusted to better support the diversity of students in the classroom (Hasja, 2023).

In addition, reflection can also be done by students. Giving students the opportunity to reflect on their learning experiences can help them understand their own learning process, recognize their strengths and weaknesses, and motivate them to improve themselves. This reflection also supports the development of students' metacognitive skills, which are very useful in increasing their independence and learning achievement. Overall, evaluation and reflection in differentiated learning complement each other to create a more adaptive and effective learning process. Evaluation provides the data needed to adjust learning, while reflection helps teachers to continue to develop teaching skills and ensure that each student gets the learning experience that best suits their needs. Finally, although most studies show positive results, not all studies report that differentiated learning directly improves student learning outcomes. Several studies state that without adequate support in terms of teacher training, facilities, and resources, the implementation of this strategy can be less than optimal. Therefore, to ensure the success of differentiated learning, schools need to provide ongoing training for teachers and provide supporting facilities, such as access to adequate learning technology.

CONCLUSION

From the results of this study, it can be concluded that differentiated learning has great potential to improve science learning achievement in elementary schools. By adjusting the methods and learning materials according to the needs and abilities of students, learning becomes more effective and enjoyable, which in turn increases student motivation and learning outcomes. However, successful implementation of differentiated learning requires teacher training, support from the school, and student readiness to accept a more personalized and varied approach. Therefore, it is hoped that there will be more attention to teacher professional development and improvement of educational facilities to support the success of this strategy.

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