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DEEP LEARNING APPROACH IMPLEMENTATION IN SCIENCE EDUCATION IN SIXTH GRADE ELEMENTARY SCHOOL: PERSPECTIVES OF TEACHERS AND STUDENTS

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Abstract

This study examines the implementation of a deep learning approach in sixth-grade science learning at Madrasah Ibtidaiyah Miftahul Ulum Pontianak Utara. Grounded in the demands of 21st-century education, deep learning emphasizes meaningful, reflective, and student-centered learning to enhance conceptual understanding and higher-order thinking skills. This research employed a qualitative case study design, with data collected through in-depth interviews with science teachers and supported by literature review. Data were analyzed descriptively to identify implementation patterns, challenges, and teacher strategies. The findings indicate that deep learning has begun to be implemented through the use of audio-visual media and discussion methods, which promote active engagement, critical thinking, and improved conceptual understanding among students. However, the implementation remains suboptimal due to several constraints, including limited teacher understanding, insufficient professional training, inadequate infrastructure, and variations in student participation. To address these challenges, teachers utilize instructional videos and structured discussions as adaptive strategies. The study highlights the need for continuous professional development, improved learning resources, and stronger institutional support to optimize deep learning practices. These findings provide practical insights for developing more effective, contextual, and student-centered science learning aligned with the Merdeka Curriculum.

Keyword: Deep Learning, Science, Pedagogical Approach

Abstrak

Penelitian ini mengkaji penerapan pendekatan pembelajaran mendalam dalam pembelajaran ilmu pengetahuan alam kelas enam di Madrasah Ibtidaiyah Miftahul Ulum Pontianak Utara. Berlandaskan tuntutan pendidikan abad ke-21, pembelajaran mendalam menekankan pembelajaran yang bermakna, reflektif, dan berpusat pada siswa untuk meningkatkan pemahaman konseptual dan keterampilan berpikir tingkat tinggi. Penelitian ini menggunakan desain studi kasus kualitatif, dengan data dikumpulkan melalui wawancara mendalam dengan guru sains dan didukung oleh tinjauan literatur. Data dianalisis secara deskriptif untuk mengidentifikasi pola implementasi, tantangan, dan strategi guru. Temuan menunjukkan bahwa pembelajaran mendalam telah mulai diimplementasikan melalui penggunaan media audio-visual dan metode diskusi, yang mendorong keterlibatan aktif, berpikir kritis, dan peningkatan pemahaman konseptual di kalangan siswa. Namun, implementasinya masih belum optimal karena beberapa kendala, termasuk pemahaman guru yang terbatas, pelatihan profesional yang tidak memadai, infrastruktur yang kurang memadai, dan variasi dalam partisipasi siswa. Untuk mengatasi tantangan ini, guru memanfaatkan video instruksional dan diskusi terstruktur sebagai strategi adaptif. Studi ini menyoroti perlunya pengembangan profesional berkelanjutan, sumber daya pembelajaran yang lebih baik, dan dukungan institusional yang lebih kuat untuk mengoptimalkan praktik pembelajaran mendalam. Temuan ini memberikan wawasan praktis untuk mengembangkan pembelajaran sains yang lebih efektif, kontekstual, dan berpusat pada siswa yang selaras dengan Kurikulum Merdeka.

Kata kunci: Pembelajaran mendalam, Sains, Pendekatan pedagogis

INTRODUCTION

Twenty-first century education requires a learning process that focuses not only on mastery of material, but also on the development of critical thinking, reflective, and meaningful understanding skills. In the context of science learning at Madrasah Ibtidaiyah, students are expected to be able to understand concepts deeply and relate them to everyday life. However, various international studies such as PISA show that students' ability to understand concepts deeply is still relatively low, so a more relevant and meaningful learning approach is needed (State, 2022). Science education is one of the subjects that plays an important role in developing logical, scientific, and systematic thinking skills. Science education in elementary school aims not only to instill concepts but also to foster curiosity, scientific attitudes, and problem-solving skills (Efendi et al., 2021). However, in reality, the science learning process in many schools is still teacher-centered, memorization-oriented, and does not involve students in exploratory activities (Puspita et al., 2025). This condition has an impact on students' low conceptual understanding and interest in learning science, so a learning approach that can encourage active student involvement and build in-depth understanding is needed.

One approach that is considered suitable for these demands is the deep learning approach. Deep learning in education is widely described as a student-centered approach where learners actively construct understanding, rather than passively receive information. Deep

learning in education emphasizes a deep, mindful, and meaningful learning process, in which learners not only receive information but also actively construct their own understanding (Li & Liu, 2021; Li & Yang, 2023 in Puspita et al., 2025). The application of mindful, meaningful, and joyful learning in elementary schools has basically been carried out, although it has not always been explicitly mentioned. Teachers play an important role in integrating these three approaches into the learning process (Hapsan and Fatimah, 2021 in Kusmawati et al., 2025). Through this implementation, students demonstrate improved conceptual understanding, as the learning process is perceived as more contextually relevant to their everyday experiences. A pleasant learning atmosphere also makes students more enthusiastic to participate and express their creative ideas. In addition, this approach contributes to the development of 21st-century skills such as critical thinking, collaboration, innovation, and communication, which are important for facing the challenges of the modern era (Kusmawati et al., 2025) . This approach is also in line with the Merdeka Curriculum, which encourages contextual, reflective learning that is oriented towards the development of higher-order thinking skills (Cholifatunisa et al., 2025).

However, the implementation of deep learning in science education at the Madrasah Ibtidaiyah level still faces various challenges. In the field, many teachers still find it difficult to apply the deep learning approach due to limited understanding and lack of instructional materials and modules that truly support deep learning, including contextual and science-related content (Mukhoyaroh et al., 2025; Pahrudin et al., 2025; Purwoko et al., 2026). Learning in some elementary schools still uses lecture and exercise methods, so it does not provide opportunities for students to explore ideas independently (Widodo et al., 2025). This condition creates a gap between the ideal concept of deep learning and classroom learning practices.

Based on this description, this study was conducted to examine the implementation of the deep learning approach in science learning in the sixth grade of Madrasah Ibtidaiyah, particularly from the perspective of teachers and students. This study is expected to provide an empirical description of the implementation of deep learning in the field of MI, as well as to identify the supporting and inhibiting factors in its application. The results of this study are expected to be a source of reflection for teachers and a reference in the development of more effective, contextual, and meaningful learning strategies at the elementary education level.

METHOD

This research used a qualitative approach with a descriptive qualitative research type. According to Emzir (in (Rianto et al., 2020), qualitative research is descriptive in nature, where the data collected is generally in the form of words or images, not numbers. The results of the research usually contain quotations from the data to provide illustrations and reinforce the presentation of the findings. The data can be in the form of interview transcripts, field notes, photos, video recordings, personal documents, memos, or other official archives. This tersearch using case study design. Case study research facilitates in-depth data collection through multiple techniques; however, its findings are limited in generalizability and typically require a relatively extended research duration (Susanty et al., 2023).

This research was conducted on December 16, 2025, at Madrasah Ibtidaiyah Miftahul Ulum Pontianak Utara, with the research location in the classroom. Data collection was carried

out through direct interviews with the research subjects, namely the sixth-grade science subject teachers and sixth grade students who chose randomly. The main data source in this study is primary data obtained by the researcher directly from the original source (Jailani et al., 2023). Primary data was collected through interviews with research subjects. Secondary data were obtained through a literature review of books, scientific journals, policy documents, and prior relevant studies to support and contextualize the primary data.

The data collection technique used was in-depth interviews to obtain information related to teachers' understanding of the concept of deep learning, its implementation in science learning, the obstacles encountered, and the efforts made to optimize its application. Data analysis was carried out by reviewing the interview results, grouping the data according to the research focus, and then presenting it in a descriptive narrative form. Data validity was maintained through the researcher's diligence and rechecking of the teacher's interview results to ensure that the data was in accordance with the research objectives.

RESULTS AND DISCUSSION

Implementation of Deep Learning in Science Learning in Sixth Grade Madrasah Ibtidaiyah.

Based on the results of interviews with sixth grade Science teachers at MI Miftahul Ulum, teachers implemented learning by utilizing audio-visual media in the form of learning videos, followed by discussion activities and the presentation of students' understanding in front of the class. As she stated:

> *"In sixth-grade science classes, I usually use audiovisual materials, such as educational videos. After the students watch the video, we follow up with a discussion, and then I ask them to explain what they've learned to the class. So, the lesson isn't just about presenting the material, but also about helping students understand the concepts more deeply."*

This was also confirmed by interviews with several sixth-grade students at MIS Miftahul Ulum, one of whom was Aisyah, who said:

> *"Yes, in class the teacher uses videos to teach, and after watching the video, we're usually asked to discuss it and explain what it means."*

This learning pattern shows that the learning process does not only focus on delivering material, but also on a deeper understanding of concepts. The use of audiovisual media in science learning has been proven to increase students' enthusiasm and motivation. This is in line with research conducted by Serungke et al., (2023) which states that audiovisual media can attract students' attention, increase learning engagement, and help students understand the material more effectively because it involves both sight and hearing. Thus, learning becomes more interesting and less monotonous. In practice, audio-visual media can encourage students to think critically because they are not only passively receiving information but are also encouraged to understand, analyze, and interpret the content of the video.

The use of audiovisual media in science education has been shown to increase students' enthusiasm and motivation. As evidenced by an interview with Ms. Rosidah, she stated:

> *"From what I've observed, the use of educational videos has been quite helpful in helping students understand the material. Additionally, they seem happier and more*

enthusiastic when learning science using audiovisual media, because the lessons feel more engaging and less boring."

The results of interviews with several students also stated that learning through videos helped them understand the material more easily than just listening to lectures from teachers. In addition, they were also happier and more enthusiastic when learning science or natural sciences using audiovisual media, because it was more exciting and interesting. The statement above is reinforced by the opinions of several students, who stated:

"I like learning using videos because it's easier to understand than listening to the teacher lecture."

Through this process, students' cognitive abilities can develop actively (Wati,2025). This reflects the characteristics of deep learning-based learning, which emphasizes deep understanding and active student involvement in the learning process. In addition, after the students watched the learning video, the teacher continued the activity with a discussion and asked several students to convey their understanding. This activity showed the process of information processing, reflection, and reinforcement of the concepts that had been learned. The discussion method itself is considered effective in improving learning outcomes and student activity. This is supported by research by Apriani & Sari (2026) which concludes that the application of the discussion method can improve student learning outcomes because it encourages interaction, exchange of opinions, and a deeper understanding of concepts. Multiple classroom action studies also show large gains in mastery when discussion is implemented, often from 45–65% initial mastery to 85–90% after cycles in Islamic education, civics, and science classes (Gusmaneli, 2024; Irman, 2024; Maulidar, 2025; Noberli, 2024; Pulungan et al., 2024)

Based on this description, it can be concluded that the implementation of deep learning in science education in the sixth grade of Madrasah Ibtidaiyah has begun through the use of audio-visual media and discussion methods. Although teachers are still in the process of learning and adapting the concept of deep learning because it is relatively new in schools, the learning practices carried out have led to meaningful, active learning and encouraged students to think critically in accordance with the developmental characteristics of sixth grade students

Factors Hindering the Implementation of Deep Learning in Science Learning in Sixth Grade MI

The implementation of this curriculum faces various challenges, such as the readiness of human resources and adequate infrastructure (Waruwu & Setiawati, 2025). Based on interviews with sixth-grade science teachers at MI Miftahul Ulum, the implementation of deep learning in science education still faces several obstacles. As teacher said:

"When it comes to understanding deep learning in science education for sixth graders, I'm still learning. Since this approach is still relatively new in schools, my understanding of it isn't yet fully developed."

The limited availability of professional development opportunities and insufficient time for training leads many teachers to feel unprepared to effectively plan, implement, and assess science instruction that is oriented toward deep learning (Isnaeni et al., 2025; Mukhoyaroh et al., 2025; Waruwu & Setiawati, 2025). This is in line with the research (Aeni et al., 2025) that

in a survey conducted through Google Form of 169 kindergarten and elementary school teachers, understanding of the concept of deep learning is still limited.

In addition, limited supporting facilities such as projectors and speakers are an obstacle to the consistent use of audiovisual media. The availability of digital learning materials and contextual learning media aligned with deep learning principles is still relatively limited (Mulyani et al., 2025; Praditya et al., 2025; Sutinah et al., 2025). Many schools continue to rely on conventional instructional materials that emphasize information delivery rather than the development of deep understanding and higher-order thinking skills. In a deep learning approach, however, instructional materials should ideally be designed to be contextual, interactive, and experience-based, enabling students to actively engage in the learning process, connect concepts with real-life situations, and ultimately foster meaningful, reflective, and sustainable learning experiences. Hanifah et al., (2025) also found that limited digital infrastructure is a challenge to the implementation of deep learning, as these limitations hinder the opportunities for character building and enjoyable learning.

The availability of technological facilities and infrastructure in education such as digital devices, internet connectivity, and learning applications remains uneven across schools. This disparity makes the implementation of deep learning approaches, particularly those based on projects and technology integration, difficult to carry out optimally (Auliah et al., 2023). Schools with limited access to technological resources often face obstacles in designing learning activities that require exploration, collaboration, and authentic problem-solving.

Based on interviews with sixth-grade science teachers at MI Miftahul Ulum, other obstacles were also mentioned, such as differences in student activity. She stated:

> *"Not all students dare to express their opinions when asked during class. Some students still lack confidence when asked during the learning process."*

This condition was also found in the study Rahayu et al., (2025) which states that differences in basic abilities among students, both in academic aspects and learning motivation, also affect the learning process. This condition requires teachers to adjust their learning strategies so that all students remain actively participating. As a result, the implementation of deep learning has not been able to run optimally. Limited learning time is also an obstacle to conducting in-depth discussions. Rahayu et al., (2025) also found that limited learning time is a factor that makes it difficult for teachers to apply all stages of deep learning ideally.

Teachers' Efforts to Optimize the Implementation of Deep Learning in Sixth-Grade Science Instruction at Elementary Schools

Based on the results of interviews with science teachers in sixth grade MI Miftahul Ulum, teachers made several efforts to overcome obstacles in implementing the concept of deep learning in science learning. One of the efforts made was to utilize audio-visual media in the form of learning videos as an alternative to help students understand the material. As she stated:

> *"To overcome the challenges of implementing deep learning, I use audiovisual materials such as instructional videos to help students better understand the material. Additionally, using videos is helpful given time constraints, as it allows concepts to be conveyed more clearly in a relatively short amount of time."*

This is in line with Subandijah (1993) as quoted or mentioned in (Syafitria et al., (2023) which states that audio-visual learning media effectively overcome time constraints, allowing teachers to convey material clearly and systematically. Additionally, to address the issue of students who tend to be passive, the teacher continued the lesson with a discussion activity after the video screening. Through discussion, the teacher could encourage students to express their opinions and understanding of the material that had been studied.

This effort was carried out with the hope that students would not only receive information passively but also be actively involved in the learning process. This is in line with Guslinda & Munjiatun, (2021) who found that applying a structured discussion method increased activeness across five indicators: asking questions, responding, discussing/ collaborating, writing/summarizing, and presenting; active participation rates on these indicators generally exceeded 60% and reached nearly 90% for summarizing by the fourth meeting. Learning activity can be seen from the increased courage of students when asking questions, answering questions, and when they express their opinions. According to Hardi, 2020), discussion groups made students more active in sharing opinions and asking questions, described as a participatory method that countered previous passivity and boredom.

Based on the interview results, teachers hope there will be special training for teachers to understand deep learning concepts, not just theory, but also training in P5 project design. Teachers hope the government can implement this training for teachers, for example, once every semester, to achieve learning objectives in line with deep learning concepts. Teachers expect continuous, practice-oriented training, mentoring, and learning communities to build conceptual and pedagogical mastery of deep learning, not just one-off workshops (Arianti et al., 2025; Isnaeni et al., 2025; Subiyantoro & Musa, 2024). Based on their research, it is hoped that the government can organize tiered training as a continuing program for teachers as a forum for good practices in developing the concept of deep learning in learning. A study on madrasah readiness emphasizes that continuous professional development is one of the three key factors for the successful implementation of a deep learning curriculum, in addition to infrastructure and pedagogical understanding (Isnaeni et al., 2025).

CONCLUSION

The implementation of deep learning in sixth-grade science learning at Madrasah Ibtidaiyah Miftahul Ulum Pontianak Utara has begun to develop through the use of audio-visual media and discussion methods. These strategies have encouraged more active, meaningful, and engaging learning, helping students better understand concepts and participate in the learning process. However, the implementation is still not optimal due to limited teacher understanding, lack of training, infrastructure constraints, and differences in student participation, indicating a gap between theory and classroom practice.

These findings imply the need for continuous teacher training focused on practical deep learning implementation, as well as improved access to technological facilities and contextual learning resources. Schools and policymakers should support the integration of deep learning with the Merdeka Curriculum by promoting interactive and student-centered approaches. In addition, teachers need to apply adaptive strategies to accommodate diverse student

characteristics, while future research should explore the long-term impact of deep learning on students' critical thinking and learning outcomes.

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