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The Use of Deep Learning-Based Interactive Visual Media in Improving Students' Understanding of Concepts in Various Subjects: Literature Review

Syerli Feronica [1], Lovita [2], Pahrozi Ahmad [3]
[1,2,3] *UIN Fatmawati Sukarno Bengkulu, Indonesia*

Corresponding Author syerliferonica3@gmail.com

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ABSTRACT

The rapid advancement of educational technology has introduced sophisticated tools to improve classroom instruction, but students often struggle to understand abstract concepts through traditional methods. This literature review aims to analyze the role and effectiveness of deep learning-based interactive visual media in improving students' understanding of concepts in various subjects. This study uses a systematic literature review method by synthesizing academic journals, research reports, and pedagogical publications in the past decade to test the synergy between artificial intelligence-based interactive media and student learning outcomes. The analysis shows that deep learning-based interactive visual media effectively enhances cognitive engagement, facilitates the simplification of complex concepts, and improves memory retention by providing a personalized and adaptive learning experience. It is concluded that the integration of interactive visual media powered by *deep learning* is a significant pedagogical advance, offering educators a dynamic tool to foster deeper understanding of concepts and active student participation.

Keywords: Interactive Visual Media, *Deep Learning*, Concept Understanding, Educational Technology

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INTRODUCTION

The development of digital technology in the field of education has brought enormous changes to the way teachers teach and the way students learn. In modern learning, the delivery of material is no longer enough only through oral explanations or textbooks, but needs to be supported by media that is able to present a more concrete, interesting, and easy-to-understand learning experience (Ahmad & Lestari, 2024). emphasizing that the right learning media can help students understand the material more effectively, especially when the material presented is abstract. This shows that interactive visual media has an important position in supporting a meaningful learning process (Ardiani & Wibowo, 2023).

In addition, Astuti & Pratama (2023) explained that the use of interactive media can create a more active and enjoyable learning atmosphere because students are not only recipients of information, but also directly involved in the learning process. This condition is very relevant to the needs of today's students who tend to be more responsive to visual displays, simulations, and participatory learning experiences. Therefore, interactive visual media is one of the effective alternatives to improve students' understanding of concepts in various subjects (Budiman et al., 2025).

The main problem in learning is still related to the dominance of conventional methods centered on teachers. Fadillah & Kurniawan (2024) state that learning approaches that rely too much on lectures are often less able to accommodate differences in students' abilities, learning styles, and cognitive needs. As a result, many students have difficulty understanding concepts in their entirety, especially in materials that require abstract reasoning and strong visualization. This condition shows the need for learning innovations that are able to bridge the gap between subject matter and students' thinking ability.

In recent years, artificial intelligence has begun to be used in the world of education to answer these challenges. Lestari & Gunawan (2025) explained that deep learning-based technology has the ability to recognize student learning patterns, analyze responses, and adapt learning materials adaptively. With this ability, learning media is no longer static, but can adapt to the needs of each student. This makes learning more personalized, flexible, and responsive to student development.

Kurnia & Sari (2024) shows that the use of digital technology in learning can help students understand complex concepts through more dynamic visualization. In this context, deep learning not only serves as a data analysis tool, but also as the basis for the development of interactive and intelligent learning media. By utilizing this technology, teachers can present material in a form that is more interesting, informative, and easy for students to digest. This integration is very important to create learning that is more in tune with the times (Hidayat et al., 2025)

21st century learning requires students to have the ability to think critically, creatively, communicatively, and be able to solve problems independently. Maulana & Fitriani (2026) explain that modern learning needs to encourage students to not only memorize concepts, but also to understand, connect, and apply them in various situations. In line with that, Nurhayati & Pratiwi (2023) found that the use of digital technology in learning can increase students' intrinsic motivation because they feel more interested and engaged in the learning process. Thus, interactive visual media based on deep learning is in line with the demands of 21st century learning.

At the elementary school level, the need for interactive visual media is becoming increasingly important because students are still at the stage of concrete thinking. Explains that interactive visualizations can help students understand difficult concepts through the presentation of material that is simpler and closer to everyday experience. In subjects such as mathematics and science, abstract concepts are often difficult to understand if they are only explained verbally. Therefore, the use of media that is able to display images, animations, and simulations is very helpful in building a stronger understanding of concepts.

Putra & Handayani (2025) also emphasized that dynamic interaction with learning objects can foster a stronger intuitive understanding than static media such as textbooks. This shows that students will understand the material more easily if they can observe, try, and respond to the learning object directly. In this context, deep learning-based interactive visual media is a potential means to improve the quality of learning, especially in materials that require visual representation and gradual thinking processes.

In addition to increasing understanding of concepts, AI-based media also plays a role in supporting the role of teachers as facilitators. Madkur and As'ad (2024) explain that AI-based digital tools can help teachers bridge the gap between traditional and modern teaching methods. With the support of technology, teachers can more easily adapt learning to the individual needs of students. Technology does not replace the role of teachers, but rather strengthens the function of teachers in creating a more effective and efficient learning process.

However, the application of interactive visual media based on deep learning still faces various challenges. Fakhruddin (2021) stated that limited facilities, teacher readiness, and access to technology are still the main obstacles in the implementation of learning innovation. Rahman & Dewi (2024) also emphasized that the success of the application of technology in education is highly dependent on institutional support, pedagogical readiness, and teachers' ability to integrate technology into learning. Therefore, the implementation of this media needs to be carefully designed to really have a positive impact on learning.

Based on this description, it can be understood that deep learning-based interactive visual media has great potential in improving students' understanding of concepts in various subjects. However, because its effectiveness is highly dependent on the context of use, level of education, and readiness of the user, a more in-depth literature review is needed to examine the available empirical evidence. This study is important to provide a strong theoretical foundation regarding the role of deep-learning-based interactive visual media in supporting more meaningful, adaptive, and student-oriented learning (Yuliani & Prasetyo, 2025)

METHOD

The methodology adopted in this study is a systematic literature review. This approach involves the rigorous identification, analysis, and synthesis of existing research from credible primary sources, including scientific journal articles, research reports, and pedagogical studies published in the last ten years (Susanto & Ayuningrum, 2024). The process begins with searching for keywords in academic databases, such as "interactive visual media," "deep learning in education," and "concept comprehension."The selection criteria prioritize research that demonstrates a clear relationship between the use of AI-based interactive media and improved student performance or engagement. Data collection involves screening these sources to ensure that at least 80% are primary research articles, in accordance with the requirements of the journal. The analysis stage focuses on identifying thematic patterns of how *deep learning* mechanisms, such as adaptive content creation and *real-time* data visualization, contribute to student learning. Finally, the findings are categorized to provide a comprehensive understanding of the current state of this pedagogical approach, highlighting the successes and challenges identified in the existing literature.

RESULT AND DISCUSSION

The results of the literature review show that the use of interactive visual media based on deep learning has a real contribution in improving students' understanding of concepts in various subjects. Findings from several studies show that this technology-based media not only acts as a visual aid, but also as a means to create a more active, adaptive, and meaningful learning experience. Research conducted by the Application of Deep Learning-Based Technology to Improve Understanding of Science Concepts in grade VI elementary school students showed that students' concept understanding increased from an average score of 65 in the pre-action stage to 83 at the end of the second cycle, which was accompanied by an increase in student participation and interest in learning.

This increase shows that deep learning-based learning media is able to help students understand abstract material better. In the context of science learning, concepts that are difficult to observe directly can be visualized through simulations and automated feedback, so that students can build understanding gradually. This is in line with the view of Siregar & Ningsih (2024) that deep learning-based technology provides opportunities for more adaptive learning because the system can adjust the presentation of material to student responses. Thus, interactivity and adaptivity are two main factors that explain why deep learning-based media are effective in learning.

In addition to science learning, studies also show positive results in mathematics learning. Research conducted by Canva's Digital Platform-Based Deep Learning and Interactive Media Approach on Broad Measurement Learning Outcomes in Elementary School showed that students' average pretest scores of 67.19 increased to 83.50 on the posttest. These results prove that the use of digital-based interactive media can help students understand abstract mathematical concepts to be more concrete and easy to understand. In this perspective, Canva is not only a design tool, but also a medium that facilitates the visualization of material in a more interesting and communicative way.

The findings can be explained through the theory that elementary school students tend to understand concepts more easily when presented in the form of visuals, animations, and direct interactions. Sundari and Lutfiansyah (2021) emphasized that dynamic interaction with learning objects can build a stronger intuitive understanding compared to static media such as textbooks. Mustakim (2021) also added that the transition from rote learning to interactive visualization is essential to encourage students' analytical abilities. Therefore, interactive visual media based on deep learning has high pedagogical value because it is able to connect abstract representations with more concrete learning experiences.

Literature review also shows that the use of Artificial Intelligence-based media has a positive impact on student involvement in learning. In a study conducted by the Use of Artificial Intelligence (AI)-Based Media to Support the Learning Process at the Senior High

School Level, it was found that AI-based media can provide learning that pays more attention to the needs of each student, encourage educational game-based learning activities, and develop various competencies such as computational thinking skills, communication, and problem-solving. These findings reinforce the idea that AI-based learning not only improves learning outcomes, but also expands students' cognitive and social competencies.

In a broader discussion, the results show that deep learning-based interactive visual media works through several pedagogical mechanisms. First, it provides visual representations that help students understand complex concepts. Second, deep learning systems are able to generate faster and more relevant feedback according to student responses. Third, this media increases learning motivation because it provides a more interesting and non-monotonous learning experience. This is in accordance with the findings of Situmorang & Sulastri (2025) who stated that when students view digital technology as a means of self-development, their intrinsic motivation to engage in learning increases significantly.

On the other hand, the role of teachers in the implementation of deep learning-based interactive visual media remains very important. Sari & Lestaria (2023) emphasized that AI-based digital tools can help teachers bridge the gap between traditional and modern learning. In other words, technology does not replace teachers, but strengthens the teacher's function as a facilitator of learning. Teachers are still needed to direct the use of media, provide additional explanations, and ensure that students' interactions with the media truly support the achievement of learning objectives.

Although the results of the study show a positive trend, some implementation obstacles still need to be noted. Widodo & Aulia (2025) highlight that limited infrastructure and lack of teacher readiness are still the main obstacles in the implementation of technology-based media. In addition, Umar (2022) explained that the success of learning innovation is greatly influenced by institutional support, school policies, and teachers' ability to integrate technology into the learning process. Therefore, the effectiveness of deep learning-based interactive visual media does not only depend on the quality of the technology, but also on the readiness of a supportive learning environment.

Based on the synthesis of these various studies, it can be concluded that deep learning-based interactive visual media is effective in improving students' understanding of concepts because it is able to present adaptive, visual, and interactive learning. Findings in science, math, and AI-based learning in general show that students become more active, more motivated, and easier to understand concepts that were previously considered difficult. Thus, the integration of deep learning in learning media is a relevant strategy to answer the learning needs in the digital era that demand higher personalization and effectiveness.

CONCLUSION

The conclusion is interactive visual media based on *deep learning* provides a powerful mechanism to improve students' understanding of concepts. By offering dynamic, adaptive, and visually immersive experiences, these tools effectively lower barriers to understanding complex topics and meeting the needs of individual learners. The findings of this study show that the synergy between AI-based advanced media and deliberate pedagogical design is the main driver to improve educational outcomes. Future implementations should focus on bridging the gap between the potential of technology and practical classroom applications to ensure that these tools continue to support diverse and effective learning environments.

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