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Integration of Artificial Intelligence in Learning to Improve Student Learning Outcomes at Sd N 42 Bengkulu City

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ABSTRACT

This study aims to describe the integration of Artificial Intelligence (AI) in learning and to illustrate the improvement in student learning outcomes in fifth grade at SD Negeri 42, Bengkulu City. This study used a qualitative, descriptive approach. Subjects included teachers and students selected through purposive sampling. Data collection was conducted through observation, interviews, and documentation. Data analysis employed an interactive analysis model encompassing data reduction, data presentation, and conclusion drawing. Its validity was tested through triangulation of sources and techniques. The results indicate that the integration of AI in learning creates a more interactive, adaptive, and engaging learning process, thereby increasing student activity, engagement, and understanding. Improved student learning outcomes are demonstrated by increases in class average grades and learning completion percentages. Several obstacles to implementing AI include limited devices, limited internet access, and the ability of teachers and students to use technology. Integrating AI into learning has significant potential to improve the quality of learning in elementary schools, but requires supporting facilities, teacher readiness, and ongoing development for optimal implementation.

Keywords: *Artificial Intelligence (AI), Learning Outcomes, Technology Integration*

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INTRODUCTION

Technological developments in the 21st century have brought about significant changes in various aspects of life, including education. One technology now widely adopted in learning systems is Artificial Intelligence (AI). The integration of AI in education serves not only as a technological aid but also as a means of creating adaptive, interactive, and contextual learning (Ali & Panduwinata, 2025).

Artificial Intelligence (AI) is a term used in Industrial Society 4.0 and Society 5.0, encompassing computer programs, machine learning, hardware, and software. The science used to build intelligence utilizes hardware and software solutions inspired by the reverse engineering of the neutron patterns that operate in the human brain. These Industry 4.0 products are widely used in various industries, including education, for development and everyday life applications. (Batubara, in Zahara et al., 2023).

The purpose of this study is to clarify the significant role of AI in education. Butler and Adam (in Zahara et al., 2023) acknowledge that education has two implementations that are developments of AI itself. First, to provide rapid services to the general public, education and research must be conducted across various fields related to AI development. Second, a curriculum and learning revolution must be implemented immediately. The second implication, research conducted by Liao et al. (in Zahara et al., 2023), explains that learning should not only be learned through robot tutors but also prioritize a deep understanding of literacy and how various world systems work. This opinion has a major impact on the Fourth Industrial Revolution in education, namely educational policies that begin with teacher quality, facilities and infrastructure, curriculum, and learning systems to produce outcomes that meet the needs of the workforce.

This technology can improve the quality of education by providing tools that enable the learning process to be more personalized, relevant, and tailored to the needs of each individual student. (Abrari and Fajarianingtya, 2025) Similarly, artificial intelligence can be used to provide learning materials tailored to students' abilities and interests, provide automatic feedback, and facilitate experiential learning and interactive simulations that deepen student understanding. (Anshori, 2025) The use of artificial intelligence in education has the potential to encourage individualization and flexibility in teaching. Overall, the integration of artificial intelligence into the teaching and learning process in higher education has the potential to increase the efficiency and effectiveness of the education system. (Hermawan, 2024).

In the context of education, AI integration is no longer just a futuristic discourse, but an increasingly tangible reality. Various AI applications are emerging, ranging from adaptive learning systems that can tailor material to individual student needs, to intelligent chatbots that provide 24/7 learning support, to data analysis tools that help teachers monitor student progress and identify areas requiring further intervention. The potential of AI to personalize learning, improve administrative efficiency, and provide deeper insights into the teaching and learning process is a major attraction driving its exploration and implementation at various levels of education. (Muthmainna, 2025).

By using AI technology, educators can develop adaptive learning platforms, provide timely feedback, and create more interactive learning experiences. This research points to increased student motivation and engagement in the learning process. (Muchtar et al., 2025) This integration has resulted in improvements in various aspects of education, including personalized learning experiences, efficient administration, and smarter content. (Hermawan, et al., 2024).

Based on this description, researchers believe that the integration of Artificial Intelligence (AI) into learning has enormous potential to improve the quality of elementary school students' learning processes and outcomes. AI functions not only as a technological tool but also as a pedagogical approach capable of adapting learning to student characteristics and needs. The effectiveness of AI implementation depends heavily on teacher readiness in designing appropriate learning, as well as adequate support from facilities and infrastructure. Consequently, targeted efforts are needed so that the use of AI is not merely a trend but actually has a real impact on improving student learning outcomes.

Several previous studies have shown that the use of AI in learning has a positive impact on various aspects of education. Mahfuzah et al. (2025) emphasized increased student motivation and engagement despite limited facilities, while Mandayani and Haifaturrahmah (2025) found that AI can improve critical thinking skills and support 21st-century learning. Research by Anita and Setiawan (2025) highlighted both opportunities and challenges in implementing AI, particularly related to infrastructure and teacher competency. Untu et al. (2025) emphasized that AI is effective in personalizing learning materials to meet student needs. Overall, these studies confirm that AI plays a strategic role in improving the effectiveness of learning in elementary schools.

Although various studies have examined the implementation of AI in learning, there are still gaps in the research that require further exploration. Most previous research has focused on general aspects such as learning motivation, critical thinking skills, or the opportunities and challenges of using AI, but has not specifically examined how AI integration directly impacts student learning outcomes in specific school contexts. In fact, there are still limited studies linking AI implementation to real conditions in the field, especially in public elementary schools with certain characteristics and limitations such as SDN 42 Bengkulu City.

The novelty of this research lies in its focus, which specifically analyzes the integration of Artificial Intelligence into learning and its impact on improving student learning outcomes at SDN 42, Bengkulu City. This research not only examines the use of AI as an aid but also examines how AI is integrated into the learning process contextually, according to school conditions. Under these conditions, this research is expected to provide a more concrete empirical picture of the effectiveness of AI in improving elementary school student learning outcomes.

Based on this gap, this study aims to describe the implementation of Artificial Intelligence (AI) integration in the learning process and determine the improvement in student learning outcomes at SDN 42, Bengkulu City. This study also aims to identify obstacles encountered in implementing AI and efforts made to optimize its use in elementary school learning.

METHOD

This study uses a qualitative approach with a descriptive type that aims to describe the integration of Artificial Intelligence (AI) in learning and describe student learning outcomes at SD Negeri 42 Bengkulu City. The study was conducted for approximately one month, namely from January 21 to February 21, 2026. The research subjects included teachers and fifth-grade students who were selected using purposive sampling techniques because they were directly involved in AI-based learning. Data collection techniques were carried out through observation, interviews, and documentation to obtain comprehensive data related to the learning process and student learning outcomes. The data obtained were analyzed using interactive analysis techniques that include data reduction, data presentation, and drawing conclusions, and their validity was tested through triangulation of sources and techniques, so that a valid picture of the application of AI in learning at SD Negeri 42 Bengkulu City was obtained.

RESULT AND DISCUSSION

The results of this study demonstrate that the integration of Artificial Intelligence (AI) into fifth-grade learning at SD Negeri 42 Bengkulu City has significantly improved both the learning process and student outcomes. Prior to the implementation of AI, the learning process tended to rely on conventional, teacher-centered methods, such as lectures and the use of textbooks as the primary source. This situation aligns with Meriyanti's (2025) opinion, which states that before the advent of AI, conventional learning methods relied on direct interaction between teachers and students in the classroom, but often failed to optimally meet students' individual learning needs. This resulted in some students being less active, easily bored, and having difficulty understanding the material presented.

After the integration of Artificial Intelligence (AI) into learning, there was a clear change in student learning activities. Based on observations, students became more active, enthusiastic, and directly involved in the learning process. The use of AI-based media such as interactive quizzes, visual presentations, and direct feedback made it easier for students to understand the material. AI enables more personalized learning because the material can be tailored to each student's abilities. According to Cakraningtyas (2025), AI is able to adapt learning approaches to individual student needs through data analysis, thereby creating more effective learning and supporting optimal student development.

Based on student learning outcomes data, a clear difference was found between conditions before and after the implementation of AI in learning. The following visualization of student learning outcomes data before the implementation of AI is presented:

Table 1. Student Learning Outcomes Before the Implementation of AI

No	Category	Result
1	Highest Score	85
2	Lowest Score	55
3	Class Average	70
4	Number of students who completed	18 students
5	Number of students who did not complete	12 students
6	Completion percentage	60%

Based on the table, it can be seen that before the implementation of AI, student learning outcomes were still considered average. The average class score was 70, with a completion

percentage of 60%. This fact indicates that a significant number of students still did not meet the learning completion criteria.

Student learning outcomes after the implementation of Artificial Intelligence (AI) in learning can be seen in the following table:

Table 2. Student Learning Outcomes After the Implementation of AI

No	Category	Result
1	Highest Score	95
2	Lowest Score	65
3	Class Average	82
4	Number of students who completed	18 students
5	Number of students who did not complete	12 students
6	Completion percentage	87%

The table shows an improvement in student learning outcomes after the implementation of AI in learning. The average class grade increased from 70 to 82, while the number of students achieving learning mastery increased from 18 to 26. The completion rate also increased significantly, from 60% to 87%. This improvement indicates that the use of AI can help students understand the material more effectively through more interactive, adaptive, and student-centered presentations.

This study also found negative data that warrants attention. Not all students experienced significant improvements in learning outcomes. Some students still experienced difficulties in engaging with AI-based learning, particularly those with low basic skills or unfamiliarity with technology. Other obstacles, such as limited devices, unstable internet connections, and limited time to use AI-based media, also hindered the learning process. Teachers noted that adjustments were still needed in the use of AI, particularly in terms of technology mastery and effective lesson planning.

Overall, the results of this study indicate that the integration of Artificial Intelligence (AI) into learning has a positive impact on improving student learning outcomes. The identified challenges serve as evaluation material for the future development of AI-based learning, ensuring its more optimal and equitable implementation.

Discussion

1. Analysis of Results

Based on the research conducted, the integration of Artificial Intelligence (AI) into fifth-grade learning at SD Negeri 42 Bengkulu City demonstrated improved student learning outcomes and positive changes in the learning process. This improvement was evident in the increase in students' average grades and the increasing number of students achieving learning mastery after the implementation of AI. Changes were also evident in student learning activities, where students became more active, enthusiastic, and engaged in the learning process. Students no longer passively receive material but began interacting with more engaging and varied AI-based learning media.

Conceptually, AI is the ability of machines or software to perform tasks previously only human-capable (Azzahra et al., 2026). With these capabilities, AI can facilitate the learning process, such as presenting material visually, providing direct feedback, and adapting material to students' abilities. This makes learning more effective and helps students understand the material more deeply.

The implementation of AI also opens up opportunities for collaboration between teachers, students, and technology. Teachers act as facilitators, guiding students in utilizing AI for self-reflection and improvement. This collaboration creates a participatory learning environment, where students are not merely objects of learning but also active subjects managing their own learning process (Butsiarah, 2025). AI-based learning not only improves

learning outcomes but also fosters student independence and engagement in the learning process.

Developments in digital technology, particularly artificial intelligence (AI), present new opportunities for transforming the learning process toward a more interactive and adaptive direction. AI can adapt to individual learning styles, provide automatic feedback, and visualize abstract concepts more concretely (Haryanto & Nugraha, 2023). This aligns with research findings showing that students understand material more easily when learning is presented interactively and tailored to their needs.

2. Literature Comparison

The results of this study align with various previous studies showing that the use of Artificial Intelligence (AI) in learning has a positive impact on the quality of learning in elementary schools. Research conducted by Mahfuzah et al. (2025) showed that the implementation of AI, even with limited facilities, can still improve student focus, engagement, and motivation. AI-based learning also encourages students to be more active, enthusiastic, and develop more systematic thinking skills compared to conventional methods. This condition aligns with the results of this study, where students demonstrated increased activeness and learning outcomes after using AI.

Furthermore, research conducted by Mandayani and Haifaturrahmah (2025) stated that AI acts as an innovative learning medium that can increase student engagement, digital literacy, learning motivation, and critical thinking skills. In this study, students also demonstrated increased active participation and engagement during learning, indicating that AI can create more engaging and meaningful learning.

Research conducted by Anita and Setiawan (2025) also revealed that AI holds significant potential for improving learning effectiveness through automated feedback and data analysis, although it still faces various challenges such as limited infrastructure and low teacher digital literacy. These findings align with this study, which also identified technical obstacles and the need for adaptation in the use of AI in the classroom.

Research conducted by Untu et al. (2025) demonstrated that AI can adapt learning materials to suit individual students' needs, abilities, and learning styles. AI-based learning systems can deliver materials in real time, making learning more effective and efficient. This finding is also supported in this study, where students demonstrated improved learning outcomes because the material was presented more adaptively and tailored to each student's abilities.

According to Nurhasanah et al. (2024), integrating AI into science learning can enrich the learning experience through scientific data analysis, experimental simulations, and intelligent system-based problem-solving. AI functions not only as a technological tool but also as a learning partner that can enhance the effectiveness of the learning process. The results of this study are not only in line with previous research, but also strengthen the fact that AI has an important role in improving the quality of learning in elementary schools.

The positive impacts of implementing artificial intelligence in education include: Simplifying the tasks of teachers and students in teaching and learning activities, unlimited data storage, making educators' tasks non-repetitive, can be used anytime without time limits, and work becomes faster and better. The negative impacts of implementing artificial intelligence in education include: Making teachers and students lazier, eliminating some educators' jobs, especially in administrative areas, AI cannot understand the goals and information created, AI works according to what has been programmed, AI has a high risk of being hacked, and AI will eventually break down.

Artificial intelligence related to implementation in education is a system designed to support the education and learning process (Holmes, Bialik, and Fadel, in Zahara (2023). In education, artificial intelligence is used to personalize each student's learning. This AI system helps create a learning profile for each student, allowing learning materials to be tailored to each student's abilities, learning styles, and experiences. Thanks to AI and machine learning, personalized digital learning content is also emerging.

3. Implications of the Findings

The results of this study provide important implications for education, particularly in the application of learning technology in elementary schools. The integration of Artificial Intelligence (AI) has been proven to improve student learning outcomes and create more interactive, adaptive, and enjoyable learning. Teachers can utilize AI as an alternative learning medium and strategy in the classroom.

The practical implication of this study is the need to improve teacher competency in optimally utilizing AI technology. Teachers play a role not only as transmitters of material but also as facilitators capable of guiding students in using technology wisely and effectively. Schools also need to provide adequate facilities and infrastructure to support the implementation of AI in learning.

From a learning development perspective, the results of this study demonstrate the importance of implementing student-centered learning. The application of AI allows students to learn at their own pace and abilities, making the learning process more effective. This also supports the development of 21st-century skills such as critical thinking, creativity, collaboration, and communication.

4. Research Limitations

This study has several limitations that must be considered when interpreting the results. First, the study was conducted in only one class at SD Negeri 42 in Bengkulu City, so the results cannot be broadly generalized. Second, this study focused on describing the application of AI and student learning outcomes, thus not examining other factors that can also influence learning outcomes, such as motivation, initial abilities, and the student learning environment.

Third, the relatively short research period meant that the researchers were unable to observe the long-term impact of AI use. Fourth, there were technical constraints such as limited devices and unstable internet connections, which could impact the learning process. Fifth, the ability of teachers and students to use technology still requires adjustments, so the implementation of AI has not been optimal.

This study nevertheless provides a clear picture of the potential of integrating Artificial Intelligence (AI) to improve the quality of learning in elementary schools.

CONCLUSION

Based on the research results and discussions conducted, it can be concluded that the integration of Artificial Intelligence (AI) into fifth-grade learning at SD Negeri 42, Bengkulu City, has positively impacted student learning processes and outcomes. The application of AI makes learning more interactive, adaptive, and engaging, resulting in more active, enthusiastic, and engaged students. Furthermore, student learning outcomes have improved, as evidenced by increases in average class grades and an increase in the number of students achieving learning completion. However, several obstacles remain, such as limited devices, internet access, and teacher and student technology skills, which must be considered when implementing AI in elementary schools. This research contributes to the development of science, particularly in the field of elementary education and the use of learning technology. The results strengthen the study of the importance of integrating Artificial Intelligence (AI) as an innovation in learning, functioning not only as a tool but also as a pedagogical approach capable of improving the quality of learning. This research also provides an empirical overview of the application of AI in elementary schools, thus serving as a reference for teachers, researchers, and policymakers in developing more effective technology-based learning that meets the needs of students in the digital age. Based on the research findings, it is recommended that future researchers conduct research with a broader scope, both in terms of the number of subjects and research locations, so that the results can be more widely generalized. Future research can examine the long-term impact of AI use in learning in more depth, combining qualitative and quantitative approaches to obtain more comprehensive results. Researchers are also advised to develop more varied AI-based learning innovations that adapt to technological developments, so that they can make a greater contribution to improving the quality of education in the future.

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