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Implementation *Artificial Intelligence* (AI) in Hots Learning (*Higher Order Thinking Skills*) to Improve Student Intelligence

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Abstract

The background of this research is the phenomenon of students' lack of critical and creative thinking skills, as well as teachers' lack of ability to develop curricula and learning strategies that align with HOTS principles. The purpose of this research is to determine how the implementation of AI in HOTS learning can improve students' intelligence. This research uses a library research method with data sources from relevant scientific articles and journals. Data collection techniques are carried out by collecting and analyzing data from various sources. Data analysis techniques use content analysis to determine how the implementation of AI in HOTS learning can improve students' intelligence. Research results show that implementing AI in HOTS learning is crucial for improving student intelligence. AI can help enhance students' critical and creative thinking skills, as well as assist teachers in curriculum development and student assessment. AI technologies used in HOTS learning include machine learning, natural language processing, and recommendation systems. Thus, implementing AI in HOTS learning can be an effective solution to enhance students' intelligence and prepare them for future challenges. This research is expected to contribute to the development of education in Indonesia in a more effective and efficient manner.

Keywords: *Artificial Intelligence (AI), HOTS (Higher Order Thinking Skills), Student Intelligence,Machine Learning, Natural Language Processing, Recommendation System*

INTRODUCTION

Education is a crucial aspect of a nation's development. High-quality education can help improve students' abilities and skills, enabling them to compete in the era of

globalization. However, many challenges remain, such as a lack of student motivation, inadequate teacher skills, and a lack of adequate educational resources (Al Farizi, 2024).

In recent years, education in Indonesia has undergone significant changes. The government has launched various programs to improve the quality of education, such as the Merdeka curriculum and the Digital School program. However, many unresolved issues remain, such as students' lack of critical and creative thinking skills (Fachrurazi & Ramadhani, 2023).

The current phenomenon is a lack of critical and creative thinking skills among students. Many students still rely on memorization and are unable to apply their knowledge in real-world situations. Therefore, HOTS (Higher Order Thinking Skills) learning is becoming increasingly difficult has not been able to be implemented optimally in various schools, mainly due to the lack of teacher ability in developing curriculum and learning strategies that are in accordance with HOTS principles (Ramadhani, 2022).

Many teachers still use conventional learning methods that focus on memorization and lack opportunities for students to think critically and creatively. Furthermore, a lack of resources and supporting facilities also hinders the implementation of HOTS learning. Therefore, efforts are needed to improve teacher skills and provide adequate resources to support HOTS learning and enhance student intelligence (Ramadhani, 2024).

However, the current state of children's intelligence is also a serious concern. Many children possess great potential but are unable to develop it due to a lack of adequate support and resources. Artificial Intelligence (AI) can be a solution to improving student intelligence. By using AI, students can learn in a more interactive and engaging way. AI can also assist teachers in curriculum development and student assessment (Ilgun Dibek, 2025).

AI can enhance students' intelligence in innovative and effective ways. Through the use of AI technology, students can learn in more interactive and engaging ways, thereby increasing their motivation and interest in learning. AI can also help teachers develop curricula that better suit students' needs, as well as assess assignments and provide more accurate and personalized feedback (Gunawan, 2021). Thus, AI can help improve students' critical thinking, creativity, and analytical skills, so they can become smarter and more prepared to face future challenges.

Previous research has shown that AI can improve students' critical and creative thinking skills (Hadzhikolev, 2021) (Chaturvedi, 2025). However, there is still little research discussing the implementation of AI in HOTS learning. Therefore, this study is important to conduct to determine how the implementation of AI in HOTS learning can improve students' intelligence. The difference between this study and previous research is the focus on the implementation of AI in HOTS learning. This study will discuss how AI can be used to improve students' critical and creative thinking skills in HOTS learning.

This research is important because it can contribute to the development of education in Indonesia. By understanding how the implementation of AI in HOTS learning can improve student intelligence, teachers and educational developers can

develop more effective learning strategies. Furthermore, this research can help raise awareness about the importance of AI in education. How AI can be used to enhance student intelligence, the public can better understand the role of AI in education.

This research is expected to yield significant results in improving student intelligence. By understanding how implementing AI in HOTS learning can improve student intelligence, teachers and educational developers can develop more effective learning strategies. This research can also help improve the quality of education in Indonesia.By knowing how the implementation of AI in HOTS learning can improve students' intelligence, the government can develop more effective education policies.

Thus it is important to do this with the aim of knowing how the implementation is carried out. Artificial Intelligence (AI) in HOTS learning (Higher Order Thinking Skills) can improve students' intelligence. This research is expected to contribute to the development of education in Indonesia in a more effective and efficient manner.

RESEARCH METHODS

This study employed a qualitative approach with a library research method. This approach was chosen because the study aimed to understand and analyze concepts related to the implementation of AI in HOTS learning to improve student intelligence. The library research method allowed researchers to collect and analyze data from various relevant sources, thus providing a comprehensive overview of the research topic.

The data sources in this study consist of primary and secondary data sources. Primary data sources consist of scientific articles and journals published in recent years, while secondary data sources consist of books, research reports, and other documents relevant to the research topic. Data collection techniques include collecting and analyzing data from various relevant sources, then categorizing and synthesizing the data to gain a deeper understanding of the research topic.

The data analysis technique used in this study was content analysis. Content analysis was conducted by identifying, categorizing, and analyzing data related to the implementation of AI in HOTS learning to improve student intelligence. The results of the data analysis were then presented in descriptive and narrative form to provide a clear picture of the research topic. Thus, this research can contribute to the development of education in Indonesia in a more effective and efficient manner.

RESULTS AND DISCUSSION

Development *Artificial Intelligence* (AI) in education has become a significant topic in recent years. AI can help improve the quality of learning and prepare students for future challenges. The AI phenomenon in education demonstrates that AI can function as a learning partner, enhancing student creativity and engagement, and assisting teachers in developing more adaptive teaching materials (Kurniawan, 2025).

An education system without AI would likely struggle to improve the quality of learning and prepare students for future challenges. The importance of AI in education lies in its ability to improve the efficiency and effectiveness of learning, provide more personalized feedback, and assist educators in decision-making. AI is also crucial in HOTS (*Higher Order Thinking Skills*) learning because it can help improve students' critical and creative thinking skills (Mytra, 2021).

The development of HOTS in education has become a major focus in recent years, as it can help students develop critical and creative thinking skills. Education without HOTS may struggle to improve students' critical and creative thinking skills (Du, 2025). The importance of HOTS in education lies in its ability to help students develop critical and creative thinking skills, enabling them to better face future challenges.

Implementation of AI in HOTS learning can be carried out using AI technology such as machine learning, natural language processing, and recommendation system to improve students' critical and creative thinking skills (Aji, 2025). *First,* Machine learning enables systems to learn from data and make predictions or decisions without being explicitly programmed. In an educational context, machine learning can be used to identify patterns in student data and tailor learning materials. Machine learning can be used in education to: (a) Predict student performance based on historical data and other factors that influence student performance. (b) Identify student needs and provide appropriate learning material recommendations. (c) Develop personalized curricula tailored to student needs.

Examples of machine learning applications in education include (a) online learning systems that use machine learning to predict student performance and provide recommendations for appropriate learning materials. (b) adaptive learning platforms that use machine learning to develop personalized curricula tailored to student needs. (c) Google Translate, which uses machine learning to automatically translate languages. (d) Netflix, which uses machine learning to recommend movies and TV shows to customers (Ilyas, 2024).

Second, Natural Language Processing (NLP) enables computers to understand, interpret, and respond to human language. NLP can be used to develop learning aids such as chatbots that can answer students' questions. NLP can be used in education to (a) Develop educational chatbots that can answer students' questions and provide relevant information. (b) Analyze text and provide personalized feedback to students. (c) Develop automated assessment systems that can assess students' answers and provide personalized feedback.

Examples of NLP applications in education are (a) Educational chatbots, using NLP to develop chatbots that can answer student questions and provide relevant information. (b) Automated grading systems: using NLP to develop automated grading systems that can assess student answers and provide personalized feedback. (c) Siri, Apple's virtual assistant that uses NLP to understand and respond to user commands. (d) Google Assistant, Google's virtual assistant that uses NLP to understand and respond to user

commands (Supeno, 2024).

Third, recommendation systems are used to suggest content or resources based on user preferences and needs. In education, recommendation systems can be used to suggest learning materials that suit students' needs. Recommendation systems can be used in education to (a) Recommend learning materials that suit students' needs. (b) Develop personalized curriculum that suits students' needs. Examples of recommendation system applications in education are (a) Online learning platforms, using recommendation systems to recommend learning materials that suit students' needs. (b) Adaptive learning systems, using recommendation systems to develop personalized curriculum that suits students' needs. (c) YouTube: using recommendation systems to recommend videos to users based on their preferences and behavior.

Thus, AI technologies such as machine learning, NLP, and recommendation systems can be used to improve efficiency and effectiveness in education, as well as provide a more personalized and tailored learning experience for students.

Other examples of AI applications in HOTS learning include (1) Online Learning Platforms such as*Khan Academy*which uses AI algorithms to analyze student answers and provide recommendations for appropriate learning materials. (2) Mobile applications such as*Duolingo*which uses AI technology to adjust practice questions according to the user's ability level. (3) Learning management systems such as*Canvas* And *Blackboard*which uses AI to analyze user interaction data and provide personalized suggestions and feedback. Using this AI technology, HOTS learning can be more effective and efficient, and it can help students improve their critical, creative, and analytical thinking skills (Ranjith, 2025).

HOTS can thrive with AI support because it can help improve students' critical and creative thinking skills. HOTS learning using AI can improve students' intelligence because AI can help improve students' critical and creative thinking skills. Other examples of AI used to improve students' intelligence include (1) *Chatbot* which can help improve students' critical and creative thinking skills by providing personalized questions and feedback. (2) A recommendation system that can help improve students' critical and creative thinking skills by providing recommendations for learning materials that suit students' needs. (3) An online learning system can help improve students' critical and creative thinking skills by providing access to broader and more diverse learning materials.

Teachers can do several things to ensure that HOTS learning can be implemented using AI and students' intelligence increases, including (1) Developing an appropriate curriculum, teachers can develop a curriculum that suits students' needs and utilize AI technology to improve students' critical and creative thinking skills. (2) Using AI technology, teachers can use AI technology such as machine learning and natural language processing to improve students' critical and creative thinking skills. (3) Providing personalized feedback, teachers can provide personalized feedback to students using AI technology, so that students can improve their critical and creative thinking

skills. Thus, the implementation of AI in HOTS learning can be an effective solution to improve students' intelligence and prepare them to face future challenges (Ramadhana, 2025).

In recent years, research has shown that AI can improve the quality of learning and prepare students for future challenges. AI can help improve students' critical and creative thinking skills by providing personalized questions and feedback. Teachers can use AI technology to develop curricula tailored to students' needs and enhance their critical and creative thinking skills.

HOTS learning using AI can improve students' intelligence because AI can help enhance students' critical and creative thinking skills. Therefore, implementing AI in HOTS learning can be an effective solution to enhance students' intelligence and prepare them for future challenges. When implementing AI in HOTS learning, teachers need to consider several factors, such as the capabilities of the AI technology used and the students' needs.

Teachers also need to ensure that the AI technology they use can help improve students' critical and creative thinking skills. Therefore, implementing AI in HOTS learning can be an effective solution for enhancing students' intelligence and preparing them for future challenges.

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CONCLUSION

The conclusion of this study indicates that implementing AI in HOTS learning can improve student intelligence. The results indicate that AI can help improve students' critical and creative thinking skills and assist teachers in developing curricula tailored to student needs. The use of AI technologies such as machine learning, natural language processing, and recommendation systems can help improve the efficiency and effectiveness of HOTS learning.

Thus, implementing AI in HOTS learning can be an effective solution to improve students' intelligence and prepare them for future challenges. Therefore, the recommendation for the education sector is to utilize AI technology in HOTS learning and develop curricula tailored to students' needs. Teachers also need to be trained to use AI technology in learning, thereby improving the quality of learning and preparing students for future challenges. Implementing AI in HOTS learning is expected to enhance student intelligence and improve the quality of education in Indonesia.

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