

TRENDS IN THE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE-BASED TECHNOLOGY IN EDUCATION

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Abstract

Artificial intelligence in education has grown to be a prominent trend. AI has a lot of promise, particularly for improving learning's efficacy and efficiency. Artificial intelligence is one technology advancement that has the power to drastically change the way that we teach and learn. AI offers a number of benefits and exciting new opportunities in the realm of education. One of the main benefits of using AI in education is the capacity to adapt training. Through data analysis and intelligent algorithm modeling, AI systems can understand each individual's unique preferences, needs and learning styles. This allows teachers to present learning material tailored to students' level of understanding more effectively. With the use of artificial intelligence, education may be tailored to each student's interests, learning style, and speed. AI is able to thoroughly examine student learning data, pinpoint strengths and shortcomings, and offer pertinent learning suggestions. In this study, the research strategy used was a review of the literature. This study explores the use of artificial intelligence technology in education, including how it can create new learning possibilities, how it affects the learning process, and how it will shape education going forward.

Keywords: Trends, development of artificial intelligence, world of education

INTRODUCTION

Artificial intelligence in education has grown to be a prominent trend. AI has a lot of promise, particularly for improving learning's efficacy and efficiency. According to Paek, S., & Kim, N. (2021), one potential purpose of AI is to supplement human intelligence and help with a variety of activities, like giving feedback, choosing relevant learning resources, and coordinating the

curriculum with the needs of the students. But the application of AI also brings up a number of other challenges, including the potential replacement of the teaching position, disparities in educational quality, and moral dilemmas with data privacy, security, fairness, and openness. Educators need to respond wisely to the trend of using AI in education. They need to be open and willing to learn new things so they are not fooled by students and tools. Apart from that, it is also necessary to understand the psychological side of students and explain patiently why the use of AI software is not allowed. It is also important to teach students the ethics of using AI and ensure that students' use of AI is transparent and in line with institutional policies for academic integrity (Xia, X., & Li, X., 2022).

Artificial Intelligence in Education presents a number of issues, but it is impossible to stop the technology's rapid advancement in this field. As a result, Indonesian education must take into account how AI might assist the trends of hybrid and personalized learning. But the use of AI in education must also go hand in hand with stringent ethical guidelines and teaching students how to utilize the technology responsibly.

There are several challenges associated with the use of AI in education and difficulties that must be resolved. However, there is also bright promise for using AI to improve learning's efficacy and efficiency. Therefore, there needs to be a wise approach in adopting AI technology in education. Educators need to understand the psychological side of students and explain patiently why the use of AI software is not permitted. In addition, it is also necessary to teach students the ethics of using AI and ensure that students' use of AI is transparent and in line with institutional policies for the sake of academic integrity (Li, Y et al., 2022).

According to Alam et al. (2022), The ability of AI to provide individually tailored learning is one of the major advantages of the technology in education. AI is capable of analyzing student progress data and needs quickly and accurately, then produce appropriate learning recommendations. This allows each student to have a learning experience specifically designed to meet their needs, accelerate their pace of learning, and overcome any difficulties they face. Apart from that, AI also enables the development of a more adaptive curriculum. By analyzing data from various sources, such as tests, quizzes, and student interactions with learning materials, AI can help teachers and curriculum developers understand trends and patterns in learning. This allows them to adjust the curriculum in real-time, adding or removing learning material according to student needs and developments in certain areas of knowledge.

AI in education also creates new possibilities for assessment and assessment of the pupils. Artificial intelligence technologies can give quick feedback on student performance, not only in terms of academic knowledge but also in terms of skill proficiency such as problem solving, creativity, and collaboration. In this way, teaching and learning can be better tailored to students' individual needs, ensuring that each student gets the support they need to reach their full potential (Zhai et al., 2021). Not only that, AI has also changed the way teachers plan and manage their classes. Teachers may use AI to automate administrative activities like scheduling lessons, keeping track of student attendance, and even designing personalized lesson plans. This enables educators to concentrate on deeper interpersonal relationships with their students, such as providing individualized feedback, facilitating class discussions, and inspiring interest in learning.

Apart from direct benefits in the learning process, AI also opens the door to wider access to education. Through AI-powered online learning platforms, education can be accessed by everyone, regardless of geographic or economic boundaries. This ensures that every person has the chance to reach their potential by lowering educational gaps and giving everyone equal access to learning opportunities. Though AI has a lot of potential for use in education, there are still obstacles that must be solved. An important obstacle is the concerns of privacy and ethics related to using AI in education. Ensuring that student data is safely kept and responsibly utilized to improve learning without infringing upon privacy or leading to prejudice is crucial (Chu, S. T et al., 2022).

In addition, it is also important to develop new skills among educators to be able to properly integrate AI technology in their learning. Adequate training and support is needed to guarantee that educators possess the expertise required to fully utilize artificial intelligence in the classroom. In conclusion, AI has brought a revolution in the learning process. With artificial intelligence, education has become more personalized, efficient and accessible to everyone. By continuing to develop and integrate this technology wisely, we can ensure that every student has the opportunity to reach their full potential in learning.

AI-based curriculum development also opens the door to improving the measurement of educational outcomes. With data collected through AI technology, we can measure student achievement and understand their progress more accurately. This allows us to identify learning trends, identify areas that need more attention, and design more efficient learning programs. Additionally, curriculum development that integrates AI enables lifelong

learning. In a rapidly changing world, where technology is constantly evolving, students need to continue learning and developing throughout their lives. AI-based curricula can support this approach by providing access to learning resources that are relevant and tailored to individual needs, not only during school, but also in their careers (Fu, Y., 2020).

RESEARCH METHOD

A review of the literature was the research method employed in this paper. Research that analyzes or critically evaluates information, concepts, or discoveries found in a corpus of academically focused literature is known as library research or literature reviews. It also formulates theoretical and methodological contributions to a certain topic (Cooper, 2010). Literature review studies are used to collect data or a synthesis of sources related to research topics from a range of sources, such as books, journals, documents, the internet, and libraries. The steps involved in the literature study method include organizing writing supplies, reading and taking notes, and gathering library information. The information found in the literature is grouped, synthesized, and interpreted as part of the analysis process. In-depth knowledge of the research topic, the ability to identify patterns, limitations, and knowledge gaps in the literature, and a solid theoretical framework for future research are all made possible by the literature study approach.

RESULT AND DISCUSSION

Artificial Intelligence Technology in the World of Education Opens New Opportunities for Learning

One area that keeps evolving with technology advancements is education. Artificial intelligence (AI) is one technological advancement that has the power to drastically change the way that we teach and learn. In the world of education, AI can provide various benefits and exciting new opportunities (Ahmad et al., 2021).

According to Chen, L., Chen, P., & Lin, Z. (2020), one of the primary advantages of utilizing AI in education is the personalization of learning. Through data analysis and intelligent algorithm modeling, AI systems can understand each individual's unique preferences, needs and learning styles. This allows teachers to present learning material tailored to students' level of understanding more effectively. For example, through a virtual tutor system that uses AI, students can get additional explanations or practice questions according to their weaknesses. Apart from that, AI technology is also able to

increase the efficiency of school and campus administration. Processes such as processing student data, automatic lesson schedules, online assignment evaluation using plagiarism detection are some examples of practical applications of AI in school/campus administration. With this automated solution, educators' time and energy can be focused more on direct interactions with students.

The presence of intelligent robots in classrooms is also an interesting trend in the world of education. These robots can help facilitate the learning process, provide interesting visual explanations, and interact with students to increase their learning engagement. Students study in a more engaging and dynamic setting as a result. Naturally, it's crucial to keep in mind that there are unique difficulties and moral dilemmas associated with the application of AI technology in the classroom. These questions are important to consider as AI technology is adopted in education (Luan et al., 2020).

Overall, AI technology carries great potential in improving learning effectiveness and providing better individualized experiences for students. However, it is important to continue to explore the possibilities wisely.

In the opinion of Bates et al., (2020) to effectively integrate artificial intelligence (AI) technology in the classroom, teachers, and students can do the following:

1. **AI Technology Education:** Teachers can provide students with an understanding of what AI technology is, how it works, and the potential benefits and challenges that may be associated with it. This helps students better understand the use of this technology.
2. **Identify individual needs:** Teachers should involve students in AI learning planning, paying attention to their individual needs. Knowing each student's interests and learning styles will help teachers develop learning materials based on their level of understanding and interests.
3. **Integrated AI technology supports:** Teachers can integrate AI technology as a tool to improve learning efficiency in the classroom. One example is the use of virtual tutor systems or AI-based e-learning platforms to provide additional explanations, adaptive practice questions, or instant feedback to students.
4. **Assess the impact of technology on learning:** It is important for teachers to regularly assess the impact of using AI technology on classroom learning. Seeing whether there is an increase in learning outcomes or active student engagement will help teachers determine whether an implementation is successful or needs adjustments.

5. Consider social and emotional aspects: Although AI technology can be beneficial in learning, It is critical that educators focus on the social and emotional needs of their pupils. Developing meaningful human interaction is still of utmost importance in the process of teaching and learning.
6. Involve parents: Teachers can persuade parents to use AI technology by sharing information about the tools or platforms used in the classroom. This helps create mutual understanding and cooperation between schools, teachers, students and parents. With a simplified approach like this, teachers and students can maximize the benefits of AI technology while maintaining a harmony between its use and interpersonal communication, which is crucial to the process of teaching and learning in the classroom.

The Influence of Using Artificial Intelligence in the Learning Process

Artificial intelligence is a technology that makes use of computer algorithms to carry out operations like learning, solving issues and making choices that are typically completed by humans. AI development has grown significantly and quickly in recent years, and this has had a big impact on a lot of different disciplines, including education. The manner that we teach and learn has changed significantly as a result of the usage of artificial intelligence in the classroom (Fitria, T. N., 2021).

The following are the positive influences of AI users in learning according to Seo et al., (2021), namely:

1. AI processes and analyzes data quickly, providing deep insights into student progress and learning trends. Teachers can use this information to design more effective teaching strategies, while students get more targeted feedback.
2. The existence of chatbots in learning platforms helps students get answers to their questions at any time. This not only increases access to information, but also provides ongoing support outside of class hours.
3. AI can craft game-based learning experiences that are not only educational but also fun. This creates additional motivation for students to engage and deepens their understanding through fun interactions
4. Integrate the teaching of artificial intelligence-based skills, such as machine understanding and programming, helping students understand the technologies that support the digital world. This prepares them for future challenges.

5. AI also plays a key role in facilitating research and innovation in education. With in-depth data analysis, research can take our understanding of how best to teach and learn to the next level

The influence of the negative impact of AI users in education according to Gupta et al., (2021):

1. AI user dependency

The existence of AI technology causes dependence in its use where there is no critical thinking that arises from one's own mind, thus causing a weakening or loss of the ability to solve problems.

2. Excessive trust in AI

Because of AI's dependence, a feeling of trust arises in what AI provides without correcting it first, even though not all AI is right.

3. Loss of human interaction Excessive use of AI can make educational institutions tend to ignore the important role of teachers and lecturers because they feel they can replace their duties with technology. Apart from that, education also tends to be carried out online because it is considered more efficient. This can reduce human interaction in real life, even though this is important for developing students' social and emotional abilities.

The use of AI in education is not just a tool, but a paradigm shift in learning. By combining artificial intelligence with human creativity and wisdom, we can shape better learning experiences and prepare future generations to face challenges yet to be revealed. However, it should also be noted that excessive use of AI causes dependency and can damage our way of thinking (Ouyang, F., & Jiao, P., 2021).

Artificial Intelligence Creating Future-Professional Education

Improvements in technology have led to a number of improvements in education policies globally, including in Indonesia. Due to the fact that more and more developed nations are utilizing technological advancements in their educational innovation platforms, which have given rise to website-based learning systems, online learning, Massive Open Online Courses (MOOC), and education, national education policies continue to undergo renewal and innovation in response to current developments in learning technology. more online learning that is distance-based (Schiff, D., 2021).

Education in developed countries has a big impact on innovation and change in education in Indonesia. The Indonesian government is trying to carry out various educational innovations following developments in science and technology which have implications for efforts to increase the professionalism

of teachers and lecturers in the realm of teaching (Yusriadi et al., 2022). With high professionalism, the quality of education can be improved. Good quality education will ultimately increase the competitiveness of the nation and state through mastery of science and technology, apart from learning systems and policies and innovation. The educational technology that is currently most highlighted is AI.

The ability of machines to mimic human intelligence in terms of learning, reasoning, and decision-making is referred to as artificial intelligence. To ensure that process data, identify patterns, and formulate wise predictions or decisions, it entails the application of sophisticated algorithms and computer procedures. Naturally, Because AI can consider what students want, it is very useful for changing the curriculum. Artificial intelligence can be used to customize instruction to each student's interests, learning preferences, and pace. AI is able to thoroughly examine student learning data, pinpoint strengths and shortcomings, and offer pertinent learning suggestions. By taking an active role in their education, students can achieve optimal results. Artificial intelligence applications in educational settings makes adaptive learning strategies possible as well. AI is able to determine a student's comprehension level in real time and modify the course material to meet each student's needs. This can help pupils reach their full potential and more skillfully navigate challenges (Chiu et al., 2023).

With personalized learning, each student's needs and preferences are taken into account while creating their learning experiences. Artificial intelligence (AI) plays a major role in enhancing individualized learning in this setting. Artificial intelligence can be used to gather, examine, and assess student learning data thoroughly. AI is able to recognize trends and patterns in that data to understand individual student strengths and weaknesses (Yang, W., 2022). This information is used to make learning recommendations tailored to each student's abilities, interests and learning style. One of the benefits of personalized learning powered by artificial intelligence is increased student engagement. By focusing learning on topics that are relevant and interesting to students, they are more likely to be actively involved in the learning process.

The application of artificial intelligence in big data analysis allows us to harness the potential of abundant student learning data to improve educational curricula. By collecting, storing, and analyzing such data, we can identify patterns and trends that are relevant to understanding the strengths and weaknesses of the current curriculum. Data analysis in an educational context can provide valuable insight into student achievement, their level of

understanding, the level of difficulty of learning material, and other factors that influence learning outcomes. By using artificial intelligence, this data can be analyzed more accurately, quickly, and efficiently compared to traditional manual approaches (Hemachandran et al., 2022).

In conducting data analysis, artificial intelligence can identify patterns and trends that indicate the strengths and weaknesses of the current curriculum. For example, through data processing, AI can reveal that most students master a topic well while other topics need improvement. This information provides insight into aspects of the curriculum that need to be adjusted and refined. In addition, big data analysis can also help identify areas where students face difficulties or experience obstacles in learning. By identifying gaps in understanding or challenges frequently faced by students, the curriculum can be adjusted to integrate more effective learning approaches and relevant strategies.

An adaptive learning approach powered by artificial intelligence (AI) provides the opportunity to deliver encounters with learning adapted to the specific requirements of the student. Using AI's capacity to scan through data and spot trends, this method allows learning materials to be customized in real time to meet individual student needs. Through the use of AI, learning systems can identify a student's level of understanding in a particular topic. By continuously monitoring students' learning activities and progress, AI can determine their level of understanding at a very detailed level. Based on this information, learning content can be tailored and presented in the most effective way for each student. Then the advantages of adaptive learning according to Vincent-Lancrin, S., & Van der Vlies, R. (2020) are as follows:

1. Students can learn at their own pace.
AI can identify if students have mastered a concept and allow them to move on to more complex or challenging material. On the other hand, if a student is having difficulty, AI can provide additional support or repeat material that the student is unable to understand.
2. An adaptive learning approach helps maximize student learning potential.
By presenting learning content that suits individual levels of understanding, students can feel more engaged and motivated. They will not feel too behind or bored with material that is too easy. Instead, they will be challenged according to their abilities, increasing their chances of achieving better learning outcomes.
3. An adaptive learning approach also provides flexibility in accommodating different learning styles.

AI can customize presentations and learning formats to meet students' learning preferences. Some students may be more responsive to visual learning, while others prefer an auditory or hands-on approach. By leveraging artificial intelligence, adaptive learning approaches can be tailored to students' individual learning styles.

The future of relevant and adaptive education involves the application of artificial intelligence (AI) as an integral part of the curriculum. By utilizing this technology, we can unlock the potential for significant innovation and progress in the education system. In this future, the use of artificial intelligence will enable a personalized and adaptive learning approach. A learning experience that is customized to each student's requirements and interests will be provided. AI will analyze student learning data in depth to identify their level of understanding, strengths and weaknesses, thereby providing appropriate learning recommendations. This will maximize each individual's learning potential, reduce gaps in achievement, and increase student engagement in the learning process (Khosravi et al., 2022).

CONCLUSION

Artificial intelligence is one technology advancement that has the power to drastically change the way that we teach and learn. AI has several advantages and fascinating new possibilities in the field of education. One of the benefits of customized education is the key advantages of utilizing AI in education. Through data analysis and intelligent algorithm modeling, AI systems can understand each individual's unique preferences, needs and learning styles. This allows teachers to present learning material tailored to students' level of understanding more effectively.

The use of AI in education is not just a tool, but a paradigm shift in learning. By combining artificial intelligence with human creativity and wisdom, we can shape better learning experiences and prepare future generations to face challenges yet to be revealed.

AI in transforming the curriculum is very functional because it can be a consideration in meeting students' needs. Artificial intelligence offers a personalized approach, where each student is free to follow their own interests, learning style, and pace of study. AI is capable of thoroughly analyzing student learning data to pinpoint their advantages and disadvantages, and provide appropriate learning recommendations. In this way, students can be more involved in learning and achieve optimal results.

REFERENCES

- Ahmad, S. F., Rahmat, M. K., Mubarik, M. S., Alam, M. M., & Hyder, S. I. (2021). Artificial intelligence and its role in education. *Sustainability*, 13(22), 12902.
- Alam, A., Hasan, M., & Raza, M. M. (2022). Impact of artificial intelligence (AI) on education: changing paradigms and approaches. *Towards Excellence*, 14(1), 281-289.
- Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education?. *International Journal of Educational Technology in Higher Education*, 17, 1-12.
- Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: systematic review. *Journal of advanced nursing*, 66(1), 3-15.
- Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *Ieee Access*, 8, 75264-75278.
- Chiu, T. K., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 4, 100118.
- Chu, S. T., Hwang, G. J., & Tu, Y. F. (2022). Artificial intelligence-based robots in education: A systematic review of selected SSCI publications. *Computers and education: Artificial intelligence*, 3, 100091.
- Fitria, T. N. (2021, December). Artificial intelligence (AI) in education: Using AI tools for teaching and learning process. In *Prosiding Seminar Nasional & Call for Paper STIE AAS* (pp. 134-147).
- Fu, Y. (2020). Research on the development trend of online education industry considering the influence of big data and artificial intelligence. In *Cyber Security Intelligence and Analytics* (pp. 852-859). Springer International Publishing.
- Gupta, R., Srivastava, D., Sahu, M., Tiwari, S., Ambasta, R. K., & Kumar, P. (2021). Artificial intelligence to deep learning: machine intelligence approach for drug discovery. *Molecular diversity*, 25, 1315-1360.
- Hemachandran, K., Verma, P., Pareek, P., Arora, N., Kumar, K. V. R., Ahanger, T. A., ... & Ratna, R. (2022). Artificial intelligence: A universal virtual tool to augment tutoring in higher education. *Computational Intelligence and Neuroscience*, 2022.
- Khosravi, H., Shum, S. B., Chen, G., Conati, C., Tsai, Y. S., Kay, J., ... & Gašević, D. (2022). Explainable artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 3, 100074.

- Li, Y., Jiang, A., Li, Q., & Zhu, C. (2022). The analysis of research hot spot and trend on artificial intelligence in education. *International Journal of Learning and Teaching*, 8(1), 49-52.
- Luan, H., Geczy, P., Lai, H., Gobert, J., Yang, S. J., Ogata, H., ... & Tsai, C. C. (2020). Challenges and future directions of big data and artificial intelligence in education. *Frontiers in psychology*, 11, 580820.
- Ouyang, F., & Jiao, P. (2021). Artificial intelligence in education: The three paradigms. *Computers and Education: Artificial Intelligence*, 2, 100020.
- Paek, S., & Kim, N. (2021). Analysis of worldwide research trends on the impact of artificial intelligence in education. *Sustainability*, 13(14), 7941.
- Schiff, D. (2021). Out of the laboratory and into the classroom: the future of artificial intelligence in education. *AI & society*, 36(1), 331-348.
- Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *International journal of educational technology in higher education*, 18, 1-23.
- Xia, X., & Li, X. (2022). Artificial intelligence for higher education development and teaching skills. *Wireless communications and mobile computing*, 2022.
- Yang, W. (2022). Artificial Intelligence education for young children: Why, what, and how in curriculum design and implementation. *Computers and Education: Artificial Intelligence*, 3, 100061.
- Yusriadi, Y., Rusnaedi, R., Siregar, N. A., Megawati, S., & Sakkir, G. (2022). Implementation of artificial intelligence in Indonesia. *International Journal of Data and Network Science*, 7(1), 283-294.
- Zhai, X., Chu, X., Chai, C. S., Jong, M. S. Y., Istenic, A., Spector, M., ... & Li, Y. (2021). A Review of Artificial Intelligence (AI) in Education from 2010 to 2020. *Complexity*, 2021, 1-18.