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HOW ARTIFICIAL INTELLIGENCE IS TRANSFORMING EDUCATION

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Abstract

Today's modern society is often dependent on advanced technologies, and artificial intelligence (AI) is emerging as a significant factor in this. Artificial intelligence is rapidly finding use in various segments of our lives, including education, which is a key part of the development of any society. The application of AI in education is significantly changing the way teachers and students approach learning and how educational processes are administered. From personalized learning to data analytics to improve student performance, artificial intelligence offers countless innovations that enable more effective educational experiences. In this paper, we will review the most significant ways in which artificial intelligence is transforming education and analyze the challenges that come with this technology.

Keywords: Artificial intelligence, ICT, education, learning,

Introduction

Artificial intelligence as an idea has been around for a long time, but its current development began in the middle of the last century, when the term "artificial intelligence" was first introduced at the first AI conference, which many consider to be the beginning of this field (McCarthy et all., 2006). Due to the limited power of machines at that time, progress was slow. Later, the concepts of machine learning began to gain popularity, and algorithms began to improve. With the arrival of the Internet and the ability to collect and quickly analyze a multitude of data, artificial intelligence experienced a revolution. In the last decade, deep learning, which uses neural networks inspired by the human brain, has enabled the creation of systems that can recognize speech, analyze images, and play games at a level higher than that of a human (Eliseeva at all., 2020).

Today, AI is integrated into many industries and segments of everyday life. The rapid development of artificial intelligence is transforming almost every aspect of our daily lives, including education. AI introduces new ways of learning, development, and administration in schools and universities, enabling customized learning methods, new ways of interacting between teachers and students, and improving the assessment process. Through adaptive teaching platforms, intelligent tutors, and advanced data analysis algorithms, AI offers the potential for effective learning that is focused on the needs of each individual student (Niemi et all, 2022).

This integration is introducing changes in the way students learn and teachers teach. However, while artificial intelligence brings significant potential, its integration brings challenges related to ethics, participant privacy and educational equity.

Personalized Learning through AI

Personalized learning is one of the most significant and widely used examples of AI in education. Most often, in traditional education systems, all students are taught the same materials in the same way, regardless of their individual needs, learning styles and interests. Personalized systems analyze the behavior of the student, his successes, and challenges during the lesson (Iqbal, 2023). The systems use algorithms to collect and process data from the student, such as his successes, failures, interests, and learning style, to suggest a special approach only for him. By analyzing individual progress, AI can adapt new tasks that are optimal for the student's current level of understanding. For example, platforms like Khan Academy, powered by AI, allow students to learn at their own pace, while algorithms suggest what material should be studied next (Tabarrok, 2023). This personalization increases student success and motivation, as they receive content that is tailored to their needs. Teachers

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also receive detailed reports on each student, which helps them provide support and focus on areas where the most attention is needed.

Recent years of integrating AI applications in education have led to the development of Intelligent Tutoring Systems (ITS). These systems represent a transformative shift from traditional teaching methods by providing personalized, adaptive learning experiences tailored to the individual needs of students. These Intelligent Tutors, also known as virtual tutors or assistants, assist students in mastering new content and solving problems. These tutors operate through interactive conversations with students and generate immediate feedback (Marouf et all., 2024). The importance of ITS lies in their ability to detect the different learning styles and paces of students, which are often difficult to identify in a traditional classroom. By analyzing student data, ITS can tailor the curriculum and the pace at which it is taught to each student individually, thereby improving learning outcomes.

AI as a support for teachers

Artificial intelligence is not intended to replace the role of teachers, or to completely exclude them from the educational process. On the contrary, AI complements and assists them in their work. By automating administrative tasks, such as grading tests, filling out reports, and tracking student progress, AI frees up more time for teachers to focus on deeper interactive learning and supporting students.

The application of this technology in the learning process leads to Learning Management System or abbreviated LMS. This system has not only found benefit in education, but it's used in different organizations where it helps in the development of electronic courses, enabling fast and stable access to them and constantly upgrades them. LMS has moved into a powerful tool for organizations which have in their nature tendency to constant improving skills of their staff. The impact of such systems is mostly felt beyond traditional educational institutions, although this same technology is always changing today's classical classroom. LMS delivers and manages all types of content, including videos, courses and documents. In the areas of lower and higher education, LMS should include a variety of functionalities similar to corporate versions, but there will also be features such as forum sections, teacher and instructor courses, place for discussion, and often the use of a curriculum. The curriculum is rarely a feature in the corporate LMS. LMS can be used to create professionally structured course content. The teacher can add text, pictures, tables, links and text formatting, interactive tests, a slide show and more. In addition, LMS can create different types of users, such as teachers, students, parents, visitors, and editors. Helps to control what content the student can access and monitor progress in it. Teachers can manage courses and modules, enroll students or set up self-enrollment, view student reports, and invite students to their classes online. In higher education, the use of LMS is more a means of subsistence than a consequence of technological development. With less and less investment in public universities lately, students and their parents have higher tuition fees. Many countries are developing education systems to reduce costs, increase teaching flexibility and expand access to higher education (Petrovski, 2020).

Impact of AI on the development of students' skills

Digital technologies are easily integrated with physical systems, thereby pushing the boundaries of industries. Traditional education systems must adapt and evolve for the rapidly changing demands and opportunities. Artificial intelligence tools have shown their potential to revolutionize various aspects of education - from content creation and personalization to interactive engagement and beyond (Baidoo-Anu & Ansah, 2023). With the development of artificial intelligence, learning has become much more dynamic and focused on developing critical, analytical and creative skills in students. AI enables the creation of simulations and virtual environments in which students can experiment and solve real-world problems. In this way, students are motivated to be active participants in the learning process, not just passive listeners (Alam, 2023).

For example, AI in STEM education facilitates the development of skills through interactive tasks such as programming robots or solving mathematical problems with AI assistants. The student can face challenges that simulate real-life situations and learn how to solve them through an iterative

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process of experimentation and analysis. (Nagaraj et all., 2023). This technology allows students to face real-world problems that would be complex or impossible to replicate in traditional classrooms.

Marrone with his colleagues investigated the relationship between creativity and artificial intelligence by interviewing students in Australia about their experiences with artificial intelligence. The authors found in their research that students with a greater understanding of artificial intelligence had more positive ideas about integrating artificial intelligence into their classroom activities. Students understood AI and used it skillfully in completing their tasks, and these experts recommended that students be allowed to use AI applications in educational tasks (Marrone et al.,2022). This approach not only improves students' understanding, but also helps them develop important 21st century skills such as critical thinking, problem-solving, teamwork, and adaptability. Through AI-based tools, students can analyze data and make fact-based decisions. Interactive platforms encourage deep thinking through simulations and complex scenarios. By using AI, students can receive immediate feedback, which encourages the development of independence and self-confidence. AI-based systems often provide space for students to independently solve tasks and track their results, which motivates them to take responsibility for their learning and encourages them to explore and learn in creative ways.

Improving inclusiveness in education

One of the major benefits of AI in education is its potential to make education more accessible and inclusive for all. AI plays a key role in facilitating learning for students with disabilities. Traditional education systems often fail to meet the needs of many students, especially those with specific educational needs. AI-based teaching aids can provide students with physical and cognitive challenges greater access to learning content, through adaptive interfaces, text-to-speech, and other assistive technologies.

One way AI can help inclusive students is through interactive reading or writing tools. Programs that use AI can identify a student's weaknesses and offer them customized methods for improvement, such as audio materials or interactive visual tools. This allows students to learn in a way that works best for them, even when they have specific needs that traditional teaching methods do not address. Additionally, artificial intelligence enables the translation of educational materials into multiple languages, which greatly benefits students from different cultures and linguistic backgrounds. AI translation systems can instantly translate texts, allowing students to learn in their native language while learning content in a new language. This not only facilitates learning, but also encourages the development of language skills in students and makes education more inclusive for those who struggle with language barriers.

Challenges in using AI in education

While the integration of AI holds great potential, it also raises ethical and practical concerns. AI systems rely on large amounts of data to provide personalized learning experiences, creating privacy risks that must be carefully managed.

While AI can automate many aspects of the teaching process, overuse of AI can lead to a lack of human interaction between teacher and students. This personal communication is crucial in developing social and emotional skills in students, something that AI systems cannot provide. Reduced interaction can make it difficult to build trust and empathy, which are the foundation for effective learning. When teachers start to rely on AI for certain aspects of teaching and assessment, they risk losing the autonomy and flexibility that characterize their profession. When students rely on AI for automated problem solving or answers, they risk developing a passive approach to learning. AI can help them achieve results, but it can also discourage them from developing critical thinking and creativity. This is especially important because creativity and problem-solving skills are essential for students' personal and professional development.

In addition, using AI in education can widen the digital divide, where students who do not have access to technology may be left behind. Therefore, a balanced and careful inclusion of AI in education is needed, ensuring equal access for all students.

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Addressing these issues requires careful oversight, ensuring that AI applications are developed and implemented with ethical standards and equitable access in mind.

Conclusion

The integration of AI in education has enormous potential to improve teaching, learning, and administration. Personalized learning, immersive experiences, and efficient administrative solutions are some of the transformative benefits that AI brings to the education sector. The future of AI in higher education is exciting as there is always innovation and new developments. As technology advances, we will see more advanced AI-powered tools and platforms that can enhance student learning. AI will also grow in importance in administrative tasks, helping to reduce costs and streamline processes.

However, the success of AI in education depends on addressing ethical challenges and ensuring equitable access. By adopting responsible AI practices, educators and administrators can leverage AI to create inclusive, engaging, and effective learning environments, preparing students for a rapidly evolving future. While AI can significantly contribute to the modernization and personalization of the educational process, its application must be carefully considered. Appropriate ethical and legal regulations, as well as frameworks for privacy protection, need to be developed. It is important to balance the advantages and disadvantages to ensure that AI will be a support, not a replacement, for teachers and students, in order to achieve an inclusive, equitable and safe education system.

References

Alam, A. (2023, June). Intelligence unleashed: An argument for AI-enabled learning ecologies with real world examples of today and a peek into the future. In *AIP Conference Proceedings* (Vol. 2717, No. 1). AIP Publishing

Baidoo-Anu, D., & Ansah, L. O. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Journal of AI*, *7*(1), 52-62

Eliseeva, D. Y., Fedosov, A. Y., Agaltsova, D. V., Mnatsakanyan, O. L., & Kuchmezov, K. K. (2020). The evolution of artificial intelligence and the possibility of its application in cyber games. *Amazonia Investiga*, *9*(28), 123-129.

Iqbal, M. (2023). AI in education: Personalized learning and adaptive assessment. *Cosmic Bulletin of Business Management*, *2*(1), 280-297

Marouf, A., Al-Dahdooh, R., Ghali, M. J. A., Mahdi, A. O., Abunasser, B. S., & Abu-Naser, S. S. (2024). Enhancing Education with Artificial Intelligence: The Role of Intelligent Tutoring Systems

Marrone, R., Taddeo, V., & Hill, G. (2022). Creativity and artificial intelligence—A student perspective. *Journal of Intelligence*, *10*(3), 65

McCarthy, J., Minsky, M. L., Rochester, N., & Shannon, C. E. (2006). A proposal for the dartmouth summer research project on artificial intelligence, august 31, 1955. *AI magazine*, *27*(4), 12-12

Nagaraj, B. K., Kalaivani, A., Begum, S., Akila, S., & Sachdev, H. K. (2023). The emerging role of artificial intelligence in stem higher education: A critical review. *International Research Journal of Multidisciplinary Technovation*, *5*(5), 1-19

Niemi, H., Pea, R. D., & Lu, Y. (2022). Introduction to AI in Learning: Designing the Future. In *AI in learning: Designing the future* (pp. 1-15). Cham: Springer International Publishing

Petrovski, J. (2020). THE NEED OF E-LEARNING PLATFORM IN THE EDUCATIONAL PROCESS. *Teacher*, *19*, 52-56

Tabarrok, A. (2023). Khan Academy Joins with OpenAI