



UTILIZING ARTIFICIAL INTELLIGENCE IN EDUCATION TO ENHANCE TEACHING EFFECTIVENESS

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ABSTRACT

Artificial Intelligence in Education (AIED) has been evolving for some time, and the advent of GPT chat at the end of December 2022 has opened up new opportunities, potentials, and challenges in educational practice. Advances in computational technology and information processing have led to widespread applications of Artificial Intelligence (AI) in the field of education. Over the last 20 years, the number of papers on AIED has been steadily increasing, with a dramatic rise since 2015 until the present. In its brief history, AIED has undergone several paradigm shifts. This research aims to explore the use of AI in education by examining the publication trends sourced from metadata from Google Scholar, PubMed, CrossRef, OpenAlex, and Scopus. The development and application of Artificial Intelligence (AI) technology, particularly in education, significantly supports educational reform and profoundly influences the learning styles of learners. Artificial Intelligence in Education (AIED) can assist teachers in preparing teaching materials, presentation media, and accurate evaluations. Furthermore, AIED can help students adapt their traditional learning styles according to their differences, thus realizing intelligent teaching that meets students' learning needs. Teachers' positive perceptions of educational technology (ET) are beneficial for using AI technology to aid teaching positively, which in turn can enhance teaching effectiveness. Overall, the trend of AIED development has successfully empowered learner personalization, enabling learners to think critically and innovatively, and fostering personalized learning.

Keywords: Artificial Intelligence, Education, Teaching, Effectiveness

1. INTRODUCTION

The advancement of computational technology and information processing has inspired the widespread use of artificial intelligence (AI) in the context of education over the past two decades, with a significant increase in the amount of scholarly literature discussing the role of AI in education. The most striking developments have been observed since 2015. Researchers have acknowledged the potential of AI to revolutionize education by providing customized and efficient solutions to enrich the learning process for students (Yahilina, et al., 2023). AI in education refers to the utilization of AI technology or program applications to enhance the quality of teaching, learning, and decision-making processes within the educational context. However, despite the growing interest in AI in education, many educational practitioners still lack a comprehensive understanding of the most effective strategies to fully harness the pedagogical potential of AI in the teaching and learning process, especially in higher education (Samar, Sharma, 2023). The integration of AI technology and education is viewed as one of the important trends that will shape the future direction of education, and research in this domain is influenced by technological advancements and evolving policy directions (Huifeng, et al., 2023). While AI offers opportunities for personalized learning experiences and enhances student engagement, there are still a number of challenges to be addressed, such as ethical considerations and the potential decline of human interaction within the classroom environment (Mbatha et al., 2023).

The emergence of Artificial Intelligence in Education (AIED) has been a significant event, with the introduction of chatGPT in late December 2022 opening up new opportunities, potentials, and challenges in the education arena. Artificial intelligence technology, which includes chatbots such as ChatGPT, Bing, Gemini, and Poe, offers great potential to transform the dynamics of teaching and learning with its ability to simulate human interaction and generate text resembling the outcomes of human communication based on natural language (K.B. et al., 2023). However, the presence of AI in the educational context also brings about a number of ethical and



practical challenges that require serious attention (Tufan, et al., 2023). Thus, the research problem can be formulated as follows: 1. How can artificial intelligence be effectively integrated into the curriculum and learning strategies to improve student learning outcomes while ensuring its use is relevant and enriches the learning process without replacing the essential role of educators? 2. What are the ethical challenges and issues in the implementation of AI technology in education? The implementation of AI in education requires careful evaluation of ethical aspects, integration with existing infrastructure, and optimal development of competencies for educators and learners (Mohammed, 2023). Although the potential benefits of AI such as personalized learning experiences and adaptive testing are promising, it must also be acknowledged that there are shortcomings, such as the possibility of reduced interpersonal interaction in the classroom due to automation triggered by the presence of AI (Ehsan, et al., 2023). Therefore, research is needed to explore the risks and benefits of using AI in the educational context, as well as to ensure that its implementation is carried out responsibly and follows applicable ethical principles. 3. How can educational institutions address the access gap to AI technology, ensuring that all students, regardless of socioeconomic or geographical background, have equal opportunities to benefit from AI-enriched learning?

The first objective of the research is to explore AI that can be used for text generation, image creation, speech synthesis, video creation, presentation media, and assessment tools, and to identify the most effective strategies for integrating artificial intelligence technology into the curriculum and learning processes. This research will focus on developing methods and approaches that enable educators to leverage AI optimally in enhancing the quality of student learning while ensuring its use is consistent with educational goals and sustainable pedagogy. The second objective is to investigate and analyze the ethical challenges and privacy issues arising from the use of AI in the educational context. This research will consider student data collection and processing, and contemplate how educational institutions can implement policies and practices that align with ethical principles and safeguard student privacy. The third objective is to explore and identify solutions to address the inequality of access to AI technology in education. This research employs the literature review study method, which identifies, interprets, and evaluates findings. Literature search involves executing a comprehensive search strategy using the keywords AIED and predefined criteria in various databases and information sources to gather relevant studies. Screening and Selection of Studies: Using inclusion and exclusion criteria to filter and select relevant studies from search results. This process often involves initial assessment based on titles and abstracts, followed by full-text assessment.

2. METHODS

The methods used for data collection involve exploring the use of AI in education by examining the publication trends sourced from metadata in Publish or Perish from Google Scholar, PubMed, CrossRef, OpenAlex, and Scopus. With the abundance of online publications and open-access resources, it's nearly impossible to conduct a comprehensive search even with well-defined criteria. This research is carefully designed to focus on research publications gathered from one of the Publish or Perish web databases and to delineate between research using VOSviewer.

3. RESULTS & DISCUSSION

Artificial Intelligence (AI) technology and its applications in education, as reported in empirical research, include Chatbots, namely Natural Language Processing (NLP): Its applications encompass automated essay grading, language translation, and text summarization. Its benefits include instant feedback to students and improvement in writing skills. Machine Learning (ML) algorithms are used for personalized learning paths and adaptive tutoring systems. Its benefits include adjusting educational content according to individual student needs and improving learning outcomes. Data Retrieval and Learning Analysis play a role in predicting student



performance, identifying at-risk students, and providing course recommendations. The benefits include supporting early intervention, data-driven decision-making, and improving student success rates. Computer Vision: Applied in face recognition for attendance and object recognition for interactive learning experiences. The use of AI in education is continuously evolving, such as the utilization of Virtual Reality (VR) and Augmented Reality (AR): Providing immersive simulations, virtual field trips, and interactive learning experiences. The benefits include increasing student engagement, providing opportunities for experimental learning, and deepening understanding of complex concepts. Intelligent Tutoring Systems (ITS): Offering personalized tutors, adaptive feedback, and skill assessments. The benefits include supporting individualized learning, enhancing student motivation and performance, and providing scalable solutions. Chatbots and Virtual Assistants: Providing assistance in answering student questions, supporting the learning process, and facilitating communication. The benefits include providing instant support, encouraging self-directed learning, and reducing educators' workload. By researching empirical studies on AI technology in education, educators and AI experts can formulate practical guidelines, examples, inspiration, and other insights. This helps facilitate communication and collaboration among stakeholders with various expertise, enabling a comprehensive understanding of AI research and development in education from various perspectives. Some generative AI that can be used in education are listed in Table 1.

Table 1. Some Generative AI and Their Uses

Generative AI Types	Uses
ChatGPT, Bing AI, Google Bard(Gemini), OpenAI's ChatGPT and GPT-4, Google's Bard and LaMDA, Microsoft's Bing, and Meta's LLaMA. Jasper AI, Salin. AI, Poe,	Text generation tool
Leonardo AI, Dall-E 2, Midjourney, Difusi Stabil, AR, VR, Gambar Bing	Image creation tool
Descript, Speechify, Listnr,	Speech synthesis tool
Steve AI, Pictory, Synthesia, DeepBrainAI	Video creation tool
Simplified, Decktopus AI, Gamma, Wepik AI, Slidesgo, ClassPoint	Media Presentation
Quizizz, QuizGecko	Quiz creation tool
Getdigest dll.	Resume

The application of generative AI in education has been extensively researched, as well as the training conducted by researchers related to AI. Therefore, the graphical display of VOSviewer below can be observed:

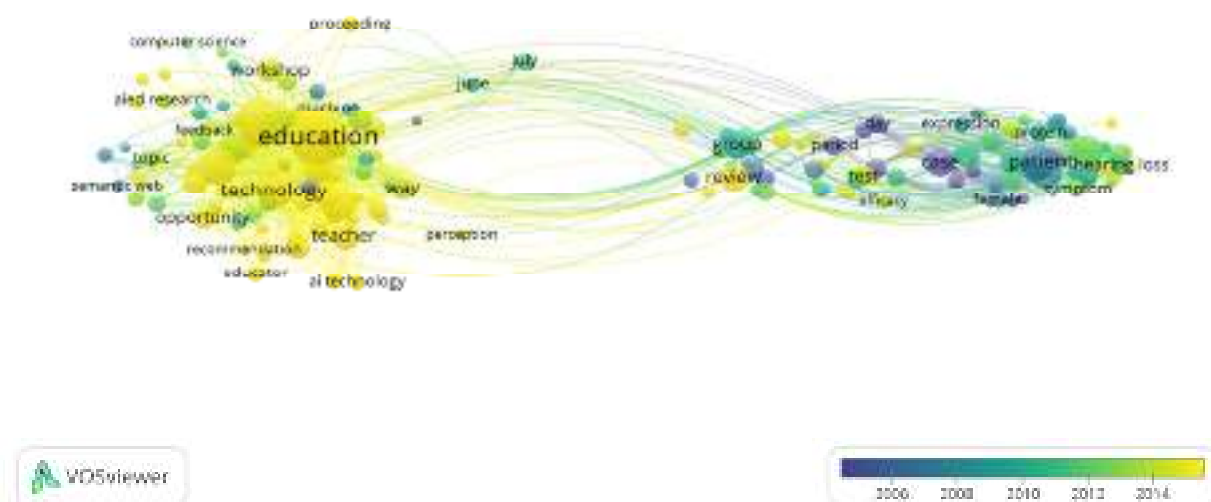


Figure 1. The Graphical Display of AI Use in Education

From the display, it is evident that in relation to education, the advantages and disadvantages of AI in education have been extensively researched and correlated with numerous publications on AIED (Artificial Intelligence in Education) in technology and education journals. There are relatively fewer publications related to testing and efficacy reviews, which is understandable because AI became widely known with the introduction of ChatGPT in late December 2022. Integrating AI-based technology into the educational context requires special attention to the technological knowledge possessed by teachers. Without strong technological knowledge, teachers may not be able to fully utilize the pedagogical opportunities offered by AI (Koehler & Mishra, 2009). One of the main reasons is the lack of comfort in using such technological tools (Joo et al., 2018). However, beyond technical expertise, pedagogical knowledge is also crucial in effectively integrating AI-based technology into the learning process. This is because the role of AI has altered the dynamics of pedagogical knowledge required by teachers. Previous research has provided limited insights into the skills required for AI usage, such as monitoring abilities and timely interventions. To the best of our knowledge, this study is the first to present a comprehensive view of relevant knowledge from both technological and pedagogical perspectives related to AI.

Artificial Intelligence (AI) has the potential to transform learning in the future. Although there are concerns about AI replacing (Voskoglou, 2023). teachers, most participants argue that human teachers still possess unique qualities that make them irreplaceable. AI can be effectively integrated into education to enhance learning without replacing teachers. It can assist in personalized learning, improved assessment, and reduced planning time for teachers. However, there are also risks associated with AI, such as the risk of cheating (Mario et al., 2023). It is important to conduct more empirical research on the impact of AI in education and prepare students for a future where machines will play a leading role. The future of education lies in the synergy between human teachers and AI, where teachers can effectively navigate the integration of AI to ensure a diverse and impactful learning experience, while also enhancing effectiveness (Adair, 2023).



4. CONCLUSION

This article contains a review of research results related to AIED (Artificial Intelligence in Education) from several reputable journals. The article aims to serve as a reference for understanding the role of artificial intelligence in education. According to the main objective of the literature review, AI-based tools promise new opportunities in the context of effective learning and teaching. One promising opportunity offered by AI-based tools is their ability to promote student-centered approaches, enabling each student to access learning materials suitable for their level of understanding and needs through personalization. The anticipated results are expected to enhance student engagement in the learning process while increasing effectiveness.

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