ARTIFICIAL INTELLIGENCE IN EDUCATION WORLD: OPPORTUNITIES, CHALLENGES, AND FUTURE RESEARCH RECOMMENDATIONS

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Abstrak

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Abstract

Artificial Intelligence (AI) is revolutionizing various aspects of life, including education. AI in education (AIEd) fosters teachers' understanding of students' learning processes, offers personalized and adaptive learning, and provides instantaneous feedback. It has the potential to improve academic performance and reduce educational disparities. This study aims to engage researchers, policymakers, teachers, students, and engineers in a dialogue about AIEd. It provides an overview of studies on opportunities, challenges, and recommendations for future research, focusing on specific educational outcomes. A comprehensive perspective is needed to understand the function of AIEd. This research utilizes bibliometric analysis and systematic literature review to analyze AIEd, presenting results as a specific bibliometric network using the VOSviewer tool. Research findings that AIEd-based environments are enhancing student learning, but their personalized learning is still in its experimental stage. Challenges include a lack of resources and ethical concerns. AI chatbots and interactive books aid language learning, but they also have advantages and disadvantages. The humanities must balance these advantages and disadvantages.

Keywords: artificial intelligence, education world, opportunities, challenges, future research recommendations

A. INTRODUCTION

Artificial Intelligence (AI) encompasses the capacity of a digital device to execute tasks typically associated with sentient entities (Chiu, 2021). The technologies that support AI are categorized into multiple domains, including big data, machine learning, computer vision, speech, natural language processing, and computer vision (Xia et al., 2022). The rapid expansion of this field is drastically altering how people live, work, study, engage, and communicate (Ida Verna et al., 2019). The use of AI technologies, such as chatbots, robots, intelligent tutoring systems, and automated evaluation of all forms of digital artifacts that support and improve education, is referred to in this research as AI in education (AIEd) (Pedró, 2019).

AIEd fosters teachers' understanding of students' learning processes, offers students more personalized and adaptive learning, and provides instantaneous feedback and machine-supported queries anywhere, anytime (Akinwalere & Ivanov, 2022). It also has enormous potential to improve teaching, learning, assessment, and educational administration (Abulibdeh et al., 2024). One of the most significant topics for educational research is AIEd, which is promoting program creation and the evolution of teaching and learning techniques (UNESCO, 2019). Resources and grants are being
given to specific institutions and organizations in the US to research and create AI-driven personalized learning platforms (Boninger et al., 2020). These platforms have the potential to improve academic performance by increasing students' cognitive engagement and to lessen educational disparities by helping students from disadvantaged backgrounds (Stancheva-Todorova, 2018).

AIEEd has been under the limelight for educational academics, policymakers, and practitioners due to AI's affordances in improving education (Williamson & Eynon, 2020). On the other hand, the majority of early research was engineering-related and concentrated on creating new algorithms and improving machine learning and deep learning methods (Aswin et al., 2022). In contrast to other educational technology domains like blended learning and gamification, the research on AIEEd is dispersed and poorly structured (Hwang et al., 2020). The effects of AIEEd are yet unknown, and further study is required to determine whether and how these new technologies improve education (Imam Karya Bakti et al., 2023).

The primary objective of this study is to engage researchers, policymakers, teachers, students, and engineers in an urgent dialogue about what lies ahead by providing an overview of studies to understand the opportunities, challenges, and recommendations for future research related to AIEEd. This will help close the research gap in this area. It's time to reveal AIEEd. These research questions served as the basis for this review: (1) How might opportunities in AI technology enhance education's teaching, learning, administration, and evaluation processes? (2) What are the challenges in their research and development? (3) Which learning outcomes for teachers and students in the future of education are influenced by AI technology? These review studies center on specific educational outcomes or core domains such as learning, teaching, assessment, or administration. To examine the function of AIEEd, a more comprehensive perspective is needed (Nigam et al., 2021).

B. RESEARCH METHOD

This research adopts a comprehensive technique to examine AIEEd based on opportunities, challenges, and future research recommendations through the use of bibliometric analysis and a systematic literature review.
Data collected in this research used the Publish or Perish (PoP) application and the VOSviewer tool to analyze the data obtained. Keywords used are related to AIEd, the education world, opportunities, challenges, and future research recommendations. The year of article that is the focus of this research is 2014 to 2024, up to the last ten years. Analysis results from many research sources may be displayed properly and as a specific bibliometric network by using the VOSviewer tool. Database search from AIEd based on opportunities, challenges, and future research recommendations in Figure 1.

**Figure 1.** Database Search from Artificial Intelligence in Education World: Opportunities, Challenges, and Future Research Recommendations

This study uses the Web of Science (WoS) database to compile an initial list of papers. The WoS database is one tool that's commonly utilized for doing systematic literature reviews. WoS for papers that have the term "AIEd" in their keywords, abstract, or title. This initial search turned up a total of 300 entries. Furthermore, the previous database search may be better understood with the use of data metric results that provide information on publications, citation years, publishing years, and other specifics. For more information, see Table 1.

**Table 1.** Data Metric Results: Artificial Intelligence in Education World

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Data Metric Results</th>
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<tbody>
<tr>
<td>Publication years</td>
<td>: 2014-2024</td>
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<tr>
<td>Citation years</td>
<td>: 10 (2014-2024)</td>
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<td>Papers</td>
<td>: 300</td>
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C. RESULT AND DISCUSSION

This study issue can be addressed by the following three findings: (1) Opportunities in AI technology to enhance education's teaching, learning, administration, and evaluation processes; (2) Challenges in their research and development; and (3) Learning outcomes for teachers and students in the future of education are influenced by AI technology. Research findings that utilize VOSviewer as a bibliometric analysis tool from opportunities in AIEd can be seen in Figure 2. Research findings about overlay visualization from AIEd challenges in their research and development can be seen in Figure 3. Research findings about density visualization from learning outcomes for teachers and students in the future of education are influenced by AI can be seen in Figure 4.
According to above Figure 2, the three clusters that are derived from network visualization using the VOSviewer software are visible. The first cluster's explanation is the great potential of AIEd in terms of relationships with educators, higher education, teaching, training, educational institutions, AI integration, AI tools, and inclusiveness. In the second cluster of the network visualization, it is evident that there is a significant advantage from AIEd connection to society, work, communication, machines, classrooms, ChatGPT, computers, and human resource management. The third cluster is where the most opportunity arises from AIEd's relationship to the world, big data, science, ethics, and future directions.

AI-based environments have been utilized to personalize student learning tasks, various studies utilizing augmented, virtual, mixed reality technologies, virtual patient systems, intelligent virtual laboratories, AI-enhanced skin for real-time feedback, and adaptive tasks (Hirankerd & Kittisunthonphisan, 2020). The studies reveal that the personalized learning offered by AI technologies is still in its experimental stage, with the biggest challenge being the lack of supportive learning resources, which are not dynamically generated (Munawar et al., 2018). Studies use AI chatbots and interactive books to facilitate language learning, emulating human thought.
processes and enhancing communication skills through ongoing dialogue with experts (Vázquez-Cano et al., 2021).

Figure 3. Overlay Visualization from Artificial Intelligence in Education World: Challenges

Figure 3 illustrates that the overlay visualization of AIEd at the end of this year is about ethics, generative AI, and inclusivity. AI is at the forefront of technological advancements, significantly impacting various societal sectors (Inuwa-Dutse, 2023). AI has significantly transformed our lives and is expected to continue so in the future (Huang et al., 2023). Ethics is a philosophical discipline that explores right or wrong, with theories highlighting consequences, duty, logic, personal character, and virtue (Stahl et al., 2023). AI ethics and human rights concerns include privacy, bias, safety, security, economic distribution, political participation, changing warfare, a prominent topic in research, innovation policy, and societal debate (Cath, 2018).

Two issues management frameworks are used to display and examine biases in AI and machine learning algorithms in an effort to demonstrate how moral conundrums and ethical difficulties might develop (Yapo & Weiss, 2018). Although the idea of singularity in AI is currently more theoretical than practical, there are advantages and disadvantages to be aware of when designing and developing AI. When designing AI algorithms, inclusivity, stakeholder understanding of possible ethical hazards, and
concerns must be taken into consideration in order to safeguard society's most vulnerable members (Alhur et al., 2023).

**Figure 4.** Density Visualization from Artificial Intelligence in Education World: Future Research Recommendations

Figure 4 shows the density visualization from AIEd for suggestions for further study. This illustrates that some hotly debated topics include, among others, AI tools, AI integration, ethics, and human resource management. The potential benefits of AI tools for individuals with neurodevelopmental disorders, focusing on their impact on personalized learning, assessment, and diagnosis, highlight the potential of machine learning algorithms and AI models (Moraiti & Drigas, 2023). AI tool use in educational settings has been linked to both beneficial and detrimental outcomes. Although AI technologies might aid students in their writing, they can also result in moral dilemmas and a loss of originality (De Freitas et al., 2023).

In the face of developing technology, the humanities can maintain their worth by weighing the advantages and disadvantages of AI technologies (Liang, 2023). The potential of generative AI tools like for individual learning and knowledge construction, focusing on a social, collective notion of knowledge. It suggests users should establish dialogs
that go beyond knowledge telling and stimulate knowledge transformation into complex relational argumentation structures (Cress & Kimmerle, 2023).

D. CONCLUSIONS

AIEd-based environments have been used to personalize student learning tasks, but the personalized learning offered by AIEd technologies is still in its experimental stage. Challenges include the lack of supportive learning resources and ethical concerns such as privacy, bias, safety, and security. AI chatbots and interactive books facilitate language learning and communication skills through ongoing dialogue with experts. AIEd has significantly transformed our lives and is expected to continue so in the future. However, there are advantages and disadvantages to consider when designing AI algorithms, such as inclusivity and stakeholder understanding of potential ethical hazards. AI tools have potential benefits for individuals with neurodevelopmental disorders, but can also lead to moral dilemmas and loss of originality. The humanities can maintain their worth by weighing the advantages and disadvantages of AIEd technologies.

E. BIBLIOGRAPHY


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