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AN ANALYSIS OF CURRENT RESEARCH TRENDS REGARDING THE UTILIZATION OF ARTIFICIAL INTELLIGENCE IN TEACHING

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ABSTRACT

This article aims to explore research trends in the utilization of artificial intelligence (AI) in the field of education between 2017 and 2024, based on data from Scopus. The PRISMA model was employed as the methodology for selecting and analyzing relevant articles, resulting in a total of 25 documents being included in the analysis. The author of the article examines the pertinent information related to the primary research topic, while also identifying unresolved issues that warrant further investigation in the future. The study's findings indicate that the majority of authors have focused on studying the role and potential of AI in the teaching and learning process, as well as the challenges and barriers associated with its implementation in education. Additionally, the research suggests that it is crucial to delve into the understanding of teachers' perceptions regarding the use of AI in education from diverse cultural backgrounds. Furthermore, exploring strategies for integrating AI into education is also deemed essential. This article serves as a valuable reference for researchers interested in the application of AI in education, providing a comprehensive overview of pertinent studies and guiding future research directions.

KEYWORDS: Artificial intelligence in education; AI in teaching; Research trends; Systematic review; PRISMA; Teachers' perceptions.

1. INTRODUCTION

Artificial intelligence (AI) has emerged as a pioneering technology with the potential to transform multiple domains of human activity, including education (Al-Tkhayneh et al., 2023). In educational contexts, AI offers substantial potential to reshape teaching and learning practices, as it can personalize learning content to accommodate learners' individual needs (Popenici & Kerr, 2017). Moreover, AI can automate administrative tasks such as grading and record keeping, thereby enabling teachers to devote greater attention to pedagogical work and professional development (Al-Tkhayneh et al., 2023). In addition, AI-based systems can identify patterns in students' learning behaviors, allowing teachers to intervene at early stages when learning difficulties arise. Consequently, AI holds promise for enhancing educational quality and improving learners' educational experiences (Ali, 2024).

The utilization of artificial intelligence in teaching and education has become an increasingly prominent topic of scholarly inquiry, attracting a growing body of research (Chuyen, 2024). This trend is evidenced by a number of review studies examining AI in education, including systematic reviews of AI applications in teaching (Chuyen, 2024), analyses of research trends and thematic foci in AI for science education (Jia et al., 2024), and investigations into trends, challenges, and opportunities associated with the use of AI in educational settings (Aldhaen, 2022; Li et al., 2024; Owoc et al., 2019; Xia et al., 2022). Other studies have examined ethical implications, as well as the risks and challenges related to the deployment of AI in education (Zawacki-Richter et al., 2019).

Nevertheless, much of the extant literature has predominantly employed bibliometric approaches, focusing on publication characteristics such as year of publication, journal outlets, authorship patterns, and prominent keywords. There remains a relative paucity of content-oriented analyses that systematically examine substantive research themes and issues concerning the utilization of AI in teaching and education. Accordingly, this article aims to investigate key issues related to the use of artificial intelligence in teaching and education by addressing the following research questions: (i) What aspects of AI utilization in teaching and education are currently being investigated by researchers worldwide? (ii) What future research directions can be identified for AI in teaching and education?

Addressing these research questions will assist educational researchers and policymakers in gaining a clearer understanding of how AI is being implemented in teaching and education across different national contexts, and in identifying practices that may be adapted to specific educational systems. Furthermore, the findings will help to delineate existing research gaps and inform future research agendas in this rapidly evolving field.

2. METHODOLOGY

The PRISMA systematic review framework was adopted to guide the identification, screening, and inclusion of relevant studies. The literature search was conducted in the Scopus database using combinations of the keywords “AI” or “artificial intelligence” and “teaching” or “learning” or “education”. The search was limited to peer-reviewed journal articles published between 2017 and 2024. After removing duplicates and screening titles and abstracts for relevance, 25 articles that met the inclusion criteria were retained for full-text analysis.

3. RESULTS AND DISCUSSION

3.1. What research issues related to the use of artificial intelligence in teaching have been addressed?

Table 1 presents the key research issues related to the use of artificial intelligence in teaching that have been discussed by scholars worldwide.

Table 1. Core research issues addressed in studies on the use of AI in teaching

References	Research issues addressed
(Delgado et al., 2020; Jaya Kannan & Pilar Munday, 2018; Hualiang Lin, 2022; Popenici & Kerr, 2017; Yang, 2020)	Examining the roles and potential of artificial intelligence in teaching and learning.
(Luo, 2018; Shuanghong Jenny Niu et al., 2022; Rabelo et al., 2022; Yang et al., 2020)	Xây dựng các chiến lược sử dụng AI trong dạy học nhằm đáp ứng dạy học phân hoá theo đối tượng học sinh. Developing AI-based instructional strategies to support differentiated instruction tailored to diverse learner needs.
(Deveci Topal et al., 2021; Huang, 2021; Huang, 2018; Hualiang Lin, 2022; Schroeder et al., 2022)	Conducting pedagogical experiments on the use of AI in teaching, with findings consistently indicating positive effects on learners' motivation and learning attitudes.
(Kong, 2020; Li, 2017; Wang & Zheng, 2020; Yang, 2020)	Analyzing applications of AI and designing instructional strategies to enhance teaching effectiveness.
(Jaya Kannan & Pilar Munday, 2018; Kong, 2020; Li & Su, 2020; X.-F. Lin et al., 2022; Popenici & Kerr, 2017)	Investigating challenges and barriers associated with the adoption of artificial intelligence in teaching.
(Kong, 2020; Wang & Zheng, 2020).	Applying the Analytic Hierarchy Process (AHP) to evaluate the effectiveness of AI applications in teaching.
(Li, 2017; Luo, 2018)	Designing AI-based software systems (e.g., AI Prolog) and intelligent robots to develop instructional guidance systems.
(Shuanghong Jenny Niu et al., 2022; Yang et al., 2020)	Designing learning platforms such as MOOCs, SLPs, and SPOCs supported by AI technologies.
(Deveci Topal et al., 2021; Rabelo et al., 2022)	Employing intelligent personal assistants (e.g., Alexa) and free chatbot tools (e.g., Dialogflow) to provide automated responses to learners' inquiries.
(Popenici & Kerr, 2017)	Examining the historical development of the use of artificial intelligence in teaching and learning.
(Yang et al., 2020)	Developing AI-based learning environments.
(X.-F. Lin et al., 2022)	Investigating teachers' perceptions and professional experiences regarding the use of AI in teaching.
(Al Darayseh, 2023)	Applying the Technology Acceptance Model (TAM) to

	explore teachers' perceptions of factors influencing the adoption of AI applications in teaching.
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Drawing on the issues presented in Table 1, research on the use of artificial intelligence in teaching has attracted increasing scholarly attention in recent years (Chuyen, 2024). Among the identified themes, the most prominent strand of research focuses on examining the roles and potential of AI in teaching and learning (Kong, 2020; Li, 2017; Wang & Zheng, 2020; Yang, 2020). The second most frequently addressed issue concerns the development of AI-based instructional strategies to support differentiated instruction (Luo, 2018; Shuanghong Jenny Niu et al., 2022; Rabelo et al., 2022; Yang et al., 2020). This pedagogical orientation aligns with broader educational reforms in many countries that emphasize the development of learners' competencies through personalized and adaptive learning approaches.

In addition, a substantial body of research has examined the practical value of AI through empirical studies investigating the implementation of AI in teaching and analyzing its effects on students' learning motivation and attitudes (Deveci Topal et al., 2021; Huang, 2018, 2021; Hualiang Lin, 2022; Schroeder et al., 2022). The findings consistently indicate that AI has positive effects on learners' motivation and learning attitudes. These results suggest that the integration of AI into instructional practices has the potential to enhance student engagement and foster more positive learning dispositions. Furthermore, several studies have proposed pedagogical strategies for leveraging AI to improve teaching effectiveness (Kong, 2020; Li, 2017; Wang & Zheng, 2020; Yang, 2020).

Despite the demonstrated potential and empirical support for the educational benefits of AI, existing studies also highlight a range of challenges and constraints associated with its adoption in teaching. Accordingly, numerous studies have examined the current state of AI implementation in educational practice and identified existing limitations, as well as institutional, pedagogical, and technological barriers to the use of AI in teaching (Jaya Kannan & Pilar Munday, 2018; Kong, 2020; Li & Su, 2020; X.-F. Lin et al., 2022; Popenici & Kerr, 2017). To address these challenges, researchers have proposed various solutions, including the development of AI-based learning environments (Yang et al., 2020), the design of AI software and intelligent robotic systems to support instructional guidance (Li, 2017; Luo, 2018), the use of intelligent personal assistants and chatbots to provide automated responses to learners' inquiries (Deveci Topal et al., 2021; Rabelo et al., 2022), and the deployment of online learning platforms such as MOOCs, SLPs, and SPOCs to create diverse and personalized learning environments (Shuanghong Jenny Niu et al., 2022; Yang et al., 2020).

In addition, some studies have examined the historical development of AI in teaching (Popenici & Kerr, 2017) or explored the factors influencing the adoption of AI in educational contexts. Collectively, these strands of research contribute to informing researchers, educational policymakers, and practitioners about effective pedagogical strategies for enhancing the role of AI in the context of Education 4.0.

3.2. What are the future research directions for AI in education and teaching?

The content presented in Table 2 highlights the future research directions concerning the use of AI in teaching that have been identified by scholars in the existing literature.

Table 2. Research gaps and future research directions regarding the use of AI in teaching and education

References	Future research directions
(Al Darayseh, 2023)	Investigating teachers' acceptance of AI across diverse cultural and professional backgrounds.
(Chan, 2023)	Examining the potential benefits and risks associated with the use of AI in academic environments; critically evaluating which AI technologies should be adopted and identifying best practices for their use.
(J. Kannan & P. Munday, 2018)	Exploring approaches to integrating AI tools (e.g., augmented reality and virtual reality applications) with face-to-face learning contexts to optimize students' learning experiences.
(J. Kannan & P. Munday, 2018)	Developing strategies to overcome challenges and leverage opportunities related to the use of AI in teaching and education.
(Chou et al., 2023)	Investigating the influence of teachers' cognitive perceptions on the effectiveness of AI use in teaching.
(H. Lin, 2022)	Further examining teachers' efforts to develop AI-supported instructional systems.
(Kaouni et al., 2023)	Employing AI for learning style detection, data classification, and prediction, as well as implementing chatbots and automated learning support systems.
(X.-F. Lin et al., 2022)	Investigating teachers' perceptions across diverse cultural and disciplinary backgrounds to gain deeper insights into teachers' experiences with AI and to inform the development of more robust theoretical frameworks.
(Shuanghong J. Niu et al., 2022)	Integrating students' learning outcomes into AI-supported learning platforms (SLP) to demonstrate the positive role of SLP in supporting student learning.
(Zhang et al., 2021)	Developing open and intelligent interactive e-books by collecting learners' interaction data and analyzing them in real time through learning analytics systems to provide personalized content, immediate feedback, and learning

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Drawing on the issues summarized in Table 2, the use of AI in teaching and education encompasses numerous aspects that warrant further investigation in order to fully leverage the potential of technology in the context of the rapidly evolving global landscape. The study by Al Darayseh (2023) primarily examined factors influencing the acceptance of AI in science education and highlighted the need to extend future research to teachers from diverse cultural and professional backgrounds (Al Darayseh, 2023). Similarly, Chan (2023) emphasized the importance of investigating both the potential benefits and inherent risks associated with the use of AI in academic environments, as well as critically evaluating which AI technologies should be adopted and identifying appropriate best practices (Chan, 2023). In addition, Kannan and Munday (2018) underscored the need to explore strategies for overcoming challenges and capitalizing on the opportunities afforded by AI in education (J. Kannan & P. Munday, 2018).

Furthermore, future research should examine the influence of teachers' perceptions on the effectiveness of AI use in teaching (Chou et al., 2023), as well as teachers' efforts in developing AI-supported instructional systems (H. Lin, 2022). Other promising directions include the use of AI to identify students' learning styles, which could inform the design of personalized learning materials and courses to better support learner agency, as well as the development of virtual assistants to facilitate teaching and learning processes (Kaouni et al., 2023). In addition, research examining cross-cultural and cross-disciplinary differences in teachers' perceptions of AI use in teaching is needed to provide deeper insights into teachers' lived experiences with AI and to inform the development of more robust theoretical frameworks (X.-F. Lin et al., 2022).

Moreover, scholars may focus on the development of intelligent educational support platforms and the design of interactive digital learning resources to enhance students' learning experiences (Shuanghong J. Niu et al., 2022; Zhang et al., 2021). Collectively, these future research directions delineate important research gaps and provide a foundation for scholars to further explore and harness the full potential of AI in education.

4. CONCLUSION

This article aimed to analyze key research issues related to the use of AI in teaching based on a content review of studies indexed in the Scopus database published between 2017 and 2024. The findings indicate that the use of AI in teaching has attracted considerable scholarly attention in recent years. The predominant focus of existing research has been on examining the roles and potential of artificial intelligence in teaching and learning. Building on this foundation, many studies have proposed AI-based instructional strategies to support differentiated instruction. In addition, a substantial body of research has explored the practical value of AI through empirical implementations in teaching and analyses of its effects on students' motivation and learning attitudes.

Despite these contributions, this review is subject to several limitations. First, the analysis relied exclusively on publications indexed in the Scopus database, and primarily on open-access articles, which may have resulted in the exclusion of relevant studies indexed in other databases. Consequently, some relevant literature may not have been captured in the present review. Nevertheless, the findings provide a comprehensive overview of research directions concerning the use of artificial intelligence in teaching, helping to identify both well-established themes and underexplored areas in the existing literature, as well as delineating future research gaps. Accordingly, this study may contribute to informing the development of future research agendas and guiding subsequent investigations in this rapidly evolving field.

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