PERSPECTIVE

Integrating AI and Education: A Multidimensional Perspective on Opportunities, Risks, and Future Development

Chuyun Liu[1,*]

[1] School of Teacher Education, Fujian Normal University, Fuzhou 350007, China

Abstract

The rapid development of artificial intelligence has profoundly impacted the field of education, influencing teaching models, learning methods, and assessment techniques. This study analyzes the current state of AI in education using the CiteSpace visualization tool, revealing key challenges such as the lack of assurance in information authenticity, the exacerbation of educational inequality, and the potential decline in essential skills. Based on these findings, the paper explores future directions for AI development in education.

Keywords: artificial intelligence, education, personalized assessment, generative AI.

1 Introduction

More than a decade ago, Steve Jobs famously posed the question: "Why have computers transformed almost every industry, yet had a shockingly small impact on education?" Today, AI has permeated nearly every aspect of society—from medical diagnostics to autonomous driving, from financial analysis to content creation—demonstrating unprecedented transformative power. In the field of education, AI presents both opportunities and challenges.

What impact will AI ultimately have on education? Will it revolutionize learning or deepen educational inequities? Is it a powerful tool for enhancing learning efficiency, or does it pose a risk of widening the education gap? This paper explores the influence of AI on education, analyzing the opportunities and challenges it brings while envisioning its future development.

2 The Current State of AI in Education

Since the emergence of Generative Artificial Intelligence in 2023, the ways in which humans acquire and disseminate knowledge have undergone significant transformations. To examine the role of AI in education, a literature search was conducted using Web of Science, the world's largest comprehensive academic information database. As of March 27, 2025, a search query was formulated as "Topic = Artificial Intelligence OR Topic = AI AND Topic = Education" within the Web of Science Core Collection database, with results limited to SSCI journals. After removing duplicate entries, a total of 2,872 relevant papers were identified. These records were then processed

Academic Editor:
Javed Iqbal

Submitted: 28 March 2025
Accepted: 30 March 2025
Published: 31 March 2025

Vol. 2, **No.** 1, 2025.
10.62762/JSSPA.2025.594321

***Corresponding author:**
✉ Chuyun Liu
qsz20230707@student.fjnu.edu.cn

Citation
Liu, C. (2025). Integrating AI and Education: A Multidimensional Perspective on Opportunities, Risks, and Future Development. *Journal of Social Systems and Policy Analysis*, 2(1), 29–33.

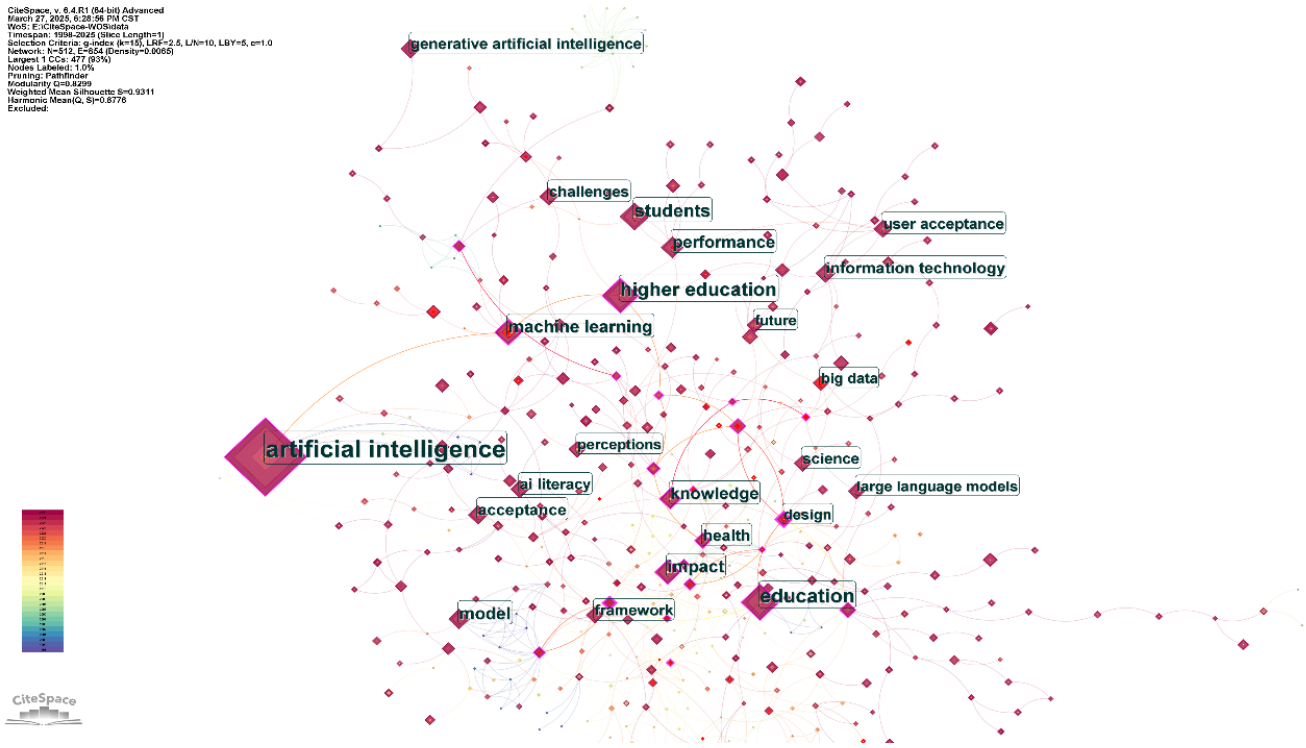

Figure 1. Clustering map of artificial intelligence in education based on 2,872 papers.

using the CiteSpace visualization tool to generate a clustering map, as shown in Figure 1.

Table 1. Frequency statistics of key research terms (Top 8).

Keywords	Count	Centrality
Artificial intelligence	1038	0.17
Education	293	0.15
Higher education	218	0.18
Students	157	0.02
Machine learning	124	0.16
Model	111	0.04
Impact	111	0.11
Performance	104	0.03

The clustering map exhibits a Q value of 0.8299, indicating significant clustering, and an S value of 0.9311, suggesting that the map is highly efficient and persuasive. As shown in Figure 1, and the high-frequency term statistics in Table 1, it is evident that research on artificial intelligence in education is primarily focused on areas such as higher education and education in general. This highlights the growing attention AI is receiving across different educational levels, particularly in higher education. The term machine learning appears 124 times with high centrality, underscoring its critical role in AI-driven education. Machine learning serves as a fundamental technology supporting applications like personalized learning systems and automated grading systems, both of which heavily rely on advancements in machine learning. The term impact appears 111 times, reflecting that the effects of AI on education have become a central research topic. While AI enhances teaching efficiency, it also raises concerns related to data privacy and educational equity. These issues manifest in several key areas, as discussed below.

One significant change occurs in the teaching model. With the explosion of information, the teaching model has shifted from the traditional "teach-first, learn-later" approach to a "learn-first, teach-later" model. In the traditional teaching model, lessons are typically delivered based on specific knowledge points, and students then practice to consolidate their learning. In contrast, in AI-supported educational environments, the "flipped classroom" has emerged, reshaping the relationship between the participants in the educational process, from "teacher-student" to "teacher-machine-student". Students can use intelligent platforms and online courses to independently learn relevant content before class, and in class, engage in discussions and exchanges. This "learn-first, teach-later" model makes students active participants in their learning, while the teacher's role shifts to that of a facilitator, better reflecting the student-centered educational philosophy.

Secondly, the emergence of machine learning and

big data has made personalized learning possible. YU believes that GPT-4o's advanced functionalities can significantly improve intelligent teaching systems, homework grading, tutoring systems, and speech interaction systems [1]. The powerful computational capabilities of artificial intelligence and deep learning models enable real-time analysis of students' learning habits, mastery of knowledge, and areas of interest, providing tailored learning resources. This shifts education from the traditional "one-size-fits-all" approach to a more personalized "teaching according to students' abilities" model.

Thirdly, the shift in evaluation methods promotes a focus on the "process" rather than just the "results". The emergence of artificial intelligence has broken down the walls of schools, making students' learning environments no longer confined to classrooms and schools. Evaluation can now extend beyond post-class assessments to encompass the entire learning process. Traditional evaluation methods rely on exam scores obtained through paper-and-pencil tests, whereas AI can digitize the recording of students' learning processes through Learning Management Systems (LMS), intelligent assignment platforms, and other tools. This includes data on study duration, time spent on tasks, problem-solving habits, error rates, and more, creating comprehensive learning portfolios and making the evaluation system more multifaceted.

3 Challenges of AI in Education

Although artificial intelligence has demonstrated significant potential in the field of education and made considerable progress in many areas, its application still faces numerous challenges due to the complexity of information filtering and content verification, which are often overlooked during use.

Firstly, the authenticity and reliability of AI-generated content are insufficient, making information filtering more difficult. The authenticity of AI-generated content still requires human oversight to ensure its accuracy. The generation logic of AI primarily relies on "statistical probability", meaning it considers to be true what is repeated the most [2]. This implies that AI-generated content is not necessarily accurate or authoritative; it may still produce errors or misleading information, even "hallucinations", where it fabricates details without a real basis. This is particularly concerning for primary and secondary school students, whose ability to discern accuracy is still developing, making it difficult for them to judge the truthfulness of generated content, and possibly leading to the reception of incorrect or biased knowledge. Since regulatory mechanisms for AI-generated content are not yet fully established, the spread of unverified false information complicates the filtering process. Cooper has pointed out that ChatGPT runs the risk of positioning itself as the ultimate epistemic authority, assuming a single truth without proper grounding in evidence or sufficient qualifications [3], making AI-generated content resemble a "statistical consensus" rather than an authoritative knowledge system.

Secondly, the potential risks arising from AI systems being trained on biased data must be considered. AI systems trained on biased data may exacerbate existing inequalities, providing advantages to some students while disadvantaging others [1], thus increasing educational inequality. The content generated by AI systems heavily depends on the quality of the input data. If the training data itself is biased, it could lead to the reinforcement of inequalities across all educational applications of AI. On the other hand, AI-recommended learning resources are often based on mainstream cultural backgrounds and values. While students in certain regions can access a wealth of high-quality learning materials that align with their backgrounds and needs, students in other regions may face resource scarcity or limitations in recommendation mechanisms, further exacerbating educational inequality.

Thirdly, with the development of artificial intelligence, AI allows students to quickly access answers and assistance during their learning. As a result, certain mechanical knowledge and memorization skills are weakened, and opportunities for students to think critically and solve problems are reduced. Long-term reliance on AI leads to the degradation of human thinking and problem-solving abilities. It fosters student inertia, making them more likely to seek quick answers when faced with learning difficulties, rather than engaging in deep exploration and critical thinking. Consequently, their abilities become trapped in the mire of the AI era. So, how should the future of education respond to the innovations and challenges brought about by artificial intelligence?

4 Future Prospects

Having examined the challenges, we now turn to future prospects. When looking ahead to the application of artificial intelligence in education, we must not only acknowledge the positive contributions AI has made to education but also address its potential risks and challenges.

First, the boundaries of AI usage need to be clearly defined to avoid over-reliance on technology, which may have negative consequences. Due to the current lack of corresponding regulations and measures, AI-generated content may contain falsehoods or biases, and students' limited ability to discern this information means they may receive inaccurate content. In response to this challenge, teachers need to guide students in using multiple sources to cross-check the accuracy of information and improve their information literacy. At the same time, AIGC detection software should be introduced to search for and identify AI-generated content, preventing the spread of information overload and disorganization, and establishing standardized labels for AI-generated content.

The emergence of artificial intelligence has thrust teachers into the wave of replacement. Kim argues that, As technology continues to develop, it is likely that the future of education would eventually adopt machine teachers in diverse roles [4]. However, the "diminishment" of the "teacher" role does not imply that teachers lose their function in the educational process. On the contrary, with the widespread use of AI in education, teachers will need to undertake more complex and diverse educational missions. As educators, they must not only enhance their own digital literacy and technical skills but also actively embrace technological transformation. The shift from being "instructors" to becoming "guides" and "collaborators" requires teachers to develop stronger instructional design capabilities and play a more crucial role in the new educational ecosystem to adapt to these changes.

The field of education has entered a new era of human-machine collaboration, where the role of teachers is becoming increasingly important. Future education cannot exist without teachers. Jeon et al. [5] explored the relationship between ChatGPT and teachers was explored with a particular focus on identifying the complementary roles of each in education. While AI can efficiently process large amounts of data and provide convenience in education and teaching, it does not possess the advantages of human teachers in understanding students' emotional needs, guiding students to think critically, and stimulating their potential. Therefore, future education must not blur the position and role of teachers but should shift from the traditional "teaching" model to one that emphasizes "educating people," reinforcing teachers' roles in fostering students' abilities and values.

While looking ahead to the future, we must also pay attention to the challenges that AI development may bring. AI can provide personalized recommendations based on students' specific circumstances, but does this recommendation promote educational equity or hinder it? Will it lead to "labeling" or "stereotyping"? And how can we ensure that AI's recommendation mechanisms do not unintentionally reinforce learning gaps between students, but instead help all students access learning opportunities suited to them? These are all issues that require further in-depth research.

Data Availability Statement

Data will be made available on request.

Funding

This work was supported without any funding.

Conflicts of Interest

The author declare no conflicts of interest.

Ethical Approval and Consent to Participate

Not applicable.

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Chuyun Liu is now a master's student in education from School of Teacher Education, Fujian Normal University, Fuzhou 350007, China. (Email: qsz20230707@student.fjnu.edu.cn)