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RESEARCH ARTICLE

A Bibliometric Study on the Use of AI in History Education: A Global Research Overview

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Abstract
Artificial Intelligence (AI) has become one of the most rapidly expanding research areas in education, offering transformative opportunities for teaching, learning, and educational management. Despite this growing interest, a comprehensive understanding of global research trends and intellectual developments in AI-related educational studies remains limited. This study aims to map the global research landscape of AI in education through a bibliometric analysis of publications indexed in the Scopus database. A total of 1,632 journal articles published between 2020 and 2024 were retrieved using the search query TITLE ("Artificial" AND "Intelligence" AND "Education"). The bibliographic data were exported and analyzed using Microsoft Excel for descriptive statistics and VOSviewer for bibliometric network visualization, including publication trends, citation performance, institutional productivity, and international collaboration. The findings reveal a substantial increase in scholarly output over the five-year period, with publication volume reaching its highest level in 2024 (559 articles). Citation analysis indicates that publications released in 2023 achieved the greatest academic impact, while leading institutions were predominantly located in Hong Kong, the United Kingdom, and the United States. Network visualization further demonstrates that China, the United States, India, and the United Kingdom constitute the principal hubs of global scientific collaboration in AI and education research. These findings highlight the accelerating growth and internationalization of AI research in education while revealing unequal global research participation. This study provides a comprehensive overview of the evolution of AI scholarship in education and identifies future research opportunities, particularly for expanding AI applications in underexplored domains such as history education.

Keywords: Artificial Intelligence; Bibliometric Analysis; Education; History Education; Scopus

INTRODUCTION

Artificial Intelligence (AI) has become one of the most transformative technologies of the Fourth Industrial Revolution, enabling machines to simulate human intelligence through advanced computational techniques such as machine learning, natural language processing, computer vision, and robotics (Zhang & Lu, 2021). The rapid evolution of AI has significantly reshaped educational research and practice by enabling personalized learning, intelligent tutoring systems, automated assessment, adaptive feedback, and data-driven educational decision-making. These technological innovations have fundamentally changed conventional teaching approaches into more interactive, learner-centered, and personalized learning environments while improving educational accessibility and effectiveness (Murtaza et al., 2022).

The rapid advancement of AI has accelerated further with the emergence of generative AI technologies, particularly large language models such as ChatGPT, which have transformed how educators design instruction, assess learning outcomes, and facilitate student engagement. Consequently, Artificial Intelligence in Education (AIED) has become one of the fastest-growing interdisciplinary research domains over the past five years. International organizations, including UNESCO and the Organisation for Economic Co-operation and Development (OECD), recognize AI as a strategic driver for future education systems while simultaneously emphasizing responsible AI implementation through ethical governance, transparency, academic integrity, data privacy, and algorithmic fairness. These developments have shifted educational research from merely investigating AI technologies toward understanding their pedagogical, social, and disciplinary implications.

Within this broader educational transformation, history education represents a distinctive disciplinary context because historical learning requires learners to evaluate historical evidence, interpret multiple perspectives, develop historical reasoning, and construct evidence-based historical arguments. Unlike many STEM disciplines that emphasize procedural knowledge, history education aims to cultivate historical thinking, historical consciousness, source criticism, and historical empathy. AI therefore offers opportunities not only to personalize learning experiences but also to enrich historical inquiry through intelligent content recommendation, AI-assisted historical simulations, automated document analysis, adaptive feedback, and interactive learning environments. These capabilities may increase student engagement while supporting more meaningful interpretations of historical events and evidence (Elbanna & Armstrong, 2024).

Recent scholarship demonstrates remarkable growth in AI-related educational research. Earlier studies primarily investigated intelligent tutoring systems, adaptive learning environments, and learning analytics, whereas more recent studies have expanded toward generative AI, ChatGPT integration, AI-assisted assessment, multimodal learning, ethical AI, and human-AI collaboration (Chen et al., 2020; Hwang et al., 2020; Chatterjee & Bhattacharjee, 2020; Ouyang & Jiao, 2021; Holmes et al., 2022; Kasneci et al., 2023; Tlili et al., 2023; Crompton & Burke, 2023). This progression illustrates the rapid diversification of AI research within education across multiple disciplines and educational levels. Nevertheless, most studies remain concentrated on higher education, STEM education, language learning, educational technology, and computer science, whereas comparatively limited attention has been devoted to discipline-specific contexts such as history education.

Bibliometric analysis has become an increasingly valuable approach for synthesizing rapidly expanding scientific literature by objectively examining publication trends, citation performance, collaboration networks, and the intellectual structure of research fields. Since its introduction by Pritchard (1969), bibliometric analysis has evolved into a widely accepted methodology for evaluating scientific productivity and identifying emerging research frontiers. Recent bibliometric studies have successfully mapped the evolution of AI in education by identifying influential authors, institutions, countries, journals, and thematic developments (Donthu et al., 2021; Moral-Muñoz et al., 2020). Such analyses provide systematic evidence regarding the maturity of research fields while offering strategic guidance for future scientific development.

Despite this growing body of literature, several important research gaps remain. *First*, previous bibliometric investigations have largely examined AI in education as a homogeneous research domain without adequately considering disciplinary differences. *Second*, existing studies predominantly describe publication growth and citation performance but rarely integrate institutional productivity, international collaboration, and intellectual structures into a comprehensive

global knowledge map that informs discipline-specific educational research. *Third*, although AI applications continue to expand rapidly across educational settings, the global research landscape concerning history education remains fragmented and insufficiently understood. Consequently, researchers and policymakers currently lack a comprehensive evidence base for understanding how AI research may shape future developments in historical teaching and learning.

Addressing these limitations, the present study conducts a comprehensive bibliometric analysis of 1,632 Scopus-indexed journal articles published between 2020 and 2024. Unlike previous bibliometric investigations that primarily describe publication statistics, this study integrates publication growth, citation performance, institutional productivity, country contributions, and international collaboration networks into a comprehensive knowledge map. By positioning history education within the broader ecosystem of AI research, the study extends existing bibliometric literature beyond descriptive analysis and identifies strategic directions for future AI integration in historical teaching and learning. This discipline-oriented perspective represents the principal novelty of the present research.

The findings of this study contribute to the literature in several important ways. Theoretically, the study advances understanding of the intellectual evolution of AI research in education by identifying major publication trends, influential contributors, and collaborative research networks. Methodologically, it demonstrates the effectiveness of bibliometric analysis using Scopus-indexed publications and VOSviewer visualization for systematically mapping rapidly evolving research domains. Practically, the results provide evidence-based insights for researchers, educators, curriculum developers, and policymakers seeking to integrate AI into history education while identifying promising directions for future interdisciplinary research and international collaboration.

Based on these considerations, this study aims to provide a comprehensive bibliometric overview of global AI research in education by analyzing publication growth, citation performance, leading countries, productive institutions, and international collaboration networks using Scopus-indexed publications from 2020 to 2024. Furthermore, this study discusses the implications of these global research trends for the future development of history education, an educational field that remains comparatively underexplored despite the rapid international expansion of AI-related educational research.

METHOD

This study employed a quantitative bibliometric research design to systematically examine the development of Artificial Intelligence (AI) research in education. Bibliometric analysis is a quantitative approach that enables researchers to evaluate scientific production, identify influential publications, map collaboration networks, and reveal the intellectual structure of a research field through statistical analysis of bibliographic data (Donthu et al., 2021). Compared with traditional literature reviews, bibliometric analysis provides a more objective and reproducible approach for identifying publication trends, citation patterns, and research hotspots. In this study, bibliometric indicators such as publication year, document type, language, subject area, source title, keywords, authors, affiliations, countries, references, and citation performance were analyzed to identify influential publications, productive institutions, and global research trends in Artificial Intelligence in education.

The Scopus database was selected as the primary source of bibliographic data because of its comprehensive multidisciplinary coverage, rigorous indexing standards, and extensive citation records, making it one of the most reliable databases for bibliometric research (Baas et al., 2020). Data were collected on 19 September 2024 using the search query TITLE ("Artificial" AND "Intelligence" AND "Education"), which was designed to retrieve publications explicitly focusing on Artificial Intelligence in educational contexts. The search yielded 1,632 journal articles published between 2020 and 2024. The analysis was limited to English-language journal articles indexed in Scopus to ensure data consistency and scientific quality. Conference papers, book chapters, editorials, notes, errata, duplicate records, and documents unrelated to educational applications of AI were excluded during the screening process. Subsequently, a data-cleaning procedure was conducted to remove duplicate records, incomplete metadata, and irrelevant publications while standardizing author names, institutional affiliations, and keywords where necessary. The overall data collection and screening procedure is presented in Figure 1.

The bibliographic records were exported from Scopus in both CSV and RIS formats for further analysis. Microsoft Excel was used to perform descriptive statistical analyses, including publication frequency, citation counts, and institutional productivity, whereas VOSviewer (version 1.6.x) was employed to construct bibliometric networks and visualize relationships among authors, institutions, countries, citations, and keywords. Network visualization was generated using the VOSviewer mapping algorithm based on the association strength normalization method. The size of each node represents the relative importance of an item, whereas the thickness of the connecting lines reflects the strength of relationships between nodes. Cluster analysis was automatically generated to identify major thematic groups and collaboration patterns within the literature. Citation performance was evaluated using indicators such as Total Citations (TC), Citations per Year (C/Y), and publication productivity, while descriptive information regarding countries and institutions was obtained directly from the Scopus database. The findings were subsequently interpreted to identify global research trends, influential contributors, collaborative research networks, and emerging research opportunities, particularly in relation to the future development of history education.

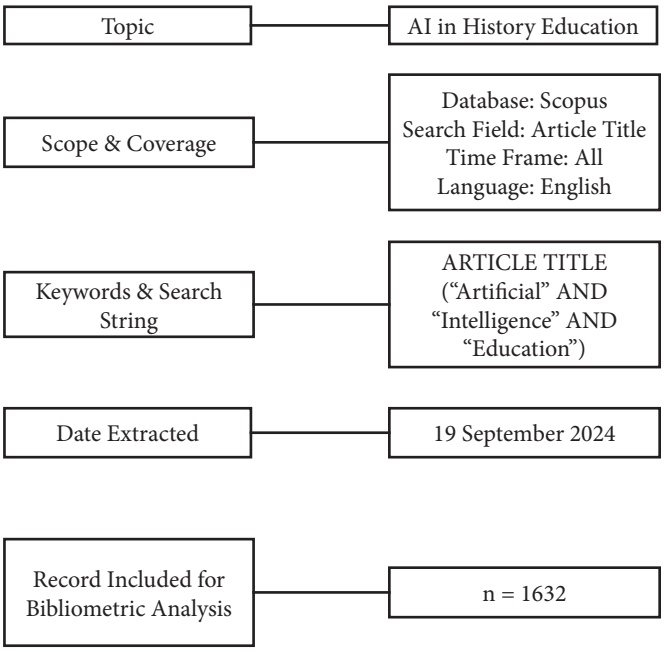

Figure 1. Flow diagram of the search strategy

RESULTS AND DISCUSSION

To answer the research question, this article examines the main aspects of scholarly works, including publications by year, type of document, country, and institution. The results of this study are mainly presented in the form of frequency and percentage. We also analyzed additional details such as the number of times a publication was cited (NCP), total citations (TC), average citations per publication (C/P) and average citations per cited publication (C/CP).

Document analysis by year of publication allows researchers to detect research patterns and visibility (Schlogl, 2024). From Figure 2, the data shows a significant increase in the number of publications throughout the year with a large jump in 2023 and 2024. The number of publications in 2023 increased to 456 followed by a higher figure of 559 in 2024. This growth reflects the growing research interest. as well as more productive research output in the field. However, despite a significant increase in the number of publications in 2024, the number of references for that year was lower (878), possibly due to the length of time required for references to accumulate.

In contrast, the year 2023 saw both a high number of publications (456) and the largest number of references (5,528), indicating that research published in that year had a strong and immediate impact. Overall, this data clearly shows a trend of increasing research output, especially in the last two years, although the number of references may not fully reflect the influence of recent studies.

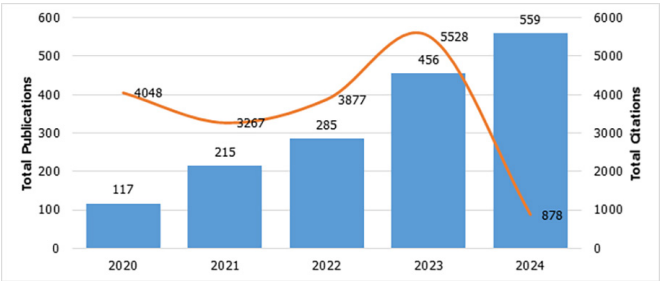

Figure 2. Document by year

Table 1 presents the 10 most referenced documents on Artificial Intelligence (AI) in education. Each of these documents has received more than 100 citations since its publication, demonstrating its importance and influence in the AI education literature. Chen L et al. (2020) stands out with the highest number of references (796) and a significant annual citation rate of 159.2, indicating its influential role in the field of AI education. Followed closely, Hwang G.-J. et al. (2020) obtained 425 citations with 85 citations per year, reflecting its continued

relevance. Chen X. et al. (2020) which focused on the theoretical gap of AI education, reached 391 references with a rate of 78.2 per year, while Hwang G.-J. & Chien S.-Y. (2022) received 338 references with a strong annual rate of 112.67, emphasizing the importance of AI in the context of the educational metaverse.

Recent contributions, such as King M.R. (2023) and Eysenbach G. (2023) discussed the role of AI in education and medical contexts, respectively obtaining 311 and 293 references with a high annual rate (155.5 and 146.5). In addition, O'Connor S. & ChatGPT (2023) received significant attention in nursing education, with 264 references at a rate of 132 per year. Chatterjee S. & Bhattacharjee K.K. (2020) who focused on the adoption of AI in higher education obtained 222 references but with a lower rate of 44.4. Ouyang F. & Jiao P. (2021) who discussed paradigms in AI education got 205 references with a rate of 51.25 per year. Finally, Luan H. et al. (2020) discussing the future direction of AI and Big Data obtained 197 references with a rate of 39.4 per year.

Overall, the most influential studies focus on comprehensive overviews of AI in education, chatbots, the role of AI in specific fields such as medical and nursing education, as well as emerging topics such as the metaverse. Recent publications are gaining attention quickly with higher citation rates reflecting growing academic interest in AI applications in education.

Table 1. Most cited documents

No.	Author(s)	TC	C/Y
1	Chen L.; Chen P.; Lin Z. (2020)	796	159.20
2	Hwang G.-J.; Xie H.; Wah B.W.; Gašević D. (2020)	425	85.00
3	Chen X.; Xie H.; Zou D.; Hwang G.-J. (2020)	391	78.20
4	Hwang G.-J.; Chien S.-Y. (2022)	338	112.67
5	King M.R. (2023)	311	155.50
6	Eysenbach G. (2023)	293	146.50
7	O'Connor S.; ChatGPT (2023)	264	132.00
8	Chatterjee S.; Bhattacharjee K.K. (2020)	222	44.40
9	Ouyang F.; Jiao P. (2021)	205	51.25
10	Luan H.; Geczy P.; Lai H.; Gobert J.; Yang S.J.H.; Ogata H.; Baltes J.; Guerra R.; Li P.; Tsai C.-C. (2020)	197	39.40

Table 2 shows the most productive institutions in publishing at least five documents related to Artificial Intelligence (AI) in education. This data provides an analysis of various institutions that contribute to the field of research with a focus on the number of publications (TP) and their respective percentages. Leading the list are The Education University of Hong Kong and University College London, each with 14 publications representing 0.86% of the total. The University of Hong Kong followed with 13 publications (0.80%), while the National Taiwan University of Science and Technology contributed 12 publications (0.74%), and the Universidad de Salamanca added 11 publications (0.67%).

Leading institutions such as Harvard Medical School and Beijing Normal University, each contributed 10 publications representing 0.61%. Other significant contributors include the University of Toronto, Tsinghua University and Symbiosis International Deemed University, each producing 9 publications (0.55%).

Some additional institutions such as Zhejiang University, University of Pennsylvania and King's College London, each contributed 8 publications (0.49%). Interestingly, Universiti Sains Malaysia (USM) together with the Chinese University of Hong Kong, Stanford University and the National University of Singapore contributed 7 publications each, representing 0.43% of the total output.

Overall, institutions from various regions of Asia, Europe, and North America are actively contributing to this field of research. The significant presence of institutions from Hong Kong, the UK, the US and other Asian countries highlights the global interest and investment in this field. Universiti Sains Malaysia (USM) with 7 publications (0.43%) stands out as an important contributor sharing the position with leading institutions such as Stanford University and the National University of Singapore. This reflects the growing influence of USM and its important role in the global academic community, especially in the research area relevant to this study.

Table 2. The most 20 most productive Institutions

Institution	TP	%
The Education University of Hong Kong	14	0.86%
University College London	14	0.86%
The University of Hong Kong	13	0.80%
National Taiwan University of Science and Technology	12	0.74%
Universidad de Salamanca	11	0.67%
Harvard Medical School	10	0.61%

Beijing Normal University	10	0.61%
University of Toronto	9	0.55%
Tsinghua University	9	0.55%
Symbiosis International Deemed University	9	0.55%
Zhejiang University	8	0.49%
University of Pennsylvania	8	0.49%
Yakın Dogu Universitesi	8	0.49%
King's College London	8	0.49%
Massachusetts General Hospital	8	0.49%
McMaster University	8	0.49%
Universiti Sains Malaysia	7	0.43%
Chinese University of Hong Kong	7	0.43%
Stanford University	7	0.43%
National University of Singapore	7	0.43%

Bibliographic linkage analysis provides insight into global research dynamics by examining the frequency of references made by institutions or countries to the same academic work. Countries such as China, the United States, India and the United Kingdom that have a high level of connectivity are major research centers. These countries not only produce a large amount of research, but are also involved in extensive international collaborations and have diverse research interests that are able to contribute to their position in network visualization. Their academic influence is significant, shaping trends and priorities in global research.

In contrast, countries with moderate to low connectivity such as Oman, Latvia and Slovenia are more likely to focus on more specialized or local research areas. These countries may have more limited international collaboration and a smaller impact on the global research community, instead focusing on niche areas that may not intersect with the main themes pursued by more connected centers. These differences highlight potential areas for growth and development, suggesting that fostering collaboration between more connected and less connected nodes can promote wider knowledge exchange and increase the visibility of global research.

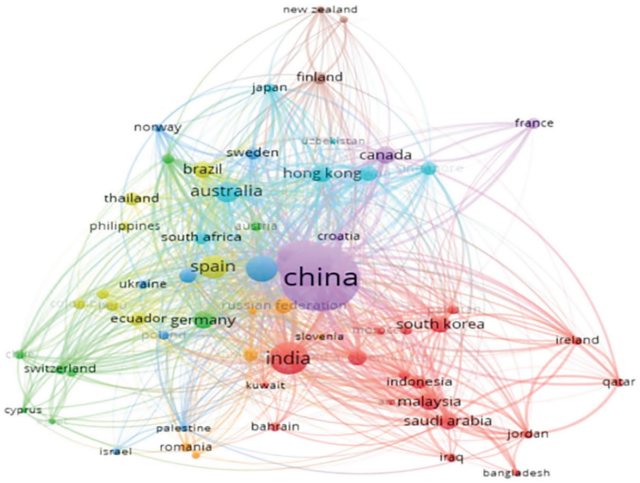

Figure 3. *Network visualization map if the citation by country*

DISCUSSION

The findings reveal a rapidly expanding global research landscape in Artificial Intelligence (AI) in education, as reflected by the continuous increase in publication output between 2020 and 2024. The remarkable growth observed in 2023 and 2024 demonstrates that AI has evolved from an emerging educational technology into one of the dominant research agendas in contemporary educational scholarship. The sharp increase in publication volume coincides with the widespread adoption of generative AI systems, particularly ChatGPT, which fundamentally reshaped teaching, learning, assessment, and academic research worldwide. Similar trends have been reported by Kasneci et al. (2023), who argued that large language models have accelerated educational innovation by enabling AI-assisted tutoring, automated feedback, and personalized learning experiences. Likewise, Crompton and Burke (2023) observed that AI research has shifted from technology-centered development toward pedagogical implementation, emphasizing curriculum integration, teacher support, and student engagement. The exceptionally high citation performance of publications published in 2023 indicates that these studies rapidly became influential references, reflecting both the novelty of generative AI technologies and the urgent need for educational institutions to understand their pedagogical implications.

The bibliometric findings also demonstrate that AI research in education is increasingly interdisciplinary, involving collaborations among education, computer

science, psychology, cognitive science, and data science. This pattern supports the argument of Holmes et al. (2022), who suggested that the future of AI in education depends on interdisciplinary collaboration rather than technological advancement alone. The dominance of leading institutions such as The Education University of Hong Kong, University College London, and other internationally recognized universities further illustrates the importance of institutional research capacity in shaping global scientific production. These universities have established strong ecosystems that combine educational research, artificial intelligence, and learning sciences, enabling continuous innovation and international collaboration. Consequently, institutional leadership has become a significant determinant of scientific productivity and research impact in AI-supported education.

The implications of these developments are particularly significant for history education. Unlike disciplines primarily focused on procedural or computational knowledge, history education emphasizes historical thinking, historical reasoning, evidence evaluation, multiperspectivity, and historical empathy. Recent studies suggest that AI can support these competencies through intelligent document analysis, adaptive learning systems, automated source classification, virtual historical simulations, and conversational AI capable of facilitating inquiry-based historical discussions (Holmes et al., 2022; Elbanna & Armstrong, 2024). However, historians and history educators have also emphasized that AI should complement rather than replace historical interpretation because historical understanding requires contextual judgment, source criticism, and ethical reasoning that cannot be fully replicated by algorithmic systems. Therefore, AI integration into history education should be guided by pedagogical principles that strengthen students' historical literacy instead of merely improving instructional efficiency.

Another important finding concerns the unequal distribution of global research productivity and collaboration. China, the United States, India, and the United Kingdom dominate international publication networks, indicating their strong investment in AI research infrastructure, research funding, and international scientific collaboration. Similar geographical concentration has been identified in previous bibliometric studies of AI in education (Ouyang & Jiao, 2021; Tlili et al., 2023), suggesting that global AI research remains concentrated within countries possessing advanced digital ecosystems and well-established higher education systems. Conversely, countries with weaker collaboration networks contribute fewer publications and possess lower citation visibility, potentially limiting their participation in shaping future educational innovations. This imbalance reflects not only differences in research capacity but also disparities in technological infrastructure, digital literacy, funding availability, and national AI strategies.

These disparities have important implications for the future development of history education worldwide. Educational systems with stronger AI research ecosystems are more likely to adopt innovative instructional approaches, including AI-assisted historical inquiry, personalized learning pathways, automated formative assessment, and immersive digital historical environments. Meanwhile, less connected countries may continue relying on conventional pedagogical approaches because of limited technological resources and research collaboration. UNESCO (2023) emphasizes that narrowing this digital divide requires international cooperation, equitable access to AI technologies, teacher professional development, and ethical governance frameworks that ensure responsible AI implementation across diverse educational contexts.

The present bibliometric analysis also contributes to understanding the intellectual evolution of AI in education by demonstrating that current research is gradually shifting from technological feasibility toward educational effectiveness and responsible implementation. Earlier studies primarily focused on intelligent tutoring systems and adaptive learning algorithms, whereas recent publications increasingly investigate generative AI, ethical AI governance, explainable AI, learning analytics, and human-AI collaboration (Kasneci et al., 2023; Tlili et al., 2023). Nevertheless, history education remains comparatively underrepresented within this expanding research landscape, indicating substantial opportunities for future investigations. Future studies should explore how AI can enhance historical thinking, historical empathy, digital source criticism, and inquiry-based learning while simultaneously addressing issues related to algorithmic bias, historical accuracy, misinformation, and ethical use of AI-generated historical narratives.

Overall, the findings suggest that AI in education has entered a new stage characterized by rapid

internationalization, interdisciplinary collaboration, and increasing pedagogical sophistication. Rather than viewing AI merely as an instructional technology, educators and policymakers should recognize it as a transformative educational ecosystem that requires balanced integration between technological innovation, disciplinary knowledge, and ethical educational practice. In the context of history education, such integration offers significant opportunities to enrich students' historical understanding while preserving the critical and interpretative nature of historical inquiry.

CONCLUSION

This study provides a comprehensive bibliometric overview of the global development of Artificial Intelligence (AI) research in education based on 1,632 Scopus-indexed journal articles published between 2020 and 2024. The findings demonstrate that AI has become one of the fastest-growing research domains in education, with publication output increasing substantially during the study period and reaching its highest level in 2024. Citation analysis further indicates that publications produced in 2023 achieved the greatest immediate scholarly impact, reflecting the rapid international response to recent advances in generative AI technologies. The bibliometric mapping also reveals that China, the United States, India, and the United Kingdom play dominant roles in global research production and international collaboration, highlighting the concentration of AI research capacity within a limited number of countries.

Beyond describing publication trends, this study contributes to the existing literature by providing an integrated understanding of publication performance, citation impact, institutional productivity, and international collaboration within AI in education. The findings further demonstrate that, despite the rapid expansion of AI research, history education remains a comparatively underexplored domain, indicating significant opportunities for future interdisciplinary investigations. In this respect, the study extends previous bibliometric research by positioning history education within the broader global ecosystem of AI-supported educational research.

The findings have several practical implications. For educators, they provide evidence supporting the responsible integration of AI technologies to enhance historical inquiry, historical thinking, and student engagement. For researchers, the identified collaboration networks and emerging research trends offer valuable guidance for developing future interdisciplinary projects. For policymakers, the results emphasize the importance of strengthening international collaboration, investing in digital research infrastructure, promoting AI literacy, and establishing ethical governance frameworks to ensure equitable and responsible implementation of AI across educational systems.

Despite these contributions, this study is subject to several limitations. The analysis was limited to journal articles indexed in the Scopus database and publications retrieved using a title-based search strategy, which may have excluded relevant studies indexed in other databases or employing different terminology. Future research should incorporate multiple bibliographic databases, broader search strategies, and more advanced bibliometric techniques, such as co-citation, co-word, and thematic evolution analyses. Furthermore, discipline-specific investigations focusing on history education are needed to better understand how AI can support historical thinking, historical literacy, and inquiry-based learning while addressing ethical concerns related to historical interpretation and AI-generated content.

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