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A Scientometric Analysis of Generative AI in Education (2023–2026)

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Abstract: Generative AI, as an important branch of artificial intelligence, has achieved a technological leap in original content generation. Its breakthrough is marked by the large-scale application of multimodal large models in 2023. However, the application of this technology in education has only lasted for four years.Based on the scientometric tool VOSviewer, this study constructs a knowledge map of English literature in this field published in the Web of Science Core Collection (SSCI and A&HCI) since 2023.The results show that the field is dominated by educational research, with a rapid and sustained growth in publications. Although empirical research has become the mainstream, insufficient interdisciplinary integration is observed.Benefiting from abundant research funds and projects provided by China, China ranks first globally in publication volume, academic influence and network centrality, demonstrating strong research capacity and collaboration potential.Research hotspots have gradually shifted from ethical risks of technology application to practical integration, and finally entered a mature stage focusing on self-efficacy, effectiveness evaluation and mechanism optimization.Overall, this field has become a global academic focus with diversified research methods. It has broad development prospects and profound research value in the future.

Keywords: Generative Artificial Intelligence; Education; Self-efficacy; VOSviewer

1.Introduction

Generative AI (Generative AI, or GenAI for short) distinguishes itself from conventional artificial intelligence with core advantages in original content generation, cross-scenario task adaptation, and high model flexibility. This endows it with revolutionary potential for rapid integration into educational scenarios such as personalized instruction, collaborative inquiry, and intelligent feedback, propelling the global digital transformation of education into a deep-water stage. From the precise adaptation of intelligent tutoring systems to the collaborative innovation of learning tools, generative AI is redefining the boundaries of teaching and learning, serving as a critical nexus linking technological empowerment and the essence of education.

Nevertheless, the in-depth integration of this technology with education has only been practiced for a few years. While unleashing efficiency dividends, it has also exposed complex cognitive, pedagogical and ethical challenges. At the cognitive level, the characteristic of cognitive extension and the risk of cognitive atrophy inherent in generative AI constitute a core dual paradox.On the one hand, users' over-reliance on AI-generated answers may bypass the effortful cognitive processes required for deep learning, leading to a state of dependence known as the "Hollowed Mind", a risk further exacerbated by insufficient metacognitive abilities. [1]Nevertheless, the in-depth integration of this technology into education has taken place over only a few years. While delivering efficiency gains, it has also exposed complex cognitive, pedagogical, and ethical challenges. At the cognitive level, the “cognitive extension” feature and the risk of “cognitive atrophy” inherent in generative AI form a core dual paradox.

From the implementation of precise prompt engineering and critical evaluation of output quality to the selection of workflow automation strategies, unprecedentedly high demands are placed on users’ self-awareness, confidence calibration, and strategic flexibility. At the pedagogical level, mature solutions have yet to be developed for interaction design, feedback effectiveness, and learning path adaptation in human–computer collaboration. Learners at different cognitive levels exhibit the dual effects of “novice leveling” and “expert amplification” in technology use, which may exacerbate educational inequality. At the ethical and social levels, emerging issues such as academic integrity disputes, weakened cognitive sovereignty, emotional dependence, and the digital divide have emerged successively, further highlighting the complexity and multidimensionality of this interdisciplinary field.
From a global research perspective, interdisciplinary studies on generative AI and education have grown exponentially. However, existing research remains limited: the cognitive mechanisms underlying human–computer interaction are insufficiently elucidated; responses to the differentiated needs of diverse groups are inadequate; long-term impacts of technology applications lack empirical support; and considerable room remains for improving the depth and breadth of interdisciplinary integration.

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2.Research Objectives and Methods

Against this backdrop, systematically sorting out the core issues, research context and development bottlenecks of the integration of generative artificial intelligence and education, and clarifying the internal logic and boundary conditions of technological empowerment in education, are of great academic and practical significance for responding to practical puzzles, avoiding potential risks and guiding research directions. Based on the existing research foundation, this paper integrates the perspectives of cognitive science, educational technology, psychology and other disciplines, focuses on the core contradictions and key issues of generative artificial intelligence in educational scenarios, and aims to lay a foundation for the subsequent in-depth exploration of the path of positive interaction between technology and education and the construction of a sustainable human-machine collaborative education ecosystem.

VOSviewer, a tool in the field of scientometrics, has been widely favored by researchers at home and abroad for its clear visualization and simple color matching. Developed by Nees Jan van Eck and Ludo Waltman, two young scientometric scholars from the Centre for Science and Technology Studies at Leiden University in the Netherlands, it can construct collaboration networks, co-occurrence networks, citation analysis, coupling analysis and co-citation analysis through bibliographic data of literatures. With a user-friendly interface and reliable results, the number of papers using this tool has increased exponentially in recent years

Against this backdrop, a systematic review of the core themes, research trajectories, and developmental bottlenecks in the integration of generative AI and education, as well as a clarification of the inherent logic and boundary conditions for technology-enabled education, carry significant academic and practical implications for addressing practical dilemmas, mitigating potential risks, and guiding future research directions. Accordingly, based on existing scholarship and integrating interdisciplinary perspectives from cognitive science, educational technology, and psychology, this paper focuses on the core contradictions and key issues of generative AI in educational contexts. It aims to lay a foundation for further exploring pathways toward constructive interactions between technology and education and constructing a sustainable human–computer collaborative educational ecosystem.

In the field of scientometrics, VOSviewer has been widely adopted by researchers worldwide for its clear visualization and minimalist color schemes. Developed by Nees Jan van Eck and Ludo Waltman, two young scientometricians at the Centre for Science and Technology Studies (CWTS) of Leiden University in the Netherlands, the software enables the construction of collaboration networks, co-occurrence networks, citation analysis, coupling analysis, and co-citation analysis using bibliographic data. Featuring a user-friendly interface and robust results, the number of publications employing this tool has increased exponentially in recent years.[2].The adoption of this method in the present study represents a relatively novel approach within the discipline of Marxist Theory.

This paper adopts VOSviewer 1.6.18, a scientometric analysis tool. On February 22, 2026, the core collection of Web of Science in the electronic database of Beijing Foreign Studies University was accessed, with the search criteria set as Title = "Generative Artificial Intelligence" OR "Generative AI" OR "Gen AI" and Topic = Education, resulting in a total of 786 retrieved literatures. After manual screening, only literatures with Document Type = Article and Language = English were retained, and individual regions and research fields with only one published paper were excluded, leaving 499 literatures that meet the requirements of recall and precision rates. These literatures were imported into VOSviewer 1.6.18 in plain text format with the total number unchanged. Therefore, these 499 samples were taken as the valid research data of this paper.

3.Graph Construction and Data Interpretation

3.1Basic Characteristics of Literatures

3.1.1 Number of Publications

The temporal change in the number of publications is a key indicator for analyzing the research context and development trend of a specific field. Its dynamic evolution objectively reflects research progress and shifts in academic attention.For the interdisciplinary field of generative AI and education, relevant publications have grown rapidly:only 26 papers were published in 2023, 139 in 2024, and 299 in 2025, which is about 2.2 times that of 2024.By February 22, 2026, 35 papers had been published.Given current academic enthusiasm and technology diffusion, the number of publications in generative AI and education will continue to increase in 2026 and the near future, and related research will remain in a stage of rapid development.

3.1.2Countries of Publication and Disciplinary Fields

The rapid development of generative AI has accelerated the digital transformation in education. Many countries have included this interdisciplinary field in their key research plans. To clarify the global research landscape, this study takes publication output as the core dimension and identifies the top 10 countries in generative AI and education research. The results are shown in Table 1.Disciplinary classification and source information of publications provide important support for defining research boundaries and predicting future trends. Based on the discipline classification system of the Web of Science database, this study systematically analyzes the disciplinary distribution of sample publications and summarizes the top five research fields. The detailed results are presented in Table 1.

Table 1 shows that China ranks first with 180 publications, about twice as many as the United States, which is second. The total number of publications by China and the United States is 289, accounting for nearly 60% of the total 499 publications. Australia, the United Kingdom, and South Korea rank third to fifth, with 117 publications in total, accounting for 23.45% of the total. Overall, the top five countries account for 80% of all publications, showing a high concentration.

Table1：Top Five Research Countries and Research Fields

No.	Countries	Count	No.	Categories	Count
1	CHINA	180	1	Educational Research	303
2	USA	109	2	Information Science Library Science	35
3	AUSTRALIA	58	3	Psychology Multidisciplinary	34
4	ENGLAND	36	4	Nursing	28
5	SOUTH KOREA	23	5	Environmental Sciences	27

In terms of research field distribution, Educational Research ranks first with 303 publications, accounting for 60.72% of the total. The number of publications in the second to fifth fields drops sharply, ranging from 27 to 35, with a total of 124 publications, accounting for only 24.85%.These results indicate that in the interdisciplinary research of generative AI and education, publications in Information Science Library Science, Psychology Multidisciplinary, Nursing, and Environmental Sciences account for relatively small proportions.

3.2 Collaboration Network Analysis

In the analytical framework of scientific collaboration networks, institutions serve as key nodes in academic research. They act as bridges connecting researchers with national or regional academic communities, and provide an important entry point for systematic investigation.Analyzing the collaboration structure and distribution characteristics of research institutions helps determine whether a relatively stable academic community and unified academic discourse system have been formed in this field. It also promotes the development of consistent research paradigms and academic schools.Therefore, visualizing and analyzing data from publishing institutions is an important way to understand the global research landscape of generative AI integration in education. This study uses VOSviewer software to conduct visualization and bibliometric analysis at the institutional level.

First, select Citation under Type of analysis in the Choose type of analysis and counting method section, and then choose Organizations under Unit of analysis. On the subsequent Create Map interface, adjust the Minimum number of documents of an organization within the Choose thresholds module to 10, and click Next. The system will then display Number of organizations to be selected: 23. After reviewing the table in the Verify selected organizations section, click Finish to generate Figure 1 and the detailed data in Table 2.

In the interdisciplinary field of generative AI and education, the top 10 research institutions by publication output have published a total of 109 papers, accounting for about one-fifth of the 499 total publications. This reflects a certain degree of concentration in research outcomes.The Chinese University of Hong Kong ranks first, with 20 relevant papers published so far, 4,015 collaborative links with other institutions, and 819 total citations. It leads in publication volume, collaboration network breadth, and academic influence.Closely following is The Education University of Hong Kong, with 19 papers. Although its number of collaborative links and citations is slightly lower, both institutions are located in Hong Kong, China. Their shared regional background provides a solid foundation for inter-institutional collaboration and future academic development in this field.

Nanyang Technological University ranks third. Although its publication output, number of collaborative links, and total citations are lower than those of the top two institutions, it is the only university from Southeast Asia among the top 10 and thus has unique regional academic representation. In addition, the School of Artificial Intelligence of NTU ranks second worldwide, and its National Institute of Education (NIE) ranks eighth globally. Its strong disciplinary foundation provides solid support for research in this field.

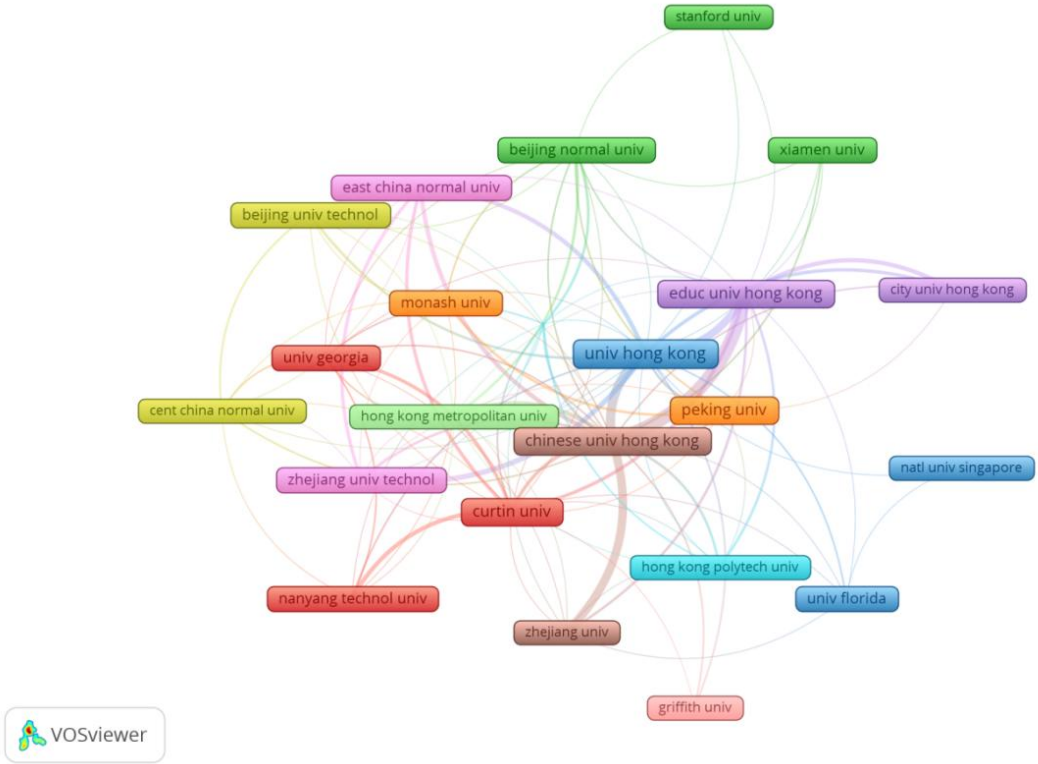

Figure 1 Top 10 Institutions Based on Collaboration Analysis

Monash University from Australia ranks fourth. Located in Melbourne, it is one of Australia's Group of Eight universities. Education, educational psychology, and educational technology are its dominant disciplines, endowing it with strong interdisciplinary research capacity. Both Monash University and NTU have published 13 papers. However, in terms of academic influence, the total citations of Monash University are about twice as many as those of NTU, indicating higher academic recognition of its research outputs.

Among the top 10 institutions, another university from Hong Kong, China is listed: The University of Hong Kong. It ranks first globally in education, but in the interdisciplinary field of generative AI and education, its current publication volume only places it sixth. Notably, the total citations of HKU's relevant publications reach 1334, with a total link strength of 1118, which are significantly higher than those of other listed institutions in the same period. This fully demonstrates the high quality and extensive academic influence of its research.

Table2：Top 10 Key Institutions Based on Publications, Citations and Link Strength

No.	Organization	Documents	Citations	Total Link Strength
1	Chinese Univ Hong Kong	20	819	4015
2	Educ Univ Hong Kong	19	537	3248
3	Nanyang Technol Univ	13	113	1288
4	Monash Univ	13	259	930
5	Zhejiang Univ	8	37	1753
6	Univ Hong Kong	8	1334	1118
7	Peking univ	7	337	1180
8	East China Normal Univ	7	219	1656
9	Beijing Normal Univ	7	111	991
10	Cent China Normal Univ	7	32	880

The remaining five universities are from Chinese mainland: Zhejiang University, Peking University, East China Normal University, Beijing Normal University and Central China Normal University. These five institutions published a total of 36 papers. Although their citation counts and collaborative link strengths are relatively low, they still show great potential for academic development.

Based on the regional distribution of the top 10 institutions, those from Hong Kong, China and Chinese mainland account for more than half of the total publications, making them the core research hubs in this field. Institutions from Singapore and Australia represent important academic forces in Southeast Asia and Oceania, jointly advancing global research on generative AI in education.

3.3Countries (Regions) of Direct Citation

From the perspective of Area Studies, the academic output structure of countries and regions directly reflects the official research orientation and resource allocation focus in this field.The Bibliographic Coupling function in VOSviewer quantifies the similarity of research topics and the homology of knowledge foundations by identifying references shared by two papers.Accordingly, this study conducts a bibliometric analysis on the national and regional distribution in the interdisciplinary field.It can provide theoretical support and decision-making references for the top-level design of relevant policies and the precise implementation of diplomatic strategies in China.Therefore, the Bibliographic Coupling analysis module was selected in VOSviewer software, with "Countries" chosen as the Unit of Analysis. Upon clicking "Next," the value of "Minimum number of documents of a country" in the "Choose thresholds" section was set to 5, and the "Number of countries to be selected" under "Choose number of countries" displayed 26. Ultimately, Bibliometric Citation Figure 2 of national (regional) publication outputs in this field was generated.

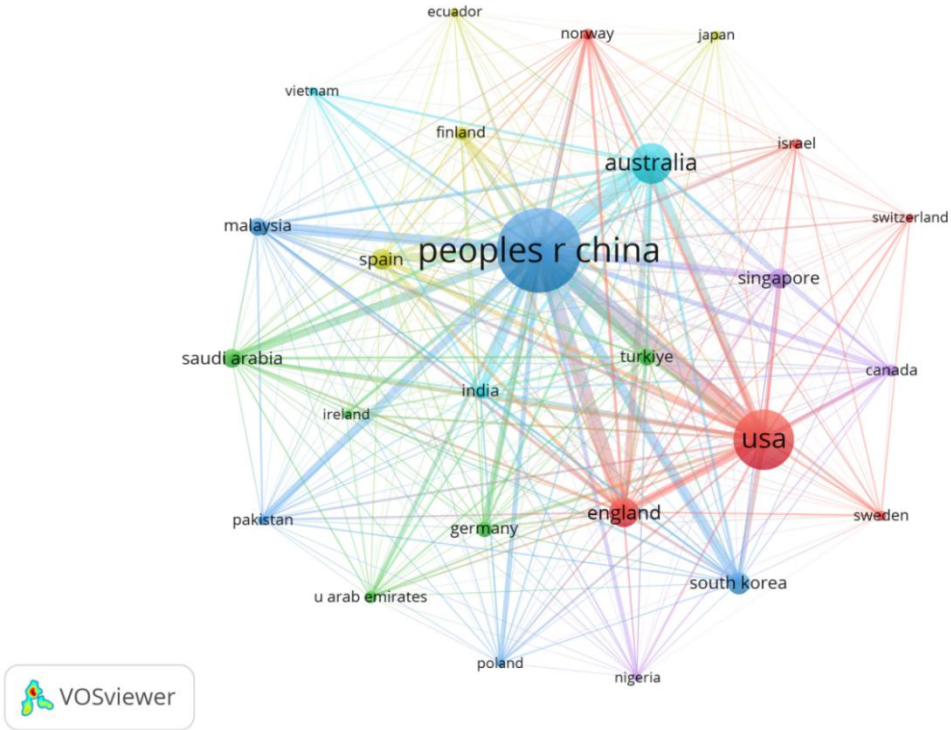

Figure 2 Countries Based on Co-citation Analysis

China (Peoples R China) ranks first globally with 180 publications, 4,230 citations, and a total link strength of 42,938, leading in publication volume, academic influence, and network centrality.The USA ranks second with 109 publications, 1,750 citations, and a total link strength of 21,147, with each indicator roughly half that of China.Australia and England rank third and fourth respectively. Although they show certain competitiveness in citation frequency or link strength, their total publication volume lags significantly behind China.From the fifth-ranked South Korea onward, the number of publications declines stepwise.Notably, non-traditional major research countries such as Singapore, Saudi Arabia, Malaysia, and Türkiye have entered the top 10, demonstrating outstanding performance in total link strength and knowledge network embeddedness.This reflects the rapid rise and high research activity of these countries in the interdisciplinary field of generative AI and education.Detailed data are presented in Table 3.

Table 3：Top 10 Countries Based on Co-citation Analysis

No.	Countries	Documents	Citations	Total Link Strength
1	Peoples r China	180	4230	42938
2	USA	109	1750	21147
3	Australia	58	2404	15449
4	England	36	805	13637
5	South Korea	23	170	6796
6	Spain	21	739	6588
7	Singapore	19	152	4809
8	Saudi Arabia	18	181	5608
9	Malaysia	16	963	6432
10	Turkiye	15	59	5924

3.4 Keyword Co-occurrence Network Analysis

Word frequency refers to the number of times a word appears in the analyzed documents. In scientometric research, the word frequency analysis method extracts keywords that can express the core content of literatures from bibliographic files, and studies the development trend and research hotspots of the field through the distribution of the frequency of subject terms [3].It can be said that keywords directly represent the research content of papers and are important elements for analyzing scientific research hotspots through literature data [4]. However, there are many types of analysis for keywords, including Co-occurrence analysis, which is used to analyze the frequency and relationship of the co-occurrence of keywords in literatures, thereby revealing the hotspots, thematic structure and knowledge correlation of the research field, and helping readers quickly identify the core themes, hot topics and internal connections between different themes in the research field. Taking Web of Science data as an example, it is a co-occurrence analysis of author keywords and supplementary keywords stored in the DE and ID fields [5]. Therefore, in VOSviewer, Co-occurrence was selected in the Choose type of analysis and counting method section, and All keywords was chosen as the Unit of analysis. Subsequently, the Minimum number of occurrences of a keyword in the Choose threshold module was adjusted to 10, which resulted in a display of 47 for the Number of keywords to be selected. Finally, Overlay Visualization was selected in the generated visualization interface, yielding the keyword co-occurrence network for this field as presented in Figure 3.

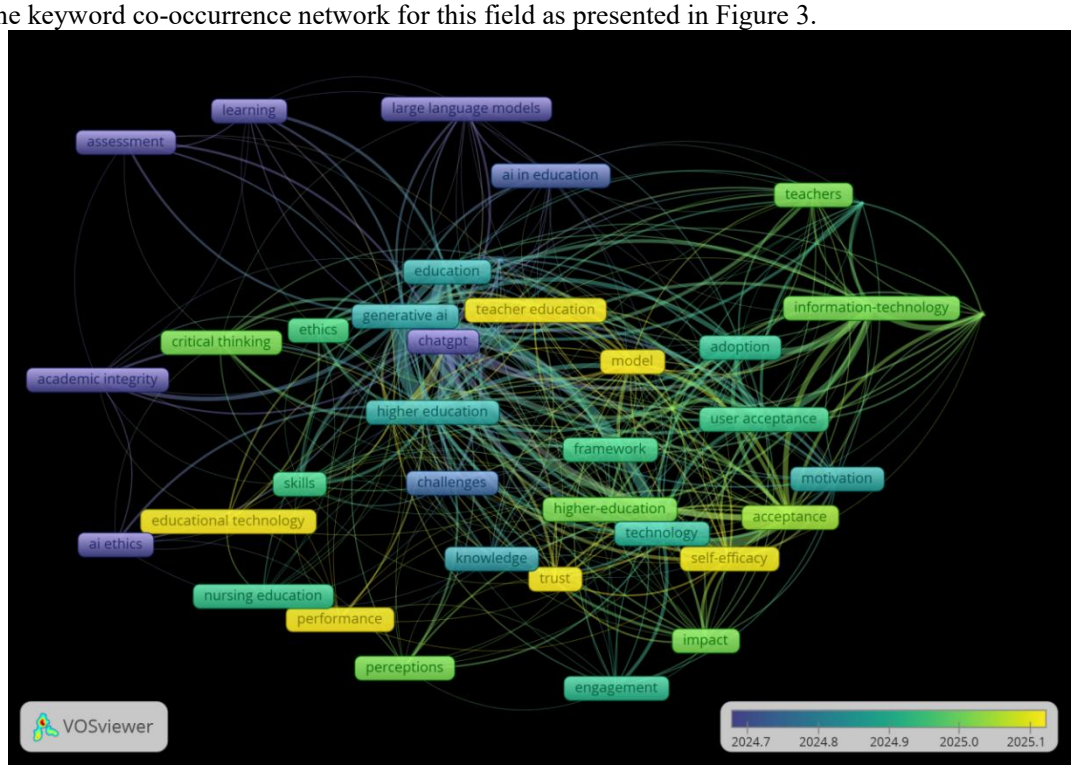

Figure 3 Temporal Zone Map of Keyword Co-occurrence Network

The terms in the figure are displayed in chronological order.The blue section shows active terms in July 2024, including ChatGPT, Academic Integrity, AI Ethics, Challenges, AI in Education, Large Language Model, Learning, and Assessment. These terms mainly reflect ethical and normative issues arising from the integration of generative AI into higher education, representing the core academic discourse on the risks of technology application.

In the following two months, research focus gradually shifted to practical application. High-frequency keywords changed to Generative AI, Education, Higher Education, Motivation, Technology, Knowledge, Engagement, and Nursing Education.During this stage, research priorities shifted from static analysis of challenges such as academic integrity crises and ethical anomalies to dynamic exploration of teaching model innovation driven by generative AI. This indicates a cognitive transition from passive response to active integration of technology in education.

Since 2025, the research context has extended further. The most frequent terms are Teacher Education, model, Educational Technology, Performance, and Self-Efficacy, forming new research clusters. Among them, Self-Efficacy appeared 22 times with a total link strength of 67, indicating that three years after the emergence of generative AI, researchers have widely recognized users' self-perception, self-planning, and self-regulation.

Notably, academic discussions in this stage show obvious systematic characteristics. Studies focus not only on the mechanism by which generative AI empowers learners' self-efficacy, but also on precise teaching practices based

on learning analytics. The research scope has expanded to the long-term symbiosis between technology and the educational ecosystem. This indicates that research on the integration of generative AI and higher education has entered a mature stage focusing on efficacy evaluation, mechanism optimization, and sustainable development.

Generally, the higher the keyword frequency in publications, the more attention the topic receives. The association strength between a keyword and others reflects its centrality in the research network. Therefore, the Occurrences and Total Link Strength of the above keywords are shown in Table 4.

Table 4： Top 10 Keywords Based on Co-occurrence Analysis

No.	Keyword	Occurrences	Total Link Strength
1	Generative ai	164	311
2	Chatgpt	110	294
3	Higher Education	78	224
4	Education	67	175
5	Technology	45	152
6	Acceptance	36	147
7	Information-technology	31	116
8	User Acceptance	28	114
9	Adoption	22	95
10	Self-efficacy	22	67

In terms of core research objects, Generative AI ranks first with 164 occurrences and a link strength of 311, being the absolute core of the entire research field and also the search term set for the literatures in this paper. Chatgpt (ChatGPT) closely follows with 110 occurrences and a link strength of 294, indicating that ChatGPT is the most representative technical carrier of the application of generative artificial intelligence in education.

Actually, this indicates that the relative ease with which GenAI can produce extensive output may also affect output evaluation and reliance via potentially misleading cues that people implicitly rely on to update their confdence and guide their subsequent metacognitive control.[6]Therefore, while researching generative artificial intelligence (GenAI), it should also be combined with metacognition to better understand its practical applications in the field of education.We propose these demands could be addressed by integrating metacognitive support strategies into GenAI systems, and by designing GenAI systems to reduce their metacognitive demand by targeting explainability and customizability. Metacognition ofers a coherent framework for understanding the usability challenges posed by GenAI, and provides novel research and design directions to advance human-AI interaction.[7]

In particular, within the rapid integration of AI into educational settings, understanding its impact on essential cognitive skills is crucial for developing effective teaching strategies and improving student outcomes. We should examines the influence of generative artificial intelligence (GenAI) on students' critical thinking and problem-solving skills in higher education.[8]In terms of application scenarios and fields, Higher Education and Education appear 78 and 67 times respectively, indicating that higher education is the key research field at present.

In terms of research hotspots, keywords such as Acceptance, User Acceptance, Adoption and Self-efficacy appear frequently, indicating that technology acceptance and adoption are important research directions in this field, focusing on the attitudes, usage intentions and influencing factors of users (such as teachers and students) towards generative artificial intelligence. Meanwhile, Technology and Information-technology reflect that technology itself and its integration in education are the foundation of research.

It raises fundamental questions about the nature of learning itself: how learning processes are evolving, what forms of knowledge and skills remain essential, and how they must be adapted to remain relevant in increasingly AI mediated contexts. As learners navigate environments where GenAI is embedded in daily academic, social and professional activities, it becomes imperative to rethink not only how we support learning, but also what we are preparing learners for. The discussion calls for a critical re-examination of core educational priorities, such as critical thinking, metacognitive regulation and epistemic agency, and how these can be reconfigured to equip learners with the capacity to thrive in a rapidly changing, AI-saturated society.[9]

3.5 Project Fund Analysis

The acknowledgments at the end of some downloaded literatures generally indicate support from the state, academic organizations or project funds, and the supporting institutions behind can also be found through these acknowledgments to obtain more academic information. Therefore, the Funding Agencies in the core collection of Web of Science can be used for this purpose. After calculation, a total of 290 papers have received support from at least one fund, accounting for 58.12% of the 499 literatures.

As shown in Table 5, the National Natural Science Foundation of China (NSFC) ranks first in the number of funded publications with 23 papers supported. From 2023 to February 2026, this foundation has supported the publication of no less than 7 papers per year on average, showing a sustained and stable funding efficiency. The National Social Science Fund ranks second with 9 funded papers.

Other funding institutions also affiliated to mainland China include the National Office of Philosophy and Social Sciences (5 papers), the Fundamental Research Funds for the Central Universities (3 papers) and the Humanities and Social Science Fund of the Ministry of Education of China (3 papers), with a total of 11 papers published by the three institutions combined. Combining the above institutions with the first two funds, a total of 5 funding institutions from mainland China are listed in the top ten, with a total of 43 funded papers, accounting for 62.32% of the total number of funded papers by the top ten institutions (69).

Table5：Top 10 Funding Agencies

No.	Funding Agencies	Count
1	National Natural Science Foundation of China (NSFC)	23
2	National Social Science Fund of China	9
3	National Science Foundation (NSF)	8
4	Spanish Government	6
5	Australian Research Council	5
6	National Office of Philosophy and Social Sciences	5
7	King Saud University	4
8	Fundamental Research Funds for the Central Universities	3
9	Humanities and Social Science Fund of the Ministry of Education of China	3
10	Ministry of Science and Innovation, Spain (MICINN)	3

The remaining five overseas funding institutions are: the National Science Foundation (NSF) of the United States (8 papers), the Spanish Government (6 papers), the Australian Research Council (5 papers), King Saud University (4 papers) and the Ministry of Science and Innovation, Spain (MICINN) (3 papers). The above institutions have a total of 26 papers published, accounting for about 37.68% of the top ten.

In summary, during the observation period of this study, the research funding system in Chinese mainland played a dominant role in supporting publications in the relevant field. The National Natural Science Foundation of China (NSFC) was the core funding provider, which is also an important reason for the large number of publications by Chinese scholars—strong national funding and support.

Overseas funding agencies were mainly from the United States, Spain, Australia, and Saudi Arabia, which together formed the international funding landscape of this research field. This reflects that relevant research has formed a development trend with China as the main contributor and the collaborative participation of funding forces from multiple countries.

4.Research Conclusions

Based on the scientometric tool VOSviewer, this study takes 499 English papers in the interdisciplinary field of generative artificial intelligence and education included in the SSCI and AHCI databases of the Web of Science Core Collection from 2023 to February 2026 as samples. A systematic analysis is conducted from the dimensions of basic literature characteristics, cooperation networks, national academic patterns, keyword co-occurrence and funding support. The global research status and development context of this field are outlined comprehensively. The main conclusions are as follows:

Research attention has grown explosively with obvious disciplinary concentration. The number of publications in this field rose rapidly from 26 in 2023 to 299 in 2025, confirming that the integration of generative artificial intelligence and education has become a global research hotspot. Research is highly concentrated in educational research, accounting for more than 60%, while outputs in interdisciplinary fields such as information science, psychology and nursing account for a relatively low proportion, indicating room for improvement in interdisciplinary integration.

China occupies a core global position with obvious regional clustering. China ranks first globally with 180 publications, nearly twice that of the United States, and also leads in core indicators such as citation frequency and total link strength, becoming a core source of research in this field. This is mainly due to abundant funds and projects provided by China, as national support has greatly stimulated researchers' enthusiasm. In particular, universities in Hong Kong, China show strong research strength and cooperation capacity. Although top universities

in the Chinese mainland are among the top 10, they still have weaknesses in academic influence and cooperation networks. Globally, Singapore and Australia have become important academic nodes in Southeast Asia and Oceania, forming a core research cluster together with China.

Research hotspots have evolved in depth, shifting from technical review to effectiveness exploration. Research hotspots in this field show a clear evolutionary path over time. In July 2024, studies focused on risk issues such as academic integrity and AI ethics caused by ChatGPT application. Later, the focus gradually turned to practical integration of technology in higher education, nursing education and other scenarios. Since 2025, the field has entered a mature stage with teacher education, educational technology and self-efficacy as core topics, reflecting in-depth exploration of effectiveness evaluation, mechanism optimization and long-term symbiosis between technology and education. Generative artificial intelligence is the core research object, ChatGPT is the most representative technical carrier, and technology acceptance and self-efficacy have become important research directions.

China's research funding system plays a prominent role, with a diversified and coordinated international funding pattern. More than 50% of the papers in this field are funded by various foundations. Five funding agencies in the Chinese mainland rank among the top 10 globally, supporting 62.32% of the total publications by the top 10. Among them, the National Natural Science Foundation of China is the core funding force with stable and sustained support. Overseas funding agencies are mainly from the United States, Spain, Australia and Saudi Arabia, accounting for 37.68% in total, forming an international funding pattern with China as the main body and the collaborative participation of multiple countries.

5.Future Prospects

Based on the above findings, this paper proposes the following potential directions for future research and development in the interdisciplinary field of generative AI and education:

First, deepen interdisciplinary integration and expand research boundaries. Current research is highly concentrated in educational research. Future studies may strengthen in-depth integration with information science, psychology, nursing, environmental science and other disciplines. By combining research paradigms and practical scenarios of different fields, researchers can explore the application paths of generative AI in vocational education, basic education, special education and other diversified educational settings, break disciplinary barriers, and enrich research connotations.

Second, improve the academic influence and collaboration capacity of research institutions in Chinese mainland. Although top universities in Chinese mainland have established a solid research foundation in this field, they still lag behind those in Hong Kong, China and world-class institutions in citation frequency and international collaboration link strength. In the future, mainland institutions should strengthen cross-regional and cross-institutional cooperation with outstanding global research teams, build international academic exchange platforms, and conduct joint research on key issues concerning the integration of core technologies and education. Meanwhile, emphasis should be placed on improving the quality and international dissemination of research outputs to further consolidate China's core position in this field.

Third, continuously focus on the effectiveness and ethics of technology application to improve the research system. Self-efficacy has become an important research focus, indicating the academic attention to the core of human-computer collaborative education. Future research should further explore the empowerment mechanisms and influencing pathways of generative AI on the self-efficacy of learners and educators, and establish a scientific effectiveness evaluation system. At the same time, sustained attention should be paid to ethical norms and risk prevention in technology application. Adaptive academic integrity guidelines and algorithmic ethical standards should be formulated according to the educational contexts of different countries and regions to balance technological development and educational ethics.

Fourth, strengthen international research collaboration and resource sharing to promote global coordinated development. A diversified and coordinated international funding and research landscape has taken shape in this field. In the future, relying on the resource advantages of national research funding agencies, a global collaborative network for generative AI and education integration should be established to promote the sharing and exchange of research data, outcomes and methods. Particular attention should be given to the development potential of emerging research countries such as Singapore, Saudi Arabia and Malaysia. Academic cooperation with non-traditional scientific powers should be enhanced to enrich the diverse perspectives of global research and jointly explore global pathways for generative AI to empower educational modernization.

In addition, promote the translation and application of research outcomes to achieve the integration of theory and practice. Current studies mostly focus on theoretical discussion and empirical analysis. Future research should strengthen the connection between academic outputs and educational practice, and promote the implementation of generative AI in classroom teaching, educational management, teacher training and other scenarios. Meanwhile, combined with the educational policies and development needs of different countries, academic findings should be transformed into operable educational practice plans and policy suggestions, so as to realize the precise empowerment of theoretical research on educational practice and facilitate the in-depth integration and long-term development of generative AI and education.

Overall, the interdisciplinary research of generative AI and education is still in a golden stage of rapid development. With continuous technological iteration and deepening global academic cooperation, the field will achieve new breakthroughs in interdisciplinary integration, effectiveness improvement, ethical regulation and practical transformation, providing important theoretical support and practical pathways for the global digital transformation and high-quality development of education.

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