

# The application and prospect of ChatGPT in China's education: A bibliometric analysis

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**Abstract:** Based on the visualization analysis data generated by CNKI, this paper explores the thematic distribution, disciplinary distribution, and keyword distribution of the current research on "ChatGPT in education" in China. The findings indicate that primary areas of the existing research mainly involve ChatGPT alongside artificial intelligence, as well as their empowerment role in educational applications, digital transformation of education, and educational reform. It is recommended that the focus of the future research should be on the effectiveness of ChatGPT empowering educational applications, and the empirical research of ChatGPT in the field of education.

**Key words:** ChatGPT; education in China; educational applications; digital transformation of education; educational reform

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## 1 Introduction

ChatGPT (Chat Generative Pre-trained Transformer), as one of the large language models, has been increasingly being applied in fields such as NLP (natural language processing), finance, customer service, education, language learning, business, healthcare, manufacturing, scientific research, demonstrating its distinct advantages in improving efficiency and outcome. With the continuous localization development of ChatGPT, there are more and more studies related to ChatGPT in China. The changes brought out by ChatGPT to the education ecosystem are evident, including its promotion of human-machine collaborative education models, teaching models, student learning, and talent cultivation. There have been related studies on the application of ChatGPT in the field of education, but there has been no systematic review of the research hotspots and development trends of ChatGPT integration in education in China. Based on the data from CNKI (China National Knowledge Infrastructure), this paper aims to investigate the latest achievements, problems, trends of the integration of ChatGPT in education and teaching in China.

## 2 Research design

### 2.1 Data sources

This study provides the general research status and prospect of the application of ChatGPT in the field of education in China. The research data comes from CNKI. Based on the CNKI database, this article used "ChatGPT in education" as the retrieval keywords under the "theme" directory to retrieve the relevant literature. The document information sources were set as the core journals of CSSCI (Chinese Social Sciences Citation Index) and GCJC (A Guide to the Core Journals of China). The time range was set from January 1, 2023 to August 20, 2024. Subsequently, 146 articles of core journals from

CSSCI and GCJC were retrieved and identified as the analysis data generated in CNKI.

## 2.2 Research methods

This paper adopts methods of bibliometric analysis and thematic analysis for the research.

(1) Bibliometric analysis. This paper conducted visualization analysis of data that were derived from 146 articles of CSSCI and GCJC in the CNKI database, and quantitatively analyzed the data of knowledge graph visualization.

(2) Thematic analysis. This study employed thematic analysis to investigate the research hotspots of the literature, compared and inferred the themes among the key themes, in order to explore the relevant characteristics and development trends of the integration of ChatGPT in the field of education in China.

## 2.3 The focus of analysis

The visualization analysis of the data from CNKI include the overall trend, distribution of research literature (including categories of main theme, secondary theme, literature level, discipline distribution, research type, authors, institutions, and fund sources), and relationship networks (including categories of literature cross-citation network, keyword co-occurrence network, and author cooperation network). This study aims to analyze data on three major topics of "main themes", "discipline distribution" and "keyword co-occurrence networks". It also roughly describes the "overall trend" and "research type" of the literature based on the data analysis of CNKI. Regarding the "literature level", this study has made it clear that the data were selected from the core journals of CSSCI and GCJC.

# 3 Analysis of the research trend of ChatGPT in education

## 3.1 Distribution of major themes

Based on the data of bibliometric analysis generated from the CNKI through retrieving the theme of "ChatGPT in education", the top ten main topics covered in the article are as follows: ChatGPT accounting for 127 papers, artificial intelligence 30 papers, generative artificial intelligence 22 papers, coping strategy 7 papers, challenge and response 5 papers, ethical risk 5 papers, generating 5 papers, educational application 4 papers, artificial intelligence technology 4 papers, digital transformation of education 3 papers. Besides, some other themes such as artificial intelligence education, large language model, risk and challenge, educational reform, postgraduate, teacher professional development, impact and response, high-quality development, application in teaching, and general large model are also involved.

Beyond the major themes mentioned above, sub themes from the data of CNKI include human-computer collaboration accounting for 6 papers, learner 5 papers, digital literacy 5 papers, human-computer collaboration mode 4 papers, along with themes of the age of AI, deep learning, and personalized learning. The data show that the research on the integration of ChatGPT into education involves topics on the application of artificial intelligence of ChatGPT in diverse aspects of education.

## 3.2 Discipline distribution

According to the data of discipline distribution generated from CNKI, the main disciplines involved in the literature are educational theory and teaching management accounting for 31.61%, computer software and application 28.39%, automation technology 19.68%, while higher education 6.77%. In addition, other disciplines covered in the literature include library information and digital books, secondary education, information economy, Chinese language and literature, vocational education, talent studies, adult education and special education, foreign language and literature, political science, computer hardware technology, agricultural economy, medical education, finance, economic system reform, administration and national administrative management, and biology.

The research on ChatGPT in education involves a wide range of disciplines. However, the focus of the research is mainly on the disciplines of educational theory and teaching management, computer software and computer application,

automation technology and higher education, as well as their interdisciplinary integration and application.

### 3.3 Analysis of keywords

The co-occurrence network analysis of the keywords generated by CNKI indicates that the keywords of the current research are artificial intelligence accounting for 94 times, generating 47 times, AI technology 36 times, educational application 24 times, empowerment 24 times, generative AI 14 times, digital transformation in education 13 times, higher education 12 times, natural language processing 12 times, subjectivity 8 times. In addition, keywords such as educational reform, teaching content, educational ethics, schooling, technical ethics, future education, and machine learning have also been discussed .

The highest frequency of the keywords "artificial intelligence" indicates that AI is closely integrated with education, and is the core field of education research, which is basically consistent with the international research trend [1][2]. The keywords in the data analysis of the current research from CNKI also include "educational application" and "higher education". In fact, the application of ChatGPT in higher education in China has triggered changes in digital transformation, educational subjectivity reflected in human-computer interaction modes and teacher-student relationships, and teaching contents, influencing the future of education, and promoting the development of higher education. According to the research by Wang and Pan, the high-frequency keywords related to "ChatGPT and educational reform" in the literature are modernization of Chinese-style education, Chinese education, foreign language education, basic education, digital transformation, higher education reform, educational ecology, educational risks, future education, reconstructionism, personalized teaching, new knowledge perspectives, and intelligent governance [3]. Based on the data of this study, the educational changes caused by ChatGPT mainly manifest in the changes of educational mechanism, educational paradigm and educational risk.

The analysis of the literature shows that, regarding the integration of ChatGPT into education, topics on ChatGPT and its application in higher education, its impact on digital transformation in education, educational reform, human-computer interaction, academic research, and the risks and governance have become the research focuses. Based on the CNKI visualization analysis, it is found that the main types of research of ChatGPT in education in China could be classified into applied research, development research, disciplinary education and teaching, and technology research.

## **4 Analysis of hotspots in the research of ChatGPT in education**

ChatGPT can serve as learning and teaching assistants in education, offering explanations related to subjects and courses at any time, and providing support for educational entities. This transformative approach ensures the adaptability, accessibility, and effectiveness of education, promoting lifelong learning and academic success among teachers and learners [4].

### 4.1 Educational application

The application of ChatGPT in education are multifaceted. ChatGPT can be applied in teaching, learning, evaluation, and academic research. Specifically, the integration of ChatGPT into education plays the following roles: (1) text organization for academic paper writing, (2) data processing, (3) generating creativity and decisions such as designing teaching syllabuses, (4) promoting human-computer interaction and human-human interaction, (5) facilitating software development, (6) analysis and prediction, (7) inspiring the creativity of educational entities, (8) conducting automatic scoring, and (9) promoting educational innovation [5]. When ChatGPT is specifically applied to curriculum teaching, Skrabut explains that 80 classroom activities such as teaching preparation, teaching evaluation, and classroom activities can be carried out [6].

### 4.2 Digital transformation in education

With the development of artificial intelligence such as ChatGPT, modern higher education has undergone profound digital transformation, empowering the digital transformation of educational concepts, methods and models. The digital transformation of education has brought about changes in training subjects and talent development. For example, the relationship between teachers, learners, and machines is characterized by coexistence and interaction. The talent cultivation has been shifted from focusing on current comparative advantages to future competitive advantages, and has been shifted towards cultivating innovative talents for future social competition, human-machine competition, and international competition [7]. The ultimate goal is to achieve digital transformation in education that aligns talent development with society's demand for artificial intelligence literacy.

## **5 Suggestions for the research on ChatGPT in education**

The research methods used in the existing literature are relatively simple, and most of them are exploratory thinking rather than empirical studies. The existing research lacks support of relevant theories, which means that relevant theories have been relatively rarely applied in the previous research. Most of the research focuses on the application of ChatGPT in education, the promotion of digital transformation and issues in educational reform, as well as the advantages and potential risks of ChatGPT in education including digital education transformation, teaching, learning, academic research, and other human-machine collaboration areas.

The Chinese government continues to attach importance to empowering education with artificial intelligence, accelerating artificial intelligence to assist in educational reform [8]. Future research on ChatGPT in education should be focused on the application of relevant theories in the research and the use of diverse empirical research methods. Crompton and Burke argue that theoretical frameworks, pedagogical perspective, and cognitive theories have been used for case studies in AI application [9]. The future research can draw on their research findings to strengthen the application of theories. In addition, empirical research such as case study should be strengthened [9][10], to verify the specific fields and application methods of ChatGPT in education, and evaluate the effect of its application. Moreover, it is necessary to further expand the research perspectives, and verify the rationality and effectiveness of ChatGPT in educational applications.

Burke and Crompton analyze the impact and relationship of AI in education around the world, especially in the field of academic integrity, pedagogy and ethics. They expressed that in the future, the focus should be on exploring AI solutions to education, promoting AI ethics, and cultivating students' ability to adapt to AI driven workplaces [11]. Future research should be conducted to focus on the above-mentioned aspects, and explore what systems or laboratories need to be established to ensure the efficiency of ChatGPT applications. It is necessary to further explore the scopes of the application of ChatGPT in education, and how to solve the shortcomings of ChatGPT in technology and application. It is proposed to conduct empirical research, to thoroughly investigate the implementation of AI empowerment for teacher development, continuing to investigate how to teach, what to teach, what students should learn and how to learn, and their "creative thinking"[12], in order to promote the further application of digitalization and artificial intelligence in education.

## **6 Conclusion**

As one of the large language models, ChatGPT continues to be applied in education, bringing changes and impacts to schooling, talent cultivation, digital transformation of education, educational reform, future education, human-machine collaboration, and educational science research. It can affect the role of teachers as knowledge transmitters, and curriculum design. How to scientifically apply ChatGPT to education requires further research. Based on the practice and effectiveness of ChatGPT application, it is proposed to actively prevent potential risks of the application, explore how artificial intelligence can achieve new knowledge production through its application in education, so that ChatGPT and other artificial intelligence can positively serve education.

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## Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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