

Convergence and Integration: Evolving Frontiers and Paradigmatic Turns in China's Geography Education

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ABSTRACT

This paper employs bibliometric analysis to examine geographical education research published in 84 core CNKI journals between 2003 and 2023. Using CiteSpace, it analyzes article distribution, funding sources, and thematic evolution. The findings indicate a clear shift toward interdisciplinary integration and paradigm innovation, supported by social science funding. Key trends include: disciplinary integration with IT and humanities; a focus on cultivating core competencies like human-environment understanding and holistic thinking; and model innovation through technology-enhanced teaching and talent development. The study highlights a transition from vocational training to competency-based education and from single-discipline approaches to interdisciplinary collaboration, providing theoretical and practical insights for future geographical education.

KEYWORDS

Geography education; Interdisciplinary integration; Paradigm shift; Core competencies; Bibliometric analysis

1 Introduction

The profound transformation of education in the new era is driving geographical education research toward a paradigm shift. This transformation goes beyond optimizing traditional teaching methods, focusing on the integration of disciplinary knowledge, technology, and educational objectives, resulting in a fundamental change in research approaches. Geography's interdisciplinarity makes it a key field for addressing global challenges and promoting systematic thinking. However, traditional research methods can no longer meet the demands of competency-based reforms, rapid technological advancements, and complex real-world problems.

The tension lies in the dual forces of "technological empowerment" and "competency-based objectives." Technologies like interactive tools, digital twins, and AI are reshaping the tools and interfaces used in geography education. At the same time, curriculum standards emphasize the development of values, thinking skills, and practical abilities, rather than just knowledge transmission. Research topics are expanding, covering GIS integration, experiential learning, and interdisciplinary teacher competencies, but often remain fragmented and superficial. The literature lacks systematic exploration of the theoretical logic behind these shifts and the role of "interdisciplinary integration" in driving paradigm changes.

This study emphasizes the importance of understanding the trajectory of this paradigm shift. Using CiteSpace to analyze 504 articles from 84 core educational journals (2003-2023), the paper aims to: 1) Map changes in the research community's cognitive structure, 2) Examine the shift from "curriculum and textbook theory" to "technological tools theory" and "competency integration theory," and 3) Provide a forward-looking view of the theoretical value and practical pathways of "interdisciplinary integration." The goal is to offer a cohesive framework for geographical education research that addresses current challenges and provides logical consistency for future development.

2 Data and methods

This study uses bibliometric methods to analyze the landscape and evolution of geographical education research in China. By quantitatively analyzing literature characteristics, it reveals underlying structures and trends. CiteSpace is used for constructing the knowledge map due to its ability to detect key paths and research frontiers. The data is sourced from the CNKI journal database, focusing on 84 core educational journals, including *Educational Research*, *Curriculum-Textbook-Teaching Method*, and others from authoritative directories like Peking University Core Journals, CSSCI, and AMI Core. The analysis covers research published from 2003 to 2023, with keywords like "geographical teaching," "geographical education," and "secondary school geography." After cleaning the data, 504 valid research articles were selected and analyzed using CiteSpace.

3 Research scale

Over the past two decades, 504 geographical education research papers were published in 84 core educational journals within the CNKI database. While annual publication volumes fluctuated slightly, the average remained around 24.1 papers per year. Peaks in publications occurred in 2008, 2014, 2018, and 2020, with 33, 37, 34, and 32 papers,

respectively. In contrast, lower publication volumes were seen in 2005, 2011, and from 2015 to 2017, with a cyclical pattern every six years. The annual growth rate of publications was around 41.18%, reflecting ongoing scholarly interest and development. Several highly cited works have been instrumental in advancing the field, including Yuan Xiaoting and Wang Xiandong's "Emphasizing the Core Competencies and Geographic Perspectives of the Geography Discipline" and Tang Guorong's "On the Connotation and Composition of Geographic Core Literacy," among others. These studies, cited between 208 and 548 times, focus on core competencies in geography and "big concepts," showing their significant influence on geography curriculum and teaching design.

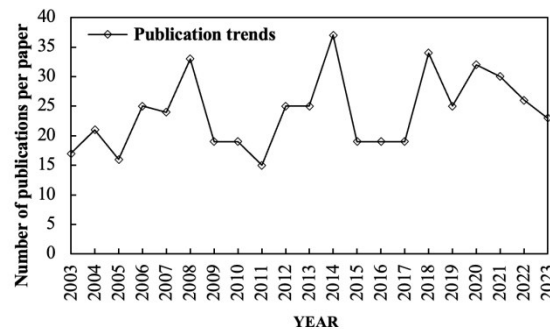


Figure 1 Annual publication trend of geographical education research in China (2003–2023)

4 Core journals

Among the 84 core education journals analyzed, geographical education research displays notable diversity in focus, reflecting varied academic orientations and contributing to the field's growing specialization. This diversity provides a robust platform for theoretical and practical innovation. For instance, journals like *Curriculum·Textbook·Teaching Method* and *Journal of Tianjin Normal University (Basic Education Edition)* concentrate on geography teaching design, offering rich resources for scholarly discussion. *China University Teaching* emphasizes higher education program development, especially in areas such as GIS and related teaching reforms, while *China Educational Research Journal* addresses macro-level themes including curriculum system design and quality education integration. Key research themes commonly explore the cultivation of geographic core competencies, curriculum goal setting, innovative teaching methods, and GIS professional development. These studies enhance theoretical understanding and offer essential support for teaching reform and innovation.

Table 1 Main journals and key publications in the field of geographical education research in China

Serial No.	Journal Name	Number of Publications	Key Publications
1	Curriculum·Textbook·Teaching Method	86	<i>The Core Components and Main Features of Geographical Literacy; On the Connotation and Composition of Geographic Core Literacy; Emphasising Core Competencies and Geographic Perspectives in Geography</i>
2	Journal of Tianjin Normal University (Basic Education Edition)	65	<i>On the Connotation, Characteristics, and Cultivation Strategies of Geographic Core Literacy; Reconstructing Geography Learning Units from the Perspective of Big Concepts; High School Geography Education for Sustainable Development under Core Competency Objectives</i>
3	Educational Theory and Practice	54	<i>Core Competency-Based Geography Curriculum and Teaching Objectives; Features and Classification of Image Systems in New Secondary School Geography Textbooks—Taking the People's Education Edition as an Example; Geography Education Based on the Cultivation of Geographic Literacy: Value and Strategy</i>
4	China University Teaching	49	<i>Survey and Analysis of GIS Higher Education in China; Development Issues in Geography Information Systems Programs in Chinese Universities; Exploration and Practice in GIS Program Development</i>
5	China Educational Research Journal	27	<i>Exploring Effective Classroom Questioning Implementation Paths; Geography Education Reform and Development from the Perspective of the "International Charter on Geography Education"; Theoretical Exploration and Practical Implementation of "Geographical Practical Ability" as Core Competency</i>

5 Key supported projects

Research funding in geographical education primarily comes from national and local sources. As indicated in Table 2, the Ministry of Education's Humanities and Social Sciences Research Fund is the major supporter, providing the most projects and publications. Additional significant support comes from national programs such as the National Social Science Fund, China Postdoctoral Science Foundation, and National Natural Science Foundation, which cover diverse

research themes.

In addition to national-level projects, local initiatives also play a vital role in advancing geographical education research. For example, projects such as the Tianjin Philosophy and Social Science Planning Project and the Shanxi Provincial Education Science Planning Project have been instrumental in promoting regional development in geographical education research. Local initiatives—such as those in Tianjin and Shanxi—also contribute importantly to regional research development. Geographically, funded projects are concentrated in eastern and central regions, highlighting a comparative lack of support in western areas. Sustained progress in the field relies on collaboration among researchers and systematic funding at all levels. To promote balanced development, increased investment in western regions is essential to align their progress with the rest of the country and improve overall quality in geographical education.

Table 2 Research Projects Supporting Geographical Education Research in China

Serial No.	Supported Project	Number of Publications
1	Ministry of Education Humanities and Social Sciences Research Fund	13
2	National Social Science Fund	11
3	China Postdoctoral Science Foundation	8
4	National Natural Science Foundation Projects	8
5	Tianjin Philosophy and Social Science Planning Project	6
6	Central University Basic Research Funds Special Project	6
7	National Education Science Planning Project	5
8	Key Project of the Northeastern Normal University Teacher Education Research Fund	5
9	Shanxi Provincial Education Science Planning Project	5
10	Southwest University Education and Teaching Reform Project	4

6 Research clustering analysis and topic development

Based on a clustering analysis and timeline mapping of existing literature (Fig. 2), this paper outlines major research topics and developmental trends in geographical education. Key areas of focus include geography teaching, secondary education, curriculum reform, teacher development, and core competencies, offering valuable insights for academic discourse, teaching practice, and policy-making.

6.1 Geographical teaching

"Geographical teaching" encompasses the educational process of conveying knowledge and skills about the Earth's surface, natural and human environments, and social phenomena. This thematic cluster includes keywords such as "teaching models," "teaching practices," "teaching evaluation," and "information resources." As illustrated in the timeline map (Figure 2), early research emphasized "geographical teaching" and "teaching evaluation"—the systematic assessment of instructional effectiveness and learning outcomes. Over time, the focus has shifted toward more specialized topics, including teaching models, practical instruction, and information resources.

"Teaching models," a concept pioneered by Joyce and Weil, refer to structured procedural frameworks grounded in pedagogical principles, serving as a bridge between theory and practice. "Teaching practices" are especially vital in geography education, as understanding the Earth's surface requires hands-on experience in real-world settings. Although many national curricula—such as those in the UK—stress the value of fieldwork, practical teaching remains underdeveloped compared to theoretical instruction. Scholars advocate integrating more geographical practice into secondary education to strengthen students' applied abilities and literacy. The increased attention to "information resources" aligns with the growth of geospatial data and technology. Researchers like Wang Jinshu and Wang Siyuan argue for better integration of modern information tools into geography education to support inquiry-based learning. Despite recent progress, further emphasis is needed—particularly on practical teaching and digital resource utilization—to advance the field.

6.2 Secondary school geography

The keywords in the "Secondary School Geography" cluster focus more on talent development from the students' perspective, such as "secondary school geography," "geography textbooks," "curriculum reform," "learning methods," and "geographical practice." Around 2003, the focus was primarily on "geography textbooks" and "curriculum reform," highlighting key tools and approaches in secondary school geography at the time.

Research on "geography textbooks" has suggested reforms like integrating ecological civilization education or enhancing visual information in textbooks^[1]. Studies on "curriculum reform" have often addressed specific teaching units or modules, such as Cao Rong's work on the "ecological environmental management" unit, which optimized unit teaching methods in geography education^[2].

Recently, core keywords like "learning methods" and "geographical practice" have emerged. These reflect the current

demands of secondary school geography education, focusing on improving "learning methods" in geography lessons. New learning models, such as autonomous learning, cooperative learning, and inquiry-based learning, are being promoted, alongside a stronger emphasis on geography practice teaching. This approach aims to enhance student engagement and maximize active participation^[3].

6.3 Teaching reform

Keywords in the "Teaching Reform" cluster are mainly related to the concept of "reform" and include terms like "teaching reform," "new curriculum reform," "training models," "talent development," and "teaching strategies." Teaching reform involves comprehensive changes to curriculum design, teaching methods, resource use, and evaluation systems. A central aspect of China's education system, "new curriculum reform" aims to enhance students' overall competencies by innovating curriculum structure, teaching methods, and evaluation mechanisms, fostering talent with innovative thinking and practical skills^[4].

"Teaching strategies," a key component of the reform, include aspects such as setting teaching objectives, designing the curriculum, organizing content, selecting methods, using resources, and assessment. For example, Tang Guorong proposed that teaching strategies should focus on "regional issues as a medium, guiding thinking construction, and applying principles," advocating for a regional geography strategy that involves "setting thematic contexts, posing inquiry-based questions, guiding critical thinking, conducting activities, presenting findings, and providing feedback"^[5].

As research progresses, the "Teaching Reform" cluster has expanded to include keywords like "talent development," reflecting a shift from classroom teaching to broader concerns about individual growth and talent quality. Some studies compare the gaps in talent development between Chinese universities' geography programs and those in developed countries. In the context of social transformation, new expectations for talent development emphasize fostering innovation, broad literacy, applied skills, and integrating patriotism and national identity^[6].

6.4 Geography teachers

The keywords in the "Geography Teachers" cluster focus on the role of teachers, including "professional development," "evaluation criteria," "skill development," and "geography classrooms." Geography teachers are a vital resource in geography education. With the reform of high school geography textbooks, both teacher training at higher normal universities and in-service training for secondary school teachers now face new demands, including geographical literacy, classroom management, and teaching presentation^[7]. Early research mainly addressed issues raised by frontline teachers, such as delivering high-quality "geography classrooms." Key topics included optimizing classroom introductions, improving questioning strategies, and establishing teaching evaluation systems^[8].

Recent research has shifted towards the "professional development" of geography teachers and their role in fostering "skill development" in students. In rural China, geography teachers face unique challenges due to their specialized subject background and isolated work environments. Current research highlights these challenges and suggests that remote education and information technologies, such as computer networks, can support their professional growth and reduce regional disparities. Some studies also emphasize accelerating the development of the geography teacher workforce and strengthening teachers' roles in fostering students' independent learning abilities^[9].

6.5 Core competencies

Since 2014, "core competencies" have become central to teaching reform. Early research focused on understanding core competencies and their "cultivation strategies." Developing geographic core competencies is key to advancing geography curriculum reform. "Cultivation strategies" refer to methods aimed at promoting the holistic development of students, fostering their professional skills, innovative thinking, leadership abilities, and other essential qualities.

In recent years, research has shifted from general discussions to exploring the specific content of core competencies. This has led to identifying key targets like "integrated thinking" and "key abilities," which have driven the development of optimisation strategies. For example, interdisciplinary approaches like "disciplinary integration" have been advocated. "Integrated thinking" involves combining knowledge and perspectives from various fields, enabling multidimensional analysis and problem-solving. In geography education, integrated thinking, along with map skills, spatial perspectives, and human-environment concepts, forms the four core dimensions of these competencies. "Key abilities" are the external manifestations of core competencies. For instance, Ren Yi and colleagues^[10] argue that skills like geographic drawing are closely aligned with cultivating core competencies. Future research will continue to refine the concept of core competencies and propose practical strategies for their optimisation.

7 Conclusion and outlook

This study, based on 504 geographical education research papers published in core educational journals on CNKI from 2003 to 2023, employs bibliometric methods to analyse trends, project funding, and the evolution of keywords within the field of geographical education in China. The findings show that the scale of research in this field has exhibited fluctuating

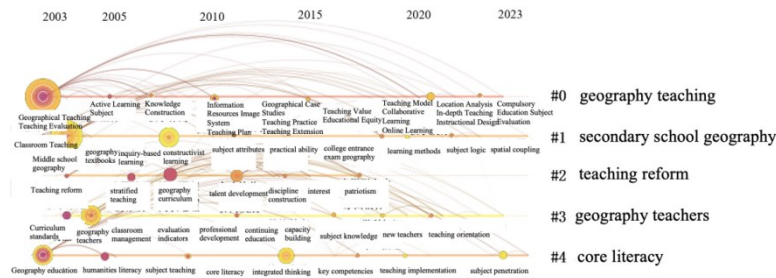


Figure 2 Clustering timeline of keywords in the field of geography teaching in my country

growth, supported by national and provincial funding. Research hotspots have clearly shifted from curriculum standards and textbook development to competency-based education, big concept teaching, and the deep integration of digital technologies (such as Google Earth). Teaching methods and approaches have become more diverse, reflecting the ongoing innovation in geographical education. Future research is expected to focus more on exploring the intrinsic value of core competencies, developing secondary school curriculum resources, and innovating teaching strategies, while also emphasising teacher professional development and the use of educational technology.

However, current research presents three main gaps: First, the application and integration of new technologies in teaching remain underdeveloped, necessitating exploration of new avenues for empowering geography education with intelligent technologies. Second, comprehensive universities show limited participation in geographical education research, highlighting the need for greater subject support and resource investment. Third, the internationalisation and modernisation of the curriculum system require improvement, with efforts needed to align curriculum content and teaching standards with cutting-edge practices to cultivate specialised talent with a global perspective and innovative capabilities. Future research should focus on strengthening interdisciplinary integration and model innovation to provide systematic support for the high-quality development of geographical education.

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