

# *A CiteSpace-based visual analysis of interdisciplinary thematic teaching research in China*

Zhang Chunyan

*China West Normal University, Nanchong, 637009, China*

**Keywords:** Interdisciplinary thematic instruction; disciplinary integration; core literacy; knowledge mapping

**Abstract:** In the era of knowledge economy, interdisciplinary thematic teaching, as an important teaching mode that advocates breaking the boundaries of independent disciplinary curricula, centering on a certain teaching theme, and carrying out teaching activities by integrating the contents of various disciplines to cultivate the comprehensive quality of students, has increasingly become a research focus and hotspot in China's education sector. In this study, 339 articles related to “interdisciplinary thematic teaching” in CNKI database from 2007 to 2024 were used as data sources, and were visualized and analyzed by CiteSpace software using mathematical statistics and scientific knowledge mapping. It was found that the annual number of publications in this field shows a fluctuating upward trend, teacher training colleges and universities and other important research institutions, and the degree of authors' cooperation needs to be strengthened. High-frequency keywords such as “interdisciplinary” and “core literacy” reflect the focus of research, and the evolution of keyword time zones reveals the dynamic change of research focus. This study provides a reference for an in-depth understanding of the current status, hotspots and trends of interdisciplinary thematic teaching research in China, and helps to promote the development of related teaching practices.

## **1. Introduction**

In today's fast-developing knowledge economy, interdisciplinary theme teaching, as a new type of teaching mode, plays a crucial role in promoting students' comprehensive development and fostering their comprehensive literacy and innovation ability<sup>[1]</sup>. At present, the society's demand for composite talents is increasing, due to the traditional single subject knowledge teaching mode is often unable to fully and correctly explain the real world, affecting the students' learning effect, it is difficult to meet the requirements of the development of education, therefore, a more comprehensive and exploratory teaching method is more common pursuit at present, and so interdisciplinary thematic teaching has gradually become a hot spot for research in the field of education. Interdisciplinary theme teaching breaks the boundaries between disciplines, and integrates the knowledge and methods of different disciplines around a certain theme, so that students can use multidisciplinary knowledge to solve problems in real situations, thus adapting to the diversified development of the future society<sup>[2]</sup>. However, although the research on interdisciplinary theme teaching in China has achieved certain results, there has not been a

systematic visualization and analysis research based on CiteSpace. Therefore, this study plans to use CiteSpace software to conduct an all-round and in-depth visual analysis of the literature related to interdisciplinary theme teaching in China, with a view to presenting the research facts, hot topics, cutting-edge directions, and the core research power in this field, providing references and inspirations for theoretical investigations and practical attempts in interdisciplinary theme teaching, promoting the further development and improvement of interdisciplinary theme teaching in China, improving the quality of education and teaching, and cultivating the quality of education and teaching, as well as improving the quality of education and teaching in China. It also promotes the further development and improvement of interdisciplinary theme teaching in China, improves the quality of education and teaching, and cultivates more innovative talents with interdisciplinary literacy.

## **2. Data sources and research methodology**

### **2.1 Data sources**

The data of this study came from CNKI database, and with “interdisciplinary theme teaching” as the keyword, we searched the period from 2007 to 2024, screened 339 related articles, exported them in text form and imported them into CiteSpace software, and then obtained the visual analysis of the literature according to the procedure. The data of this study were then obtained.

### **2.2 Research Methods**

#### **2.2.1 Mathematical and Statistical Method**

In this study, we analyzed the literature on interdisciplinary theme-based teaching in China by using CiteSpace software and imported the authors, institutions, publications, and keywords into Excel for statistical analysis. CiteSpace Knowledge Graphs “can show the evolution of the ins and outs of a field on a single citation network map”<sup>[3]</sup>, and can sort out and mark the research hotspots and fronts of the field, helping researchers to understand the research progress and trends of the field.

#### **2.2.2 Scientific Knowledge Mapping**

In the fields of scientometrics and informetrics, scientific knowledge mapping is an innovative research method, which can clearly show the source and development law of knowledge, and can also perfectly display the linkage of knowledge structure and evolution law of the relevant fields in the form of intuitive maps. In this paper, we use CiteSpace software to conduct an in-depth visualization and analysis of the research hotspots and frontiers of interdisciplinary subject teaching in China.

## **3. Results and Analysis**

### **3.1 Analysis of the amount of literature issued**

The time-series change in the number of documents is an extremely important indicator, which can provide comprehensive statistics on the research results in the field of interdisciplinary word subject teaching and learning research in China, and then draw a statistical chart of the number of documents issued per year, which can help researchers to grasp the research heat, changes in the number of results, the overall development of the field and the trend of the field in different periods

of time from a macroscopic point of view. From the time series 2007-2024, 339 articles were analyzed by CiteSpace software and imported into Excel to form Figure 1. The time series 2007-2024 will be 339 pieces of literature through the CiteSpace software analysis and imported into Excel to form the annual trend of the number of articles, as shown in Figure 1, in the field of education continues to innovate at the present time, the importance of interdisciplinary thematic teaching as a key driving force to promote the innovation and development of education is becoming more and more significant. In order to gain a precise insight into the dynamics of research in this field, this study systematically and deeply analyzes the annual publication volume of interdisciplinary thematic teaching in China from 2007 to 2024.

Throughout the period of 2007-2024, the number of annual publications on interdisciplinary theme-based teaching in China shows a significant fluctuating upward trend. At the beginning of the research period (2007-2010), the number of annual publications was at a low level of less than 5 per year. At that time, the research on interdisciplinary thematic teaching was still in the initial exploration stage. The education sector's understanding and research were not thorough enough, and the research methodology was relatively single and the perspective relatively limited, which made it difficult to realize a significant increase in the number of articles published during this period.

With the continuous promotion of educational reform and the increasing emphasis on the comprehensive literacy development of students, the number of articles on interdisciplinary thematic teaching began to rise steadily during the period until 2015. During this period, educational policies gradually tilted toward interdisciplinary education and actively encouraged schools to carry out interdisciplinary teaching practices. Numerous educational researchers and front-line teachers have keenly captured this trend and have devoted themselves to the research of interdisciplinary theme teaching, which has led to a yearly increase in the number of articles published, reaching about 7 articles by 2015.

From 2021 to 2024, the research fever of interdisciplinary theme teaching climbs sharply, and the number of articles published shows explosive growth. During this period, with the emergence of the concept of “core literacy”, the important value of interdisciplinary teaching in the cultivation of students' comprehensive ability is further emphasized. Universities and educational research institutions have set up related research programs, and a large number of empirical studies and theoretical explorations have sprung up. These research results have greatly enriched the body of knowledge in this field, and have also led to a peak in the number of articles published annually in 2024, which is about 67 articles. This suggests that as educational practices continue to deepen, new research questions and hotspots continue to emerge and continue to attract the attention of researchers.

Compared with studies in the same field in different time periods, during the period of 2007 - 2015, the studies mainly focused on the conceptual definition, meaning interpretation and theoretical basis of interdisciplinary theme teaching; while during the period of 2021 - 2024, the studies are more diversified, covering the construction of interdisciplinary teaching mode, curriculum design and implementation, and the improvement of the teaching evaluation system, and other aspects. Compared with the research on other related topics, such as interdisciplinary education, the number of articles published on interdisciplinary thematic teaching grows more rapidly, which fully demonstrates that its application in educational practice is more specific and in-depth, and it also attracts more attention from educators.

Overall, the changes in the annual publication volume of interdisciplinary thematic teaching in China intuitively reflect the ups and downs of the research heat in this field. Looking ahead, with the rapid development of educational technology and the continuous growth of society's demand for innovative talents, the research on interdisciplinary thematic teaching is expected to continue to maintain a good development trend. However, at the same time, we also need to pay attention to the

problems existing in the research process, such as the scientificity and standardization of the research methodology, and the promotion and application of the research results, in order to promote the research on interdisciplinary theme-based teaching and learning to go deeper and better.

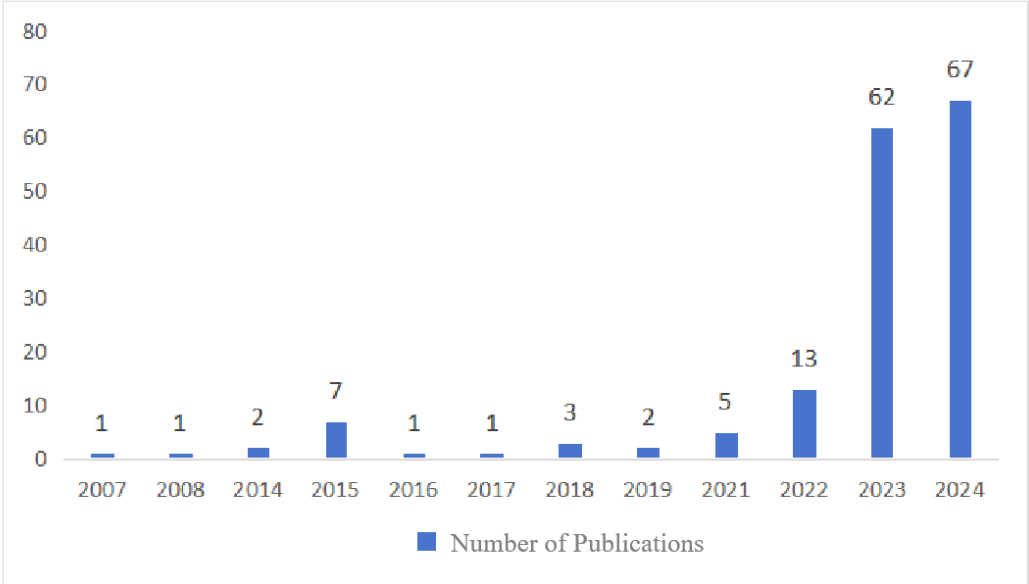


Fig. 1 Statistics on the annual publication volume of research on interdisciplinary theme-based teaching and learning in China, 2007-2024

### 3.2 Analysis of important authors of interdisciplinary theme-based teaching in China

CiteSpace software was used to analyze the research scholars on interdisciplinary thematic teaching in China to obtain the co-occurrence network diagram of important authors (Figure 2), and to count the top 8 authors in terms of the number of publications (Table 1). From Figure 2, we can see that there are 135 authors involved in the research on interdisciplinary theme-based teaching in China (N=135), among which 38 authors have collaborative relationships (E=38), and the network density is 0.0042 (Density=0.0042), which can be found that the degree of cooperation among authors is not high. In terms of the degree of cooperation, the highest degree of cooperation as well as the highest number of publications is dominated by the research team consisting of Zhang Wenpeng, Gao B and Wang Jian.

Among the authors with important publications, Zhang Wenpeng and others have the highest publication volume, and a certain cooperation network has been formed among the authors. Interdisciplinary theme teaching is of great value, for students, it can promote knowledge linkage and transfer, and cultivate holistic and innovative thinking skills; the change of teaching paradigm needs to promote teachers' interdisciplinary awareness, thus prompting the teaching mode from “input-based” to “output-based “ transformation<sup>[4]</sup>. In terms of practice cases, for example, the interdisciplinary theme teaching design of elementary school language copes with the teaching dilemma through integration measures and optimization strategies. However, interdisciplinary theme teaching still faces many challenges, such as the difficulty of integrating subject content and the problem of integrating knowledge from different disciplines; the difficulty of choosing teaching methods and the difficulty of determining suitable teaching methods; and teachers' insufficient interdisciplinary competence and deficiencies in knowledge reserves and the use of teaching methods. In conclusion, China's research on interdisciplinary thematic teaching has achieved certain results, but it also faces many problems, and in the future, it needs to be further strengthened in

terms of policy support, teacher training, and development of teaching resources in order to promote its better development.

Table 1 Statistics of important authors of Chinese interdisciplinary theme-based teaching and learning studies

No.	Author's name	Amount of publications
1	Zhang Wenpeng	3
2	Song Jiangwang	2
3	Wu Lei	2
4	Huang Huitao	2
5	Wang Jian	2
6	Wang Zhonghua	2
7	Ding Yiran	2
8	Gao Yi	2

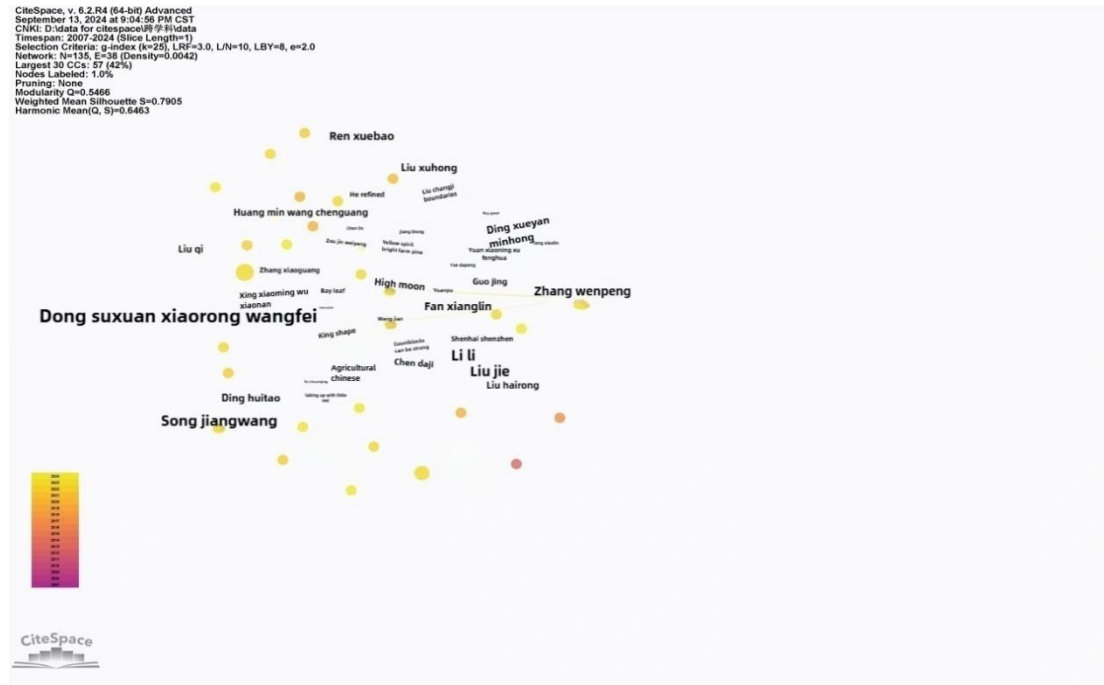


Fig. 2 Co-occurrence network mapping of authors of important publications on interdisciplinary theme-based teaching and learning research in China

### 3.3 Analysis of Important Publishing Institutions of Interdisciplinary Thematic Teaching in China

By analyzing the important issuing institutions of China's interdisciplinary theme teaching research we can conclude the progress status and influence of Chinese issuing institutions on China's domestic research in the field of interdisciplinary theme teaching. Comparative data analysis shows that the ranking of the top 10 issuing organizations is shown in Table 2. From Table 2, it is found that the top three are Shandong Normal University, Southwest University, and Central China Normal University, of which Shandong Normal University, with 15 articles, is located in the first place. In addition, the comparison of the number of articles issued can be found that the research institutions have a strong influence in this research field, and their research is more in-depth than the rest of the institutions.

In China's interdisciplinary thematic teaching research, the important issuing institutions present multi-dimensional characteristics and contributions. The teacher training institutions represented by Shandong Normal University and Southwest University are at the top of the list in terms of the number of articles published, and their research covers many aspects of interdisciplinary thematic teaching, such as the construction of the teaching mode, the innovation of the teaching method, and the improvement of the evaluation system, etc., which provides an important support for the theoretical development and practical application of interdisciplinary thematic teaching. The College of Physical Education and Health of East China Jiaotong University and the College of Physical Education of Yunnan Normal University, and other professional college-type institutions, on the other hand, focus on the research of interdisciplinary teaching and learning in the field of physical education and health, and contribute their professional strengths to promote the interdisciplinary development of this field. In terms of influence, the academic influence of these important issuing institutions is remarkable, with their papers being cited more often and some of their research results winning relevant awards, reflecting high academic value; in terms of practical influence, their research results strongly promote the educational and teaching practice of the schools, and provide assistance for the improvement of teachers' interdisciplinary teaching ability and professional development.

In addition, the analysis of the co-occurrence network mapping in Figure 3 reveals that there are 142 institutions (N=142) involved in interdisciplinary theme teaching in China, and there are 33 institutions (E=33) with collaborative relationships, with a network density of 0.0033 (Density =0.0033). Although the number of research institutes in China is high for their domestic interdisciplinary thematic teaching, the cooperative links between their research institutes are not deep. Nonetheless, there are still some cooperative relationships between the issuing institutions, such as joint research projects between certain teacher training colleges and universities to jointly explore the effective ways of interdisciplinary thematic teaching, which realizes the complementarity of strengths and further promotes the in-depth development of research in this field.

Table 2 Statistics of Important Issuing Institutions of China's Interdisciplinary Thematic Teaching Research

No.	Name of Institution	Amount of publications
1	Shandong Normal University	15
2	Southwest University	11
3	Central China Normal University	9
4	East China Normal University	8
5	Fujian Normal University	6
6	Shanghai Normal University	6
7	East China Jiaotong University School of Physical Education and Health	5
8	Liaocheng University	5
9	Yunnan Normal University School of Physical Education and Sport	5
10	Xinyang Normal College	5

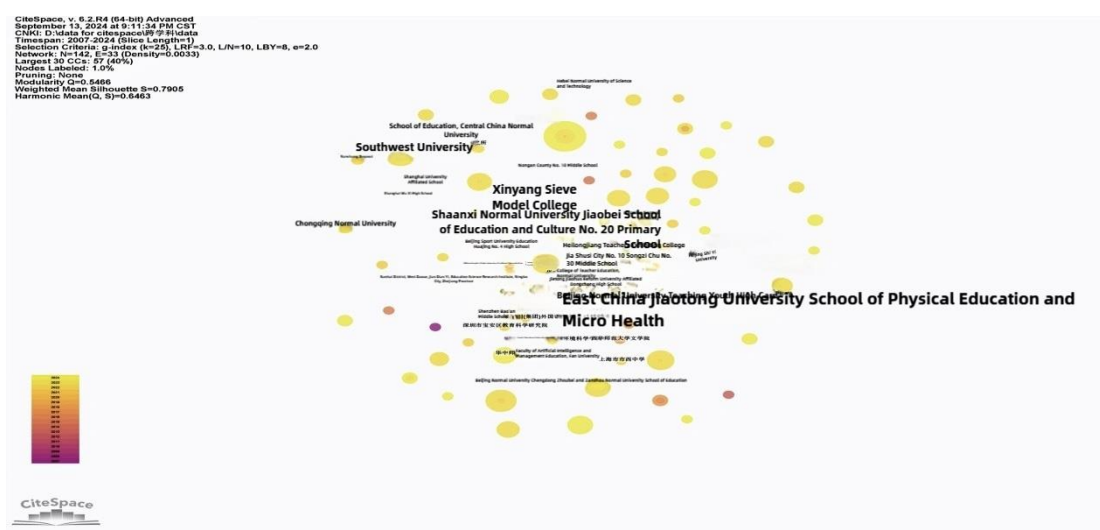


Fig. 3 Co-occurrence network mapping of important issuing organizations in China's interdisciplinary theme-based teaching and learning research

### 3.4 Visual analysis of research hotspots and trends in interdisciplinary theme-based teaching in China

#### 3.4.1 Keyword Analysis

Keywords, as a highly condensed and summarized content of the literature in the research field, carry the core concerns of the field and the research focus of the authors, and their frequency can be used to some extent as an important index to measure the degree of attention paid by scholars to the field, i.e., the higher the frequency, the higher the attention paid by research scholars to the field. At the same time, the centrality of keywords reflects the degree of attention and important value in the field, usually the importance and heat of keywords with centrality more than 0.1 is more significant, according to which high-frequency words and high and medium-centered keywords can be statistically combined with centrality, as shown in Table 3. In order to deeply understand the connotation and development trend, this study focuses on relevant keywords for analysis. By adopting the frequency and centrality analysis method for specific table data, it is found that the top three keywords in the frequency and centrality values are interdisciplinary, instructional design and core literacy, which shows that the main research direction in interdisciplinary thematic teaching lies in how to reasonably design the integration of different disciplines in order to comprehensively improve the core literacy of the students through the integration of different disciplines in teaching. Meanwhile, from the frequency as well as the top 10 keywords ranked by the centrality value, interdisciplinary integration mainly appeared in elementary school language, elementary school mathematics and junior high school history.

In the current wave of education reform, interdisciplinary thematic teaching is becoming an important trend in the field of education. “Instructional design” provides guidance for teaching practice, and “core literacy” is an important goal guide for teaching, and interdisciplinary thematic teaching is important for promoting the integration of teaching and cultivating students' comprehensive ability<sup>[5]</sup>. Interdisciplinary theme teaching plays an important role in promoting discipline integration teaching and cultivating students' comprehensive ability and core literacy. All in all, these high-frequency and high-centered keywords play an important role in leading and supporting the development of interdisciplinary theme teaching, and future research in this area can be further deepened and expanded around these keywords, so as to promote the sustainable

development of interdisciplinary theme teaching.

Table 3 High-frequency and high centrality keywords (top 10) in China's interdisciplinary thematic teaching research

No.	keywords	frequency	centrality
1	spanning several branches of science	80	0.86
2	instructional design	49	0.16
3	core literacy	32	0.17
4	junior high school geography	20	0.08
5	thematic teaching	20	0.14
6	thematic learning	15	0.04
7	junior high school history	15	0.03
8	elementary school language	13	0.05
9	elementary school mathematics	12	0.06
10	teaching strategy	12	0.02

The literature on interdisciplinary theme teaching in China from 2007 to 2024 was imported into CiteSpace software and operated according to the keyword procedure to generate its keyword co-occurrence network graph (Figure 4), in which the nodes in the visual graph represent keywords, and the size of the nodes is directly proportional to the frequency. From Fig. 4, it is observed that the number of linked keywords is 313 ( $E=313$ ), and the keyword density is 0.0194 (Density = 0.0194), which shows that the keywords are related to a higher degree through the above data. From the presented keyword co-occurrence mapping, the field of interdisciplinary thematic teaching in China presents a rich and closely connected knowledge network. Among the high-frequency keywords, “core literacy” is in a prominent position, closely connected with many teaching-related words, emphasizing its central position as a fundamental orientation in interdisciplinary thematic teaching and playing an important role in the setting of teaching goals and the development of teaching activities. “Teaching strategies” also appears frequently and is closely related to keywords such as ‘instructional design’ and ‘teaching methods’, indicating that diversified and effective teaching strategies are the key links in the practice of interdisciplinary teaching. This suggests that the exploration of diverse and effective teaching strategies is the key link in interdisciplinary teaching practice. The co-occurrence of the keyword “interdisciplinary” with the names of various disciplines clearly shows that interdisciplinary teaching breaks down the barriers of disciplines and integrates the knowledge of different disciplines. The keywords “teaching design”, “teaching case”, “implementation path”, etc., are interrelated to outline the operation process of interdisciplinary teaching from design and planning to concrete practice. Through the interdisciplinary teaching design and implementation path, students can enhance their comprehensive literacy through interdisciplinary learning.

In terms of keyword associations, “interdisciplinary” is strongly associated with “teaching strategies,” suggesting that it is crucial to explore appropriate teaching strategies in interdisciplinary teaching. On the whole, interdisciplinary theme teaching in China is being actively explored, and certain research results have been achieved, but there are also problems such as insufficient integration of teaching resources, lack of interdisciplinary competence of teachers, and imperfect evaluation system, which need to be continuously improved and perfected in future teaching practice and research.





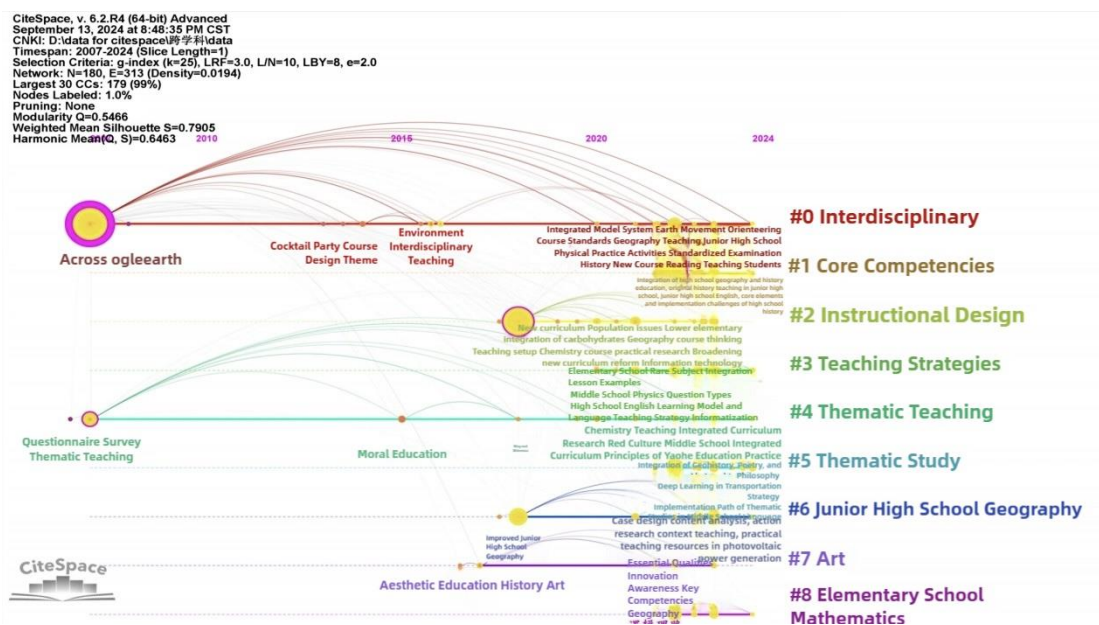


Fig. 5 Mapping the evolution of keyword time zones for interdisciplinary thematic teaching in China

## 4. Conclusions and recommendations

### 4.1 Conclusion

(1) In terms of the number of published articles, there is a fluctuating upward trend from 2007 - 2024, reflecting that the field has gradually received attention, in which the number of published articles on interdisciplinary thematic teaching has rapidly climbed from 2021 to 2024, and the research content has become more diversified, including the construction of interdisciplinary teaching mode, curriculum design and implementation, and the improvement of the teaching evaluation system and many other aspects. (2) In terms of authors, the degree of cooperation between authors is relatively low, and most of the studies are carried out by independent authors or small teams, which limits the breadth and depth of the studies to a certain extent. (3) In terms of research institutions, teacher training colleges and some professional colleges play an important role in the research, with Shandong Normal University and the network of cooperating institutions it constitutes conducting the most research on interdisciplinary thematic teaching and learning, although the cooperation and communication among research institutions need to be strengthened. (4) In terms of keywords, the main focus is on the practical research direction of interdisciplinary teaching, such as interdisciplinary integration embodied in elementary school mathematics activities, etc. However, there are still problems in the current research, such as insufficient integration of teaching resources and teachers' interdisciplinary teaching ability to be improved. Meanwhile, in terms of research trends, the evolution of keywords such as “interdisciplinary”, “core literacy” and “instructional design” over time reflects the continuous deepening and refinement of research.

### 4.2 Suggestions

#### 4.2.1 Strengthen author collaboration

Organize training courses for interdisciplinary research collaboration and invite experts in the field of interdisciplinary research from home and abroad to give lectures. The training content

includes how to find suitable subjects for cooperation, how to make cooperative research plans, and how to deal with differences in cooperation. Through the training, the authors' sense of cooperation and ability to cooperate are improved, and the effective formation of interdisciplinary research teams is promoted.

#### 4.2.2 Deepening institutional cooperation

Teachers' colleges, professional colleges and primary and secondary schools can jointly set up the “Interdisciplinary Teaching Research and Practice Alliance” and formulate the alliance's constitution and cooperation plan. The alliance organizes regular exchange activities among its members, such as annual interdisciplinary teaching seminars and displays of teaching achievements, to promote information sharing and cooperation and exchange among members. Teachers' colleges and related professional colleges can work together to carry out interdisciplinary professional talent training programs, formulate training programs together, build interdisciplinary curriculum systems, create composite talents who possess both solid professional knowledge and proficient interdisciplinary teaching skills, and then provide talent support for the research and practice of interdisciplinary teaching.

#### 4.2.3 Expanding Research Directions

First of all, in the development of teaching materials, in addition to focusing on the integration of traditional disciplines, we should also pay attention to the combination of emerging disciplines and traditional disciplines. For example, in the development of teaching materials for the integration of information technology and subject teaching, the relevant contents of artificial intelligence, big data and other emerging technologies should be integrated to cultivate students' ability to adapt to the future society. Secondly, in the interdisciplinary knowledge training, in addition to explaining the method of subject knowledge association and integration, interdisciplinary research case studies should be introduced. Finally, a mechanism for assessing the effect of teachers' interdisciplinary teaching ability training is established, and the learning effect of teachers is assessed after the training through questionnaires and teaching practice assessment. Based on the assessment results, teachers will be provided with personalized advice and follow-up support.

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