Research tendency of China ESP teaching from 2007 to 2021 based on visualization analysis using CiteSpace

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ABSTRACT: With the increasing demand for the enhancement of interdisciplinary competence in English teaching reform, English for specific purposes (ESP) teaching has become a hot topic in the field of English education. In order to better understand the phenomena and problems of ESP teaching in China, this study investigated the research tendency in China ESP teaching between 2007–2021 based on 206 articles from the Web of Science (WOS) by employing the CiteSpace Atlas. The study revealed that the literature in China ESP teaching formed an inverted "V" shape over the past 15 years. It can also be seen that most of the institutions with cooperative relations are in the same region, and cross-regional cooperation is less. In addition, the latest research focuses on cutting-edge topics as keywords such as "ESP teaching," "ESP," and "ESP theory" emerged. The findings suggest that it needs to develop effective methods for ESP teaching in China and expand research areas for the future.

KEYWORDS: China ESP teaching; knowledge graph; CiteSpace; visualization

1. Introduction

English for specific purposes (ESP) refers to the teaching and learning of English as a second or foreign language where the goal of the learners is to use English in a particular domain (Brain and Sue, 2013). In the early days, ESP teaching was largely motivated by the need to communicate across languages in areas such as commerce and technology, but now it has expanded to other areas. The ultimate goal of ESP education is to scientifically design teaching tasks according to the different needs of learners and the register of communicative activities, so as to cultivate learners in using communicative strategies properly, thereby enhancing their English competence (Cui and Li, 2019). ESP teaching has a significant development as a vital force in English teaching and research. In the process of economic and cultural globalization, English plays an important role as the bridge that connects different worlds (Zhang, 2018). The rise of ESP in China is not accidental. There might be many reasons that have contributed to the origin and development of ESP (Zhu, 2022). Most of all, there are three reasons for the emergence of all ESP programs: the demand for effective communication in a changing world, an innovation in linguistics, and a focus on the learners (Hutchinson and Water, 1987).

In China, the procedure of English for specific purposes can be divided into two stages: the first stage considered from 1994 to 2004 is the exploration period for theory, while the second stage deemed from 2009 up until now is the pilot period for a practical application (Cai, 2015). Although Chinese universities were initiated to conduct research for ESP teaching in the 1960s and 1970s, the teaching

system has not yet been established. (Li et al., 2016). In fact, the gap between English teaching and social needs is widened, which requires reform of the method of English teaching in college (Hu, 2019). The primary contradiction of foreign language education in Chinese colleges has been transformed as schools were demanded to elevate the competence of foreign language teaching in colleges (Cai, 2018). ESP teaching has laid a foundation for Chinese colleges to improve the competence that can master both professional knowledge and English knowledge. The key to successful ESP is language learning skills rather than specialized skills, which is the most lacking in students and the focus of ESP teaching (Zhang, 2019). In other words, it is necessary to strengthen the professionalism of English teaching in colleges to adapt to the rapidly changing international society. Therefore, ESP teaching has been given growing attention.

ESP, as an extended teaching of college English, creates a personalized language learning environment and makes learning more real and effective (Wang and Wang, 2019; Zhang, 2019). Therefore, taking into account the influencing factors in economic, trade, and technical exchanges (Borzova and Shemanaeva, 2019; Cai, 2021), ESP can meet the needs of college students to directly learn and communicate cutting-edge international information about their major in English to the greatest extent (Chi, 2021; Al-Wahaibi and Tuzlukova, 2023), increasing Chinese scholars have used different methods to analyze the literature on ESP teaching based on its characteristics of interdisciplinary, which is the combination of professional knowledge and English language competence. (Cao, 2017). These methods include analyzing ESP teaching and the curriculum construction for the Major of Business English (Li, 2014). Using ESP to analyze the present situation and the countermeasure research on sports English interpretation in Chinese international sporting events (Yang, 2015). Taking the "News English" SPOC course offered by Yangzhou University for example to research the school-based "1 + 2 + X" ESP blended teaching model (Liang and Yu, 2018). Using a bibliometric visualization analysis program to quantitatively analyze ESP research articles published in SSCI journals from 2005 to 2016 (Zheng, 2019). Aside from this, the literature was collected to study and sort out that focused on ESP teaching published from 2007 to 2017 in 11 core domestic journals in foreign languages (Si, 2012). Using bibliometric tools, it conducted a visualization analysis of core ESP international and Chinese papers published from 1998 to 2020 to draw a graph describing scientific knowledge (Liu and Li, 2021). Exploring ESP teaching and talent training practice in music colleges in the era of "Internet+"—Sichuan Conservatory of Music as an example (Zhu, 2022). Furthermore, research on college English textbooks from the perspective of interdisciplinary foreign language teaching (Cai, 2023). It can be concluded that the research content and approaches to ESP teaching are rich and diverse. Some scholars carried out ESP teaching research in different majors such as business English, sports major, Internet and so on. Numerous scholars studied bibliometric visualization analysis with the help of different databases such as CNKI, and CSSCI journals, etc.

However, since existing literature often focuses on individual perspectives, it hinders understanding the new phenomena and problems that have emerged in current China ESP teaching. There are a few types of research on China ESP teaching using bibliometric visualization analysis with the aid of the WOS database. Therefore, it is highly important to use proper approaches and tools to find the patterns hidden in the data because mining the core data with a proper approach and the right tool allows to extraction of valuable knowledge, and discloses the dynamic relationships amongst them. Besides, ESP, as an extended teaching of college English, creates a personalized language learning environment and makes learning more real and effective (Wang and Wang, 2019; Zhang, 2019). ESP teaching has already overturned the past college English educational system (Li, 2016). Reforming ESP teaching is a

must for colleges to adapt to the current situation and improve the English competence of their students. One of the significant guidelines is to reform the English curriculum in colleges, which embraces ESP teaching and learning for the first time (Ji, 2017). These guidelines provide a new perspective to promote the performance of ESP theoretical research and teaching reform in China. ESP teaching is still needed to have a concrete link to English teaching in colleges (Chen, 2009; Ren, 2022), as the literature body on ESP teaching tends to be "fragmented".

Therefore, it is of great significance to present the historical evolution of China ESP teaching research such as the hot issues and the key path of the subject. By analyzing the potential mechanism that scientifically predicts the frontier of ESP teaching and research, it is possible to make timely adjustments and effectively promote ESP teaching and research under new situations.

In this regard, this paper will focus on these research questions as follows:
(1) What is the general trend of China ESP teaching and research?
(2) What is the analysis of the publishing institutions and their collaborative relationships?
(3) What are the research focuses and paths on development trends in China ESP teaching?
(4) How has the research topic in China ESP teaching changed?

2. Research methods and data collection

In social science, the most common method to achieve a systematic and comprehensive review of previous research is through bibliometric analysis which helps form a scientific understanding of the problem. Bibliometric analysis is a method that objectively evaluates the research status and development process of different regions, institutions, and authors in a certain field based on a quantitative measure such as mathematical statistics (Chen, 2014). In order to apply bibliometric analysis, this study employs visualization tools such as CiteSpace and the built-in tools of the WOS database to conduct a visual analysis of the research development of China ESP teaching. CiteSpace can display the overall situation of a research field while highlighting specific literature in the development process of the field (Li, 2005).

In addition, this study utilizes the WOS database developed by the American Institute of Scientific Information to collect data as the data source to ensure the completeness and accuracy of the data, which contains the largest number of literature resources and the most comprehensive thematic scope. Taking "China ESP teaching" as the theme, "2007–2021" as the time node, and the WOS as the search source, a total of 206 kinds of literature were searched using Python, covering a period of fifteen years. The data were then extracted according to "authors, institutions, and keywords" to construct co-occurrence matrices and triples, which used graphs in network relationships to visualize the research trend and describe the dynamics of the ESP teaching field. In analyzing data, the study intended to identify the development trends based on time and space. Throughout this process, the study explored the research trends and potential patterns among them including the future development research trends in ESP teaching.

3. Results and analysis

3.1. The general trend of China ESP teaching and research

The volume of literature serves as an important indicator that reflects the characteristics of the time distribution for the published research articles in a research field. Thus, the bibliometric analysis tool was used to understand the structure, characteristics, and principles, that can evaluate scientific

achievements to carry out scientific predictions (Zheng, 2014). The volume of the annual publication shows the relationships between articles and the changes over time, which helps us understand the development speed and research status in this field which allows us to predict the future pattern as they were analyzed the past research articles. From the collected data, during the 15 years from 2007 to 2021, 206 kinds of literature related to China ESP teaching have been published abroad, and the publication trend chart and publication growth rate have been obtained by statistical analysis of the number of literatures in each year, the result of the analysis described the trend and growth rate of the publication, as shown in **Figures 1** and **2**.
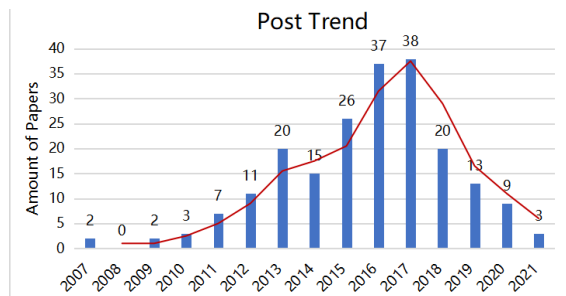

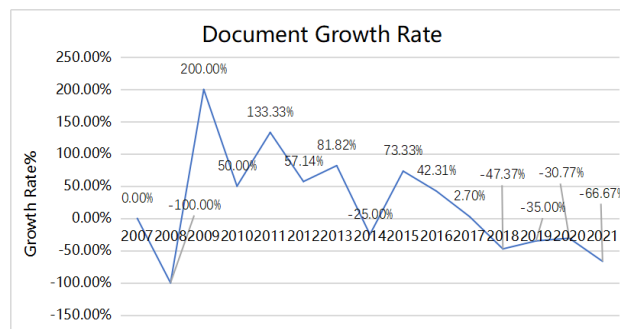**Figure 1.** Pattern of the temporal variation based on the number of publications.

Figure 2. Distribution of the growth rate of annual publications.

From the **Figures 1** and **2**, it is evident that the distribution of publications in this field shows an inverted "V" shape. The number of articles published in each period can indicate the research level and trend in the field (Qi, 2020). The figures demonstrate that research on China ESP teaching stagnated at the early stage. Yet, it rapidly increased at the middle stage before declining at the last stage. According to the variability shown in the figures, the research on China ESP teaching can be divided into three stages such as the initial stage from 2007 to 2010, the rapidly growing stage from 2011 to 2017, and the decline stage from 2018 to 2021. In the initial development stage, it has 7 papers total which refers to only to 2 papers every year during this time has been published. However, during the rapidly increased period, the number of published articles on average is considered 22 papers, and a total of 154 papers were published in this period. This indicated an annual publication rate 11 times higher than that of the initial development stage. In the decline stage, a total of 45 papers were published, with an average of 11 papers per year. The publication rate during this period decreased to 0.5 times compared to the rapidly growing period.

3.2. The publishing institutions and their collaborative relationships

The analysis of co-occurrence among research institutions can provide insights into their collaborative efforts and the extent of interdisciplinary research within the field (Huang, 2014). The analysis of publishing institutions and their collaborative relationships provides one with a

comprehensive understanding of the key research institutions in China ESP teaching. By utilizing the CiteSpace software, data was imported into CiteSpace and the "institution" analysis project to standardize the sample literature. The data was then analyzed based on the time range from 2007 to 2021, resulting in the creation of a co-occurrence graph illustrating the institutions associated with the research on China ESP teaching. **Figure 3** displays this graph, where each node represents a research institution, and the connections between nodes indicate collaboration between different institutions. The font size of each node reflects the publication output of the represented institution, with larger font sizes indicating higher publication output.
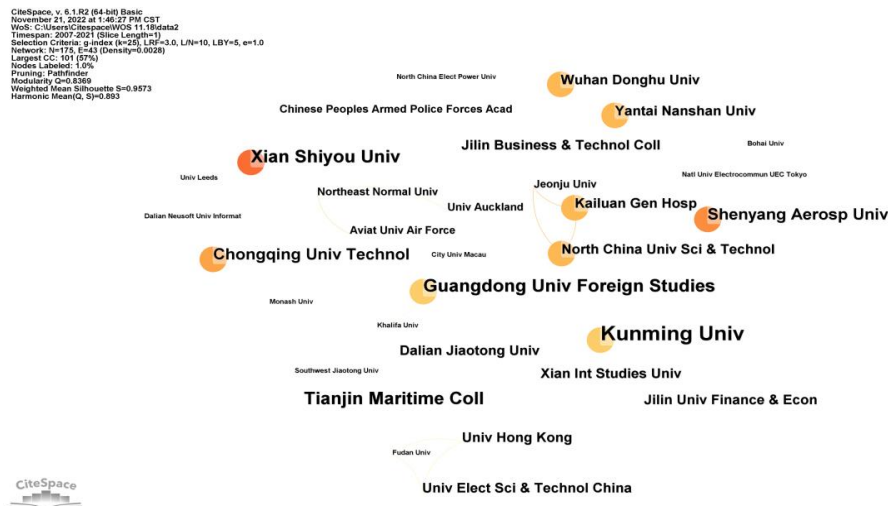

Figure 3. Research institution co-occurrence network graph.

The analysis results reveal that the network consists of $N = 175$ nodes and $E = 43$ edges, with a network density = 0.0028. This means that the co-occurrence knowledge graph of research institutions in China ESP teaching consists of 175 institutions and connections between them. By observing the graph, it is apparent that the number of connections is lower than the number of nodes and the density is relatively low, indicating a lack of close collaboration and relatively low communication among the institutions that have made significant contributions to ESP teaching in foreign literature.

Notably, a few institutions such as North China University of Science and Technology, Kailuan General Hospital, and Northeast Normal University, demonstrate closer cooperation and have achieved a certain scale. On the other hand, other institutions are distributed independently. Some institutions such as Kunming University, Guangdong University of Foreign Studies, Tianjin Maritime College, Xi'an Shiyou University, and Shenyang Aerospace University exhibit high publication output in China ESP teaching and are considered the backbone of the field.

Based on **Table 1** and **Figure 3**, it is evident that numerous foreign institutions have engaged in research on China ESP teaching, and they have relatively large research teams. However, there exist certain disparities in terms of publication levels and research efforts among these institutions. Among them, four institutions have published five or more articles, whereas the remaining institutions have published four or fewer articles. In general, the publication volume varies significantly among foreign institutions involved in China ESP teaching research. Only a few institutions have undertaken a comprehensive and in-depth exploration of China ESP teaching, while most institutions have focused on singular aspects without conducting systematic and comprehensive research across multiple dimensions. Consequently, the investment in this field is deemed insufficient.

Table 1. Top 10 Issuing institutions by number of publications.

No.	Frequency	Institution
1	7	Kunming Univ
2	5	Guangdong Univ Foreign Studies
3	5	Tianjin Maritime Coll
4	5	Xian Shiyou Univ
5	4	Shenyang Aerosp Univ
6	4	Chongqing Univ Technol
7	3	Yantai Nanshan Univ
8	3	North China Univ Sci & Technol
9	3	Wuhan Donghu Univ
10	3	Jilin Business & Technol Coll

3.3. The research focuses and paths on development trends in China ESP teaching

The concepts conveyed by a document are expressed through keywords (Yang and Ren, 2016). In academic research, keywords not only reflect the focus of a specific research field but also indicate the current research trends and popularity within that field. Analyzing the frequency of cited high-frequency keywords can unveil the common themes that researchers pay attention to. The higher the frequency of occurrence of a keyword, the more central and prominent the topic is, indicating greater attention received (Jordan, 1997). By conducting a co-occurrence analysis of keywords, it is possible to effectively identify the distribution of popular research focuses in ESP teaching research, and summarize the relevant hot topics. Keywords serve as concise terms used by authors to succinctly summarize the main themes of their literature. They represent scholar's condensed and refined academic ideas, research topics, and specific research contents. Therefore, keywords can also be used as a means and method for analyzing research topics. By examining the frequency of keyword appearances in a field, one can gain an understanding of the current hot topics in the field, assess the pace of research content updates, and evaluate the academic vitality of the discipline.

Keyword analysis in a knowledge graph allows for the identification of research topics and popular focuses within a specific field. The CiteSpace software constructs a keyword contribution network image, where each node represents a keyword, with the node size indicating the frequency of occurrence. The co-occurrence network of keywords, generated using CiteSpace's "keyword" function, is illustrated in the accompanying figure. The network consists of $N = 228$ nodes and $E = 291$ edges, resulting in a network density = 0.0112. In this study, a total of 228 keywords were extracted, with a cumulative frequency of 336.

The literature data in the WOS database was used to summarize the top 20 keywords, as displayed in **Table 2**. The centrality metric of each keyword indicates its significance within the overall co-occurrence network of keywords and provides insights into the research focus and topics within this field during a specific period.

By analyzing **Figure 4** and **Table 2** while excluding irrelevant items such as topic keywords, it becomes apparent that "English teaching" has experienced the highest frequency change rate among the theme keywords in recent years. It is followed by "college English," "course design," "ESP teacher," "teaching mode," "business English," "needs analysis," "teaching reform," and "classroom teaching," among others. These diverse research focuses have collectively contributed to the acceleration of

research in the field of China ESP teaching, promoting the optimization and advancement of more comprehensive studies in this area. Aside from the keywords, the highest occurrence frequency is observed in "teaching mode." This underscores the significance of these keywords as research focuses on the field.
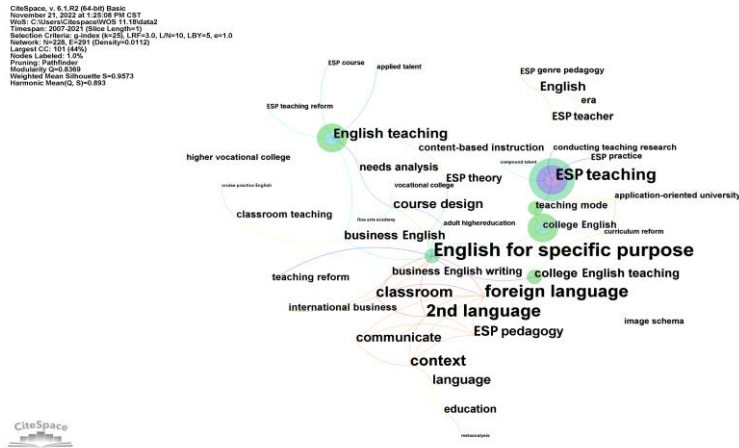

Figure 4. Co-occurrence knowledge graph of keywords.

Table 2. Top 20 high-frequency keywords statistics.

No.	Frequency	Centrality metric	Keywords
1	13	0.13	ESP teaching
2	13	0.29	English for specific purpose
3	10	0.06	English teaching
4	10	0.08	college English
5	9	0.1	college English teaching
6	6	0.05	course design
7	5	0.05	ESP teacher
8	4	0	curriculum design
9	4	0.07	teaching mode
10	4	0.09	business English
11	4	0.02	ESP theory
12	3	0	college English education
13	3	0.01	ESP course
14	3	0.02	needs analysis
15	3	0.02	education
16	3	0	ESP testing
17	3	0.02	teaching reform
18	3	0.02	classroom teaching
19	3	0.07	application-oriented university
20	3	0.02	English

In order to summarize the research focus, the study proceeded with keyword clustering for analysis. In the clustering module of CiteSpace, closely related keywords can be classified. As each keyword holds a value within the same cluster, the largest cluster represents all clusters, which indicates the label

of each cluster is a classification referring to a keyword with a higher centrality than other keywords of the same category. In this study, the log-likelihood ratio (LLR) algorithm in CiteSpace is used. Moreover, the filtering capability of CiteSpace is utilized to screen out groups with less than 10 categories. However, these groups are not included due to the small number of members which has little research significance in this article.

As a result of clustering using the LLR algorithm, the graph of a keyword cluster related to China ESP teaching research from 2007 to 2021 was drawn as shown in **Figure 5** which is divided into eight categories.

According to the data, the cluster module value (0.8369) of the keyword cluster graph is greater than 0.3, indicating that the clustering structure is significant. Additionally, the average silhouette value *S* (0.9573) meets the requirement of being greater than 0.7, indicating that the clustering results are convincing.
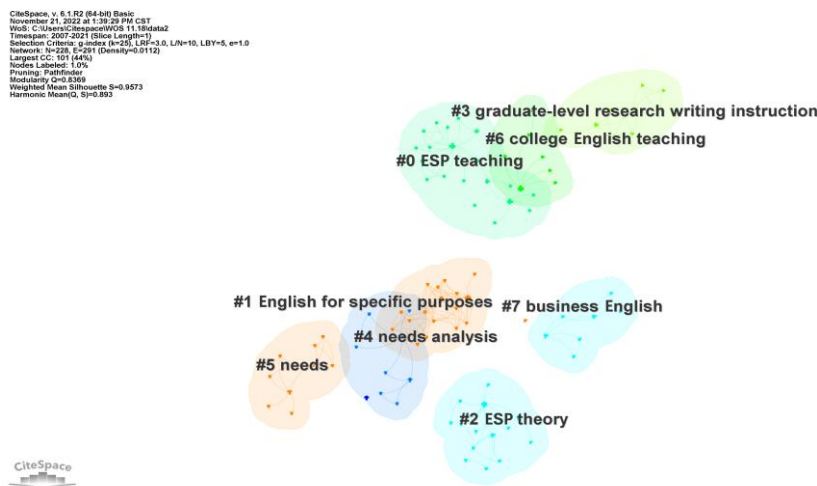

Figure 5. Keyword clustering.

From the result of clustering analysis, the research shows characteristics of clustering, diversification, and rapid growth, which have been derived from many studies on China ESP teaching. The keyword clustering graph shows that there are eight clusters formed from high-frequency keywords in China ESP teaching research from 2007 to 2021, i.e., #0 ESP teaching (Cluster 0), #1 English for specific purposes (Cluster 1), #2 ESP theory (Cluster 2), #3 graduate- level research writing instruction (Cluster 3), #4 needs analysis (Cluster 4), #5 needs (Cluster 5), #6 college English teaching (Cluster 6), and #7 business English (Cluster 7). The clusters are numbered starting from 0 according to their size, with cluster#0 being the largest and subsequent clusters following in descending order. Therefore, #0 ESP teaching (Cluster 0) is the largest cluster, containing the largest content and scope. These clusters represent the major research directions during this period.

3.4. The evolution of research topic in China ESP teaching

As research focuses are dynamically changing, they are not the same in each time period. CiteSpace software provides the presentation mode of Time zone View literature co-citation network. By placing the keyword clusters in the time zone of their first appearance, the time series is arranged in order from the past to the present, and a keyword co-occurrence timeline graph is obtained through adjustment and beautification. This displays the process of the themes that the research focused on in terms of time dimensions. In order to have clearer research keywords and directions for each year and

how they change, this article uses a timeline graph to display the research focus for each time period. A timeline graph is composed of a series of vertical bands representing time zones. It mainly shows the evolution of a knowledge graph over time dimensions. It clearly shows the relationship between keywords while disclosing the trend of changes in research focus. The time zones on a timeline graph are listed from left to right in chronological order. After setting the time slice to 1 year on the basis of the co-occurrence graph of keywords with other settings unchanged and clicking "Run", the original graph can be obtained by clicking "Layout" on the shortcut control panel in the visualization interface and selecting "Time zone View" under "Visualizations". By adjusting the parameters, the 2007–2021 co-occurrence time zone graph of research focus in China ESP teaching (see **Figure 6**) can be obtained, which reveals the evolution process of research trends and frontiers in this field. It is of great help for analyzing the dynamic development of this field.
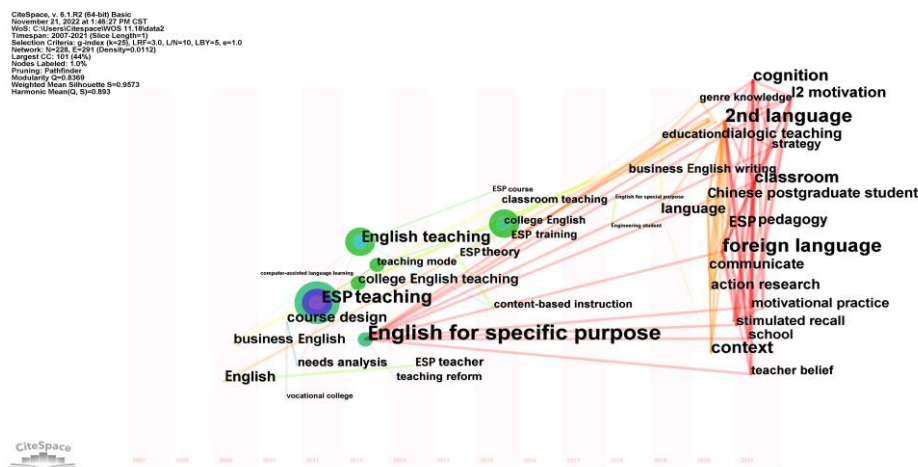

Figure 6. Time zone graph of keyword co-occurrence.

As shown in **Figure 6**, the nodes in the graph represent keywords, and the year in which the keyword first appeared in the collected data is indicated. Yet the specific year cannot be determined since the time slice is one year. It only shows that the keyword appeared during that year. After the first appeared keyword, the frequency of the keyword appeared accumulated at the position it appeared at first, with the circle size increasing accordingly. However, a larger circle for the "ESP teaching" node does not indicate a higher frequency of appearance in that particular year. It rather reflects the total frequency of the keyword that appeared in the collected data. In regard to the lines, they connect between keywords. If two keywords appear together in a paper, a line will be connected between the two nodes. This connection indicates a relationship between the two years. If two keywords appear in multiple papers at the same time, the lines will be thicker.

Thus, it is concluded that the research of foreign literature in China ESP teaching mainly focused on business English, course design, and vocational college as Figure 6 shows. This is because business in China highly demands English communication skills which led to the graduates who have professional knowledge with English competence, since it was the period that Chinese society developed and it started opening the society to the outside world. In this circumstance, higher education institutions in China made great efforts to reform English language teaching as a top priority.

From 2011 to 2017, research topics in China ESP teaching emerged such as ESP, ESP teaching, needs analysis, college English teaching, and ESP theory. This result indicates that the research topics are gradually expanded as they are improved in the quality of ESP teaching. This helped develop

teaching methods and design curriculum through various approaches to language learning.

Furthermore, those research topics in China ESP teaching from 2018 to 2021 became much more logical and systematic. Scholars shifted their research focus towards areas such as cognition, second language, context, ESP pedagogy, and communication, which indicates a more refined and comprehensive understanding of ESP teaching.

In order to better observe the trend of hot research topics, this study used the keyword burst index, which shows the keywords with a relatively high frequency of change. Utilizing CiteSpace illustrates the continuity and development of the research trend in the keyword burst graph. Additionally, the keyword co-occurrence graph was displayed. By clicking the "Burstiness" shortcut function key in the visualization interface, it entered the burst detection function area where the parameters were modified to "the number of states = 2, γ = 0.4, minimum duration = 3". Subsequently, clicking "View" rendered the burst detection results, which allowed to obtain 24 keywords with high burst values in China ESP teaching research from 2007 to 2021. The 24 high burst keywords were arranged in chronological order on their start date from the farthest to the nearest. As the result shown in **Figure 7**, "Strength" represents the intensity of the burst, and "Begin" and "End" indicate the start and end times of the burst, while the red line segments refer to the time period when the burst occurred.
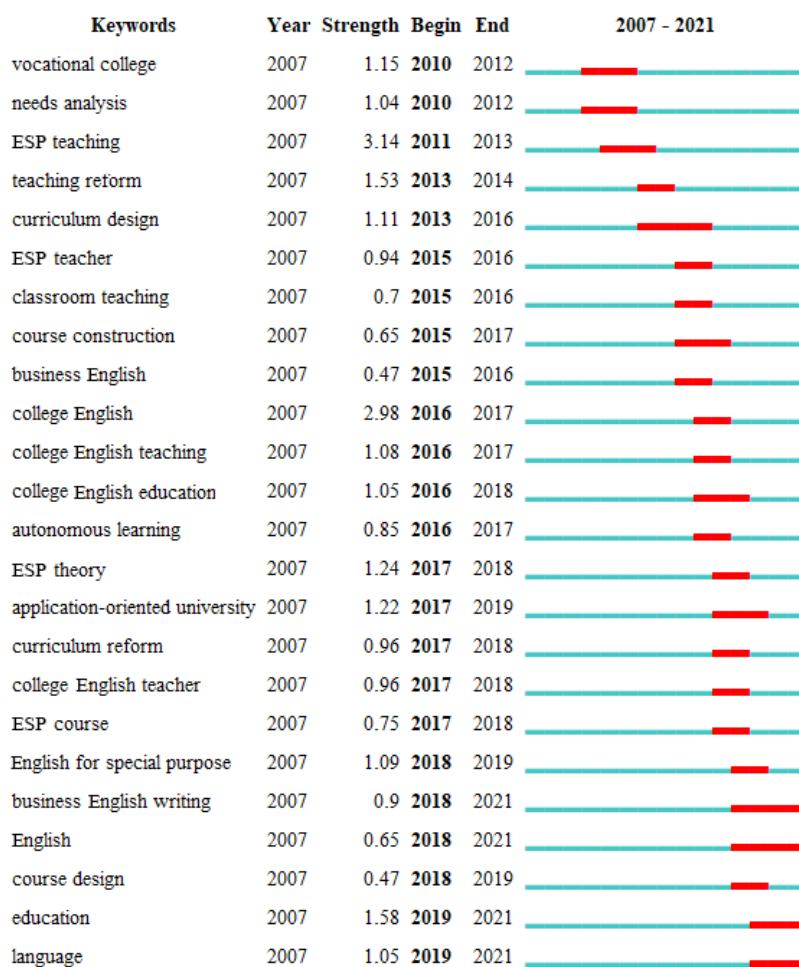
Top 24 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2007 - 2021
vocational college	2007	1.15	2010	2012	
needs analysis	2007	1.04	2010	2012	
ESP teaching	2007	3.14	2011	2013	
teaching reform	2007	1.53	2013	2014	
curriculum design	2007	1.11	2013	2016	
ESP teacher	2007	0.94	2015	2016	
classroom teaching	2007	0.7	2015	2016	
course construction	2007	0.65	2015	2017	
business English	2007	0.47	2015	2016	
college English	2007	2.98	2016	2017	
college English teaching	2007	1.08	2016	2017	
college English education	2007	1.05	2016	2018	
autonomous learning	2007	0.85	2016	2017	
ESP theory	2007	1.24	2017	2018	
application-oriented university	2007	1.22	2017	2019	
curriculum reform	2007	0.96	2017	2018	
college English teacher	2007	0.96	2017	2018	
ESP course	2007	0.75	2017	2018	
English for special purpose	2007	1.09	2018	2019	
business English writing	2007	0.9	2018	2021	
English	2007	0.65	2018	2021	
course design	2007	0.47	2018	2019	
education	2007	1.58	2019	2021	
language	2007	1.05	2019	2021	

Figure 7. Keyword burst graph.

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As **Figure 7** shows, the keywords with high burst strength were revealed as such "ESP teaching (3.14)", "college English (2.98)", "education (1.58)", "teaching reform (1.53)", "ESP theory (1.24)", etc. This indicates that these keywords were the cutting-edge topics of interest to researchers during their corresponding time periods. Regarding the duration, keywords with longer duration were exhibited such as "curriculum design (3 years)", "business English writing (3 years)", "English (3 years)", and "college English education (2 years)". These keywords were deemed the focus that scholars have paid attention to for a long time. Some of them seemed truly hot issues. According to the chronological order, it explains that cutting-edge keywords are constantly changing over time, presenting an overall evolution. In this regard, the study enables to division of the research frontiers in China ESP teaching according to different time periods as such the early stage is considered from 2007 to 2014, which explains through the keywords with high burst strength including "ESP teaching (3.14)." The period from 2015 to 2018 is classified as the middle stage and the keyword with high burst strength is "college English (2.98)", The time from 2019 to 2021 can be classified as the recent stage, which it revealed "education (1.58)" as the keyword with high burst strength. It is expected that in the future, this field will continue to develop in the direction of business English and language teaching.

4. Discussion and conclusion

This study reviewed the 206 articles related to "China ESP Teaching" gathered from the WOS database from 2007 to 2021. By using bibliometric analysis and software such as CiteSpace, the study aimed to explore the development process of China ESP teaching research based on time and space, as well as results such as the hierarchical evolution, trends of research focus, and development dynamics. The research results show that with the continuous change and expansion of research topics, China ESP teaching research has gradually received attention, and the development process is relatively stable. Researchers and research institutions have begun to collaborate in clusters, and the demand of the talent market has begun to integrate deeply with the direction of teaching reform.

However, this study has limitations. Firstly, the WOS used as the data source may restrict the comprehensiveness of the analysis. If it includes Chinese literature on ESP teaching, the results will be more precise which help understand the research trend of ESP teaching which can broaden the research perspective while helping develop local research. Secondly, this study solely used the literature co-citation analysis in CiteSpace software to conduct preliminary investigations on the knowledge structure and evolutionary development of international academic English writing research. However, CiteSpace software encompasses various other functions that could be explored in future research. Furthermore, while this study used CiteSpace software to visually present the "trend of China ESP teaching," it is worth debating whether the number of literature in the data source comprehensively reflects this point. Future research can integrate literature resources from different databases to provide a more comprehensive and robust view of ESP teaching research.

This article conducts a comprehensive analysis and summary of the research in the China ESP teaching and also provides valuable references and models for future research. The following points should be the key issues of common concern and continuous exploration in the future research process of China ESP teaching. First, future research should explore the alignment between the demands of the job market and the direction of teaching reform in China ESP teaching. This integration can lead to more practical and applied research outcomes that contribute to the development of the field. Secondly, broaden the sources of databases, taking into account quantitative factors such as co-citations and funding support, and comprehensively analyze the development of China ESP teaching. Thirdly,

deepen research methods: future research can further explore other data mining tools and methods to fully understand the dynamics and trends in ESP teaching research. Fourthly, future research can explore the integration of different disciplines to promote the interdisciplinary development and cooperation of ESP teaching research.

Author contributions

Conceptualization, RL and MY; methodology, RL; software, RL; validation, RL and MY; formal analysis, RL and MY; investigation, RL; resources, RL; data curation, RL; writing—original draft preparation, RL and MY; writing—review and editing, RL and MY; visualization, RL; supervision, MY; project administration, MY; funding acquisition, RL. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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