Analysis of Chinese Practical Teaching Research in the Past Ten Years

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Abstract: [Object] The purpose of this thesis is to sort out the research context of domestic practical teaching, reveal the current research status of domestic practice teaching, predict its development trend, and provide reference for future practical teaching research. [Methods] 376 papers on practical teaching research under engineering certification and professional certification in China from 2009 to 2019 included in CSSCI journals of CNKI Chinese database were taken as the main data samples. Meanwhile, with the help of CiteSpace, the hot issues and trends in higher education research were analyzed from the aspects of published journals, research topics and content evolution. [Results] Practical teaching research has attracted the attention of many educational journals, and the relevant literature has gradually increased. Practical teaching shows up more frequently as a key word. [Conclusions] It has become a new trend in research and is a hot topic for scholars.

1. Introduction

At present, the country promotes the innovation-driven development strategy, and the new economy represented by new technologies, new formats, new models, and new industries is booming, and higher demands are placed on engineering and scientific talents. It is urgent to accelerate the construction and development of new engineering[1]. Practical education in universities is an important part of the undergraduate professional teaching plan. By combining the basic theoretical knowledge, professional basic knowledge and practical application, it is of great significance to strengthen students' comprehensive knowledge, scientific research ability and independent work ability[2,3]. The practice teaching base is an important place for the cultivation of students' practical ability and innovative ability in China universities[4]. Relying on high-tech enterprises to establish a practical teaching base for college students, forming a long-term stable cooperative relationship between schools and enterprises, deepening the talent training mode of multi-faceted cooperation between schools and enterprises, realizing the innovation of university organizational model through the reform of institutional mechanism, and constructing a new engineering practice education system and the practice platform has important significance[5].

With the development of the quality assurance movement of higher education, practical teaching has received more and more attention from scholars in recent years. This paper attempts to analyze the hotspots of practical teaching research through the analysis and research of relevant research literature in the past ten years. The analyzing was aiming at analyzing the existing research results, combing the research context, predicting its development trend, and providing reference and suggestions for the sustainable development of practical teaching research.

2. Data Selection and Research Methods

2.1 Sample Data Source Selection.

In order to make an overall understanding of this research field, this paper has analyzed 376 articles selected from CNKI database. Keywords includes "Engineering certification", "Professional

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certification", "Practical teaching" and "fuzzy" is the search condition, the publication time is from 2009 to 2019, all journals are the source, mainly through the amount of publications, the distribution of subject research and High-frequency keywords do system analysis.

2.2 Research Methods.

The main research tool of this research is CiteSpace[6]. Through the literature statistics and data visualization analysis method, the time span of this study is 10 years, and the "Engineering Certification" published in CNKI during this decade Under the premise of "professional certification", the research literature with the theme of "practical teaching" has been quantitatively analyzed, aiming at objectively analyzing the research hotspots and frontiers of the current professional certification field in China. As a research tool, it is an information visualization software that presents a series of maps and measurement statistics to show the subject hotspots and the frontiers of discipline development.

3. Data Selection and Research Methods

3.1 Posting Situation.

From Fig. 1, we can find that in the decade from 2009 to 2019, the number of articles on practical teaching was 74, ranking fourth, and practical teaching was very concerned. It can be seen from Fig. 2 that during the decade from 2009 to 2019, the number of journals in practical teaching has generally increased year by year. In the decade from 2009 to 2019, the number of published literature has basically increased linearly except 2016 (maintained steady in 2016). With the advancement of higher education reform in China, the corresponding research has also become more active, and practiced in this nearly ten years. Certification has always been a research hotspots in academia.

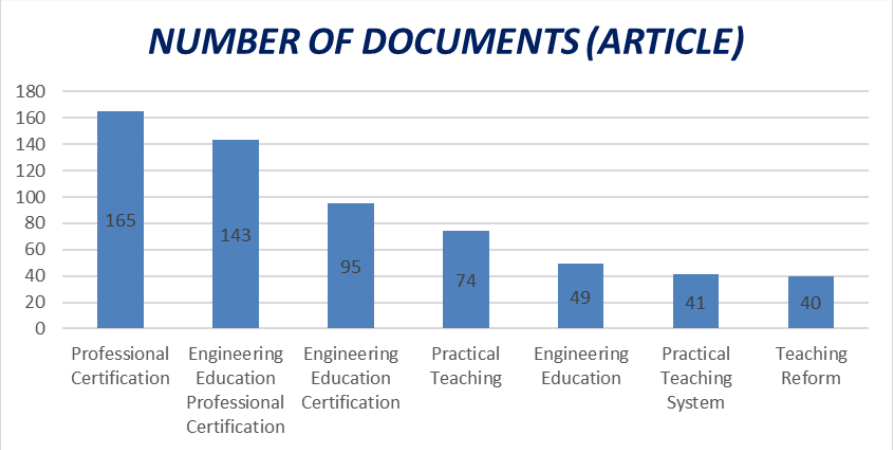

Figure 1. Subject issue volume [Article]

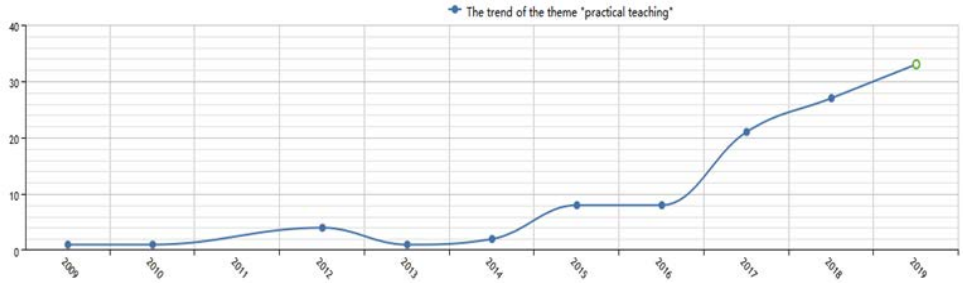

Figure 2. The trend of theme “practical teaching”

3.2 Literature Source Journals, Disciplines.

Statistics on the distribution of literature source journals show that 376 papers are distributed in

various journals. According to the statistics, the Journal of Education and Teaching Forum has published 20 papers, accounting for 5.3% of the total. The Journal of Education Modernization has published 11 papers, accounting for 3.0% of the total. The Journal of University Education has published 8 papers, accounting for 2.0% of the total. The Journal of Curriculum Education Research published 6 papers, accounting for 1.6% of the total (see Fig. 3). In summary, the "Education and Teaching Forum" plays an important role in promoting the research of higher education in China. At the same time, the other three journals are all educational journals. It can be seen that practical teaching research has received the attention of many educational journals, and practical teaching will become a hot topic in future research.

The classification of the selected literature, as shown in Fig. 4, is mainly concentrated in the social science II series 198 (52.6%), engineering science and technology II series 47 (12.5%), engineering science and technology I series 45 (11.9%) 33 subject areas (8.7%) and 21 basic sciences (5.5%). It can be seen that the Social Science II series is an important subject in the field of practical teaching. It occupies half of the discipline and plays an important role in the study of practical teaching.

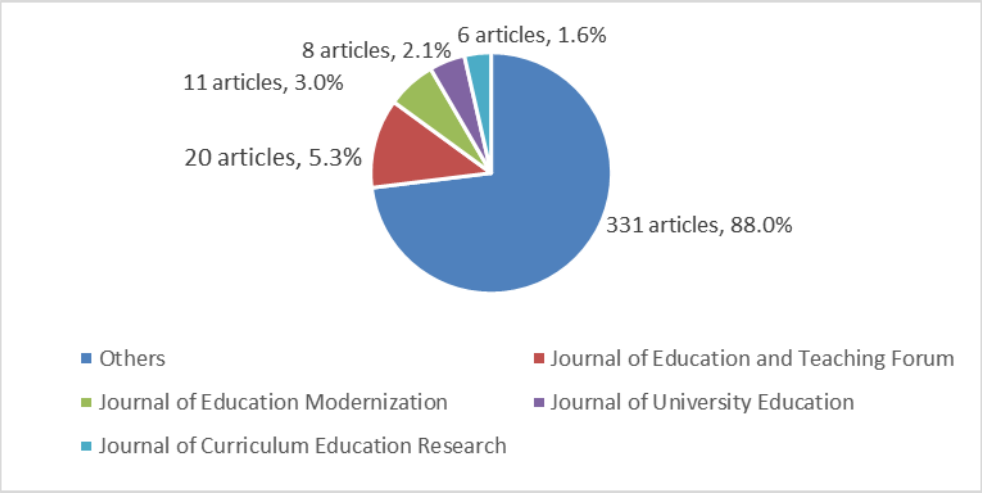

Figure 3. Journal distribution

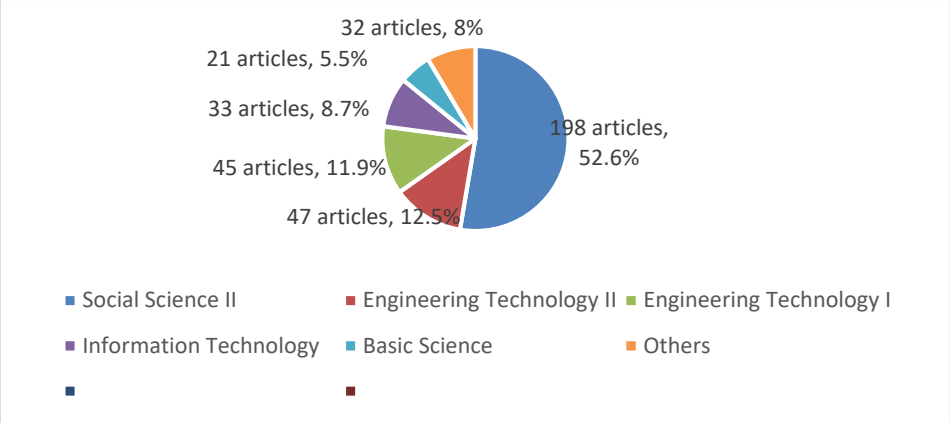

Figure 4. Disciplinary distribution

4. Document Subject Analysis

4.1 Key Analysis.

The key word is the core conciseness of the research content of an academic paper. Through the statistics of the keyword frequency, the disciplines, institutions and research hot-spots in a specific time period can be clearly understood and judged [8]. According to the time node and threshold running software (data processing CiteSpace) set in the previous period, the keyword common

knowledge map of the “practical teaching” journal literature included in CNKI 2009-2019 was generated. The research hot-spots are mainly measured by the frequency and centrality of the keywords. High-frequency keywords and high-central keywords can be displayed in the map.

The higher the frequency of the keyword, the more it reflects the popularity of the research topic. Therefore, studying the frequency characteristics of the keyword can reflect the characteristics of the keyword co-occurrence network, research hotspots and frontier. Using the statistical tool CiteSpace, the literature data is imported into the analysis, and the knowledge clustering is carried out to show the hidden complex relationships between the knowledge individuals and the knowledge group network, structure, interaction, and intersection in professional certification and practice teaching research. As shown in Table 1, we can see that the frequency of the keyword "practice teaching" is 93, the rate of explosion is 3.32, ranking second, second only to professional certification. Under the premise of professional certification, professional certification The development is getting more and more popular, which has attracted the attention of scholars.

Table 1 High and low settings of predictor variables

Freq	Burst	Keyword
132	3.96	Professional certification
93	3.32	Practical teaching
50	0	Engineering education
49	0	Engineering Education Certification
43	0	Teaching Reform
38	0	Engineering Education Professional Certification
23	0	Practical teaching system
21	0	Curriculum teaching system
18	0	Talent development
13	0	Complex engineering problem
13	0	Engineering certification
10	0	Training mode
8	0	Engineering practice ability
8	2.94	Surveying engineering
7	0	Professional construction

The connection between nodes and nodes represents the number of times different keywords co-occur. The more and more dense a node is connected, the stronger the role of the node in the whole network. It is a high-centric keyword, and the centrality is bigger. The keywords for the “Practical Teaching” research center with a degree greater than 0 were extracted for a period of 10 years. The statistical results are shown in Table 2.

Table 2 Centrality of Keywords

Centrality	Keywords
0.24	Talent development
0.18	Education reform
0.17	Engineering Education Professional Certification
0.16	Engineering Education Certification
0.08	Practical teaching system
0.06	Curriculum structure
0.03	Training made
0.02	Complex engineering problem
0.02	Engineering certification

4.2 Mutation Word Analysis.

At the same time, according to the Kleinberg algorithm of CiteSpace[7], the frequency change rate of subject words is detected, obtain the mutation words in the knowledge map field. The basic principle is to Terms with sudden increase in frequency or marked increase in frequency growth in a relatively short period of time to determine the research frontier and trend [9], finally obtain the top ten mutant words, as shown in Figure 7. Set the parameters $a_1/aa=4.0$, $a_1/a_{i-1}=4.0$, [0,1] =1, minimum duration=1, the number of states=2, arranged according to the year of emergence [10], the result is shown as Fig. 5. The mutation intensity greater than 5.0 indicates that the keyword is very popular in this period of time. From the figure we can find that the strength of the “professional certification” in 2009 is as high as 5.5452, the strength of “professional certification” in 2010-2012 up to 5.219, and "practical teaching" will become a trend of development, the hot spot that scholars pay attention to.

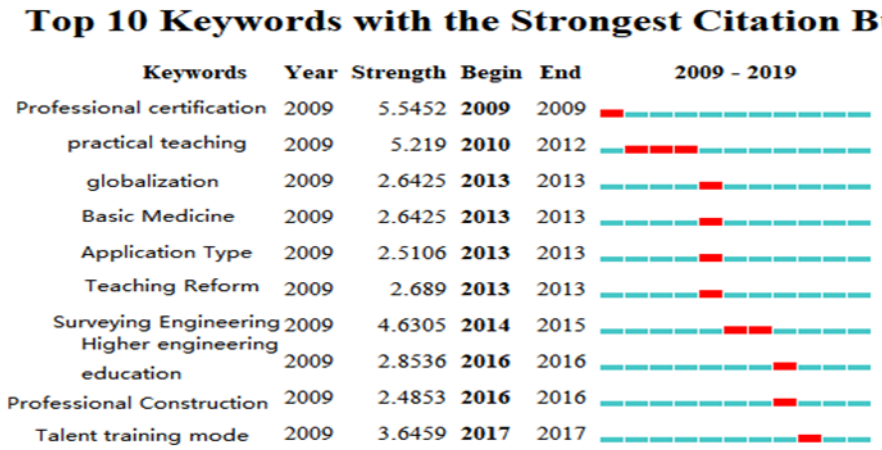

Figure 5. Top 10 Keywords with the Strongest Citation Bursts

5. Summary

With the rapid development of science and technology and the increasing employment pressure, how to cultivate high-quality talents is the main problem faced by Chinese universities[11]. Practical teaching is an important part of college teaching. More and more college educators have realized the importance and necessity of practical teaching, and have done a lot of useful experiments in teaching, and have achieved fruitful results. In order to implement the "National Medium and Long Term Education Reform and Development Plan (2010-2020)" and solve the main problems in China higher engineering education, China has carried out a series of theoretical and practical reforms. Through the research results in 2009-2019, it can be found that the relevant research on practical teaching is extensive and many fields are developing rapidly, but engineering certification has always been an important part of professional certification.

Acknowledgements

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