

Research Status and Hot Trends in Industrial Colleges of Vocational Colleges

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Abstract: Based on the research sample of papers from CNKI on industrial colleges in China from 2007 to 2023, visual analysis was conducted using Citespace literature analysis software. The results showed that: (1) The number of research papers in industrial colleges has gradually increased, and the growth rate has recently increased sharply. (2) Currently, the influence of institutions and scholars in industrial colleges is still insufficient, lacking leaders. (3) Research in industrial colleges focuses on topics such as integration of production and education, school-enterprise cooperation, talent cultivation, collaborative education, and professional groups. (4) Fully leveraging the role of vocational education groups and deep integration into the development of the digital economy will be the future development trend of industrial colleges.

Keywords: Higher vocational colleges; Industrial College; Citespace; Knowledge map; Visual analysis.

1. Introduction

The Industrial College serves as an important platform for the integration of industry and education in vocational colleges and the cooperation between schools and enterprises. It not only benefits the development of the original functions and strengths of vocational colleges, but also leverages the innovation advantages of enterprises, promotes two-way integration of supply and demand, enhances the adaptability of vocational education development, and improves the quality of vocational education talent development [1]. As early as 2017, the “Opinions of the General Office of the State Council on Deepening the Integration of Industry and Education” pointed out that enterprises could collaborate with vocational colleges to establish industrial colleges. By 2019, with the progress of the national “Double High” construction, industrial colleges have been included as important evaluation indicators in the development strategy of “Double High”. In July 2020, the Ministry of Education’s General Office and other departments issued the “Guidelines for the Construction of Modern Industrial Colleges (Trial)”, which further clarified the goals and tasks of constructing industrial colleges in vocational colleges, and encouraged multiple entities including vocational colleges, local governments, and industry enterprises to jointly build, manage, and share industrial colleges. In 2021, the “Key Tasks of the Ministry of Education in 2021” emphasized the layout and construction of future technology colleges, and accelerated the construction of a group of modern industrial colleges.

Therefore, research on vocational industrial colleges has been continuously deepening. Existing studies have focused on micro-level practices such as the development, motives, development models, construction paths, and talent cultivation within industrial colleges [2-3]. There have also been macro-level studies on governance systems, operational logics, and multi-dimensional collaborations [4-5]. However, previous research has tended to be fragmented and the related research methods have mainly been qualitative descriptions and analyses, which still have certain limitations in deeply understanding the regularities, structural characteristics, and holistic nature of vocational industrial college research. Therefore, this study takes a quantitative approach, relying on

Citespace literature analysis software, to conduct a comprehensive and systematic analysis of research on vocational industrial colleges. It visualizes the analysis from various aspects including scholars, institutions, keywords, hotspots, and trends, in order to identify problems in existing research on vocational industrial colleges and propose corresponding adjustment strategies.

2. Research Design

2.1. Research Tools

This study is based on the theory and practice of vocational colleges and utilizes Citespace to analyze journal articles with a focus on vocational colleges. Citespace is a bibliometric software developed by Professor Chaomei Chen, which can conduct regularity and structural analysis of specific research fields and identify the hotspots and trends of the entire research [6]. Currently, this software and analysis method have been widely used in disciplines such as education, psychology, medicine, and computer science.

2.2. Data Sources

This study uses academic journal articles from the China National Knowledge Infrastructure (CNKI) as the sample for analysis, following the following procedures: first, search for journal literature. Conduct advanced searches with the keyword “vocational college”. Non-academic papers are excluded, and a total of 663 papers are selected. Second, convert data format. According to the software analysis requirements, the data from CNKI can be converted using Citespace. Third, set relevant data indicators: the time span is set as 2007-2023, the time slice is set as 1 year, the node type is set as keyword, and the selection threshold is set as Top N=50. Finally, visualize and analyze dimensions such as authors, institutions, keywords, and trends, and draw corresponding maps.

3. Research Findings

3.1. Analysis of Annual Publication Output

As shown in Figure 1, the annual publication output of the Vocational and Industrial College has shown a gradual

increase. From 2007 to 2019, research in the Vocational and Industrial College has been in a low growth phase, with an average annual publication output of less than 50 papers, indicating a relatively low overall quantity. However, since 2019, vocational education has been receiving increased attention from the government and relevant policies and incentives have been introduced to promote and guide the development of industrial colleges. As a result, the research

output of the Vocational and Industrial College has significantly increased in both quantity and speed. For example, in 2022 alone, the number of publications exceeded 200. Therefore, it is evident that the research output of the Vocational and Industrial College is increasing, which is a result of the growing national and societal interest in vocational education. It is expected that the research output of industrial colleges will continue to increase in the future.

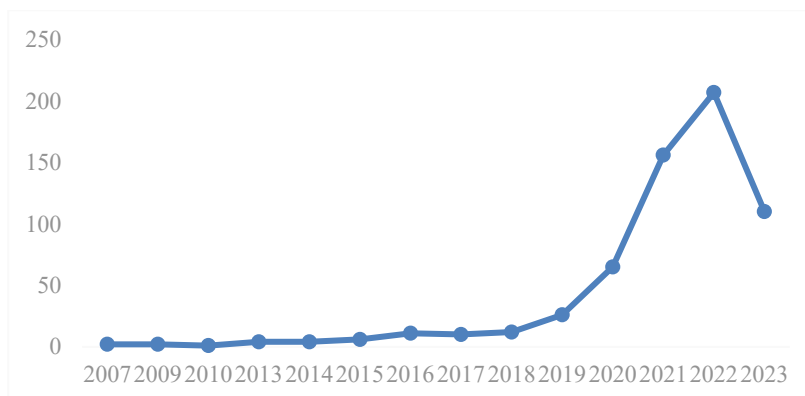


Figure 1. Number of publications

3.2. Analysis of Publishing Institutions

As shown in Table 1, Guangdong Province’s higher vocational marketing industry colleges have performed outstandingly in terms of publishing. Four institutions, namely Zhongshan Vocational and Technical College, Guangdong Polytechnic of Science and Technology, Guangzhou Science and Technology Trade Vocational College, and Guangzhou Urban Vocational College, have

made it into the top twelve in the ranking. Among them, Zhongshan Vocational and Technical College ranked first with 15 publications, far surpassing similar institutions. Universities with industrial colleges in Jiangsu, Zhejiang, and other regions also rank high in research output. However, overall, the publishing institutions in higher vocational industrial colleges currently do not exhibit particularly distinctive characteristics. The publications are relatively scattered, and the overall quantity is relatively low.

Table 1. Research institution rankings

Number	Initial year	Institution	Frequency	Region
1	2014	Zhongshan Polytechnic	15	Guangdong
2	2021	Henan Vocational College of Agriculture	8	Henan
3	2020	Guangdong Institute of Science and Technology	7	Guangdong
4	2019	Guangzhou Vocational College of Technology & Business	7	Guangdong
5	2020	Harbin Vocational & Technical College	5	Heilongjiang
6	2019	Guangzhou City Polytechnic	5	Guangdong
7	2020	Yiwu Industrial and Commercial College	4	Zhejiang
8	2020	Tianjin Transportation Vocational College	4	Tianjin
9	2020	Changzhou Vocational Institute of Mechatronic Technology	4	Jiangsu
10	2021	Jiangsu Vocational College Of Information Technology	4	Jiangsu
11	2021	Xiangyang Vocational and Technical Collage	4	Hubei
12	2020	Liaoning Financial Vocational College	4	Liaoning

3.3. 3.3Analysis of the authors of publications

Analyzing the authors of publications in the Vocational and Industrial College can better identify the research teams and research directions of the college. From the perspective of authors of publications in the Vocational and Industrial College (as shown in Table 2), the author with the highest number of publications is Jiang Xinghe. Liu Dan, Sun Hong, Zhang Yanfang, Yi Xuelling, Li Juntao, Cheng Jianwei, Zhao

Dongming, and others have published three papers, while the remaining authors have published two papers related to the Vocational and Industrial College. It can be seen that in the current development of the Vocational and Industrial College, research needs to be prioritized, continuously summarizing the experience and path of college construction, and conducting research on the college from multiple perspectives, allowing the core researchers to provide professional guidance.

Table 2. Author rankings

Number	Initial year	Author	Frequency	Number	Initial year	Author	Frequency
1	2020	Xinge Jiang	4	11	2020	Yangru Ren	2
2	2022	Dan Liu	3	12	2020	Baijun Wu	2
3	2020	Hong Sun	3	13	2016	Hongjun Wu	2
4	2017	Yanfang Zhang	3	14	2019	Fengming Yu	2
5	2013	Xueling Yi	3	15	2023	Changxing Liu	2
6	2021	Juntao Li	3	16	2020	Yi Liu	2
7	2022	Jiangwei Cheng	3	17	2021	Shudan Liu	2
8	2015	Dongming Zhao	3	18	2023	Yongyang Kuang	2
9	2015	Weiping Wan	2	19	2022	Wei Xiang	2
10	2021	Cong Qiu	2	20	2021	Hong lizhou	2

3.4. Research Hotspot Analysis

3.4.1. Keyword Co-occurrence Analysis

Keywords are the core of an article, and they can indicate research hotspots [7]. Currently, keyword co-occurrence analysis can be used to study the relationships among knowledge units in industrial colleges and visually present them through a graph. From the keyword co-occurrence graph, it can be observed that the graph has 300 nodes, 779 connections, and an overall network density of 0.0174. Additionally, the research hotspot keywords include vocational education, higher vocational colleges, school-enterprise cooperation, educational models, professional clusters, higher vocational education, industry-education integration, talent cultivation, and collaborative education, among others.

3.4.2. Keyword Cluster Analysis

Using keyword co-occurrence analysis, further cluster analysis is conducted on the keywords to obtain a graph of keyword clusters. Through visual analysis, nine clusters are identified: Higher Vocational Colleges, Integration of Industry and Education, School-Enterprise Cooperation, Vocational Education, Higher Vocational Education, Collaborative Education, Industrial Colleges, Talent Cultivation, and Professional Groups. Meanwhile, the indicators of the keyword cluster graph meet the requirements, with a modularity value of 0.4193 and an average silhouette value of 0.8058. Furthermore, a qualitative analysis of the literature related to keyword clusters reveals that previous literature mainly focuses on two aspects:

The first aspect is macro-governance research on higher vocational industrial colleges. The corresponding clusters include: #Higher Vocational Colleges, #Integration of Industry and Education, #School-Enterprise Cooperation, #Higher Vocational Education, #Vocational Education, etc. Macro-governance research is mainly based on the macro-governance dimension of vocational education. Relevant studies suggest that higher vocational industrial colleges need to clarify the governance logic, operational mechanisms, development models, and other aspects at the macro level. For example, Li Xiaojie (2015) studied from the perspective of institutional logic and proposed that important conditions for industrial colleges include talent cultivation concepts, institutional choices, and service demands, while multiple interests serve as direct driving forces [8]. Zhu Yuedong (2019) believes that independent, administrative, and higher education issues are prominent in industrial colleges,

therefore, it is necessary to empower industrial colleges with independent legal person status, improve governance institutions, and market operation models [9]. Zhang Yu and Wang Wei (2022) propose that the mechanisms of mixed-ownership industrial colleges are the balance mechanism of school-enterprise interests, the mechanism of resource co-construction and sharing, and the mechanism of “dual-element” education of school and enterprise [10]. Zhang Xuecui and Wang Yi (2022) put forward the operational logic of higher vocational industrial colleges, suggesting that the establishment of industrial colleges requires symbiotic co-construction and sharing, taking into account talent cultivation and skill improvement, to achieve overall regional development [11].

The second aspect is micro-practice research on higher vocational industrial colleges. It mainly includes: #Collaborative Education, #Talent Cultivation, #Professional Groups, etc. Micro-practice research is mainly based on the specific practices of higher vocational industrial colleges, exploring the connotations, talent cultivation, current development status, and specific construction paths of these colleges. For example, Lu Kunjian et al. (2017) took Guangdong Light Industry Vocational and Technical College as an example and set the goal of building a “first-class domestic and internationally renowned” college, integrating key resources of secondary colleges and connecting with Fortune 500 companies to establish industrial colleges [12]. Wang Jiaojiao and Ke Zhengyan (2021) analyzed the nature of industrial colleges, their operating models, industry orientation, and governance models based on 17 industrial colleges in Jiangxi Province, and proposed solutions to specific problems based on this analysis [13]. Cao Yuanjun et al. (2022) took Taizhou Vocational and Technical College as an example and proposed a talent cultivation model of “Five Integration” for high-level and high-quality industrial colleges, emphasizing the integration of five industries [13].

3.5. Keyword Emergence Analysis

Keyword emergence refers to the sudden increase of keywords in relevant literature data for a specific period. For keyword emergence analysis, the beginning of emergence is denoted as Begin, the end as End, blue represents time slices, and red indicates the period of emergence. This analysis can identify the latest directions and hot trends in certain research fields [14]. Additionally, the analysis of emergence intensity reveals that “vocational education” and “school-enterprise cooperation” have higher emergence intensity, indicating that

research in these two areas is a strong research focus in vocational industry colleges. Furthermore, the analysis of emergence time reveals different characteristics in different stages, roughly divided into three stages: the first stage, 2009-2019. In this stage, the emergent keywords include “school-enterprise cooperation,” “vocational education,” and “innovation and entrepreneurship.” The second stage, 2019-2023, consists of emergent keywords such as “transformation and development,” “community,” “educational model,” “vocational colleges,” “school-enterprise synergy,” “vocational education group,” and “digital economy,” among others.

4. Conclusion and Recommendations

4.1. Conclusion

This study utilized bibliometric software to conduct a visual analysis of vocational colleges in the industrial sector. It provided an intuitive presentation of the research status of vocational colleges in the industry and identified the hotspots and trends in their research. The study found that: (1) The overall publication output of vocational colleges in the industry has shown a gradual increase, with a significant acceleration in recent years; (2) Research institutions and scholars in vocational colleges in the industry have yet to achieve wide academic influence, resulting in limited leadership in research and development; (3) Research in vocational colleges in the industry mainly focuses on macro-level governance and micro-level practical experience; (4) Future development of vocational colleges in the industry should fully leverage the role of vocational education groups and deeply align with the development practices of the digital economy industry. This study provides a systematic summary and generalization of research in vocational colleges in the industry, addressing the fragmented, diverse, and differentiated nature of previous studies. It also offers valuable insights for the development path and direction of vocational colleges in the industry.

4.2. Policy Recommendations

4.2.1. Deepen research collaboration and encourage academic exchange among vocational colleges

Based on the analysis of research spectrums, research on vocational industrial colleges in China is relatively lacking in terms of collaboration. The main reason may be the existence of regional differences, with vocational industrial colleges being geographically dispersed and lacking corresponding platforms for exchange. As a result, the development trends of each college are more distinct. Therefore, it is recommended that future vocational colleges' industrial colleges should be based on regional development and industrial characteristics, develop distinctive disciplines and majors, gradually establish research institutions and centers based on industries, continuously expand internal and external communication levels, strengthen collaboration with industry experts, professionals, and senior scholars, and promote information sharing and real-time industry insights among industrial colleges, thereby promoting the transformation of academic achievements.

4.2.2. Coordinate the integration of industry and education and focus on cultivating digital talents

To promote the high-quality development of vocational industrial colleges, it is necessary to coordinate the field of industry and education, rooted in the development of the

digital economy, and continuously improve digital talent skills. From the perspective of the main actors, it requires joint efforts from the government, schools, and enterprises. The government needs to introduce relevant policies to support the cultivation of digital economy talents, while encouraging schools and enterprises to strengthen cooperation, promote resource sharing, optimize curriculum offerings, and enhance international cooperation through exploration and practice. In terms of capital allocation, it is necessary to optimize capital investment, innovate capital operation models, and improve capital risk management. Schools and enterprises also need to jointly promote the interaction between capital and talent cultivation, so as to effectively integrate industrial and educational resources, improve the quality and level of digital economy talent cultivation, and provide strong support for the development of the digital economy.

4.2.3. Improve the macro-to-micro system and innovate the construction path of industrial colleges

Regarding research on industrial colleges, there is currently a division between macro and micro levels, and a complete research system has not yet been formed. In the future, it is necessary to first expand and deepen the research system. On the one hand, starting from a micro perspective and based on the quality of talent cultivation, research how industrial college talents can meet the needs of enterprises, continuously optimize the reform of the “three education” (teaching, research, and practice), and extract experiences to summarize the characteristics of industrial colleges. On the other hand, at the macro level, researchers also need to further explore the difficulties in the construction of industrial colleges, such as mixed ownership, institutional governance, operational mechanisms, and logic, under the background of high-quality development of vocational education and promote innovative construction of industrial colleges.

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