

Retrospective and Prospective Research on Cultivation of Innovative and Entrepreneurial Talents between Universities and Enterprises

-- A Bibliometric Analysis based on CiteSpace Knowledge Graph

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Abstract: This paper utilizes the CNKI journal database to retrieve literature related to "school-enterprise collaboration" and "innovation and entrepreneurship". It employs bibliometrics and utilizes CiteSpace for quantitative analysis and information mining, demonstrating the spatial distribution characteristics and evolutionary context of research on school-enterprise collaboration in innovation and entrepreneurship. The research results indicate that the academic community has a high level of interest in the topic of school-enterprise collaboration in innovation and entrepreneurship, covering aspects such as the current situation of talent cultivation, problem analysis, platform research for nurturing talents, and student innovation and entrepreneurship ability cultivation, and has achieved certain results. However, research on the talent cultivation system of school-enterprise collaboration in innovation and entrepreneurship is still in its early stages, and a systematic theoretical model has not yet been formed. Therefore, establishing a systematic ecological model for talent cultivation in school-enterprise collaboration in innovation and entrepreneurship, and strengthening research on ensuring the operation of the talent cultivation system for school-enterprise collaboration in innovation and entrepreneurship, will become an important trend in future research on talent cultivation in school-enterprise collaboration in innovation and entrepreneurship.

Keywords: School-enterprise Collaboration in Innovation and Entrepreneurship; CiteSpace; Knowledge Map; Talent Cultivation.

1. Introduction

In recent years, the collaborative talent development model between universities and enterprises, as a new type of educational model, has received increasing attention from universities, enterprises, governments, and even the whole society. Collaborative education between universities and enterprises is not only an important way for higher education in China to face and serve society but also a crucial direction for promoting social development and an inevitable trend in the development of higher education in China.

2. Data Source and Research Methodology

2.1. Data Source

To ensure the authority and accuracy of the research sample, in December 2022, I accessed the China National Knowledge Infrastructure (CNKI) database and selected the "Journal Database." I used "collaboration between universities and enterprises" as the main theme and conducted a search. Then, I used "innovation and entrepreneurship" as the main theme in the search results. The source journals were set to include SCI, EI, Peking University Core, CSSCI, and CSSCD journals, with no other restrictions. A total of 200 papers were retrieved, and after filtering out papers with low relevance, 160 journal papers remained. These 160 transformed paper records were imported into CiteSpace software for analysis of prolific institutions, author collaborations, and research themes.

2.2. Research Methodology

Bibliometrics uses mathematical and statistical methods to analyze literature information. Researchers can use bibliometric methods to study the growth and distribution of literature, revealing the quantitative characteristics and patterns of change in literature. CiteSpace software is an information visualization tool that can display knowledge maps and overall development in a research field, identifying new dynamics and trends in disciplinary areas.

3. Spatial Distribution Characteristics of Research on Collaborative Innovation and Entrepreneurship between Universities and Enterprises

To more clearly reveal the development status of research on collaborative innovation and entrepreneurship between universities and enterprises in China, an analysis of spatial features such as institutional distribution and author distribution of research achievements was conducted.

3.1. Prolific Institutions in Research on Collaborative Innovation and Entrepreneurship between Universities and Enterprises

Using CiteSpace software, an analysis of institutional collaboration was conducted on 160 sample documents with a time slice set to 1, aiming to understand the current status

and actual contributions of domestic research on collaborative innovation and entrepreneurship between universities and enterprises. Figure 1 is a co-occurrence map of institutional collaboration obtained through CiteSpace analysis. From the map, it can be inferred that the top three institutions in terms of publication volume are the Institute of Strategic Studies of Chinese Academy of Sciences, the Institute of Strategic Consulting of Chinese Academy of Sciences, and the Document and Information Center of Chinese Academy of Sciences, with publication volumes of 7, 5, and 5, respectively. The analysis of the map reveals 277 network nodes and 129 connecting lines, with a network density of 0.0034, indicating that there are 277 institutions conducting research on collaborative innovation and entrepreneurship between universities and enterprises in the sample documents, and the degree of cooperation among institutions is relatively low.

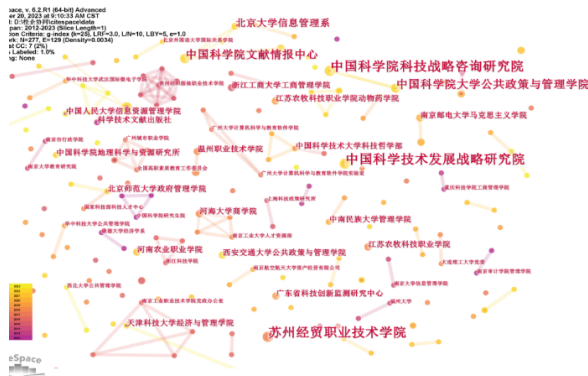


Fig 1. The institutional cooperation co-occurrence map of research on collaborative innovation and entrepreneurship between universities and enterprises.

The distribution characteristics of authors in research on collaborative innovation and entrepreneurship in university-enterprise cooperation. The development of research fields relies on the diligent contributions of authors, especially the invaluable contributions of prolific authors. There are 35 authors with two or more publications, some of whom are listed in Table 1.

Table 1. Prolific Authors in Domestic Research on Collaborative Innovation and Entrepreneurship in University-Enterprise Cooperation

Author	Number of Publications
Long Zhang	3
Yan Li	3
Chen Huang	2
Yuqian Li	2
Yuyang Ren	2
Jianhui Zhuang	2

From the distribution of authors, it can be seen that research on domestic school-enterprise cooperation in innovation and entrepreneurship is still developing. Some scholars have formed relatively stable collaborative networks, but there are not many stable research cooperation groups. Authors are relatively scattered (as shown in Figure 2), and the formation of research cooperation groups among authors is still pending.

The keywords in academic papers usually directly or indirectly imply the theme of the paper. Using CiteSpace information visualization software, we drew the co-occurrence network knowledge map of key words in the field of China's university-industry collaboration in innovation and entrepreneurship research during the above-mentioned period,

thus displaying the evolution of research themes in university-industry collaboration in innovation and entrepreneurship, as shown in Figure 3.

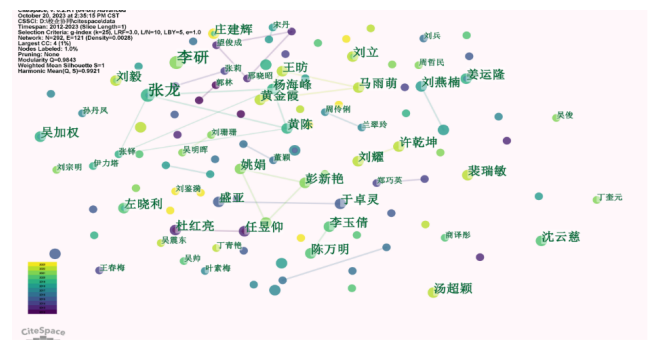


Fig 2. Co-occurrence Network of Authors in the Field of School-Enterprise Cooperation in Innovation and Entrepreneurship Research

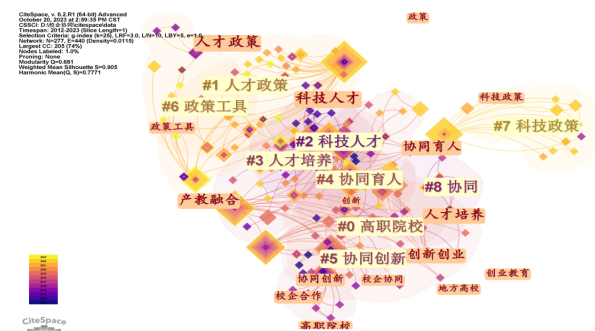


Fig 3. Knowledge Map of Keyword Co-occurrence Network in University-Industry Collaboration in Innovation and Entrepreneurship Research.

The research conducted a literature review by reading 160 papers and using software prompts, focusing on four aspects of research: the current status of talent cultivation in collaborative innovation and entrepreneurship between universities and enterprises, issues in talent cultivation in collaborative innovation and entrepreneurship between universities and enterprises, research on platforms for nurturing innovative entrepreneurial talents through university-enterprise collaboration, and research on cultivating students' innovative and entrepreneurial capabilities through university-enterprise collaboration.

Table 2. Specific Research Themes in University-Enterprise Collaboration for Innovation and Entrepreneurship

Specific Research Themes in University-Enterprise Collaboration for Innovation and Entrepreneurship	
Research on University-Enterprise Collaboration in Innovation and Entrepreneurship	Study on the Current Status of Talent Cultivation in University-Enterprise Collaboration for Innovation and Entrepreneurship
	Study on the Problems in Talent Cultivation in University-Enterprise Collaboration for Innovation and Entrepreneurship
	Research on the Platform for Nurturing Innovation and Entrepreneurship in University-Enterprise Collaboration
	Study on the Cultivation of Students' Innovation and Entrepreneurship Abilities in University-Enterprise Collaboration

4. Study on the Current Status of Talent Cultivation in University-Enterprise Collaboration for Innovation and Entrepreneurship

Domestic scholars have conducted research on the status of talent cultivation in university-enterprise collaboration for innovation and entrepreneurship. For instance, Hongjing Du (2017) conducted an analysis and research on the current status of the "dual-teacher" professional teacher talent cultivation model in the context of university-enterprise collaboration[1]; Yue Yang (2017) studied the talent cultivation model for innovation and entrepreneurship in university-enterprise collaboration[2]; Xujun Fang(2018) discussed the talent cultivation model for innovation and entrepreneurship in vocational colleges in the context of university-enterprise collaboration[3]; Haitao Gao (2021) explored the ideas for cultivating talents in the new engineering disciplines under the background of collaborative education[4]; Yujing Peng (2022) analyzed the optimization scheme for talent cultivation in vocational colleges based on the "three integrations" policy[5]; Yan Zhu(2023) conducted research on the reform and development trends of polymer chemistry courses from the perspective of university-enterprise collaboration [6].

4.1. Study on Existing Issues in University-Enterprise Collaboration for Innovation and Entrepreneurship Talent Cultivation

Researchers have analyzed papers on the existing issues in university-enterprise collaboration for innovation and entrepreneurship talent cultivation. Juan Yuan (2016) analyzed the problems existing in the talent cultivation model for innovation and entrepreneurship in vocational colleges under university-enterprise collaboration[7]; Lifeng Wang(2017) conducted a study on talent cultivation issues under the background of university-enterprise collaboration for innovation and entrepreneurship[8]; Feng Zhang (2018) researched the problems in talent cultivation for innovation and entrepreneurship in vocational colleges under university-enterprise collaboration[9]; Aihua Xu(2020) discussed the shortcomings of entrepreneurship education practice platforms in promoting talent cultivation through university-enterprise collaboration[10]; Jie Li(2021) analyzed the problems in cultivating talents for innovation and entrepreneurship in universities under the background of industry-education integration[11]; Ying Lv(2022) studied the dilemma of cultivating innovative talents based on collaborative theory in industry-university-research integration[12].

4.2. Study on University-Enterprise Collaboration in Cultivating Innovation and Entrepreneurship Platforms

Through literature review, statistical analysis was conducted on the study of university-enterprise collaboration in cultivating innovation and entrepreneurship platforms. Shiming Wan (2016) explored university students' innovation and entrepreneurship education under the university-enterprise collaboration and knowledge sharing theory [13]; Li Chen (2017) conducted an exploration and practice of university-enterprise collaboration in cultivating innovation and entrepreneurship mechanisms using Guangdong

Vocational College of Technology and Trade as a case study[14]; Shaobin Cai(2017) explored innovative teaching models in medical laboratory technology in vocational colleges based on university-enterprise collaboration platforms[15]; Xiaofei Xu (2020) constructed a model for cultivating talents in new engineering disciplines based on cross-disciplinary approaches and university-enterprise collaboration[16]; Bing Li(2021) explored a market-oriented, diversified integration model for cultivating mechanical talents in vocational colleges[17]; Yaxu Wang (2022) discussed the construction of a composite and applied university-enterprise collaboration system using universities in the Guangdong-Hong Kong-Macao Greater Bay Area as an example[18].

4.3. Research on the Cultivation of Students' Innovation and Entrepreneurship Abilities through University-enterprise Collaboration.

Researchers have analyzed relevant papers on the cultivation of students' innovation and entrepreneurship abilities through university-enterprise collaboration. For example, Wenbin Zhang (2015) explored a program for cultivating entrepreneurship abilities in vocational college students based on the concept of university-enterprise collaboration[19]; Bo Kang(2017) conducted an exploration and practice of jointly cultivating innovative and entrepreneurial talents through university-enterprise collaboration[20]; Guoqin Ma (2018) studied the cultivation of students' innovation and entrepreneurship abilities through university-enterprise collaboration[21]; Zhijun Chen(2020) proposed a stratified teaching approach for different students to cultivate diversified innovation abilities[22]; Lianying Li (2023) researched and developed a program for synergistically cultivating talents through virtual and real-world experiences[23]; Wentao Li(2023) analyzed the importance of improving students' engineering practice capabilities and put forward recommendations to enhance engineering practice education for students[24].

5. Summary and Outlook

The academic community has paid attention to the topic of university-enterprise collaboration in innovation and entrepreneurship. Research on the current status of talent cultivation, existing problems in talent cultivation, platforms for nurturing innovation and entrepreneurship, and the development of students' innovation and entrepreneurship abilities through university-enterprise collaboration has yielded a batch of results, providing a solid foundation for future research. However, there are areas that require further deepening:

(1) Lack of a systematic construction of the ecological model for talent cultivation in university-enterprise collaboration in innovation and entrepreneurship:

Currently, research on the talent cultivation system in university-enterprise collaboration for innovation and entrepreneurship in China is still in its early stages. Few scholars have systematically constructed an ecological model for talent cultivation based on theory and multiple case studies in university-enterprise collaboration for innovation and entrepreneurship. Therefore, this study will use methods such as case studies and interviews to systematically construct an ecological model for talent cultivation in university-

enterprise collaboration for innovation and entrepreneurship.

(2)Lack of research on the practical effectiveness of the ecological model for talent cultivation in innovation and entrepreneurship:

Due to issues such as the selection of schools for collaborative innovation and entrepreneurship, and challenges in curriculum design, few scholars have studied the practical effectiveness of the ecological model for talent cultivation in innovation and entrepreneurship. Hence, this study will use case study methods, interviews, and other research methods to explore the practical effectiveness of the ecological model for talent cultivation in innovation and entrepreneurship.

(3)Lack of research on the operational guarantee of the talent cultivation system in university-enterprise collaboration for innovation and entrepreneurship:

Through literature review, it is found that there is limited research on the operational guarantee of the talent cultivation system in university-enterprise collaboration for innovation and entrepreneurship. Therefore, this study will focus on improving the institutional and organizational mechanisms for talent cultivation in university-enterprise collaboration for innovation and entrepreneurship, and clarifying the roles of various participants in university-enterprise collaboration to ensure the smooth operation of the talent cultivation system.

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