Employment Core Competencies of Chinese Higher Vocational Students: A Systematic Review and Research Agenda

Zheng, J.H.[1], Lee, M.F.[1]

[1] *Faculty of Technical and Vocational Education*
   Universiti Tun Hussein Onn Malaysia, Parit Raja, 86400, MALAYSIA

*Corresponding Author: mflee@uthm.edu.my
DOI: https://doi.org/10.30880/ojtp.2024.09.01.006

Abstract

This study explores the number of publications, major researchers, major research institutions, research hotspots and research trends in this field of study by conducting thematic searches on the Scopus knowledge service platform and bibliometric analyses using CiteSpace.The results indicate that the number of publications on research on structural equation modelling in the area of employment core competencies is increasing, but the total amount of literature is still too small and there are many gaps. Research on the application of structural equation modelling in the field of employment core competencies focuses on topics such as higher education, healthcare, human resources, and behaviour. Future colleges and universities are the main research participants. Considering the lack of richness of current research perspectives, this review also provides suggestions for future research directions in order to strengthen the Chinese higher vocational students' employment core competency.

1. Introduction

In recent years, over-expansion of higher education due to rapid social change and industrial transformation has led to academic gaps in talent training and utilisation in many countries (Stan et al., 2022). Traditional teaching content and methods cannot adapt to the requirements of talents in the new economy and new industry; from the viewpoint of employers' demand, the industrial upgrading and transformation brought about by the supply-side structural reform has led to prominent structural contradictions in the employment of college graduates among industries, occupations and regions (Ma & Deng, 2019).

Education develops people into good employees with professional skills and competences, which is the key to personal development, social progress, economic prosperity and sustainable national development (Bozionelos et al., 2020). In the context of higher education, employability is recognised as more than just getting a job (Harvey & Knight, 2005). Jackson (2016) defined employability as including an ability-based dimension. Studies have shown that college students from different family backgrounds present differentiated employability (Shi & Ren, 2023), and that family background not only directly affects the employability of college students, but also indirectly affects employability through factors such as personal effort, level of higher education, and quality of education (Ma & Zhang, 2019). Curriculum, course teaching, career guidance, and club activities in the higher education training environment all have an impact on the employability of university students (Zhang et al., 2019). In terms of personal input, research has shown that club participation, work-related experiences become an important bridge between formal study and future employment for university students, enabling students to better adapt to changing labour market needs, but this may raise new issues of

inequality. In the 21st century, rapid growth in the rate of technological development, new business models, expanding globalisation and increased demand for productivity, creativity and flexibility have accelerated scholarly interest in the study of core competencies for university students' employment (De Vos et al., 2018). Grosemans et. al, (2023) examined the idea that improving core employability competencies in universities expands employment opportunities, and one would expect a positive change. McCormack and Baron (2023) noted that employability in Australia has become a key strategic objective for all universities and is driving federal government funding reforms. Kong et. al, (2021) published the first research paper on the determinant outcomes of occupational competence and utilised SEM research to indicate that occupational competence positively contributes to job engagement and job satisfaction. In order to overcome the skills gaps and global talent shortages, universities face continued pressure to produce future-proof graduates (Jackson et. al, 2019).

Therefore, it is of great significance to integrate international organisations' talent cultivation ideas, methods and approaches into talent cultivation programmes according to local conditions, to make up for the shortcomings of traditional higher education in talent cultivation, and to enhance college students' core competencies for employment more widely and effectively, so as to achieve broad and high-quality employment for graduates (Chen et. al, 2023). Throughout the existing review most of the traditional literature research methods are used, and the research results are mostly subjective generalisations and summaries, whereas bibliometric methods can objectively reflect the development of related research in different periods through quantitative data analysis (Pan & Wang, 2011).

Most of the research relies on the subjective judgement of experts, resulting in a lack of quantitative bibliometric analysis in the field. Despite the increasing number of publications in the field, little is known about the overall structure of its knowledge. In terms of methodology, subjective content interpretation is dominant, and not many objective analyses using scientometric tools. Therefore, this paper attempts to use CiteSpace, a scientometric software that is more widely accepted in the current academic community, as a research tool, and analyses the trend of the application of structural equation modelling (SEM) in the field of core competencies of employment based on the visual analysis of CiteSpace in an attempt to present the trend of SEM in the study of core competencies of employment objectively, with a view to providing new ideas and directions for the academic community.

2. Method

In this study, the CiteSpace was used to conduct bibliometric analyses by performing topic searches on the Scopus Database to explore the number of publications, major researchers, major research institutions, research hotspots, and research trends of the research in this field. CiteSpace has a wide range of applications in the field of pedagogical research, and the main methods used were the co-citation analysis of literature and the analysis of the co-occurrence of keywords, and the focuses on illustrating the basic legends of high-frequency nodes, clustered knowledge groups, high centrality nodes and graphs (Chen, 2006; Jiang & Hong, 2019).

Based on the review of existing studies and the exploration of research deficiencies, this study uses CiteSpace software to conduct data mining and metrological analysis of the corresponding data of the research literature on college students' core competence for employment in recent years by scholars at home and abroad, so as to show the development process and structural relationship of the existing studies in a visual way, and to provide scholars with a reference for analysing the current status of the research on the core competence for employment of college students and exploring the new frontiers of the research. The analysis is centred on the following three questions. The analyses focus on the following three issues:

- What are the main contributors to the field of core competences for university students' employment in different countries and in different types of institutions?
- What is the main knowledge structure and evolution of the field, and what are the main disciplines and topics involved?
- What are the emerging future trends in the field of study?

Bibliometric analysis can quickly identify the developmental context, research hotspots and frontiers of the academic field through graphical visualisation, and through graphical visualisation, we can quickly identify the developmental context, research hotspots and frontiers of the academic field and explore what needs to be improved. This will enable academics to have a more intuitive understanding of the research context and content of competency in the SEM field. This study attempts to conduct a scientometric review of the scientific literature related to core competencies for university students' employment with the following three main objectives:

- Identify key contributors to the research area at the country, institutional and contributor levels.
- Describe the structure of knowledge in the field and its evolution, identifying the disciplines and topics covered by the field.
- Learn about new trends for the future.

Bibliometric methods can objectively reflect the development of related research in different periods through quantitative data analysis (Pan Li & Wang Su, 2011). In this paper, by adopting the theme COMPETENCY and SEM, we conducted a thematic search of college students' employment core competencies and SEM in Scopus database, limiting the search period from January 2003 to August 2023, and initially obtained 1,185 of journal article. After reading the information such as title, abstract and keywords of the literature, we excluded the literature unrelated to competency, incomplete information, conference papers, and others. Then finally obtained 1134 of journal article. CiteSpace was used for bibliometric analysis to explore the number of publications, major researchers, major research institutions, research hotspots, and research trends in this field of study.

3. Results and Discussion

3.1 Analysis of the Volume of Publications

The annual number of publications and development trend of college students' core competencies for employment in SEM searched in Scopus are shown in Figure 1. The number of publications was low from 2003 to 2007, and showed a steady growth in 2008; the application of college students' core competencies for employment in SEM was a high-growth stage from 2008 to 2023, and the highest front of the number of publications was reached in 2022. Based on the papers we identified, we classify the related research progress into the following three stages:

- Phase 1 (2003-2007): not much research has been conducted on the use of college students' core competencies for employment in the field of SEM in this period.
- Phase 2 (2008-2017): a steady increase in the amount of literature, indicating that competencies are receiving increasing attention in the SEM field during this period.
- Phase 3 (2018-2023): during this period, the number of papers has been showing a fluctuating upward trend, with 2022 being the most frequently researched year in the last 20 years for the use of core competencies for college employment in the SEM field.

It can be concluded that the research on college students' core competence for employment has received extensive attention from scholars, and with the depth of the research, the competence has demonstrated a strong explanatory power in different industries and positions. Under the background of the new economic normal, improving the core competence of university students' employment is the fundamental to alleviate the structural contradiction of employment in the labour market, and the research on the core competence of university students' employment by scholars will show a rising trend (Xu, 2022).
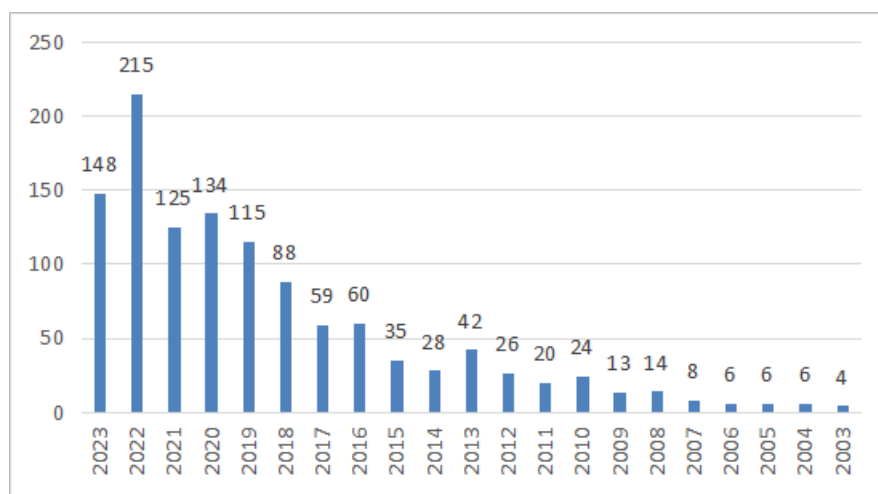

Fig. 1 *The annual number of related studies published from 2003 to 2023*

3.2 Mapping of Issuing Authors and Research Organisations

3.2.1 Author Mapping Analysis of Publications

Using CiteSpace to analyse author collaboration networks in the literature, we explored the core authors in the field and how closely they work together. Table 1 lists the top 10 authors in the study, with Kong, Zulnaidi, Otoo, Schneider, and Vrontis, among five others contributing to the field with four articles each. The top 10 authors are

the leading scholars in the field of research. However, the partnership between authors is small and low, and there is no group of collaborative teams of highly productive and manuscript-impacting research collaborators.

Table 1 *Information table of the top 10 authors in terms of number of publications*

No.	Author	Number of communications
1	Kong, H	4
2	Zulnaidi, H	4
3	Otoo, FNK	4
4	Schneider, W	4
5	Vrontis, D	4
6	Iqbal, J	3
7	Asghar, MZ	3
8	Herrmann, C	3
9	Cheung, C	3
10	Arditi, D	3

3.2.2 Institutional Mapping Analysis of Cooperative Networks

This study lists the institutions that are ranked among the top 10 institutions in the collaborative network institutions (as shown in Figure 2). The graph contains 454 nodes and 248 connections with a network density of 0.0024. Figure 2 depicts the collaborative relationships among the institutions that form a core group of institutions that includes renowned universities such as University of Malaya, COMSATS University Islamabad, University of Helsinki and other reputed universities form a core cluster of institutions.
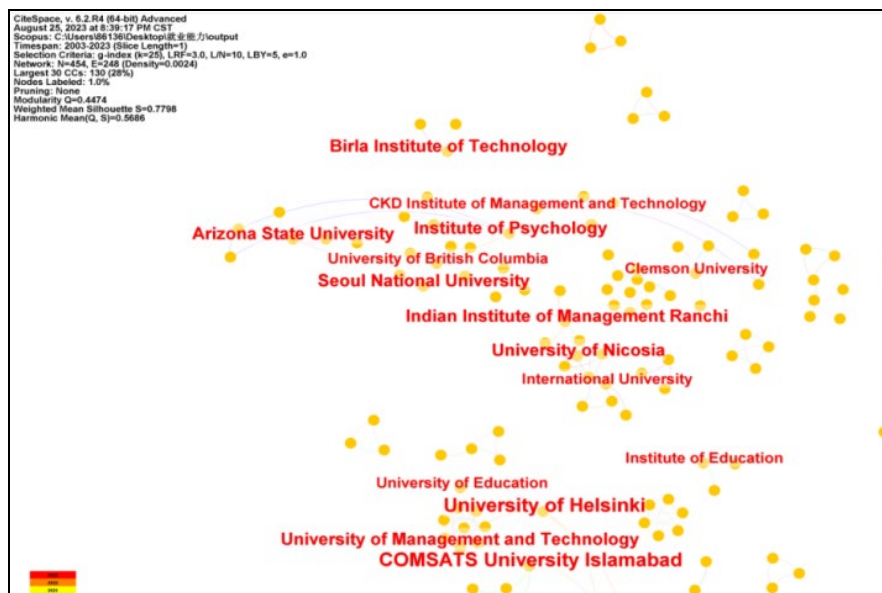
Fig. 2 *Top 10 research organizations in terms of publications*

The network diagram as shown in Table 2 provides information on institutional collaboration. An interesting finding is that the top 10 institutions are all universities, which suggests that universities are an important research force in the field of SEM research on core competencies for university students' employment. University of Malaya is ranked first with 8 articles. Other institutions that published a large number of articles include COMSATS University Islamabad with a total of 5, University of Helsinki, Seoul National University, Birla Institute of Technology and other universities all with 4 articles.

Table 2 Top 10 research institutions in terms of number of publications

No.	Organization	Quantity
1	University of Malaya	8
2	COMSATS University Islamabad	5
3	University of Helsinki	4
4	Seoul National University	4

5	Birla Institute of Technology	4
6	University of Isfahan	4
7	Koforidua Technical University	4
8	University of Nicosia	4
9	Indian Institute of Management Ranchi	4
10	University of Management and Technology	4

3.3 Keyword Mapping Analysis

The relevance of keywords, as a concise expression of the research topic of academic papers, can to a certain extent reveal the intrinsic connection of knowledge in the research field (Zhang et.al, 2019). In this study, keyword co-occurrence analysis is used to identify the main research directions and hotspots of student employment research, and to make a judgement on the evolutionary path and development trend of student employment research. With the help of CiteSpace software, we drew a keyword co-occurrence map based on the sample data identified in the previous section (as shown in Figure 3), which contains a total of 590 nodes and 3007 connecting lines.
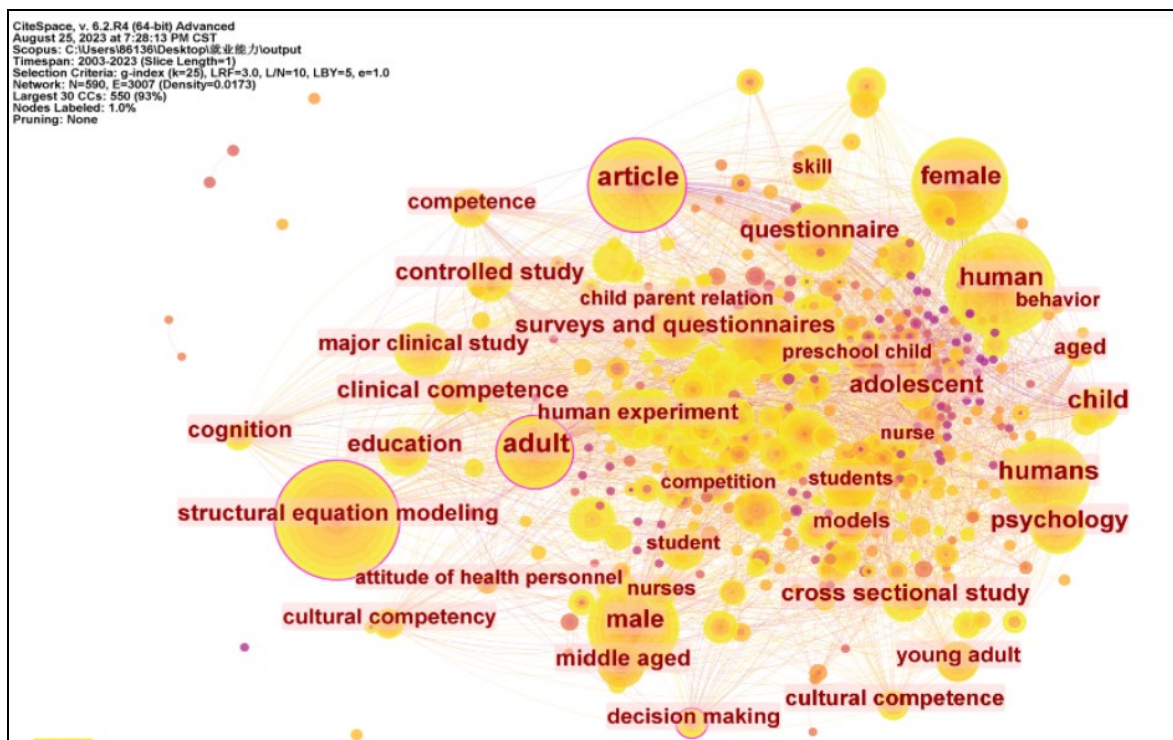

Fig. 3 *Keyword distribution for research on trends in the use of student core competencies in SEM, 2003-2023*

It is known from the display in Table 3 that the keyword co-occurrence mapping is selected to appear with a co-occurrence frequency of at least 20 or more. Structural modelling appeared for the first time in 2005, and in every year from 2009-2023, it appeared with at least 3 times or more, and in 2020, it reached the highest number of uses of 42 times. This is followed by the keywords Human, article, competency, psychology, students, and education.

- The study by Coklar (2016) was conducted on 398 undergraduate students using Online Information Search Strategies Scale (OISSI), Information Literacy Scale and Digital Nativity Assessment Scale, and structural equation modelling was used in the analysis to examine the correlation between the model variables. Based on the statistical results, it was shown that increased levels of both information literacy and digital nativity affect online information searching ability.
- The study by Shafique (2019) reveals some important but mostly neglected dynamics in the employment relationship under the current organisational structure system. The study suggests that managers' feelings of detachment from their work and work environment need to be

addressed as it can emotionally exhaust them and hinder their exploration and acquisition of new knowledge and competencies Files must.

- The direction of the research by Kong (2021) was mediated by organisational commitment to the relationship between AI awareness and occupational competence and between AI awareness and burnout. The research is also relevant to the IT literature as it suggests that IT competencies are not sufficient on their own to generate and sustain competitive advantage. Firms need complementary strategic capabilities such as knowledge management to enhance the impact of IT capabilities on firm performance.

Through these high-frequency keywords and the keywords shown in Table 3, we can see that the research trend of SEM in competency modelling has become an important tool for human resource management, and the model construction is more researched more from education, healthcare, human resources, mental health, construction and so on.

Table 3 *Trends in research use of competency in SEM high frequency keywords*

Frequency	Centrality	Keywords	Starting year
228	0.13	structural equation modeling	2005
192	0.04	human	2003
145	0.07	humans	2003
139	0.14	article	2003
135	0.04	female	2003
130	0.03	male	2003
100	0.12	adult	2004
86	0.05	structural equation modeling	2009
74	0.04	questionnaire	2013
60	0.01	competency	2005

3.4 Keyword Clustering Analysis

In order to deeply explore the knowledge structure of the research trend of college students' employment core competence related research in SEM, the combination of keywords is classified, and the keywords are analysed by clustering. The keyword clustering analysis of the employment competence related literature using CiteSpace is shown in Figure 4, in which Modularity Q=0.4474 (>0.3), the clustering structure is significant: the average profile value is 0.7798 (>0.5), the clustering is reasonable, and 10 clustering research hotspots, such as organisational civic behaviours , knowledge sharing, and psychological functions, have been formed. In order to ensure the validity of the keyword clustering and to further summarise the clustering information, the five keywords with the largest name, number of nodes, closeness and label value of each cluster are listed, as shown in Figure 4.
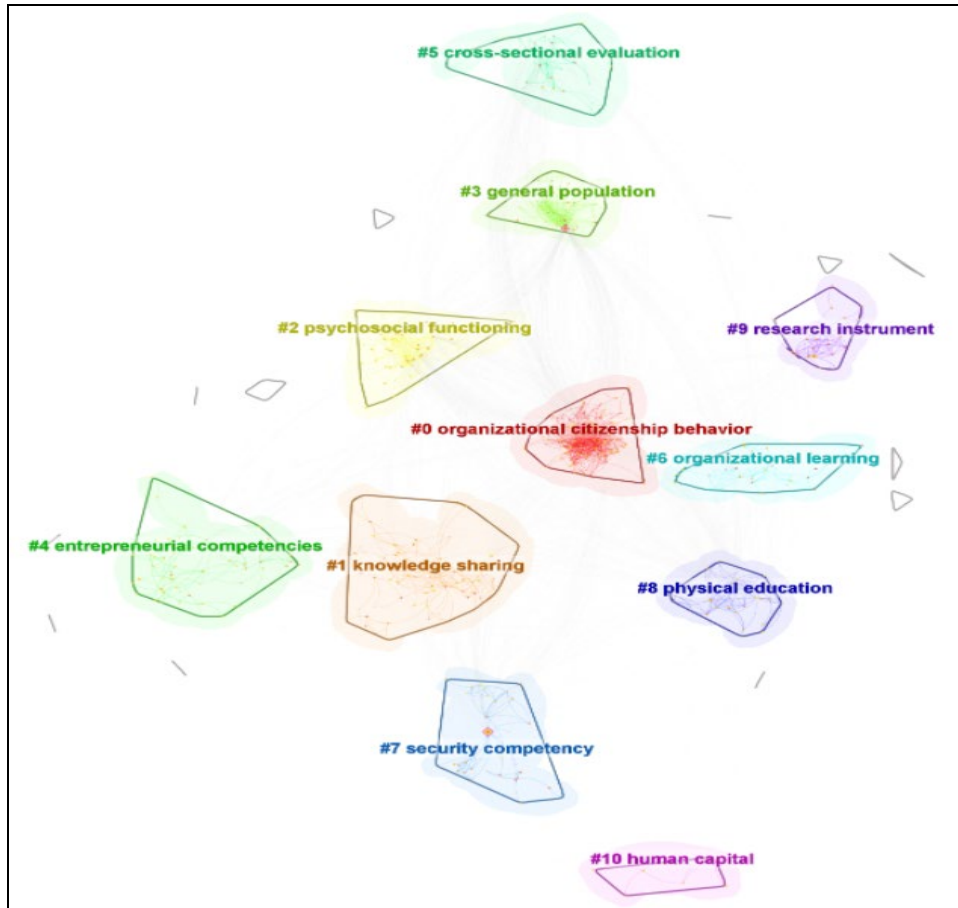
Fig. 4 *Keyword clustering mapping of research trends in SEM for core competencies of university students*

In Table 4, #0 Organisational Citizenship Behaviour, with a clustering frequency of 98 and a clustering effect of 0.694, includes the keywords through psychometric properties; Organisational Citizenship Behaviour; Professional Competence; Influencing Job Satisfaction; and Palliative Care Nurses. While #1 Knowledge sharing, with a clustering frequency of 75 and a clustering effect of 0.839, with denser connectivity between the nodes and other studies, this phase enriches the use of research on core competencies of university students in SEM, including through knowledge sharing; mediation; financial performance; and performance of construction companies. Then, #10 Human capital, with a clustering frequency of 8 and a clustering effect of 0.954, is the category with the highest clustering effect.

Table 4 *Keyword clustering table for research trends in SEM for competence*

| Cluster ID	Year	Frequency	Silhouette	Top Terms
#0 organizational citizenship behavior	2013	98	0.694	psychometric properties; organizational citizenship behavior; professional competency; influencing job satisfaction; palliative care nurses
#1 Knowledge sharing	2012	75	0.839	knowledge sharing; mediating role; financial performance; construction company performance; finite-mixture structural-equation methodology .
#2 psychosocial functioning	2016	64	0.728	modelling approach; structural equation; cultural competence; covid-19 pandemic; health-related quality ;
#3 General population	2006	53	0.885	twin study; autistic trait; general population; explaining change; exploratory study;
#4 Entrepreneurial	2019	52	0.777	entrepreneurial competencies;

competencies				structural equation model; virtual platform; sustainable performance; entrepreneurial competency;
#5 cross-sectional Evaluation	2010	35	0.843	prostate cancer patient; patient-provider communication; cross-sectional evaluation; socio-cultural factor; racial difference ;
#6 organizational learning	2012	33	0.733	organizational learning; local environment; competence creation; multinational enterprises; structural equation model;
#7 security competency	2014	32	0.831	career competencies; security competency; effective health information security; nursing competency; mediating effect ;
#8 physical education	2015	28	0.805	physical education; electrical technology; basic competency; self-regulated learning process model; structural equation modeling analysis ;
#9 research instrument	2012	23	0.898	core competencies; research instrument; competency model; workplace learning; motion picture actor;
#10 human capital	2019	8	0.954	sustainable healthcare value; empowering patient; hospitality industry; continual human resources empowerment; organizational performance;

With the shift in the economic growth rate, the transformation and upgrading of the economic structure and the disappearance of the demographic dividend advantage in the labour-intensive manufacturing sector, the employment situation has become complex and severe. At the same time, new problems such as shrinking number of jobs, lowering quality of jobs, and unstable employment have been derived from the impact of the new Crown Pneumonia epidemic. The term #psychosocial functioning, # human capital appeared in the clustering, indicating that the research on competency in the field of domestic health system has been revealed in recent years, and has paid attention to the competency of human resources in the field of SEM.

In order to provide a more in-depth understanding of the emergence in this research area, this paper uses a topic mutation algorithm to detect emergent words and rank the keywords in focus (see Figure 5). According to the year of emergence, the emergent words can be divided into the following two stages. The first phase of emergent words occurs between 2006 and 2019, with emergent words such as "vocational competence", "psychology", "structural equation modelling", "physiology", and so on. "Physiology" and other emergent words. The onset of the financial crisis has left the world in disarray, with severe economic downturns and disruption of the labour market in various countries. This has put a lot of pressure on employment in all walks of life. As a result, vocational ability and psychology have become a hot topic of research by scholars.

The second group of emergent terms appears from 2017 to 2023, with emergent terms such as "least squares", "higher education", "artificial intelligence" and "entrepreneurial willingness". "In 2014, the slogan of "mass entrepreneurship and innovation" was put forward, encouraging a group of Chinese young people with dreams to actively join the entrepreneurial army, which in turn gave birth to a group of entrepreneurial talents with vision and ability. In addition, the keyword "PLS-SEM" appearing in 2021 is also worthy of attention. As a modern multivariate analysis technique, PLS-SEM is relatively new in the field of college students' core competencies for employment.
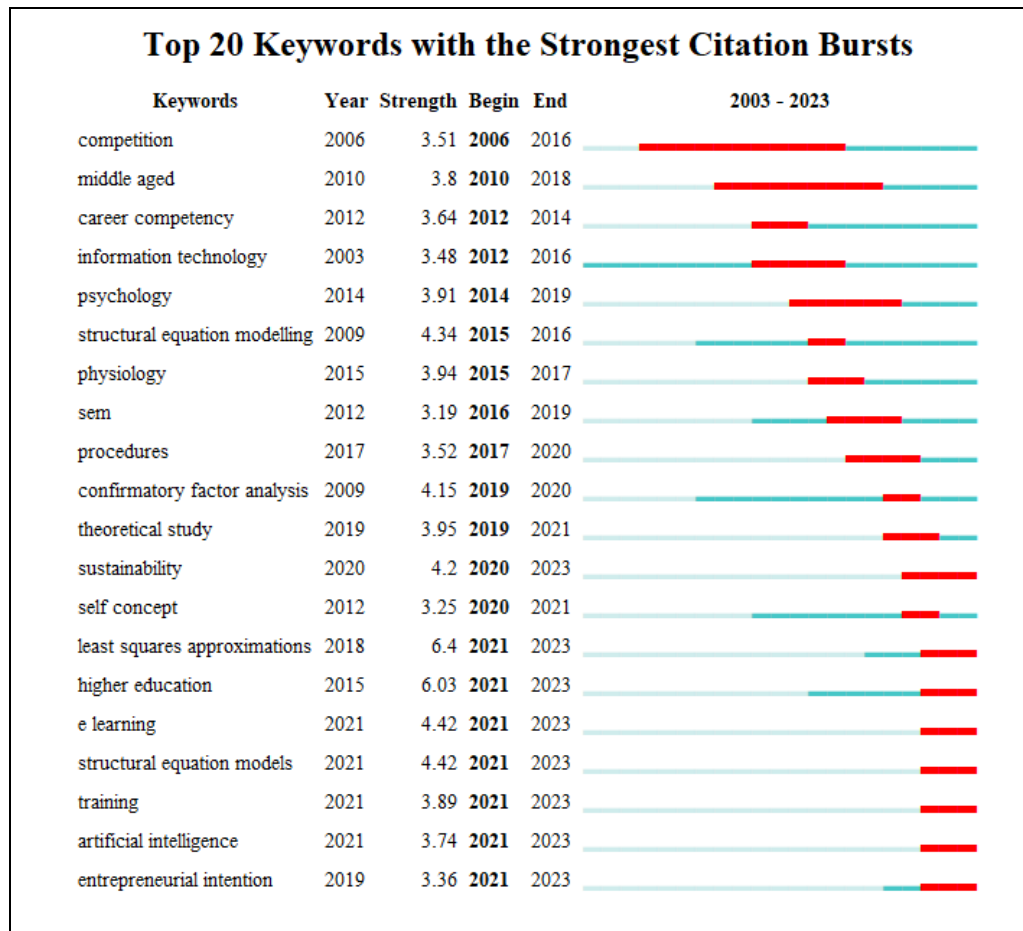
Fig 5. *Higher education students' employability research keywords highlighted*

In this study, we explored the application of college students' core competencies for employment in the field of SEM research. We found that these two aspects were presented. First, the research topic is closely centred on the policy and realistic background of each country, and has a strong realism. Contemporary college students' employment problems have long been widely concerned by all sectors of society and are very realistic problems, and academics have embodied a strong sense of realism in their choice of topics. Secondly, the research themes are dispersed, showing the characteristics of diversified intermingling. The research hotspots, prolific authors and research institutions of core competencies of college students' employment were identified through the knowledge mapping analysis, so as to clearly understand the current status of competency research, and it was found by analysing the keywords of the related literature that Human, article, competency, psychology, students, education, etc. are high-frequency keywords, which involve education, management, epidemiology and other disciplines. These themes are closely connected with each other, with strong internal logic, and the whole shows the characteristics of diversification and intermingling.

4 Conclusion and Recommendations

The research use of SEM in employment core competencies is diverse and complex. In this paper, we use the literature related to research on the use of core competencies in employment in the field of SEM research from 2003-2023 to conduct a knowledge mapping analysis. Firstly, the number of published studies generally shows an upward trend from 2008 to 2022, and the number of published papers has increased significantly after 2018 in particular, indicating a continued increase in research interest. Relevant journals cover the categories of medicine, public health, ethnic health, and epidemiology.

The mapping of the distribution of author collaborations and institutional collaborations shows that more and more scholars are combining SEM with the competency research component, but the collaborations among researchers are fragmented, the main research institutions are located in major universities, and the author collaborations and institutional collaborations have not yet formed clusters. In terms of countries, the United States is leading the research in this field; in terms of research institutions, University of Malaya and COMSATS University Islamabad are leading. However, international co-operation in this field is not active. Therefore, there is still a need to enhance the awareness of SEM among scholars of competency research compared to the

traditional statistical methods, which can be used as an effective statistical method for competency research to solve the problems encountered in the research.

To sum up, the research on the core competence of college students' employment has made good development in recent years, gathering a diversified knowledge base and hot topics, and higher vocational colleges and educational institutes are important platforms for related research, and the research results provide useful help in guiding college students' employment. However, there is a lack of co-operation between authors and institutions, and most of the research focuses on graduates exploring the core competencies for first-time employment, while there are fewer studies related to the relationship between the career development of college students in the period after graduation and their performance during their working life.

In view of the above problems, the study of college students' core competence for employment can be studied in depth from the following two aspects. First, strengthen ties and integrate resources. A prerequisite for in-depth research and development on the core competencies of university students' employment is the strengthening of cooperation and exchanges among various researchers and research institutions. However, the current research on college students' employability is only concentrated in some colleges and universities or educational research institutes, and there is a lack of connection among them. In the future, it is possible to make a reasonable allocation of various employment resources to form the employment synergy of students, colleges and universities and employment organisations, so as to improve the core competence of college students' employment and guarantee the quality of college students' employment.

Secondly, we will dig deeper into the mechanism of generating the core competence of college students' employment in different professions and different industries. When college students enter the workplace, they face the transition from campus environment to workplace environment, and from student role to workplace role, all of which have different requirements for college students' core competence in employment due to the differences in their respective majors and positions. Therefore, an in-depth exploration of the industrial mechanism of the employment ability of college students in different positions with different majors is crucial to the future career development of college students.

Acknowledgement

Conflict of Interest

We declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

*We confirm contribution to the paper as follows: **draft manuscript preparation:** Zheng, J. H.; **study conception and draft manuscript editing:** Lee, M. F. We reviewed the results and approved the final version of the manuscript.*

References

Bozionelos, N., Lin, C.-H. V., & Lee, K. Y. (2020). Enhancing the sustainability of employees' careers through training: The roles of career actors' openness and of supervisor support. Journal of Vocational Behavior,117, Article 103333. https://doi.org/10.1016/j.jvb.2019.103333

Chen,C.M. (2006)..CiteSpace II:detecting and visualizing emerging trends and transient patterns in scientific literature[J]. Journal of the American Society for Information Science and Technology,57 (3):359-377.

Chen, J.H., Pu S.L, Zhang, Y.B, & Zhour, H.X. (2023). Implications of the Talent Cultivation Model of International Organisations for Enhancing the Employment Competitiveness of College Students in China[J]. Education Progress, 13(7): 4886-4892.

De Vos, A., Van der Heijden, B. I. J. M., & Akkermans, J. (2018). Sustainable careers: Towards a conceptual model.Journal of Vocational Behavior,117,Article 103196. https://doi.org/10.1016/j.jvb.2018.06.011

Grosemans, N., De, C., Anneleen, F., & Sarah V.,(2023).Graduation is not the end, it is just the beginning: Change in perceived employability in the transition associated with graduation,Journal of Vocational Behavior,Volume 145. https://doi.org/10.1016/j.jvb.2023.103915

Jackson, D., Fleming, J., & Rowe, A. (2019). Enabling the transfer of skills and knowledge across classroom and work contexts. Vocations and Learning, 12(3), 459-478. https://doi.org/10.1007/s12186-019-09224-1

Jiang, X. & Hong, M.. (2019). Hot spots, frontiers and trends in international education big data research - a quantitative analysis based on wos database. China Distance Education (2), 13.

Pan, L. & Wang, S. (2011). Hot areas and cutting-edge themes of education research in the last decade - an econometric analysis based on the co-occurrence of keywords in the knowledge map of literature published in eight education journals from 2000 to 2009. Educational Research, 000(002), 47-53.

Ma, Y.X. & Zhang, X. (2019). Pre-assignment or post-assignment:What is affecting college students' employability? Educational Economics Review (1), 24.

Ma, L. & Deng Y. (2019). Exploration of "slow employment" of college graduates and its countermeasures. Journal of China Youth Politics College, 038(005), 93-99.

McCormack, S., & Baron, P. (2023). The impact of employability on Humanities, Arts and Social Sciences degrees in Australia. Arts and Humanities in Higher Education, 22(2), 164-182. https://doi.org/10.1177/14740222231156888

Stan, M. M., Topală, I. R., Necşoi, D. V. & Cazan, A.-M. (2022). Predictors of learning engagement in the context of online learning during the COVID-19 pandemic. Frontiers in Psychology,13, Article 867177. https://doi.org/10.3389/fpsyg.2022.867122

Shi, Q.H. & Ren K.X.(2023).Exploring the connotation of employment ability of college students in China and its influencing factors--Based on the comparison between applied colleges and research colleges[J]. Journal of East China Normal University (Education Science Edition), 41(8): 1-12.

Xu, J.Y. (2022). A CiteSpace-based visualisation study of college students' employability measurement, Channel Science, 1(4): 106-109.

Zhang, M.M., Liu, T.P. & Yang, J.H. (2019). Current status, hotspots and trends of precision poverty alleviation research - based on CNKI and Citespace visualisation perspectives[J]. China Agricultural Resources and Zoning, 40(8):11-19. https://doi.org/10.1016/j.jvb.2023.103915