

KAJIAN TENTANG KONSEP KOMPETENSI PEKERJAAN PELAJAR VOKASIONAL DI CITESPACE

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Abstrak

Artikel ini mengaplikasikan perisian Citespace untuk menyusun dan memvisualisasikan 623 dokumen yang berkaitan dengan kompetensi pelajar vokasional dengan Konsep Kompetensi Pekerjaan (COC) dari artikel Scopus yang bermula pada tahun 1979 sehingga 2023. Melalui analisis grafik pengetahuan, didapati bahawa Piernagnetik, Boahin, dan Agrawal adalah ilmuan yang paling banyak menyumbangkan artikel; Institut Pendidikan, Kazan Federal University, University of Groningen adalah institusi penyelidikan yang dominan dengan jumlah penerbitan terbesar; Pemetaan kata kunci menunjukkan keupayaan profesional yang agak tinggi. Pemetaan kata kunci menunjukkan bahawa kemahiran vokasional sangat berkait dengan pendidikan-dual, inovasi dan keusahawanan, dan pendidikan teknologi vokasional. Data juga menunjukkan, kemahiran insaniah adalah topik popular dalam penyelidikan hari ini. Pada masa akan datang, kita perlu mengukuhkan komunikasi dan kerjasama, serta menggunakan pendidikan teknologi vokasional untuk merealisasikan kesan langsung kemahiran insaniah terhadap kedua-dua inovasi dan keusahawanan. Tinjauan dan analisis sebelumnya menunjukkan pilihan visual literatur terpilih dapat memberikan petunjuk yang berharga, tepat pada masanya, berulang dan fleksibel untuk lebih memahami situasi dan arah global yang telah muncul dalam kajian yang lepas.

Kata Kunci: Citespace, Kompetensi pekerjaan, Pendidikan vokasional, Penyelidikan hotspot.

Dihantar: 05 September 2023

Disemak: 31 Januari 2024

Diterbit: 31 Mac 2024

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A STUDY ON THE CONCEPT OCCUPATIONAL COMPETENCE OF VOCATIONAL STUDENTS IN CITESPACE

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Abstract

In this paper, Citespace software tool was selected to comb and visualize 623 documents related to concept occupational competence (COC) of vocational students on Scopus during 1979-2023. Through the knowledge mapping analysis, it was found that Pilz, Boahin, Agrawal were the scholars with the most number of publications; Institute of education, Kazan Federal University, University of Groningen were the research institutes with the most amount of publications; the keyword mapping showed that Occupational Competence. The keyword mapping shows that vocational skills are highly related to dual education, innovation and entrepreneurship, and vocational education technology, of which soft skills is a hot research topic nowadays. In the future, there is a need to strengthen communication and cooperation and to use vocational education technology to realize the practical impact of soft skills on innovation and entrepreneurship. As a review and analysis of previous research, the visual analysis of selected literature can provide a valuable, timely, repeatable, and flexible way to better understand global trends and directions that have emerged in the field in the past.

Keywords: Citespace, Occupational Competency, Research hotspot, Vocational Education.

Submitted: 05 September 2023

Revised: 31 January 2024

Published: 31 March 2024

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1.0 Introduction

Study concept of occupational competence of vocational students is driven by various key contextual factors. The continuous economic and technological transformations in the global landscape, coupled with rapid technological advancements, are reshaping the demands within professional fields. ¹This dynamic environment gives rise to new industries and technologies, transforming existing professions and necessitating modern vocational competencies. Globalization escalates competition not only in goods and services but also in talent, urging nations to ensure a highly adaptable and internationally competitive workforce. Skills shortages challenge many industries, creating job market imbalances that underscore the importance of cultivating talent with specific vocational competencies.²

Educational reforms in numerous countries are actively addressing the demands of the 21st century, with vocational education forming a pivotal component of these reforms. This shift necessitates curricula that are more flexible, practical, and directly relevant to industry needs. Furthermore, vocational education serves a crucial role in promoting social inclusion.³ By offering opportunities to students from diverse backgrounds and economic statuses, it contributes to reducing social inequalities and enabling a more heterogeneous population to attain vocational success. The rise of digital education and technological tools has significantly enhanced the flexibility and accessibility of vocational education, although it also prompts research into effective integration methods for these tools in developing vocational competencies.⁴

The concept of vocational competence is an interdisciplinary and complex issue. Its multidimensionality and complexity are manifested in a number of dimensions: cognitive, technical, social and emotional, which need to be considered in an integrated manner, as well as the interactions between them.⁵ Secondly, this study needs to consider different cultural and national contexts. Cross-cultural research may involve the investigation of language, cultural differences, and educational systems, which requires a nuanced approach. ⁶Finally, and most importantly, there are various individual differences between students and workers, including background, interests, learning styles, and cultural factors, which exacerbate the challenge of adapting the concept of vocational competence.

This paper focuses on analyzing the relevant 649 related literature retrieved from Scopus from 1979 to 2023 using CiteSpace 6.2 R2 (64-bit) Advanced software. Bibliometric analysis can help us quickly identify the developmental lineage, research hotspots, and frontiers of academic fields through knowledge mapping, and mine what needs to be improved. This study contributes to existing research in three ways. First, unlike previous

¹ McGrath, S., & Yamada, S. (2023). Skills for development and vocational education and training: Current and emergent trends. *International Journal of Educational Development*, 102, 102853.

² Lund, H. B., & Karlsen, A. (2020). The importance of vocational education institutions in manufacturing regions: adding content to a broad definition of regional innovation systems. *Industry and Innovation*, 27(6), 660-679.

³ Le, S. K., Hlaing, S. N., & Ya, K. Z. (2022). 21st-century competences and learning that Technical and vocational training. *Journal of Engineering Research and Lecturer*, 1(1), 1-6.

⁴ Kovalchuk, V. I., Maslich, S. V., Movchan, L. G., Soroka, V. V., Lytvynova, S. H., & Kuzminska, O. H. (2022, March). Digital transformation of vocational schools: problem analysis. In *CTE Workshop Proceedings (Vol. 9, pp. 107-123)*.

⁵ Li, J., Wiemann, K., Shi, W., Wang, Y., & Pilz, M. (2019). Vocational education and training in Chinese and German companies in China: a 'home international' comparison. *International Journal of Training and Development*, 23(2), 153-168.

⁶ Deardorff, D. K. (2019). *Manual for developing intercultural competencies: Story circles*. Routledge.



literature reviews, this is a CiteSpace study that systematically analyzes COC of vocational students. It will provide new insights that have not been fully explored in previous studies. Secondly, this study identifies influential authors, countries and institutions and the relationships between them. This will give scholars a better visualization of the research in the field and its content. Finally, the most important contribution is the listing of major research trends over time, which will inform subsequent studies and help to strengthen our understanding and enrich disciplinary knowledge.⁷

The concept of competence also changes in response to socio-economic development and, in particular, technological change. However, one thing remains unchanged: literacy is closely related to education. That is to say, from the lexical point of view, the concept of literacy, no matter how it is understood, requires the development of literacy through education, training and other means. Since the definition of competence has not formed a unified standard around the world, competence, competency, skills, core skill, ability, employability are often mixed up in national policy texts. Therefore, this paper uses competence, skills, and ability in the selection of keywords.⁸

This study consists of the following sections. First, we introduce the research design (section 2), then we present the number of publications in the field, explore the main authors, institutions, and countries (sections 3 - 6), and analyze the research hotspots and frontiers through keyword highlighting and clustering (section 7 and 8). Finally, we present conclusions and perspectives for future research (sections 9).

2.0 Research Design

We derived the literature under study from Scopus, which is a comprehensive and multidisciplinary abstract and citation database that provides a wealth of information and tools for researchers, academics, and institutions. On 25 August 2023, we retrieved a total of 849 articles using the following search terms with associated meanings: Article title, Abstract, Keywords = vocational AND training AND education; AND Keywords = competence; OR Keywords = skills AND ability; Subject area = social sciences; Document type = Article. After excluding literature related to teacher competence in vocational education and articles with low relevance, a total of 623 valid samples were collected. Data processing was conducted using CiteSpace 6.2 R2 (64-bit) Advanced software, complemented by Excel. Together, these tools were used to generate a knowledge map, considering aspects such as publication volume, authors, institutions, countries, co-occurrence of keywords, and keyword clustering.

3.0 Analysis of the number of Articles Issued

Figure 1 illustrates a data set of 623 scholarly papers published between 1979 and 2023, depicting a notable overall upward trend in the quantity of studies conducted in the domain of occupational competence. Prior to 2007, there was limited scholarly engagement in this area, with fewer than five papers published annually. The zenith of scholarly interest was observed in 2022 when the number of papers reached its peak at

⁷ Koerber, S., & Osterhaus, C. (2019). Individual differences in early scientific thinking: assessment, cognitive influences, and their relevance for science learning. *Journal of Cognition and Development*, 20(4), 510-533.

⁸ Chappell, C., Gonczi, A., & Hager, P. (2020). Competency-based education. In *Understanding adult education and training* (pp. 191-205). Routledge.



71. Based on this discernible trend, it is conceivable that the quantity of papers for the current year may either surpass or at least equal the count from the previous year.

The research on the concept of occupational competence is divided into 4 stages:

1. Early Stage (before 1979)

In the early 20th century, the focus of educational research was primarily on traditional academic education, with vocational education often receiving less attention. Research into occupational competence was limited, and the emphasis was more on academic knowledge and theoretical subjects.⁹ With the end of World War II, there was a rapid increase in the demand for industrial and vocational skills, leading to greater attention on vocational education and training. Research began to explore how to better cultivate and assess the vocational skills required in the workplace.¹⁰

2. Developmental Stage (1979-2007)

In the 1960s and 1970s, researchers started to propose models and frameworks for occupational competence to better understand the skills and knowledge required in different vocational fields. These models typically included cognitive, technical, and social skills among others.¹¹

3. Rapid Developmental Stage (2008-2016)

With the rapid development of technology, the definition and requirements of occupational competence also evolved. Digital literacy, information management, and innovation skills gradually became important components of vocational education.¹² In the era of globalization, there is increased focus on occupational competence within diverse cultural contexts. Cross-cultural communication, multilingual skills, and cultural sensitivity have become crucial.¹³

4. Modern Research Stage (2017-2023)

Currently, research into the concept of occupational competence in vocational education has expanded to encompass individual development, educational policies, curriculum design, and assessment, among other aspects.¹⁴ Researchers are also employing advanced research methods such as big data analysis and educational technology to delve deeper into this field.

⁹ Wolf, A. (2011). Review of vocational education. London: DfE.

¹⁰ Li, J., & Pilz, M. (2023). International transfer of vocational education and training: A literature review. *Journal of Vocational Education & Training*, 75(2), 185-218.

¹¹ Vazirani, N. (2010). Review paper: Competencies and competency model—A brief overview of its development and application. *SIES Journal of management*, 7(1), 121-131.

¹² Feng, Y., & Richards, L. (2018). A review of digital curation professional competencies: theory and current practices. *Records Management Journal*, 28(1), 62-78.

¹³ Abdullah, N. S., Sumarwati, S., & Abd Aziz, M. I. (2020). Life and career skills among technical and vocational education and training (TVET) students in vocational colleges. *Online Journal for TVET Practitioners*, 5(2), 20-26.

¹⁴ Boone, C. G., Bromaghim, E., & Kapuscinski, A. R. (2023). Sustainability Careers. *Annual Review of Environment and Resources*, 48.



In summary, the study of the concept of occupational competence in vocational education has gone through 3 stages of development, reflecting changes in society, technology, and the education system. Research in this area continues to provide valuable insights for the advancement of vocational education and the success of vocational students.

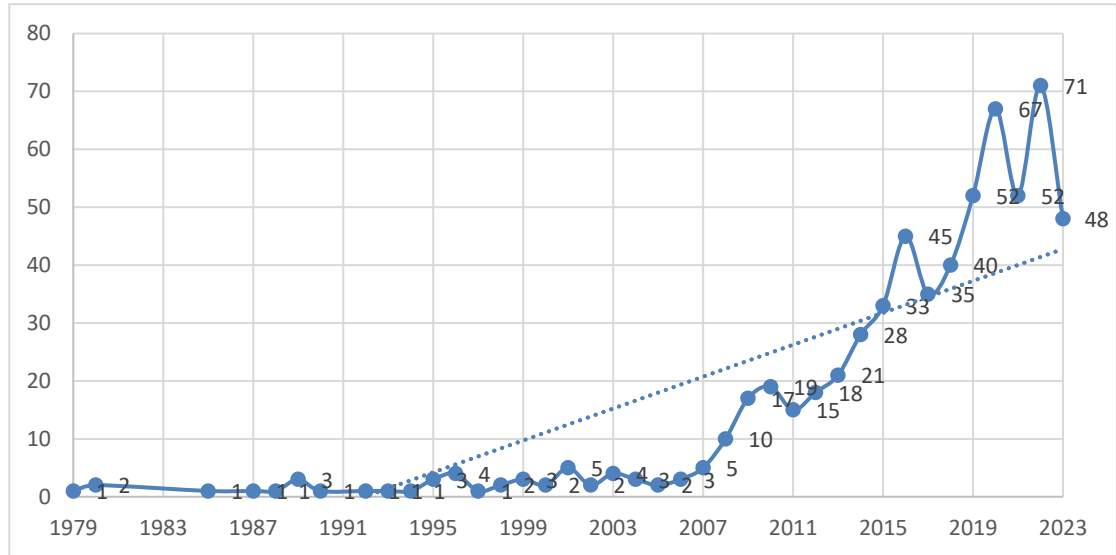


Figure 1. The number of COC of vocational students related studies published from 1979 to 2023. (result analysis by CiteSpace)

4.0 Co – Author Analysis

Utilizing CiteSpace for the analysis of author collaboration networks within the literature, we conducted an exploration of the prominent authors in the field and the degree of their collaborative endeavors. Table 2 lists the top 10 authors of the study "COC of vocational students". Among them Pilz, M has published the most (5 papers) and with Boahin. Agrawal. Bakar who have both published 4 papers, become as the first tier. They are followed by Cincinnato. de wever. lester. bieman. goldberg. mude. Figure 2, provides a comprehensive overview of author collaboration within this domain, encompassing 516 nodes and 336 connections, resulting in a network density of 0.0025. This density suggests that, on the whole, there is a relatively lower degree of collaboration among researchers. Hence, there is a notable need to enhance the construction of multi-level and broadly encompassing research clusters in this field.



Table 1. Top 10 productive authors in COC of vocational students research

NO	Author	Quantity	NO	Author	Quantity
1	Pilz, M.	5	6	De wever, B	3
2	Boahin, P.	4	7	Lester, S.	3
3	Agrawal, T.	4	8	Biemans, H.	3
4	Bakar, A. R.	4	9	Goldberg, D.	3
5	Cincinnati, S.	3	10	Mulder, M.	3

Pilz, M. specializes in comparative studies of vocational education, evaluating competencies in terms of culture, models and methods. Boahin, P. focuses on the impact of competency-based training (CBT) systems on employability, professional skills and provides training case studies. Agrawal, T., Bakar, A. R. presents an Asian perspective on employability of Indian and Malaysian academics.

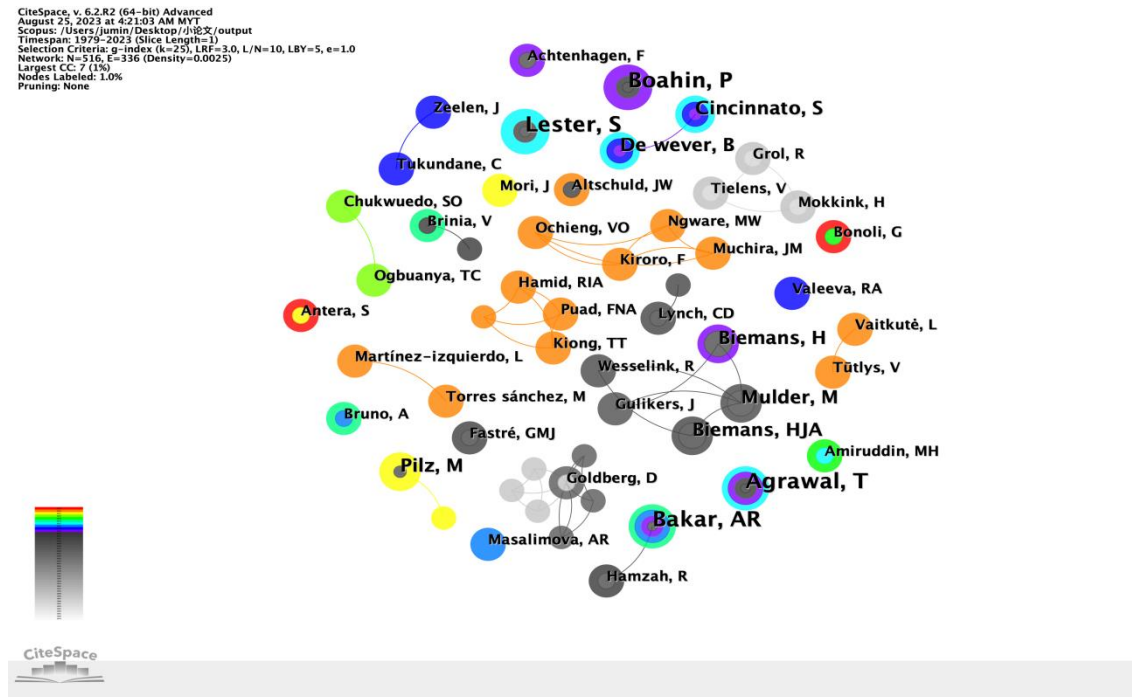


Figure 2 Network map showing authors' collaborations in COC of vocational students research

5.0 Co – Institution Analysis

From 1979 to 2023, a total of 428 institutions are involved in research in this field. Figure 3 depicts the collaboration between institutions, which contains 428 nodes and 174 connections, with a network density of 0.0019, suggesting that there is less collaboration between individual research units. Griffith University organized several universities to form a core group of institutions. An interesting finding is that the top 2-9 institutions are all universities, suggesting that universities are an important force for research on occupational competence. Institute of education is ranked first with 11 papers. Other institutions with a high number of publications include Kazan Federal University,



University of Groningen, University of Granada.

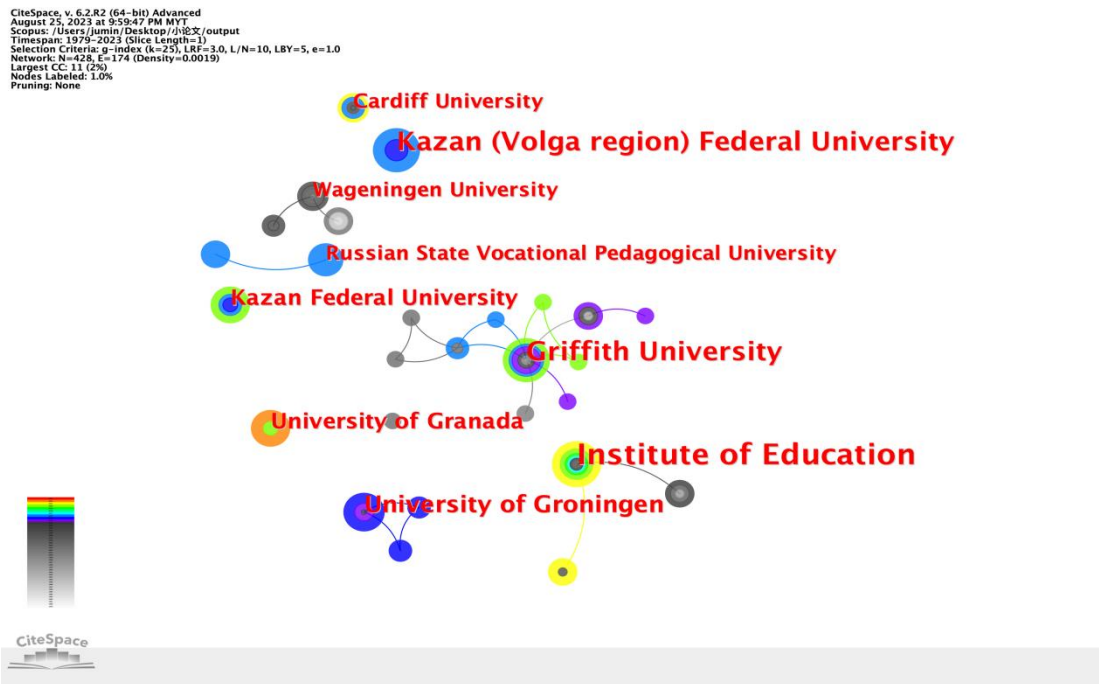


Figure 3. A network map showing institutional collaborations in COC of vocational students research

6.0 Co – Country Analysis

A total of 83 countries and territories worldwide participated in this study. The network diagram (Figure 4) illustrates that the top 10 countries in terms of article publications primarily comprise Western nations, with the exception of Malaysia, and are notably concentrated within Europe. These leading countries, listed in descending order of article contributions, are the Russian Federation, the United Kingdom, Germany, the United States, Spain, Australia, Malaysia, the Netherlands, Switzerland, and Finland. It is noteworthy that these top 10 countries collectively account for a substantial 61% of the total articles published. Intriguingly, the foremost contributor to research in vocational competence is not the United States or the more established European nations, but rather Russia. It has been actively engaged in this field since 2005 and is progressively emerging as a significant research powerhouse within it.¹⁵

It is worth mentioning that Malaysia is an Asian country that is the only that ranks in the top 10 in terms of the number of articles issued. With the development of industrialization in the country, the formation of Malaysia's more comprehensive vocational education system, covering a wide range of institutions such as vocational and technical colleges, community colleges, technical schools, and technical and vocational training institutes.¹⁶ The system covers vocational and technical colleges, community colleges, technical

¹⁵ Chernaya, I. P., Masyuk, N. N., Prosalova, V. S., Bodunkova, A. G., & Bushueva, M. A. (2023, June). University 4.0 concept: educational and scientific policies, innovative development of vocational education and training. In *Frontiers in Education* (Vol. 8, p. 1125361). Frontiers.

¹⁶ Adams, D., & Cheah, K. S. (2022). Technical and vocational education and training: Reflections, recognition, and renaissance. In *Education in Malaysia* (pp. 183-194). Routledge.



schools, technical and vocational training colleges, and other institutions. At the same time by the influence of multiculturalism, Malaysia's vocational education institutions actively pursue internationalization¹⁷, not only to attract international students and partners from around the world, but also actively spread the country's vocational education experience.

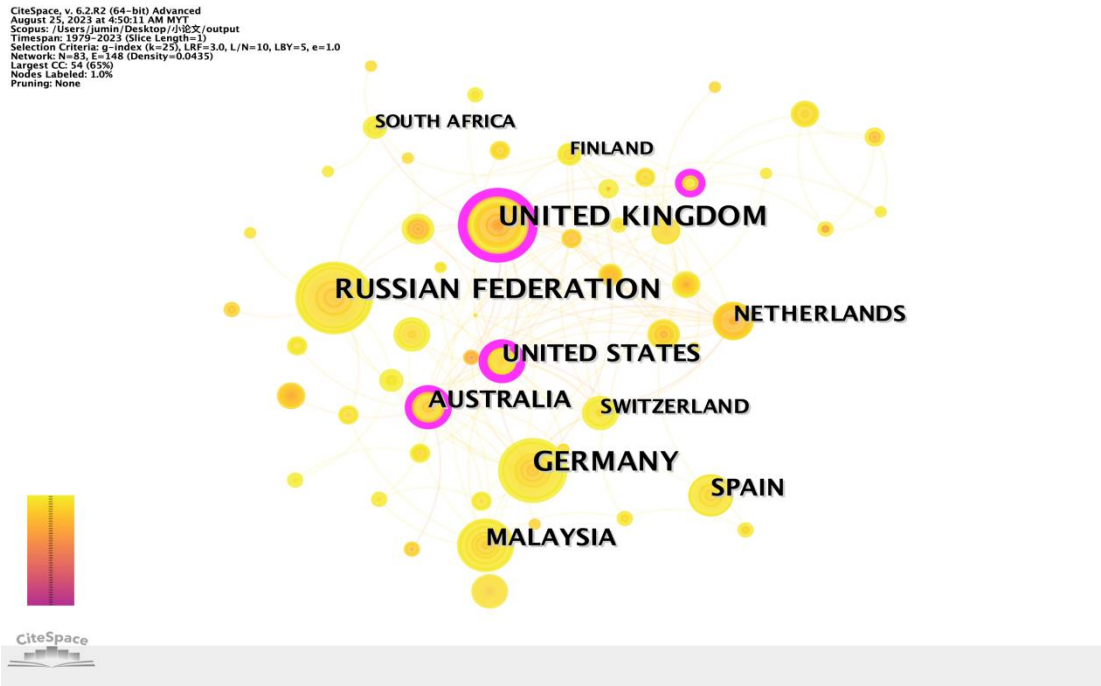


Figure 4. A network map showing national collaborations in COC of vocational students research.

7.0 Keyword Cluster Analysis

Keywords reflect the core content and ideas of an article. Thus, high frequency occurrences of high frequency keywords indicate research hotspots in a particular subject area. By using CiteSpace keyword co-occurrence, we came up with the top 10 keywords (in order of most frequent occurrence): vocational education, human, vocational education and training, education, Article, humans, competence, training, skills, and female. Next, we performed keyword clustering (Figure. 5), and the icon shows that the modularity Q-value is 0.6263, which is greater than 0.5 indicating that the clustering structure is significant and reasonable.

Combined with the keyword clustering map, we categorized the hot studies into the following three groups :

1. Dual Education System (#1#5)

Germany, France and Spain are representative of countries with a dual education

¹⁷ Minghat, A. D., Mustakim, S. S. B., & Shahrani, N. (2022). Literature Review: Technical and Vocational Education and Training (TVET) in Malaysia. ASEAN Journal for Science Education, 1(2), 89-102.



system (Dual Education System) in vocational education¹⁸, which is expressed in the fact that students receive practical training during internships in companies, while at the same time learning the relevant theoretical knowledge at school. The modern apprenticeship system is a model for developing competencies in the real workplace and is particularly important in Germany. Many students obtain their vocational training through apprenticeships. This is a combination of practical work and study over a period of several years. Apprenticeship systems in France and Spain allow students to learn on the job. Such systems usually involve a contract with an employer to gain practical work experience¹⁹.

2. Innovation and Entrepreneurship (#2#4) :

Has been an important area of vocational education in recent years. It has expanded from an area primarily associated with small businesses to enhance students' entrepreneurial attitudes and skills. It can help students to develop independence and versatility by fostering their entrepreneurial spirit, encouraging interpersonal interaction, and stimulating flexibility, leadership, and initiative.²⁰ However, some studies have shown that vocational education is unable to meet the demand for innovation. Therefore, there is a need to update teaching practices and develop assessment tools to measure and develop the innovative capacity of individuals.²¹

3. Vocational Education Technology (#0#3)

Whether it is "assisted training" or "technology education", technologies not only make vocational education more flexible and accessible, but also provide more opportunities to improve career competencies.²² They motivate students to actively participate in the learning process, gain real-world experience, and grow and develop throughout their careers. By utilizing these technologies, individuals can better meet the demands of the occupational field and become more competitive for employment.

¹⁸ Bibatchayeva, A. (2023). Dual oriented education for future pedagogical professionals. Scientific Collection «InterConf», (149), 60-65.

¹⁹ Civera, A., Lehmann, E. E., & Meoli, M. (2023). The Attractiveness of European Higher Education Systems: A Comparative Analysis of.

²⁰ Miço, H., & Cungu, J. (2023). Entrepreneurship Education, a Challenging Learning Process towards Entrepreneurial Competence in Education. Administrative Sciences, 13(1), 22.

²¹ Keinänen, M., Ursin, J., Nissinen, K. (2023). How to measure students' innovation competences in higher education: Evaluation of an assessment tool in authentic learning environments. Studies in Educational Evaluation, 58, 30–36.

²² Kovalchuk, V. I., Maslich, S. V., & Movchan, L. H. (2023). Digitalization of vocational education under crisis conditions. Educational Technology Quarterly, 2023(1), 1-17.



CiteSpace, v. 6.2.R2 (64-bit) Advanced
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 Scopus: /Users/jumin/Desktop/小论文/output
 Timespan: 1979-2023 (Slice Length=1)
 Selection Criteria: g-index (k=25), LRF=3.0, L/N=10, LBY=5, e=1.0
 Network: N=660, E=1049 (Density=0.0048)
 Largest CC: 553 (83%)
 Nodes Labeled: 1.0%
 Pruning: MST
 Modularity Q=0.6263
 Weighted Mean Silhouette S=0.8921
 Harmonic Mean Q, S=0.7359

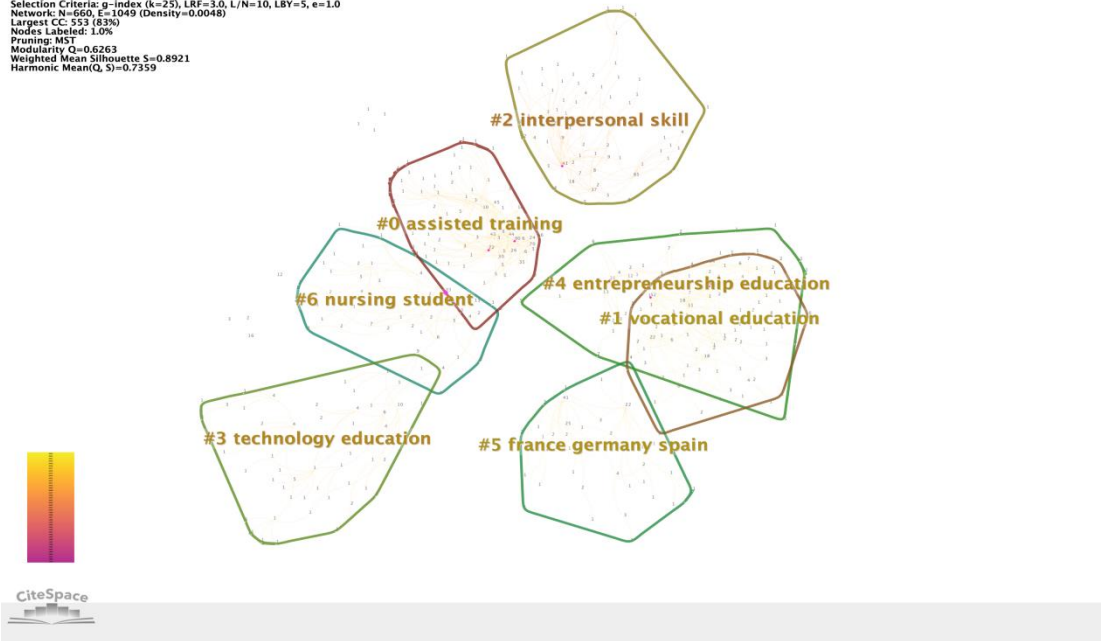


Figure 5. Clustering map of keyword co-occurrences in RSH research.

8.0 Burst Keyword Analysis

Using CiteSpace to produce a keyword burst mapping (Figure 6), it is possible to delineate the research frontiers and trends in a given discipline. In the analyzed map, the blue line represents the whole research period, and the red line indicates the duration of the emergent research. If the duration is longer, the higher the burst intensity value is, indicating that the topic is more influential at a certain stage. The highest intensity value in the graph is 5.69 (SOFT SKILLS). Medical education is the keyword with the longest duration. The 3 changes in this area are summarized below :



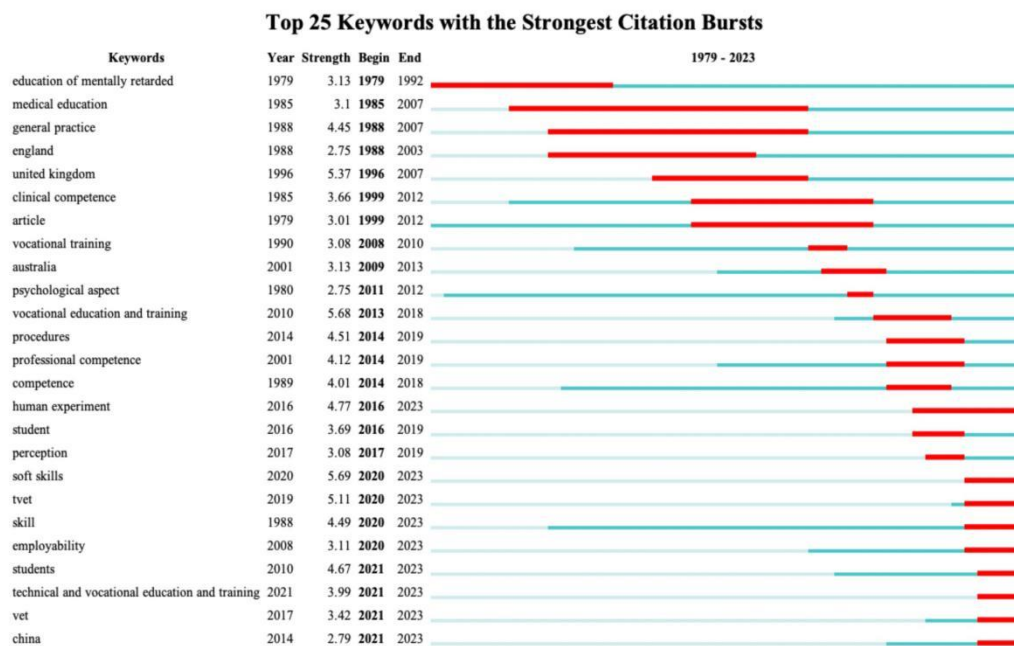


Figure 6. Top 25 keywords with the strongest citation bursts of COC of vocational students research from 1979 to 2023

8.1 Changes in the Field of Research

In the late nineteenth and early twentieth centuries, a modern system of medical education evolved, including medical schools, clinical internships, and specialized medical training. During the same period, vocational education gradually expanded into a wider range of fields, including business, medicine, engineering, and information technology. Vocational schools and community colleges became important institutions for training and providing skills. Early literature focused on the field of medicine, where medical education often included clinical internships in which students actually participated in patient care in hospitals or clinics. Similarly, certain vocational education programs included internships or work experiences in which students applied the skills they learned in actual workplaces. Competencies such as hands-on skills training, teamwork and communication, and continuous learning have remained at the intersection of the field for quite some time. Today, modern vocational education encompasses a much broader range of fields, from traditional manual occupations to highly technical industries. Vocational education institutions are committed to providing students with skills and knowledge relevant to specific occupations in order to meet the demands of the labor market.

8.2 Changes in the Study Area

The study of the concept of Occupational competence has been closely linked to the development of vocational education itself, as well as to the development of the manufacturing industry and the economy it serves. The United Kingdom, Australia and China have each played an important role in global research on



this study at different stages of development (Table 2)

Table 2. Definitions of the concept of occupational competence in the United Kingdom, Australia, and China.

National	Year	Expression of Definition	Define content
United Kingdom	1979	Core skills	Communication skills; problem solving skills; numeracy skills; IT skills; language use skills ²³ .
Australia	2000	Key competence ; skills	Skill to gather, analyze, and process opinions and information; ability to express opinions and exchange information; skills to plan and organize activities; ability to work cooperatively with others in a group; skill to apply mathematical thinking and techniques; ability to solve problems; ability to use new technologies ²⁴ . Occupational core competence is the requirement of occupational development changes on the quality of occupational talents, which is directly related to the occupational environment and job competence, and involves the individual's social adaptability, job competitiveness and occupational development of the necessary character and key competencies. ²⁵
China	2018	Core competence	

In 1947, The need to study the concept of occupational competence was first suggested by United Kingdom scholar Landy²⁶. "Foundations of Choice" is a report that was published by the U.K. Office of Further Education in 1979. This report was an influential document in the field of education and had a significant impact on the development of education policies in the United Kingdom. In this document, for the first time, the key competencies involved in vocational education in the United Kingdom are clearly defined. In this document, the key competencies involved in vocational education in the UK are specified for the first time and are considered to be eleven in total. It is noteworthy that China has been committed to reforming and upgrading vocational education over the past few years. This includes improving the quality of vocational education and strengthening skills training to meet changing vocational needs. Competency-based thinking has been increasingly noticed and recognized by the vocational education community, and improving the vocational competence of students in vocational colleges and institutions has become the starting point and destination

²³ West, J., & Steedman, H. (2003). Finding our way: vocational education in England (No. CEPOP18). Centre for Economic Performance, London School of Economics and Political Science.

²⁴ Werner, M. C. (1995). Australian Key Competencies in an International Perspective. National Centre for Vocational Education Research, 252 Kensington Road, Leabrook, South Australia 5068, Australia.

²⁵ Sang Lei. (2020). Research on Vocational Core Literacy of Higher Vocational Students and Its Cultivation (Doctoral Dissertation, Nanjing Normal University). <https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CDFDLAST2021&filename=1021506549.nh>

²⁶ Landy, E. (1947). Educating for occupational competence. The School Review, 55(5), 278-284.



of vocational education.²⁷

8.3 Changes in Competence Concerns

Compare and contrast hard and soft skills (Table 3.) While hard skills are still very important in specific fields and positions, soft skills are increasingly valued by employers and organizations as they directly impact an employee's overall job performance, career development, and organizational success. With the rise of AI, many positions are predictably being replaced with big language models, rich corpora, superior computing power, and more. Today, it seems that the competitiveness of hard skills, represented by "knowledge", is declining, while soft skills, represented by "competence", will have more and more space to play a role. Moreover, soft skills are a key component of the ability to innovate. Innovation is not only about technology or science, but also about interpersonal relationships, communication, ways of thinking and working methods. Being well equipped with soft skills such as communication, teamwork, creativity, and critical thinking can help foster the development and success of innovation²⁸. Therefore, today's workers not only need to possess hard skills, but also need to continuously develop and improve their soft skills in order to excel in the competitive workplace.

Table 3. Key differences between hard and soft skills²⁹

	Hard skills	Soft skills
characteristic	Specific techniques, knowledge, or skills that can be measured and taught, such as programming, math, mechanical maintenance, etc.	Skills related to interpersonal relationships, emotional intelligence, and personality traits, such as communication, leadership, and teamwork
Transferability	Often have a well-defined field of application and are difficult to transfer directly between fields	Often have broader applicability and can be translated into strengths in different work environments and occupations
Training and development	Can learn and improve through courses, training and practice	Often takes longer and more practice to develop, but can also be improved through reflection and interpersonal interactions
Measurement	Usually based on standardized tests, exams, or project completion	Measurement is usually based on a variety of methods such as observation, self-assessment, and feedback from coworkers and supervisors
Development time	Can usually be mastered in a relatively short time	Development usually takes much longer and may require sustained effort to improve.

²⁷ HAO Yun-liang, WANG Yi-fang & CHEN Hui. (2019). Construction of Vocational Competence Evaluation Index System for Students Based on The Needs of Enterprises—A Case Study of Five-year Vocational College of Architecture. *Communication of Vocational Education* (16),55-61.

²⁸ Putra, A. S., Novitasari, D., Asbari, M., Purwanto, A., Iskandar, J., Hutagalung, D., & Cahyono, Y. (2020). Examine relationship of soft skills, hard skills, innovation, and performance: The mediation effect of organizational learning. *International Journal of Science and Management Studies (IJSMS)*, 3(3), 27-43.

²⁹ Purwanto, A. (2020). Effect of hard skills, soft skills, organizational learning and innovation capability on Islamic University lecturers' performance. *Systematic Reviews in Pharmacy*.



Impact on work	Directly affects job performance and task execution	Increased impact on relationships, leadership, teamwork, and career development
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9.0 Discussion

In this paper, CiteSpace was used for the first time to comb through the literature in COC of vocational students and some novel insights were obtained. For example, the Asian countries Malaysia and China are influential in this field.

However, this study is also limited by the literature databases. Only Scopus database was selected, and the coverage of the paper was not wide enough and insufficient. At the same time, a large number of medical-related literature caused great trouble in the initial screening. Inevitably, important papers and authors were omitted.

After the above data mapping analysis, within the field of vocational education, we obtained the trend of the number of publications since 1979, the authors, institutions, and countries with the highest number of publications, the keywords with the highest frequency of occurrence, as well as 6 clustered keywords and Top 25 keywords with the strongest citation bursts. From this we can examine the future direction of the field.

9.1 Enhancement of Collaborative Exchanges

It is found that the degree of cooperation on this study is low, whether it is authors, institutions, levels, or regions. The advantageous resources in this field are mainly concentrated in western developed countries. In the future, the exchange and cooperation between regions and institutions can be strengthened to give full play to the advantageous resources and enhance the impact of research. In addition, the connection and cooperation between research and practice should be strengthened. In the future, the research results can be used in countries and regions where the manufacturing industry is booming, which is also conducive to the formation of multi-core research clusters around the world.

9.2 Strengthening the Development of Technology in Vocational Education

This will not only help students adapt quickly to the employment environment and become competitive, but also help them understand the profound changes in social development. In the long run it can effectively reduce the cost of training, improve labor efficiency, and support personalized learning to encourage lifelong learning.

9.3 Strengthening Research on Soft Skills

In vocational competencies requires further defining the concept of soft skills according to the times, especially sorting out the relevant links with innovation and entrepreneurship competencies and quantifying the impact evaluation. Due to the multi-latitude non-technical skill characteristics of soft skills related to social, emotional, and cognitive abilities. It means that the short-term, massive, and inherent educational model of vocational education needs to be changed urgently.



10.0 Conclusion

In this paper, we analyze a large number of publications on COC from its emergence to the present day and review the scholarship and progress in the field from a quantitative and visualization perspective using CiteSpace software. This is specified below:

(1) Number of Articles Issued: Since the 1980s, significant progress has been made in the study of COC, especially after 2008, when it entered a phase of rapid development and the volume of literature increased substantially.

(2) Research Areas: Medical Training, Vocational Education Curriculum, Practical Education Teaching, and Vocational Information Technology are the four research areas with the most papers published.

(3) Countries: Russian Federation, the United Kingdom, Germany are the most active countries in COC research.

(4) Authors: The top five scholars in terms of cumulative number of publications are Pilz, M, Boahin, P, Agrawal, T, Bakar, A. R, Cincinnato, S.

(5) Institutions: The top three institutions in terms of cumulative number of publications are Griffith University, Kazan Federal University, University of Groningen.

(6) Keywords Subsequently: the top three keywords are soft power, vocational education and training, United Kingdom.

This addresses an important issue in previous reviews in the field that rarely analyze COC as a whole from multiple perspectives and do not adequately reveal changes in COC over time. This study analyzes the entire history of COC more comprehensively and provides support for more scientific and accurate predictions of changes in urban metabolism. As such, it provides guidance for policymakers and insights into the future development of the field.

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