

Research hotspots and trends between open education and vocational education

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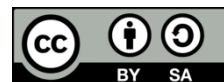
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ABSTRACT

Open education and vocational education are crucial for building a learning society and promoting national development. This study uses CiteSpace software to conduct an in-depth analysis of keywords visual timelines for research hotspots, and keywords with the strongest citation bursts in China and other countries. Given the rapid global development of open and vocational education, it is essential for policymakers, educators, and researchers to stay abreast of emerging trends and critical areas to formulate and implement effective educational policies and strategies. Therefore, analyzing these research hotspots and trends holds significant importance. The results indicate that in China, the integration and development of open and vocational education are key trends, with a strong emphasis on coordinated development and innovative educational models. In other countries, the focus shifts towards enhancing adult learners' vocational skills and online learning capabilities. These insights offer concrete guidance for resource allocation, curriculum development, and future research directions. They assist policymakers in optimizing resource distribution, educators in creating innovative curricula, and researchers in identifying new research areas. Thus, this comprehensive understanding of the dynamic evolution of open and vocational education can lead to more effective educational practices and policies worldwide.

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1. INTRODUCTION

Open education is organized and implemented by open universities, aiming to serve working adults and acting as an important form of continuing education [1]. Educators and learners are in relative isolation in terms of space and time and is relatively flexible. Vocational education mainly refers to vocational school education based on a combination of secondary vocational school and higher vocational school education [2]. Vocational education aimed for learners to acquire certain professional qualifications, improve professional knowledge and skills, and possess or develop specific professional ethics and character. As an independent education system, open education and vocational education jointly serve the construction of a learning society and a lifelong education system.

Promoting the development of open education and vocational education in China is a political task. In July 2010, the National Medium and Long-term Education Reform and Development Plan (2010-2020) of China stated that vocational education and open education should continue to be vigorously developed. In October 2020, the 14th Five-Year Plan stated: Give full play to the advantages of online education, improve

the lifelong learning system, and build a learning society. Promote high-level universities to open up education resources, improve registration learning and flexible learning, and open up channels for mutual recognition and conversion of different types of learning achievements. The Vocational Education Law of the People's Republic of China stipulated that the state should promote and ensure that citizens receive education in vocational schools or various forms of vocational training, and encourage the development of various forms of continuing education [3]. In March 2021, the fourteenth five-year plan highlighted implementing quality vocational and technical education, deepening the integration of vocational and general education, and promoting high-level universities. It also called for opening up educational resources, improving flexible learning systems, and facilitating the recognition and conversion of different learning outcomes. In October 2022, Xi Jinping reiterated the importance of coordinating innovations in vocational, higher, and continuing education, and integrating vocational education with production, education, and science.

Researchers both domestically and internationally have studied the importance of integrating open education with vocational education, as well as the theoretical foundations necessary to achieve this integration. In the early 2000s, Chinese scholars focused on integrating and coordinating open and vocational education [4]–[6]. Creating a supportive policy environment for higher vocational education and adults was also highlighted [7]. They emphasized the perception of teachers towards Open Educational Resources in higher education [8]. Theoretical research aimed at building a driving mechanism and establishing a multi-participant organizational system was necessary in open education [6], [9]. Strengthening process management and improving the institutional environment were also key goals [9], [10]. Duwi *et al.* [11] emphasized that open learning was crucial for building student character, providing clear instructions, fostering interactive and active learning, and offering open resources to enhance vocational students' learning outcomes and interactions with teachers. Per and Karolina [12] highlighted the need for flexibility and personalization in adult vocational education in Sweden, focusing on career orientation to better integrate adult learners into the labor market. Vocational education reform could integrate open education through top-level school design and culture [4]. Vanessa *et al.* [13] suggested that, in response to COVID-19, adult learners should pursue continuing and vocational education, with online learning models tailored to their motivations, personalities, digital literacy, and learning strategies. The concept of resource sharing [14], lifelong learning theory [15] have been used to study the integration of open and vocational education. A certain similarity in cultivating skilled and application-oriented talents created a strong basis for their interaction and integration [16], [17]. Support from the macro environment, organizational policies, and bilateral awareness further supported this integration [5]. The identity and complementarity between these education types offered a logical and practical foundation for their coordinated development, essential for achieving high-quality education in the new era [10].

Many provincial-level open universities in China now offer higher vocational education, facilitating the integration of open and vocational education. In 1978, Shanghai Television University Zhabei Branch and Shanghai Xingjian Vocational College, sponsored by the Zhabei District People's Government, implemented a “one team, two brands” model, laying the foundation for this integration [7]. By the end of 2022, around 21 Open universities had adopted this model, offering vocational education and recruiting full-time students [4]. Currently, some open universities are simultaneously offering vocational education and adult education [18].

In other countries besides China, institutions such as the Open University of the United Kingdom and the National Extension College began in 1970 to explore ways for distance education institutions to carry out vocational education. India used the distance open education model to provide vocational education, formulated a draft framework for open school courses, and taught a large number of young people through the National Institute of Open Education. Vocational education courses were provided for adults and adults, with the aim to enable disadvantaged groups to obtain sustainable occupational survival and development capabilities through open education [5]. The intrinsic motivation of individual learning, such as “improving one's social status and self-worth” through learning, also is critical to preparing for a professional career [19]. Through the adult apprenticeship learning model, adult learners are required to spend 30% of their time in school for open education learning and the remaining 70% of their time for offline corporate practice [12].

This research utilized visual analysis methods to explore the research hotspots and trends concerning the relationship between open education and vocational education in China and other countries. Although earlier studies have examined the relationship between open education and vocational education in terms of educational resources, teaching outcomes, learning models, and policy environments, they have not explicitly used visual analysis methods to understand and analyze this relationship, nor have they summarized and revealed new trends and frontier hotspots in the research. This research fills this gap, providing deeper insights and comprehensive analysis. Therefore, exploring the relationship between open education and vocational education has important value both in theory and practice.

CiteSpace 6.2.R2 version was used in this study as a tool for visual research and analysis to conduct keywords visual analysis, timeline analysis of research hotspots, and keywords with the strongest citation

bursts for the retrieved relevant literature. Research results for the relationship between open education and vocational education in China and other countries were compared to shed light on the future development of China's open education and vocational education. The research objectives were: i) to identify the keywords trends in the relationship between open education and vocational education in China and other countries, ii) to identify the timeline of research hotspots in the relationships between open education and vocational education in China and other countries, and iii) to identify the keywords with the strongest citation bursts in the relationships between open education and vocational education in China and other countries.

2. DATA AND METHOD

2.1. Data source (China)

The source for the Chinese literature used in this study is the China National Knowledge Infrastructure (CNKI) database and the subject is set to "open education and vocational education". The time span is from 2012 to 2023. The 528 documents obtained were manually screened, and relevant content published in conferences and newspapers was deleted. A total of 515 valid documents related to the subject terms were retrieved on January 8, 2023 and exported to RefWorks format to facilitate the CiteSpace analysis in Figure 1.

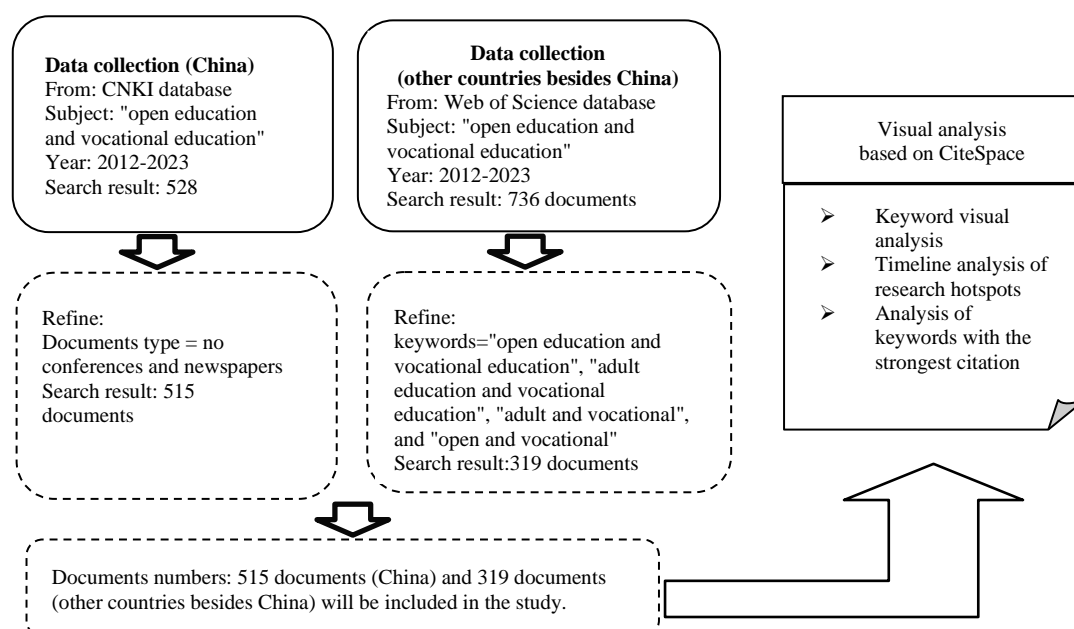


Figure 1. Research design of visual analysis based on CiteSpace on the relationship between open education and vocational education in China and other countries

2.2. Data source (other countries besides China)

The source for foreign literature is the Web of Science database. Note that, in this paper, 'foreign' refers to countries other than China. A total of 736 articles were searched under 'open education and vocational education', but most research falls under 'vocational education' with few results for 'open education'. In order to improve the relevance of the research analysis, the author used the following keywords: 'open education and vocational education', 'adult education and vocational education', 'adult and vocational', and 'open and vocational' for research published from 2012 to 2023, retrieved on April 5, 2023. A total of 329 documents were exported in plain text format for further analysis using CiteSpace in Figure 1.

3. RESULTS AND DISCUSSION

3.1. Keywords visual analysis

3.1.1. Keywords visual analysis (China)

Keywords visual analysis was conducted to explore the relationship between China's open education and vocational education. The visual analysis of keywords lines of 518 CNKI documents yielded 1 time slice, 91 network nodes, and 187 connections, with network density of 0.0457. Figure 2 presents the keywords

visual analysis map. The larger the circle that was used to represent the node, the greater the keywords frequency [20]. Figure 2 shows that open education, vocational education, higher vocational education, open university, distance education, distance open education, integrated development, communication integration, collaborative integration, adult vocational education, practical teaching, and information technology. are the research hotspots over the past ten years that can be used to study the relationship between open education and vocational education.

It was found that in the keyword's visual analysis of the relationship between open education and vocational education in China, open education and vocational education had higher keywords frequencies. Integrated development, as a research hotspot in the relationship between open education and vocational education, showed significantly higher keywords frequency. This indicated that the theme of integrated development is of great importance when exploring the relationship between open education and vocational education.

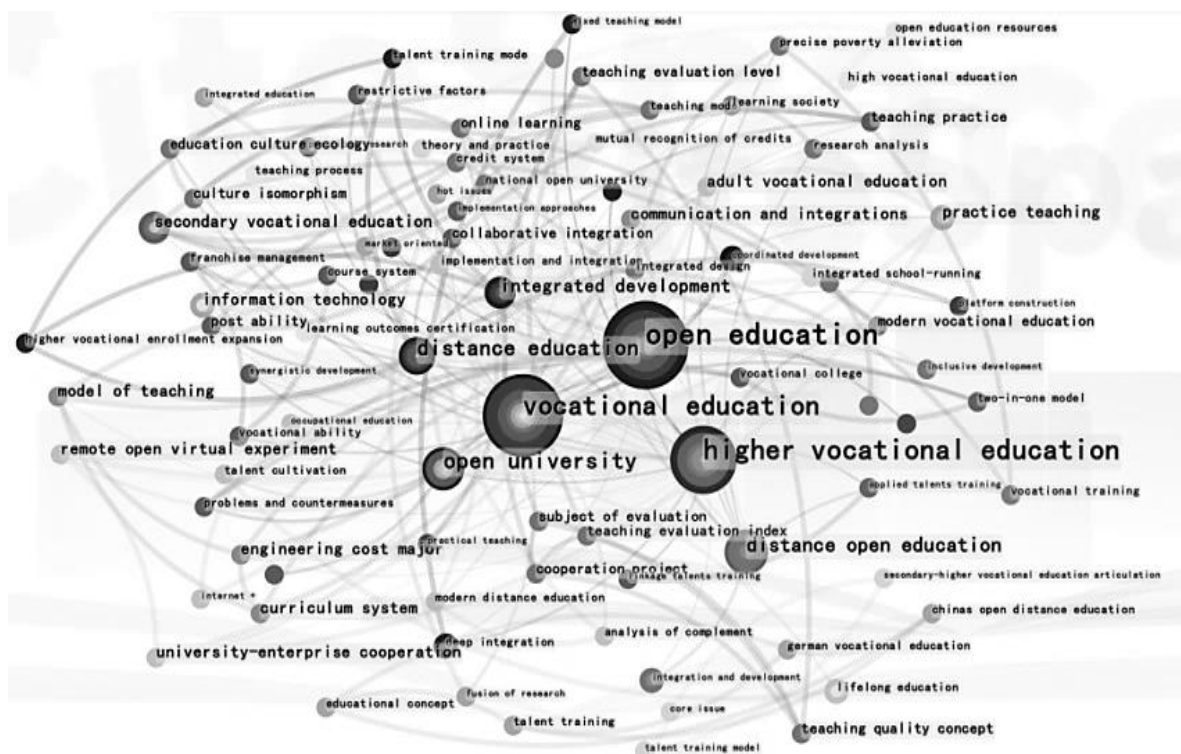


Figure 2. Keywords visual analysis map (China)

3.1.2. Keywords visual analysis (other countries besides China)

Keywords visual analysis also was conducted to explore the relationship between open education and vocational education in other countries besides China. The visual analysis of keywords lines from 328 documents imported from the Web of Science database and CiteSpace yielded 1 time slice, 308 network nodes, and 709 connections, with network density of 0.0163. Figure 3 shows that the keywords with the most frequency are vocational education, adult education, online learning, vocational training, vocational education and training, adult learning, adult learning, higher education employees, and lifelong learning. These fields have been the main focus of foreign research involving the relationship between open education and vocational education over the past ten years. In some foreign countries, due to the differences in the naming forms of education undertaken by respective Open University systems, few related studies focus directly on open education as the main research object.

It was found that in keywords visual analysis of the relationship between open education and vocational education in countries other than China, adult education and vocational education showed higher keywords frequencies. However, there was a noticeable absence of clear research hotspots specifically addressing the relationship between open education and vocational education. In contrast to keywords visual analysis conducted in China, studies in these countries revealed distinctions, with a predominant focus on

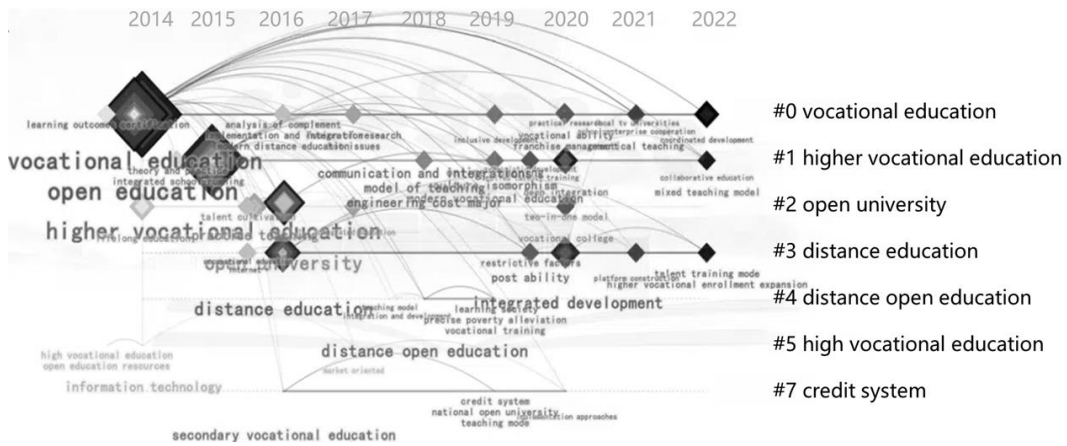


Figure 4. Timeline analysis of research hotspots (China)

3.2.2. Timeline analysis of research hotspots (other countries besides China)

Figure 5 presents a timeline map of research hotspots that pertain to the relationship between open education and vocational education in other countries besides China. Taking the publication time of 2012 to 2023 as the horizontal axis and clustering as the vertical axis, modularity Q is 0.6983, which is greater than 0.03, indicating that the network community structure is strong. The weighted mean silhouette index value is 0.9019, which is greater than 0.5, indicating that the clustering density is high. The modularity Q and weighted mean silhouette index values are higher for other countries than for China.

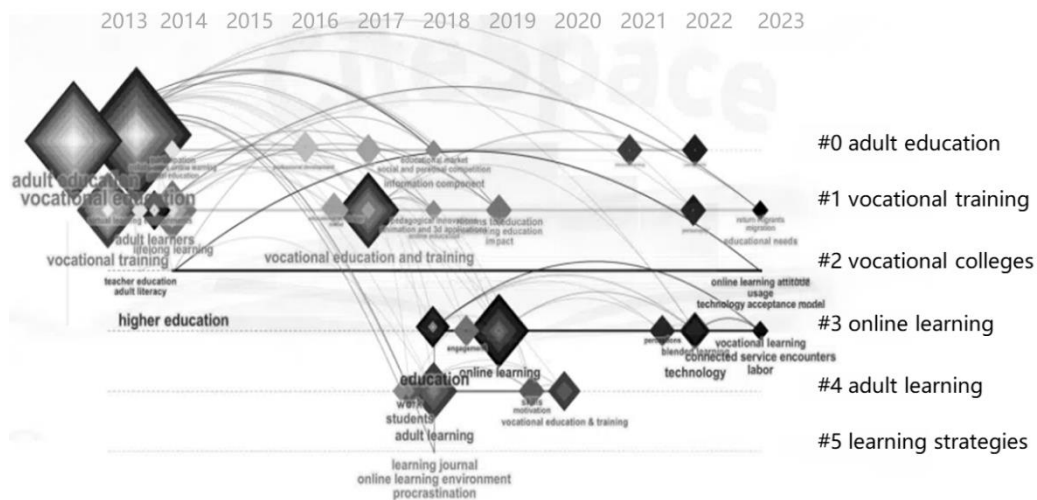


Figure 5. Timeline analysis of research hotspots (other countries besides China)

Figure 5 highlights clusters (#0 to #5) related to adult education, vocational training, and online learning. The vocational training cluster includes keywords such as adult learners, vocational education and training, open educational resources, and personality traits. The adult education cluster includes vocational education, professional development, and lifelong learning. Since 2013, research has increasingly focused on adult vocational education and vocational skills. After 2018, studies on online learning for vocational education participants have grown. Self-regulated learning (SRL) strategies were particularly effective for adult online learners [22], [23]. Motivation was a key success factor in adult learning [24]–[28]. Adult education was crucial for bridging societal gaps [29]. Per and Karolina [12] advocated for flexible and personalized approaches in vocational adult education in Sweden, emphasizing career orientation to improve labor market integration. Duwi *et al.* [11] found that integrating open educational resources and open learning formats in vocational education enhances learners' self-awareness and learning outcomes. E-learning has become increasingly

relevant in continuing vocational education, especially for adults new to digital learning [13], [30]. Vanessa *et al.* [13] suggested that adult learners should pursue continuing and vocational education due to the impact of the COVID-19 pandemic. Understanding characteristics such as motivation, personality, digital literacy, and learning strategies helps tailor online learning modes to adult learners' needs. It was found that the main research hotspots included adult education, vocational training, and online learning, which dominated in terms of keywords frequency and research clustering. Since 2018, there has been a gradual increase in research focusing on online learning for adult learners participating in vocational education.

3.3. Analysis of keywords with the strongest citation bursts

3.3.1 Analysis of keywords with the strongest citation bursts (China)

Keywords with the strongest citation bursts are keywords whose frequency suddenly increases significantly within a certain period of time [31]. These keywords thus indicate the research themes and development trends over a certain period of time. By analyzing the keywords with the strongest citation bursts in research into the relationship between open education and vocational education in China, we can better understand the evolution of the research field.

Figure 6 shows a total of 25 influential keywords with the strongest citation bursts that were obtained using the emergence function in CiteSpace. From 2014 to 2015, the main keywords with the strongest citation bursts are teaching process, mutual recognition of credits, high vocational education, open education resources, and integrated school-running. Since 2018 to the present, research into the relationship between open education and vocational education has gradually emerged, with high-intensity keywords with the strongest citation bursts that include integration and development, integrated development, and coordinated development (strength>0.8). It was found that since 2018, keywords such as integration and development, integrated development, and coordinated development have shown significantly higher Strongest Citation Bursts. Our findings underscore a growing interest among researchers in achieving closer integration and coordination between open education and vocational education.

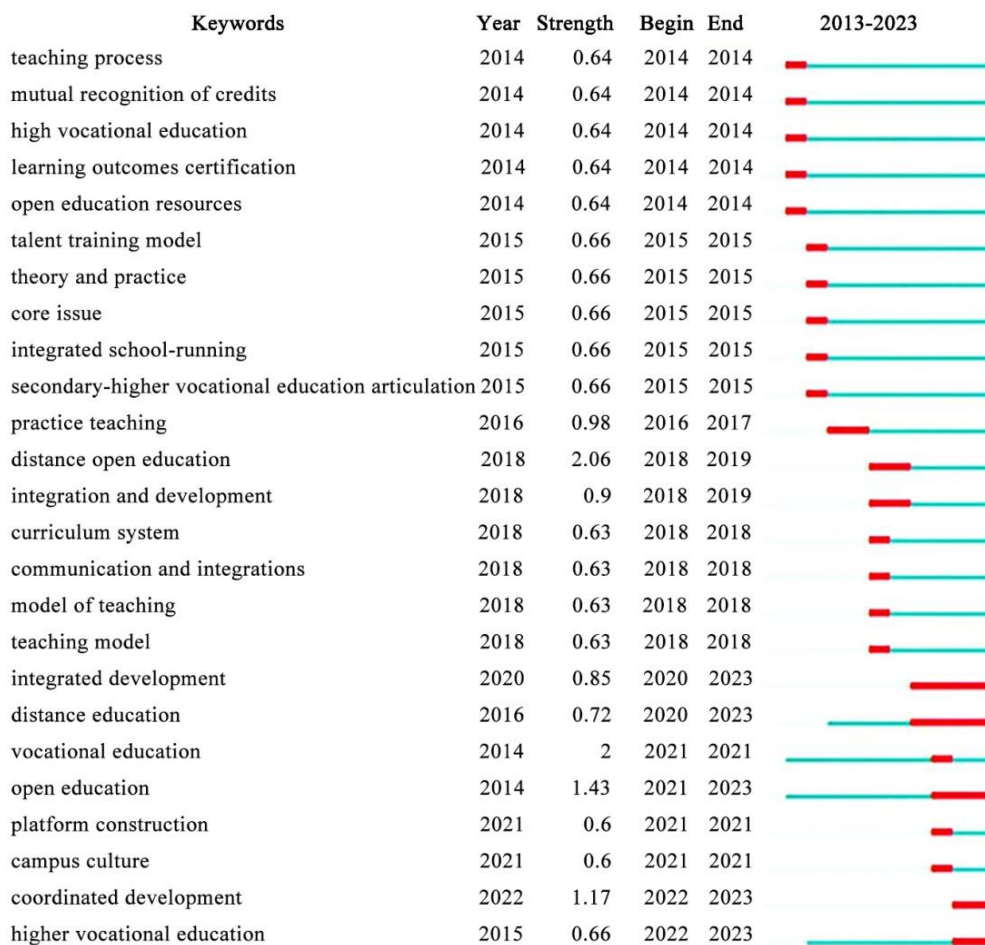


Figure 6. Analysis of keywords with the strongest citation bursts (China)

3.3.2. Analysis of keywords with the strongest citation bursts (other countries besides China)

Figure 7 shows 25 high-frequency keywords with the strongest citation bursts for other countries besides China. The overall intensity is greater than that of domestic keywords with the strongest citation bursts. From 2016 to 2019, the main keywords with the strongest citation bursts are higher vocational education, open education resources, professional development, lifelong learning, continuing education, model, and policy. In 2014 to 2015, higher vocational education and open education resources were the influential keywords with the strongest citation bursts for research into the relationship between open education and vocational education. Between 2020 and 2023, the keywords with the strongest citation bursts that appeared gradually include online learning, vocational education and training, adult learning, blended learning, young adults, technology, and personality. The two keywords with the strongest citation bursts, online learning and vocational education and training show strength values >1.85, and since 2020, these keywords have received significant attention. Keywords with the strongest citation bursts, including online learning, blended learning, young adults, technology, and personality, continue to be prevalent. This finding suggests that, in foreign countries, online learning and technology are hot topics in the field of research into the relationship between open education and vocational education. Blended learning has been a continuous interest to scholars and may be an important topic for follow-up research.

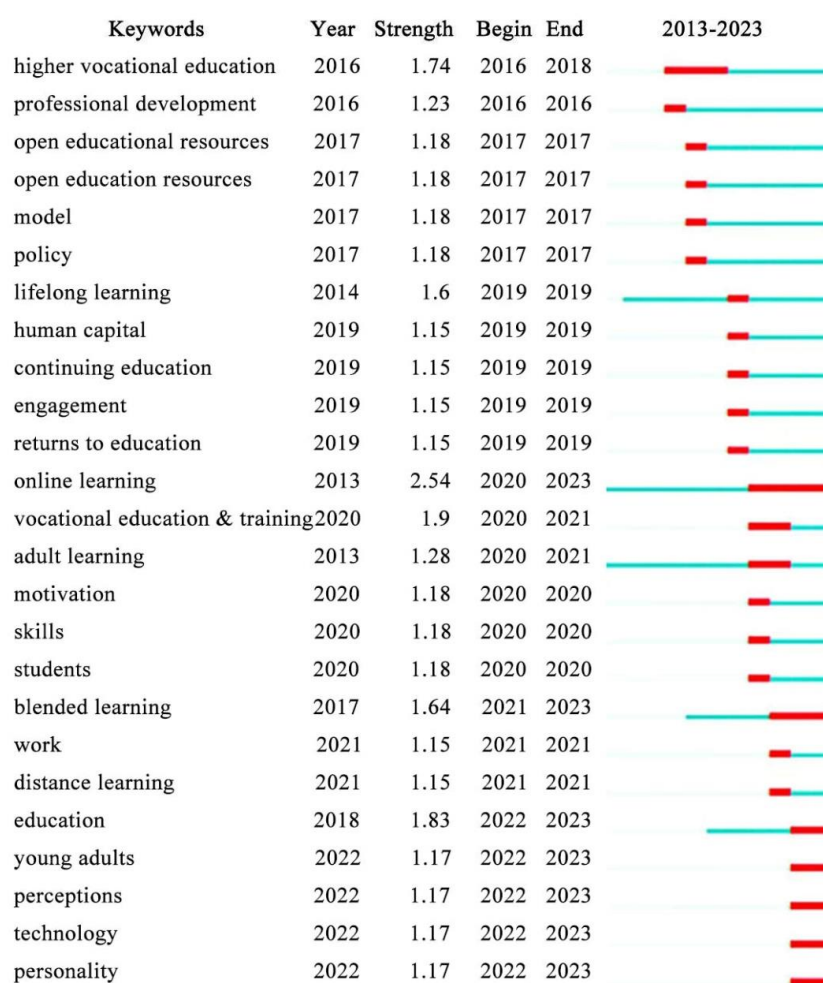


Figure 7. Analysis of keywords with the strongest citation bursts (other countries besides China)

4. CONCLUSION

Based on our analysis of keywords related to research on the relationship between open education and vocational education over the past decade in China, we found that the integrated development of these two domains has been the primary research hotspots. In contrast, international research has mainly focused on improving adult vocational skills and online learning for vocational education learners. This indicates a divergence in research priorities, with China emphasizing integration and other countries focusing on adult skills enhancement

and online learning. Our analysis also reveals that in China, the research on the relationship between open education and vocational education intensified post-2016, whereas other countries saw a shift from enhancing adult vocational skills to exploring online learning since 2018. This trend underscores the evolving nature of research priorities in different regions, reflecting local educational needs and policy directions.

These findings provide a robust theoretical and practical foundation for future research aimed at deepening our understanding through quantitative methodologies and addressing the dynamic and evolving nature of educational integration. This will ultimately guide educational policy and practice to meet the career development needs of adult learners. The study also highlights the resilience of the integration between open education and vocational education, suggesting that future research should explore how big data analytics and statistical models could further quantify their interactions and produce more precise outcomes. Future investigations could benefit from visual analyses of research hotspots and citation bursts, offering insights into optimal integration practices, policy frameworks, industry collaborations, and technological innovations.

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