

Comparison of open education research between China and other countries from knowledge graph perspective

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Abstract. Based on the Chinese Social Science Citation Index (CSSCI) and Social Science Citation Index (SSCI), this paper uses visualization software CiteSpace to draw the knowledge graph, and makes a bibliometric analysis of open education research between China and other countries from 1998 year to 2020 year. Keywords co-occurrence, word frequency distribution and keyword clustering are used to analyze hot topics and research trends. The research finds that research hotspots mainly focus on the current situation, practical achievements, sustainable development of open education resources, the design of open curriculum and analysis of learner characteristics. The paper points out that the current open education research lacks of in-depth research on resource evaluation, and it should be strengthened to sustainable development of open education resources in the future.

Keywords: Open education; visual analysis; CiteSpace; knowledge graph.

1. Introduction

The purpose of open education is to provide lifelong education and services to the whole people. Therefore, it provides diversified learning methods to meet the learning needs of learners and promote educational equity and resource sharing. It has the characteristics of learning anytime and anywhere [1]. In terms of the scope of open education, China is different from abroad. In China, open education refers to higher education services provided by open universities and distance education colleges, while abroad refer to the opening of educational resources and practices [2]. On the research of open education, many scholars have given a series of research results. For example, in view of the concept and practice of open education, some scholars proposed to strengthen the top-level design of the education system, and carry out systematic planning and management of open education, so that it can better serve lifelong learning [3]. they have studied the impact of the use of social networking tools on group cohesion and learner interaction, and explored sustainable open education resources [4].

Open education in foreign countries started earlier than that in China, and some of their experiences are worth learning from. However, China's open education shows some characteristics in the learning mode and learning resources, and cannot copy foreign models. Therefore, it is of great significance to compare and analyze the similarities and differences of open education between China and other countries.

2. Visual comparative analysis

2.1 Data sources

In terms of data sources, we selected CSSCI database and SSCI database to compare China and other countries research on open education. The above databases were selected with full consideration of the representativeness of the study. In China, CSSCI collects high-quality research

papers, which represent high-level research achievements of Chinese scholars. We selected advanced search in the CSSCI database, and the search conditions were set as "keyword=open education; document type=paper; year=1998-2020". A total of 431 relevant literatures were retrieved.

In terms of international research, SSCI database includes international authoritative journals of social sciences, which covers the core achievements of international scientific research. We select the SSCI citation index in the Web of Science core collection, and set the retrieval criteria as: "Topic=" open education * "; Document Types=Articles; Languages=English ", with the time span of" 1900-2020 ", A total of 475 relevant literatures were retrieved.

2.2 Keywords co-occurrence graph analysis

The keywords are the high generalization of the literature research topic and the core of the research content. The frequency of keywords reflects the importance of the research field to the relevant topic, and the change of keyword frequency over time reflects the change of research hotspots. By analyzing and comparing the keywords of open education research between China and other countries, we can more intuitively grasp the research hotspots and research trends, and understand the similarities and differences of research content between China and other countries. In order to visualize the differences, CiteSpace software was used to analyze China's CSSCI and foreign SSCI data. The set parameter is "Node Types=Keyword", the standard is "g-index, threshold value k=25", the clipping algorithm is "Pathfinder; Pruning sliced networks; Pruning the merged network", the Chinese data time range is 1998-2020, the English data year is 2002-2020, and the time slice is set to 1 year. Because 1998 and 2002 were the initial years for Chinese and English literature collection. The keyword co-occurrence graph was shown as in Fig. 1.

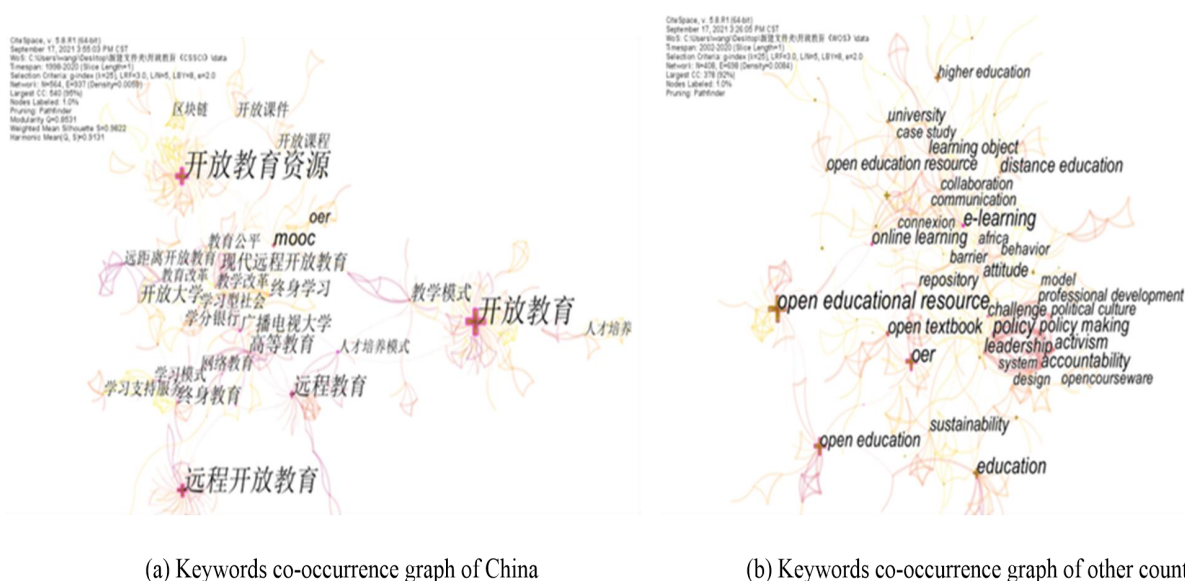


Fig. 1 Keywords co-occurrence graph of open education research in China and other countries

In the keyword co-occurrence graph, the occurrence frequency of keywords is reflected by the size of keyword nodes. The higher the frequency of keyword occurrence, the larger the node is, which means the higher the number of researchers publishing on this topic and the higher the research heat of this topic. Specifically, the co-occurrence map of keywords in China's open education research has 564 nodes, 937 lines, and the network density is 0.0059. The co-occurrence map of keywords in foreign open education research has 408 nodes, 698 lines, and the network density is 0.0084. Under the same threshold standard, the number of keywords in China's co-occurrence network is higher than that in foreign countries, and there are more keyword nodes

and connections. The network density of foreign studies is higher than that of China, and their research is more concentrated.

The frequency distribution of keywords of China and other countries is shown in Table 1.

Table 1 The frequency distribution of keywords of China and other countries

China				Foreign countries			
No	Frequency	Centrality	keyword	No	Frequency	Centrality	keyword
1	200	0.72	Open education	1	170	0.23	Education resource
2	112	0.69	Education resources	2	85	0.21	OER
3	84	0.48	Distance education	3	78	0.2	Open education
4	41	0.35	Teaching quality	4	43	0.01	MOOC
5	21	0.36	MOOC	5	41	0.13	Higher education
6	13	0.19	Teaching model	6	41	0.19	Education
7	13	0.19	Open University	7	31	0.24	Open textbook
8	10	0.03	Teaching design	8	22	0.03	Technology
9	9	0.12	Open Courses	9	21	0.03	Adoption
10	9	0.18	Higher Education	10	19	0.07	Student

It can be seen from Table 1 that China's research focuses on the development and utilization of open education resources and practice. The keywords include open education, education resources, distance education, teaching quality, teaching model, teaching design, open course, etc. However, the foreign research mainly has the following characteristics. First, it generally focuses on the development of open education and the use of open education resources. The keywords include open education resource, OER, open education, open textbooks and technology etc. Second, it pays attention to the curriculum content and design of distance education. The keywords include higher education, student, adoption etc.

By comparing the key words, we can find that there are both similarities and differences in research topics between China and other countries. The similarities are reflected in the overall research, which is based on the current situation of open education and emphasizes the resources and practice of open education. The purpose of teaching is the same, which is to eliminate educational barriers, provide educational resources and promote educational equity. In addition, they are concerned about the improvement of teaching level and the improvement of curriculum quality. The main differences are that the main bearers of open education are different. The bearers of open education in China are radio and television university or open university, and the relevant literature studies are mostly from the above university. Foreign open education is mainly undertaken by institutions of higher learning and national open universities. In addition, there are different concerns about learners' characteristics. Chinese research focuses on learners' motivation, while foreign research focuses on learners' perception, considering learners' participation, learning experience and feedback.

3. Keyword cluster graph analysis

In order to further explore the theme distribution of open education research in China and other countries, the Log-Likelihood Ratio (LLR) is selected to cluster the keyword co-occurrence graph. The expression of LLR is as follows [5].

$$LLR(b_i) = \ln\left(\frac{P(b_i = 1 | r)}{P(b_i = 0 | r)}\right) \quad (1)$$

In (1), $P(b_i=1|r)$ is the probability of correctly judging the value of r as 1, $P(b_i=0|r)$ is the probability of correctly judging the value of r as 0.

The keyword clustering graph of open education at China is shown as in Fig. 2.

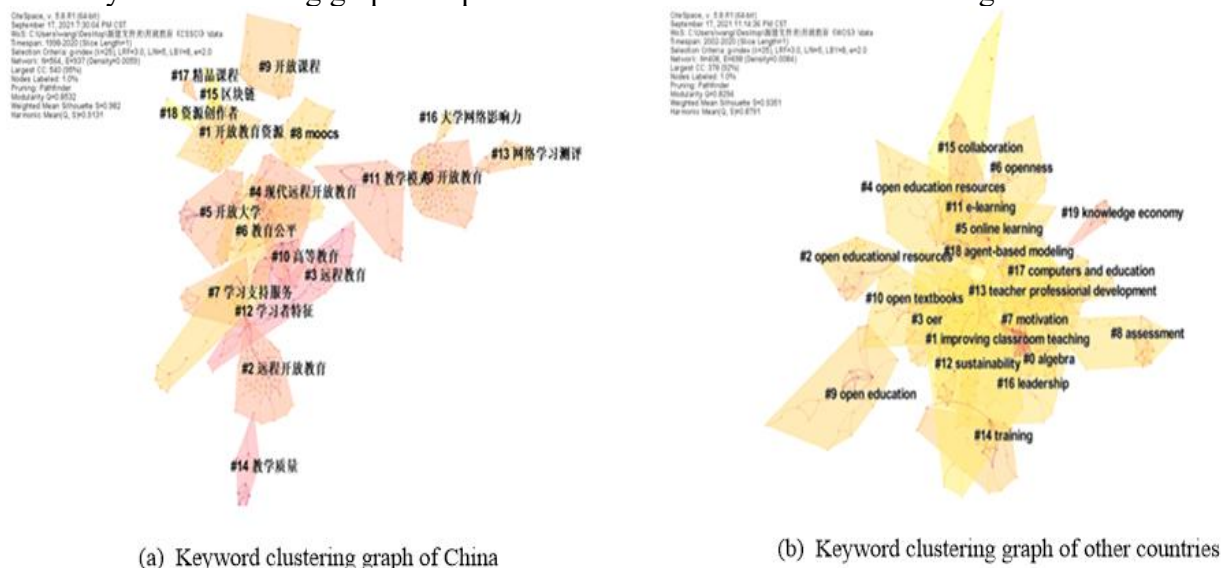


Fig. 2 Keywords clustering graph of open education in China and other countries

It can be seen from Fig. 2 that open education of China research mainly involves the following contents. The first is the concept of open education, open educational institutions and open educational resources at the macro level. With the emergence and continuous development of the concept of open education, online learning and distance education institutions have been established and gradually improved. The educational management system and operation mechanism of open education institutions have always been the focus of researchers [6]. Secondly, after the popularization of the concept of open education, in order to improve the quality of open courses and provide high-quality learning support services, a large number of studies have emerged around the teaching model [7]. The third type of research topics is curriculum-related or learner-related, which including specific instructional design, course content selection, learner characteristics, learning motivation and formative assessment [8].

However, foreign open education studies are different, their research mainly involves the following contents. The first is the macro level, which includes the development of open education, open education practice and open education resources. For example, some literatures review the connotation of open knowledge in universities and higher education institutions [9]. Scholars discussed different groups of university educators and teaching strategies, and paid attention to the application of OEP teaching concept [10]. Second, some literatures have studied the learning mode, online learning platform, and open textbooks and classroom content. For example, based on Massive Open Online Courses (MOOC), the literature studies lifelong learning, personal knowledge management and online learning tools from the technical level, and puts forward relevant suggestions to MOOC. Third, the research focuses on teacher professional development and learner characteristics, which emphasize the training of teachers and the observation and analysis of learner behavior and motivation [11].

4. Conclusion

From the perspective of research hotspots, it mainly focuses on the current situation of open education, the practical results of open education, the development and sustainable development of open education resources, the design and quality improvement of open courses, and the analysis of learner characteristics. In addition, China's research pays more attention to the reform of talent training mode and teaching mode, while foreign research pays more attention to the educational benefits of open textbooks and learners' participation and learning perception in distance education. From the perspective of research trends, the research topics in China have the characteristics of stages. The initial research focus is the theoretical model of open education and distance learning system, and then gradually turns to course quality and MOOC. The recent research focus is related to university culture and open university. Foreign research is different from that in China, and there is no obvious stage in their research. The scholars' research topics include distance education, open educational resources, and the application of new technologies in open education in recent years.

At present, research on open education resources focuses on quality improvement and sustainable development, but few studies focus on the evaluation and differentiation mechanism of resources. In addition, China's research on open universities has not yet formed a system, and the application of new technologies in the field of open education has just begun. Relevant research in the future needs to be deepened to help the sustainable development of open education resources and practice.

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