What is The Hot Topic of Graduate Education Research?

—A Literature Analysis Based on SSCI Articles in 2015-2019

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Abstract—The graduate education plays a vital role in economic development and national competitiveness, so it has been a hot topic for international academic researchers and policy makers, and the discussion will continue for a long time. This paper had taken a literature analysis of the graduate education relevant articles in SSCI database by "Bibliometric Mapping" methods, keywords co-terms analysis and cluster analysis which to sum up the research hotspots and achievements of scholars all over the world. The result of the keywords co-terms analysis shows that the theme of graduate education research has been expanding rapidly in the past five years, and reveals a continuous refinement of the research trend. The result of the keyword cluster analysis shows that the hot topics of graduate education research can be divided into four categories, including the management, the public health, the process and outcomes and the subjective perception.

Keywords—Graduate Education Research; Keywords Co-Terms Analysis; Keywords Cluster Analysis; SSCI Articles

I. INTRODUCTION

With the economic upgrading and structural adjustment in China, the "Connotative Development" of higher Education is the inevitable path under the "National Strategy Driven Innovation", and the public's expectations of graduate education are getting higher and higher. The high-level human resource cultivated by graduate education plays a vital role in social and economic development, especially in promoting core technology research, also in business integration and innovation. It can be inferred that graduate education will still be a hot topic in international academic circles and policy makers for a long time in the future.

Since the 1990s, the scale of graduate education in China has been developing rapidly, relevant research literature and reports have also emerged one after another. Scholars such as Zhao (2012) [1] and Xu (2016) [2] have sorted out the research results after the enrollment expansion of graduate education student, also made comments on the existing research by using the traditional literature analysis method. But the problem is that, this kind of summary research will inevitably be influenced by the author's own reading quantity, subjective thought and knowledge blind area and so on. Nowadays, "Bibliometric Mapping" methods which root in mathematical

statistics and computer software tools (Heersmink, 2011) [3], is widely used in the fields of information science and enterprise management, it also has been used to explore the frontier of the research field of education.

Therefore, this paper takes a literature analysis of graduate education research though software CiteSpace (5.3.R3.8.5.2018 version), and the expected conclusion might help to make a scientific summary of the development status in the recent years, as well as explore the changing trend of international graduate education research. Chinese scholars have used CiteSpace to carry out research on private universities, ordinary colleges and some other topics, the representative research results are the papers published by Qu (2015) [4] and Cheng (2017) [5], etc.

II. RESEARCH METHOD AND DATA SOURCES

According to the literature distribution "Law of Bradford", most of the important literature in a discipline are usually published in a few core journals. Therefore, the first task of this study is to find a suitable literature database, in order to ensure that the sample can reflect the development frontier in the field of graduate education research. As a result, the SSCI database which is considered to have high quality, standardization and world-wide influence, was taken as the sample source.

After entering the advanced retrieval of SSCI database, taking "Topic= (graduate education) OR (postgraduate education)" as the retrieval condition, the type of extracted literature is "Article", and the time span is nearly five years. A total of 5632 articles were searched (retrieval date is July 19, 2019). After data de-reprocessing, a total of 5313 related literatures will be retained, and the information of these literatures will be used as the basic data set of this study.

For helping us to understand the relationship between the SSCI graduate education literature, and to distinguish the topics directions in the past five years, this study takes the methods of keyword co-terms and cluster analysis, which are important text content analysis techniques, to explore the form of words or noun phrases in the articles.

In the CiteSpace software, the time span of the study object is from 2015 to 2019, so we chose to set 1 year as a time partition (Years Per Slice=1) which divided the data into 5 time

slices. Also, the keywords set in the original SSCI articles can be analyzed directly, so we chose to set the "Node Type" as the "Keyword", the "Selection Criteria" was set to select top 50 levels of occurred items from each slice. Since the quantity of sample data, which is about 5,000 records, cannot reach the magnitude of ten thousand, the original overall network structure can be retained when the knowledge graph is not complex (Chen, 2003) [6]. So this study did not do any additional diameter cutting and the software setting in not "pruning".

III. LITERATURE ANALYSIS AND DISCUSSION

A. Co-Terms Analysis of Keywords

First of all, this study takes keyword co-terms analysis method, which is to study the co-occurrence frequency of the same keyword appears in different literature. The initial knowledge graph formed by the operation of CiteSpace software is greatly affected by the retrieval setting, for example, the keyword "Education" has the highest co-occurrence frequency, which can only ensure the accuracy of the retrieval range but unable to reflect the specific content and research direction of the literature. Therefore, it is necessary to manually exclude the node of keyword "Education" and then carry out keyword co-terms analysis again. In this paper, the label display threshold is set to 100 to form the map shown in figure 1.
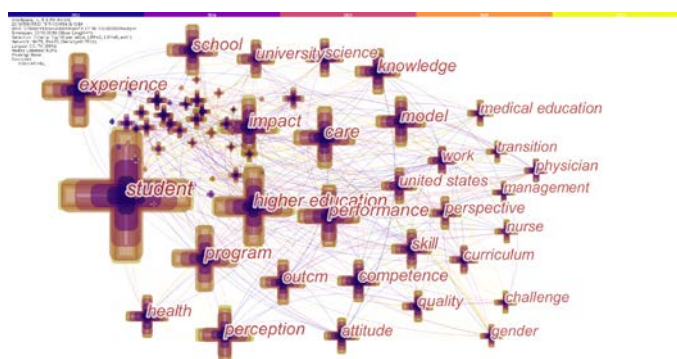

Fig. 1. The Knowledge Graph of Keywords Co-Terms Analysis.

As showed in *Fig. 1*, there are 75 nodes in the knowledge graph network, the dots in which represent keywords, and the larger dots means the corresponding keywords have higher occurrence frequency. The network density is 0.1514 and there

are 420 connections lines in the graph, which represent the co-occurrence relationship between keywords and the corresponding keywords are closely connected.

In addition to the keyword co-occurrence frequency, the centrality of network nodes also has a certain research significance. The nodes with higher centrality are in the shortest way to connect with other nodes, which indicating that some keywords have more co-occurrence relationships in different articles than other keywords. Therefore, this study set the co-terms frequency greater than 100 and the centrality greater than 0.08 as the standard to screen important keywords, and the collated results is shown in Table 1. Which showed that the keywords such as "student", "performance", "higher education", "experience", "impact" and "work" are relatively important in the whole knowledge network of research literature related to graduate education in the past 5 years.

TABLE I. SUMMARY OF KEYWORDS CO-TERMS ANALYSIS

Number	Keywords	Co-Terms Frequency	Centrality
1	student	558	0.23
2	performance	267	0.19
3	higher education	337	0.15
4	experience	304	0.14
5	impact	259	0.09
6	work	125	0.08

B. Cluster Analysis of Research Topics

According to the degree of proximity between nodes, the clustering function of CiteSpace software will cluster the nodes with obvious co-terms relationship into different categories, each of which can be regarded as a basic topic composed of a group of common keywords.

On the basis of the previous processing, this study still chooses "keyword" as the clustering label to better reflect the characteristics of the SSCI literature related to graduate education. By drawing lessons from the developer of CiteSpace software Chen (2010) [7], this study takes 3 algorithms including the LSI(Latent Semantic Index), the LLR (Log-Likelihood Ratio) and the MI (Mutual Information) to extract terms and identify each cluster name(Li, 2017) [8].Figure 2 is the time-line chart of keyword clustering which is formed, and it is helpful to divide the time interval of all kinds of research, and to distinguish the differences between the main research topics involved in different stages.
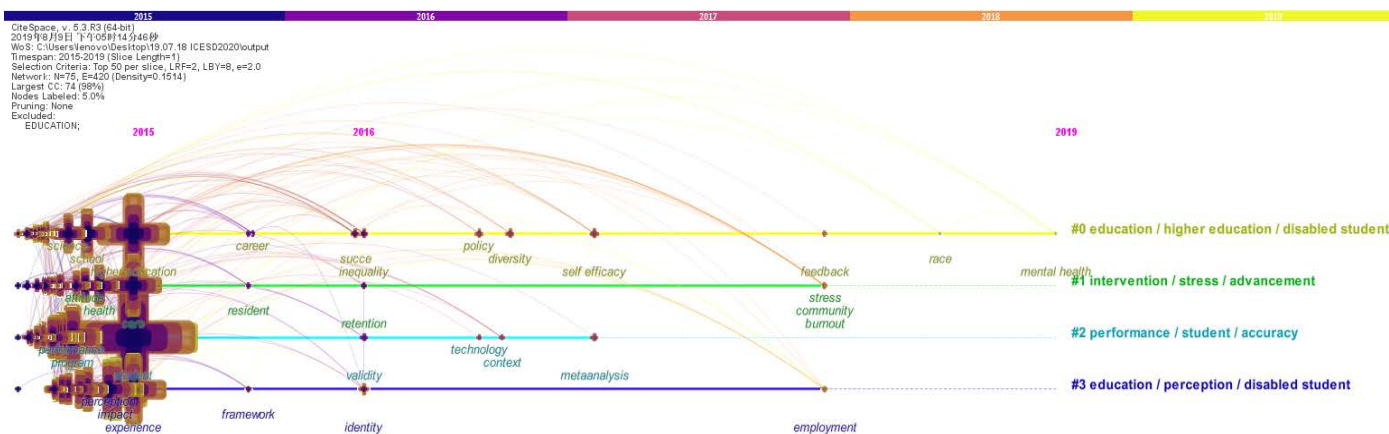
Fig. 2. The Time-Line Chart of Keywords Clustering.

It can be seen from *Fig. 2* that in the past five years, the SSCI literature related to graduate education can be divided into four clusters which is labeled with the symbol #, and further analysis can be sorted out from these four categories of research topics.

- The 1st keywords cluster of research topic (labeled as "# 0", including 24 nodes) shows that a large number of papers have studied the management of graduate education, which has always been a hotspot during the past five years. Some of the literature takes the subject of policy-making as the main research object, whose common keywords are such as "united states" (co-term frequency=162), "school" (co-term frequency=214), "college" (co-term frequency=90), etc. Part of the research articles focus on the inner management system and the key factors, common keywords are such as "gender" (co-term frequency=103), "faculty," (co-term frequency=90), "labor market" (co-term frequency=74), etc. There is also some literature constructing the graduate education quality evaluation system, and its common keywords are such as "achievement" (co-term frequency=98), "return" (co-term frequency= 63), "self-efficacy" (co-term frequency=49), etc.

- The 2nd keywords cluster (labeled as "# 1", including 20 nodes) also covers many SSCI articles of graduate education, this articles aim to promote public health. There is a large number of literature studies related to the teaching content and training mode of professional degrees in medicine, pharmacy and nursing, which are regarded as the main way to train medical workers in the United States and other north American countries and regions, common keywords are such as "care" (co-term frequency= 264), "physician" (co-term frequency= 107), "medical student" (co-term frequency= 78), etc. Along with the increasing difficulty and competitive pressure of employment, the psychological state and corresponding intervention measures of graduate education students have gradually entered the research scope, common keywords are such as "health" (co-term frequency=

191), "attitude" (co-term frequency= 159), "intervention" (co-term frequency= 88), etc.

- The 3rd keywords cluster (labeled as "# 2", including 17 nodes) are mainly focus on the process and outcomes of graduate education. Some articles are based on perspective of educated object, these kind of research topic studies the student curriculum planning and the communication between teachers and students, common keywords are such as "student" (co-term frequency=558), "program" (co-term frequency=272), "curriculum" (co-term frequency= 124), etc. Also, there are many articles discuss the achievements like knowledge transfer and competitiveness improvement of graduate education outcome, common keywords are such as "performance" (co-term frequency=267), "knowledge" (co-term frequency= 196), "competence" (co-term frequency=186), etc.

- The 4th keywords cluster of research topic (labeled as "# 3", including 13 nodes) contains relatively few nodes. This kind of research articles discuss the subjective perception of graduate education in all kinds of social groups, the concept definitions of graduate-education in different periods, and compares the similarities and differences, common keywords are such as "experience" (co-term frequency= 304), "impact" (co-term frequency= 259), "perception" (co-term frequency= 243), etc.

IV. CONCLUSIONS

Based on the analysis of the SSCI literature related to graduate education from 2015 to 2019, the following conclusions can be drawn:

- On the one hand, the results of keywords co-terms analysis show that the theme of graduate education research has been expanding rapidly in the past five years, showing a continuous refinement of the research trend.

Many new hotspots have emerged and the scope of the research object is getting wider and wider, which reflected the

ability of researchers to keep pace with the times, to diversify around the most urgent needs of society, or to tap new issues related to graduate education with the times. However, too much hotspots may also weaken the independence and sustainability of the research results, if the research interest and attention of scholars are scattered too much. Therefore, future research attentions also should be paid to the theoretical depth, and research conclusions should be more fully applied.

- On the other hand, the results of keyword cluster analysis show that the hot topics of graduate education research can be divided into four categories, including the management, the public health, the process and outcomes and the subjective perception.

For a long time, the research literature on graduate education in China tend to adopt the research idea of "experience-reference", focusing on the standard developed countries through the analysis of foreign cases in the practice and experience to put forward a series of policy recommendations. However, the key "human" factors of graduate education have great characteristics of the times, region and culture, it is difficult to simply copy the experience of others and imitate the practices of others to ensure that it plays a guiding role in the practice of our country. Therefore, the future research should deepen the understanding of the goal of graduate education-training high-level talents, and enhance the theoretical applicability, structure and interpretation of the research conclusions.

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