The Rise of MOOCs: The Literature Review of Research Progress and Hot Spots of MOOCs Education in Mainland China

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ABSTRACT
With the development of information technology, knowledge acquisition is not just limited to the traditional classroom. As a rising educational method, "Massive Open Online Courses (MOOCs)" has attracted extensive attention by educational circles. Taking 445 pieces of journal articles about educational study of MOOCs included in China Academic Journal Network Publishing database (CAJD) from 2013 to 2016 as samples, this study adopts bibliometric analysis method and visual knowledge network analysis tool CiteSpace to carry out in-depth exploration of aspects such as development status, developing trend, and hot subjects of educational study of MOOCs. The study discovers that the quantity of the articles about educational study of MOOCs presents a rising trend as a whole in the past four years. Highly cited articles mainly concentrate on pedagogy. A small part of articles focus on fields like library and information and computer science. The evolution course of study has experienced the process of "introduction-development-deepening" and its hot subjects include reflection on teaching practice, modern teaching means and existing problems and reform path. On this basis, the shortcomings of the existing researches are pointed out.

Keywords: MOOCs in education, progress and hot spot, bibliometric analysis, mapping knowledge

INTRODUCTION

With the development of information technology, knowledge acquisition is not just limited to the traditional classroom. As an educational method, Massive Open Online Courses (MOOCs) have made the educational process break through the traditional restrictions of time and space, and extend the way to acquire knowledge. In the winter of 2016, haze happened frequently in north, central and other regions of mainland China, leading to serious environmental pollution. Air pollution emergency plan was started many times in several places and primary and secondary schools therefore suspended classes. In order to ensure the smooth progress in course teaching, many teachers adopted online teaching, which aroused wide public concern of the society. Hence, "MOOCs" has become one of the most talked-about topics in the education circle. Along with the advent of the era of knowledge economy, MOOCs education will change people's traditional learning idea and provide a new way for people to acquire knowledge more conveniently (Deng, 2013).

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State of the literature

- The existing research shows that Massive Open Online Courses (MOOCs) education may be a "double-edged sword". Although MOOCs are showing a rapid development trend and are supported by the public because of its low threshold and lack of time and space constraints, it also faces multiple doubts at the same time such as high loss of raw resources, high resource support requirements, and the system is not perfect, and so on.
- In the existing research, some scholars maintain the neutral position of MOOCs education. Their research focus on the teaching practice, education mode, means of implementation, and other aspects of MOOCs education. While approving the new educational model, it also points out that there are some problems and threats in reality. For example, the challenges in the development of MOOCs education include students' integrity, curriculum quality, performance evaluation, innovation, and many other issues.

Contribution of this paper to the literature

- The rise of MOOCs education in mainland China is not very long. It still lacks a comprehensive comb of existing research. In this paper, we use the method of bibliometrics and visual network analysis tool CiteSpace to analyze the literature about MOOCs education published in mainland China for nearly four years, to make clear the research status, research hotspot, and evolution trend.
- This paper does not directly point out the advantages and shortcomings of MOOCs education as other scholars, but rather analyzes the research status and the shortcomings of MOOC study, as well as pointing out the development trend of future MOOCs education research from the perspective of academic research.

"MOOCs" refers to Massive Open Online Courses. It originated in the top universities of the United States and is a kind of online course development mode gradually popular in recent years in mainland China. It has such characteristics as great scale, open to the public for free, big data support and so on. Since its first introduction to China in 2013, MOOCs education has gained rapid development, and is actively changing people's way of accepting education. According to relevant data, since "Chinese University MOOCs" was carried out in 2014, it has gradually become the first platform of MOOCs after several years of development. Now it cooperates with more than 90 colleges and universities and a total of 542 MOOCs were open to the whole nation in 2016 with more than 20 million people selecting the courses. Currently, the learning concept of MOOCs have been incorporated in the mind of the general public imperceptibly and the learning mode of MOOCs have been gradually spread from universities to primary and secondary schools in Shanghai, Guangzhou and other developed areas in mainland China.

Existing research shows that MOOCs education may be the "double-edged sword". Although MOOCs have been supported and favored by all sectors of society due to their low threshold and being not limited by the space and time and now it shows a trend of rapid development, it is still questioned by most academic circles because of its own high loss of students, high resource support requirements and imperfect system. Some scholars stay neutral for MOOCs education. They conduct studies on MOOCs education respectively from teaching practice, educational mode, implementation means, etc. In recognition of MOOCs education mode, they also point out that it still has problems and threats in reality. For example, some scholars put forward that MOOCs have not been endorsed by many educators at present and are disruptive, resulting in potential threats to the higher education mode (Haggard et al., 2014). Some scholars summed up the challenges in the development of MOOCs, including 10 problems such as students' integrity, curriculum quality, performance evaluation and innovativeness (Gao, 2015).

In short, MOOC has been the subject of heated discussion in the academic world since it was introduced into mainland China. Scholars have revealed the practice development status from different theoretical perspectives. However, the following issues should be handled clearly in a timely manner: What is the current research status of MOOCs education? How is its evolution process? What research hotspots does it include? When will MOOCs education develop into full swing? In view of this, taking 445 pieces of core journal articles about educational study of MOOCs included in CAJD database in mainland China from 2013 to 2016 as samples, this study adopts bibliometric analysis method to carry out in-depth exploration of aspects such as quantity of articles

about the MOOCs education research and highly cited literature information. On this basis, it also takes advantage of Citespace5.1 to draw co-word network atlas based on key words and depict the development status and hot subjects of educational study of MOOCs. Finally, based on the analysis and arrangement of the existing research literature, this paper points out deficiencies of the research on MOOCs education and clearly presents future research directions. This study aims at providing important reference for the current and future MOOCs education from the perspective of theoretical research development in depth and breadth, and practice advancement.

RESEARCH DESIGN

This paper takes the journal literature of MOOCs education research as the research object, and data come from the journal paper library of the mainland China Academic Journal Network Publishing Database (CAJD). The document retrieval was conducted on January 14, 2017 with "MOOCs" and "education" as the themes and logical relationship was selected to be "contain". The retrieval years were from 2013 to 2016. In order to guarantee the quality of research papers, "Chinese Social Science Citation Index (CSSCI)" was chosen for the journal source category. After invalid documents such as meetings and circulars were deleted, 445 valid pieces of papers were eventually obtained, including 649 authors and 1234 quotations with pedagogy, computer science and other research fields involved. These journal articles are the main knowledge results of the present MOOCs education research. They can reflect the present situation of the research and are the foundation of the hotspot mining.

In this paper, the research method is Bibliometric Analysis, which uses qualitative research methods such as statistics, regards the literature system and bibliometric characteristic as the research objects, and explores knowledge structure, characteristics and laws in some field of study by analyzing the distribution features, quantitative relation and evolution rules of the research literature. Specifically, this paper makes statistical summary of the quantity of research papers, highly cited documents, and then describes the research status and adopts co-word analysis based on keywords for the evolutionary process analysis and hot topic mining. Co-word analysis, as one of the analysis methods of bibliometrics, explores the evolution trend and hot topics in the field of study by counting the frequency of two keywords of literature in the same stage and according to the relations of common key words after clustering integration. To show the research status clearly and artistically and to achieve the visualization effect, this paper adopts the visual knowledge atlas analysis instrument CiteSpace5.1, which has the function of co-word analysis based on keywords and can draw clustering atlas and time zone atlas to explore the research status and hot spots in some field of study.

RESEARCH STATUS AND ANALYSIS OF EVOLUTIONAL CHARACTERISTICS

Figure 1 depicts the annual quantity of papers published and the overall trend of mainland China's MOOCs education research since 2013. In general, the quantity of MOOCs education research literature presents a fast growth tendency. Since MOOCs formally entered mainland China in 2013, a few scholars have begun to pay close attention to MOOCs education. Thus, the number of related research increased dramatically in 2014 and 2015, and rose to 160 articles in 2015 from 5 in 2013, showing scholars strong research interest in MOOCs education. Although research publications of MOOCs education fell slightly in 2016, the quantity still remains high as a whole. With the gradually rising cognition and acceptance of the current educational world and the social public for MOOCs education, education research literature of MOOCs also presents the trend of "developing from nothing" in number, which further reflects the academic circle's earnest attention to the hot spot phenomenon in educational practice. In accordance with the forecast of CAJD database, research articles of MOOCs education will be up to about 250 in 2017. The quantity of related research literature continues to present a trend of rapid growth, which is also a positive response of the academic world to the rapid popularization of the current MOOCs educational practice. In addition, in order to compare the coupling relationship of "MOOCs education research" and "MOOCs research", this study specially counts the quantity of core periodical publications with "MOOCs" as the theme according to the same literature retrieval method. Thus, it can be further seen that two research topics completely overlapped in 2013, but papers of MOOCs education research began to be fewer than those of MOOCs research since 2014. In 2015 and 2016, the gap of article quantities grew and showed the consistently changing characteristic, namely, tending to be gentle for the quantities of articles, which indicates that "MOOCs education research" is an
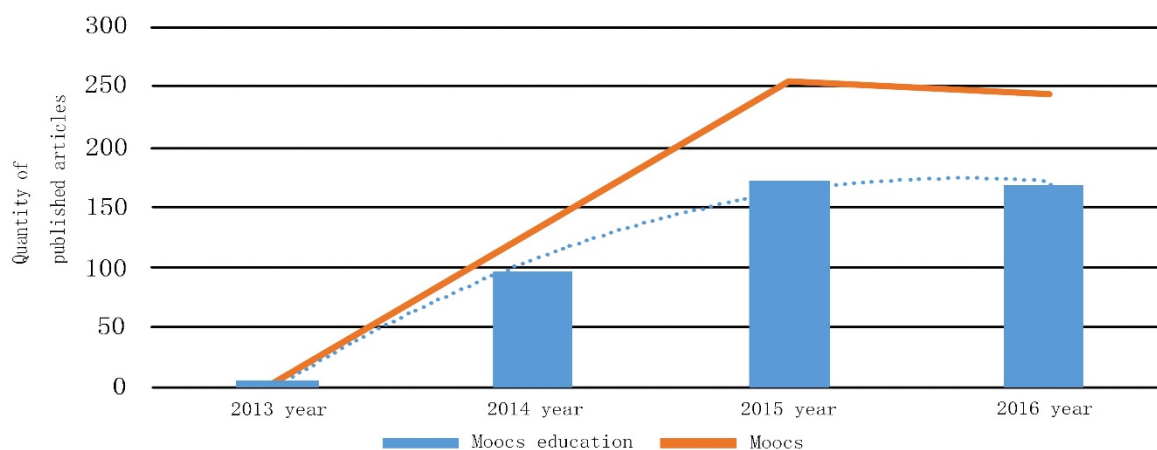
Figure 1. Quantities of Articles about MOOCs Research and MOOCs Education Research in mainland China (2013-2016)

important part of "MOOCs research" and the research topic of MOOCs education is the mainstream research direction of the MOOCs research.

Seen from the bibliometrics, research literature cited most frequently in some field of study is usually the concentrated reflection of research hotspots in this field. **Table 1** shows 15 papers with top frequency of citation among MOOCs education research papers in mainland China since 2013.

From the year distribution, highly cited literature of MOOCs education is mainly concentrated in 2014 when MOOCs education was just introduced into mainland China and many scholars conducted introductory or exploratory research on it or made some experience summary and refection based on foreign practical experience, showing scholars' attention and response to realistic practice. In terms of periodical distribution, due to low quality and influence of periodicals, only about half of the periodicals are included by CSSCI and the impact factor of most of periodicals is lower than 1.00, which can partly reflect the low quality of the current MOOCs education research papers, and there is greater room for improvement. In addition, highly cited articles of MOOCs education research are mainly concentrated in pedagogy field and also involve library information, computer science and other fields. From the research content, highly cited literature mainly introduce the basic concepts and practice situation of MOOCs education from the experience reference and practical reflection, and illustrate scholars' observation and reflection of subject contents related to MOOCs education, such as Zhang (2014), Qin (2014), Wu (2014), etc. However, among the research literature, all authors adopt the normative research method except Jiang et al. (2015). There is scarce empirical research and there is lack of contribution in the construction of a theoretical system for the research content.

Taking advantage of the Time Zone provided by Citesapce5.1, this paper describes the evolutional situations of high-frequency keywords in each year. The correlation between high-frequency keywords can reflect the evolution process of MOOCs education research and the results are shown in **Figure 2**. Since 2013, hot frontier information of MOOCs education research in mainland China includes more than 20 keywords, such as Mooc, information technology, learning process, online education, flipped classroom, teaching reform, teaching mode, and so on.

Table 1. Highly Cited Literature (Top 15) of MOOCs Education Research

Ranking	Author	Title	Journal	Year	Frequency of Being Cited
1	Zhang, Z. Y.	The MOOCs and Chinese Higher Education	Journal of Hebei Normal University (Educational Science Edition)	2014	245
2	Qin, H.	Rising Tide of MOOCs and Roles of Libraries	Journal of Library Science in China	2014	150
3	Wu ,W. W.	Sober Reflections about MOOCs Mania	Fudan Education Forum	2014	149
4	Ye, Y. M.	MOOCs: A Fulcrum to Lever the New Reform of the Library	Journal of the National Library of China	2014	119
5	Haggard, S., et al.	The MOOC Is Maturing	Educational Research	2014	104
6	Hu, H. & Liu, Y.	Thoughts on Higher Vocational Colleges' English Education in MOOC Era	Vocational and Technical Education	2014	85
7	Sang, X. M., et al.	Deep Interpretation of Effect of MOOC Tide on Universities and Future Prospects	China Higher Education	2014	82
8	Dong, L. L.	Impact of MOOC on Traditional Higher Education and Countermeasures	China Adult Education	2013	72
9	Chen, Y. K.	Research on MOOC of Primary and Secondary Schools and Flipped Classroom Teaching Mode	Curriculum. Teaching Material and Method	2014	68
10	Pan, Y. T. & Liao, Y. Y.	MOOC Trend of University Students' Information Quality Education	Journal of Academic Libraries	2014	65
11	Jiang, M. W., & Li, X. Z.	Thinking of MOOC Mania	Journal of Hebei Normal University (Educational Science Edition)	2014	62
12	Wu, W. Z., et al.	Thoughts on University Teaching Reform Triggered by MOOC Tide	Journal of Northeast Normal University (Philosophy and Social Sciences)	2015	55
13	Jiang, Z. X., et al.	Learning Behavior Analysis and Prediction Based on MOOC Data	Journal of Computer Research and Development	2015	53
14	Hao, D.	MOOC: Subversion and Innovation? Review of the Fourth Young Scholars Forum of China Distance Education	Distance Education in China	2013	53
15	Gao, D.	MOOC: Core Ideology, Practice Reflection and Cultural Security	Journal of Northeast Normal University (Philosophy and Social Sciences)	2014	51
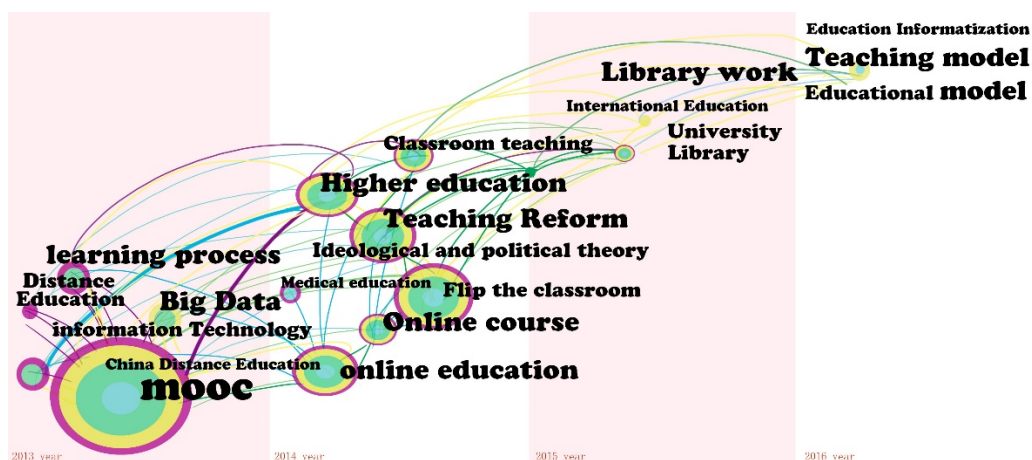
Figure 2. Knowledge Atlas of the Evolution Process of MOOCs Education Research Topics (2013-2016)
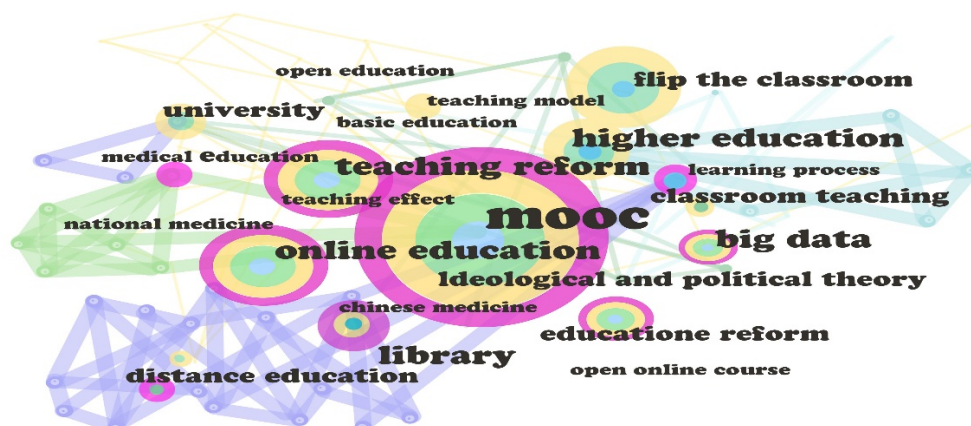
Figure 3. Co-word Network Atlas of MOOCs Education Research (2013-2016)

Combined with the articles published and time distribution features of keywords, it can be concluded that MOOCs education has roughly evolved from "domestic introduction" to "rapid development" and then to "content deepening". Specifically, (1) In 2013 when MOOCs education was just introduced into mainland China, a few scholars had a strong interest in it and took the lead to study the related subjects. In this stage, the main keywords included MOOC, learning process, information technology, etc. The research was dominated by experience introduction and exploration of the impact effect. When focusing on the importance of MOOCs education, it also pointed out that educators should tackle the effects brought by MOOCs education positively and practically. In addition, it also offered positive referential significance to the subsequent research. During this period, some basic contents had been put forward for the field of study early. (2) In 2014, MOOCs education research achieved rapid development. Its research field was extended and the research depth was also enhanced. Keywords in the research subject included flipped classroom, teaching reform, higher education, online education, etc. Due to the background of MOOCs as "an imported teaching mode", scholars in mainland China had been aware of the need to combine the current development of information technology with subject characteristics to absorb and accept MOOCs education according to local conditions. On this basis, studies in this phase not only attached importance to the exploration of MOOCs education's value and importance, but paid more attention to the role and feasibility of MOOCs education practice, which also strengthened the depth and breadth of the research to a certain extent. Moreover, absorption and popularization of MOOCs education practice were proposed gradually in specific subject fields such as medical education and ideological and political education, which also reflected the feature of MOOCs education research "coming from practice and guiding practice". (3) In 2015 and 2016, research basically followed the research contents of the first two years. However, research in 2015 paid more attention to the thinking of means and ways by which MOOCs education could be implemented and emphasized the role of university library in the construction and promotion of MOOCs education. The research in 2016 attached greater importance to the effect and role of MOOCs education on and in the teaching mode, and summarized the existing research results. However, on the whole, there was no breakthrough compared with the previous research.

DISCUSSION OF MOOCs EDUCATION RESEARCH HOTSPOTS AND THEMES

Based on co-word analysis of keywords in the periodical literature, co-word network knowledge atlas of keywords of MOOCs education research can be generated through Citesapce5.1, as shown in **Figure 3**. In the co-word network atlas, the frequency of key words determines the size of node circle. Thickness of node connection reflects the correlation between the nodes, and the size of nodal label font is determined by the frequency and centrality of nodes. Seen from the overall structure of co-word network atlas, nodes with greater influence attracted other nodes. These nodes also interacted with each other, generating homogeneous attraction. Naturally, several hotspot themes could be condensed and formed. As shown in **Figure 3**, MOOCs was the most influential and the core of the network. Words like "flipped classroom", "teaching form", "online education" and "online classroom" had greater influence, reflecting the hot subjects of MOOCs education research.

Table 2. List of Top 30 High-frequency Keywords of Research on Disclosure of Government Information

Ranking	Keywords	Frequency	Ranking	Keywords	Frequency	Ranking	Keywords	Frequency
1	MOOC	313	11	Ideological and Political Theory Course	11	21	Medical Education	8
2	Flipped Classroom	33	12	Colleges and Universities	10	22	Distance Education	8
3	Online Education	29	13	Countermeasure	9	23	Basic Education	7
4	Teaching Reform	29	14	Massive Open Online Course	8	24	Educational Reform	7
5	Higher Education	27	15	Big Data	8	25	Open Education	7
6	Online Course	18	16	University Library	8	26	Education	6
7	Teaching Mode	16	17	Teaching Effect	8	27	Educational Reform	6
8	Information Technology	16	18	Challenge	8	28	Ideological and Political Education	6
9	Classroom Teaching	14	19	Library	8	29	Thinking	6
10	Learning Process	13	20	Micro-course	8	30	Localization	5

Word frequency analysis software was further adopted to make word frequency statistics of keywords for the research papers retrieved. The result shows that 445 papers of MOOCs education research contain 898 effective keywords and the total frequency of the keywords is 2240, which means there are 2.02 keywords in each paper on average. **Table 2** shows the top 30 keywords of high frequency according to the summary of software analysis results. These keywords are important research contents in the current study field of MOOCs education and also reflect the research hotspots in the field to some extent. Among these key words, the frequency of MOOC is up to above 300, so MOOC is the core of the research field. In addition, "flipped classroom", "online education" and "teaching reform" also appear relatively frequently, which can also reflect that they are hotpots of the MOOCs education research. Combining with the high-frequency keywords of MOOCs education research and the content of the classical literature, hot topics of MOOCs education research in recent years include: reflection on teaching practice, modern teaching method, and reform of educational mode.

The first aspect is about the research on the reflection of teaching practice. As disruptive innovation, MOOCs education had huge impact in the education innovation when it first appeared and many scholars launched a series of studies on the topic. High-frequency keywords included in the research hotpot are flipped classroom (33), higher education (27), classroom teaching (14), learning process (13), medical education (8), ideological and political theory (6), teaching effect (8), etc. MOOCs education, as a new way of online education, has triggered a heated discussion among all sectors of society since it was introduced into mainland China in 2013. Due to the application of modern information technology, MOOCs education has realized "home schooling" and broken through the requirements of traditional teaching methods for time and space. It is a kind of innovation of educational practice. Some scholars point out that MOOCs education has thoroughly changed the relationship between teachers and students in the traditional teaching, and knowledge teaching begins to change from the dominated "teachers teaching" to "students selecting", reflecting essentially the change of supply and demand relation in terms of knowledge acquisition. MOOCs originated from foreign countries, so there is a certain gap between its background of emergence and reality. Therefore, MOOCs education is a little unaccustomed to in mainland China, and would also generate some unknown threats like educational crisis and culture invasion, which scholars have also discussed.

The second one is about the research on modern teaching means. As a new type of education, MOOCs education needs some tools to be relied on. Therefore, the research on modern teaching means also has become an

important component in the field of MOOCs education research. High-frequency keywords contained in the topic include online education (29), online courses (18), information technology (18), massive open online courses (8), big data (8), university library (8), library (8), micro-course (8), etc. Compared to traditional education, the more obvious difference of MOOCs education lies in the teaching means and tools it relies on. The concept of MOOC generated in big data. Due to the development and progress of big data technologies, MOOC was gradually made a reality from the concept. Therefore, the reason why MOOCs education can be realized is fundamentally beneficial from the modern teaching means brought by the advances in information technology. MOOCs education needs no campus and facilities that are necessary for the traditional education, but it needs to be established on the construction of digital teaching resources and teaching platforms. Scholars have also realized the particularity of MOOCs education, so they have discussed modern teaching means by which MOOCs education could be achieved. At present, most of scholars believe that, university libraries should be the platforms and major construction forces for MOOCs education. By virtue of huge education teaching resources and information technology advantages, combined with the special status in knowledge production, storage, and innovation process, they can effectively boost the construction and promotion of MOOCs education.

The third one is about the research on the existing predicament and pathways of transformation. High-frequency keywords contained in this research hotpot include teaching reform (29), teaching mode (16), countermeasures (9), challenges (8), basic education (7), educational reform (7), open education (7), educational transformation (6), localization (5), etc. With the advancement of MOOCs education practice, MOOCs education research has also ushered in deepening development in mainland China. This research hotpot reflects that a large number of scholars put forward that MOOCs education mode may have some problems, and propose practical and effective countermeasures and suggestions when they think profoundly about the present situation and dependence means of MOOCs education. For instance, some scholars hold that in the development of MOOCs education, there are such problems as the falling participative enthusiasm of universities, teachers and students, imperfect ecological system that supports open online education mode, and universities' lack of power to conduct MOOCs education. They also suggest that mainland China should ensure the supply of effective systems and policies, and universities should provide necessary support and services for the development of MOOCs education. Teachers should strive to promote information literacy, professional competence and teaching level. There are also some scholars who criticize the traditional education mode under the current background of MOOCs education, and put forward that universities should have innovative information teaching methods, establish MOOCs credit recognition method. They also propose specific measures for the reform of teaching practice in the evolutionary process from the traditional education mode to MOOCs education mode.

In short, from the co-word network atlas based on keywords (**Figure 3**) and statistical results of high-frequency keywords (**Figure 2**), it can be summarized that the current hotspots of MOOCs education research are as mentioned above. The coupling relationship between keywords in the co-word network of MOOCs education research is very complicated and the staggered distribution between keywords of hotpots reflects that the current research hot subjects are not independent, but have intrinsic links. The interrelation and support between research subjects jointly promote the development and evolution of MOOCs education research in mainland China.

CONCLUSION AND FUTURE PROSPECTS

Through the in-depth analysis and review of journal papers of MOOCs education research in nearly four years, based on the understanding of time-space distribution of research literature, this paper discusses highly cited literature, evolutionary trend and hot contents. Specifically, the main conclusions of this paper include: (1) mainland China's MOOCs education research presents an overall increasing trend, and now it is in the rapid growth; (2) highly cited articles of MOOCs education research are mainly concentrated in pedagogy field and part of the literature also involves library information, computer science and other fields. Most of the research adopts the normative research method and there are fewer empirical research results. In the meantime, the research content also lacks the contribution to the construction of a theoretic system; (3) the evolution of MOOCs education research reflects the progressive process "introducing-developing-deepening"; (4) high-frequency keywords include flipped classroom, online education, teaching reform, teaching mode, information technology, etc., and the research

hotpots are reflection on teaching practice, research on modern teaching means, and research on existing problems and pathways to transformation.

Although the current MOOCs education research presents the good development momentum, positively responds to the practical development of MOOC technology and forms effective guidance to the traditional educational practice, on the whole the research has the following deficiencies: First, research content is relatively scattered with insufficient construction of a theoretical system. Although most of the MOOCs education research focuses on the education science, research objects are relatively complicated. Such contents as teaching mode, learning process and platform construction are involved in existing research, but at present there has not been an effective theoretical framework to integrate the research contents and form a set of scientific theoretical system. Second, the research is quite shallow and research depth is excavated limitedly. Since MOOC appeared first in mainland China in 2013, MOOCs education research has only been developed for 4 years. In the relatively short period, scholars' research is still in the exploratory stage. Descriptive and dialectical research is still the mainstream, and countermeasures and suggestions proposed based on this are also vacuous and general. Therefore, there is great space for the improvement of the practical guidance. Third, the research method is simplex and quantitative research needs to be strengthened. Current research mainly describes the reality and elucidates views, so scholars regard the observation and thinking of MOOCs education practice as the primary research contents. Research methods adopted are mostly normative. Only a few studies use the quantitative empirical research method so that the research as a whole lacks objective data and related empirical evidence to support.

Given the deficiencies of the existing research, based on the development trend of MOOCs education practice, related research in the future can be strengthened in the following aspects: First, it can integrate existing research results and explore a theoretical system. Although MOOCs education embraces shorter development and its practice and research are still in the rapid growth, it still has made a certain amount of achievements. Therefore, effective integration of these research results should be conducted in the future research and further research can be carried out to ravel out the logical relations of concepts and variables, and explore to form a set of reasonable theoretical system to lay an important foundation for the future MOOCs education research. Second, scholars should enhance exchanges and cooperation, and strengthen the research depth. At present, the research content of MOOCs education is scattered, which means that scholars of different backgrounds conduct their research from their own disciplines. Research forces are distributed and independent, but longitudinal and deep advancement of MOOCs education research needs joint efforts of multiple forces. Therefore, in future research, scholars in different disciplinary systems should cooperate with each other and promote the further deepening of research through complementary advantages and resources integration. Finally, quantitative research should be introduced to enrich the research methods. In the latest research of MOOCs education, there have been some studies that use quantitative research methods such as questionnaire survey, data analysis and so on. In future research, quantitative empirical research methods should be more generalized to strengthen objective data support of MOOCs education research and form close integration of qualitative and quantitative research combined with existing normative research methods.

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