

Research status of online learning investment-based on Cite space visualization analysis

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Abstract: This paper mainly collects research literature on online learning investment included in the Web of Science core set SSCI database in the past 5 years (2017-2021), and uses Citespace software to visually analyze the publication time, research structure, authors and keywords, and draw Out of the network map. The study found that in the past five years, the investment in online learning has increased year by year; the research structure is mostly concentrated in colleges and universities; there are many authors related to it, but the cooperative research between them is not compact; the research hotspots focus on definitions, influencing factors and mediation. variables, etc.

1. Introduction

In recent years, with the promotion of open online course platforms such as MOOCs (MOOCs), online learning has become very common, especially during the outbreak of the new crown epidemic, 203 national-level resource banks and 217 provincial-level resource banks are all open for free. There are more than 240,000 SPOC courses, and 1,977 MOOC courses have been added. All these have made a significant contribution to the call of the Ministry of Education to "suspend classes without stopping". Major universities have used the Internet platform to teach students. Online learning has become a major way of learning, and it also reflects a new teaching method. With the current situation, online learning has become an unstoppable trend and a new force in education reform. In 1988, Hiltz, the founder of the concept of online learning, pointed out that online learning refers to placing course-related information and resources in a virtual learning space formed by the Web. This network application enables students to achieve the effect of face-to-face learning. . Compared with the traditional learning mode, online learning has its own advantages, such as flexible class time and arbitrary learning location . [1]Therefore, it is a great challenge to effectively improve students' online learning engagement.[2]

With the deepening of online learning research, in addition to topics such as learning, satisfaction, interest, and future behavioral intentions[3], online learning engagement has become an important criterion for measuring learners' learning quality, and it is also an important direction for colleges and universities to measure the level of education quality[4]. Studies have shown that in the online learning mode, a high level of learning input can better adjust the learner's participation, gain a sense of self-efficacy, and improve the learner's thinking mode, so as to conduct in-depth learning more effectively. Therefore, it is very necessary to study online learning. [5]This paper uses the Web of Science database to collect articles on online learning investment, and analyzes the research status of online learning investment in the past five years.

2. Research sample and method

2.1 Research sample

The literature and data of this study are derived from the SSCI database of the Web of Science core set (hereinafter referred to as WOS). WOS is published by Thomson Reuters (Thomson Reuters) Technology Information Group in the United States. It is a large-scale comprehensive, wide-ranging, core journal citation index database. It is also one of the main ways for researchers from all over the

world to obtain academic papers. and world-renowned reputation. The first is to use the subject search method in the basic search. The search method is to limit the subject to "online learning engagement OR online student engagement", the selected time range is "last 5 years", the database selection is "SSCI", and then the selected time range is "SSCI". The selected language was "English", and the final document type was selected as "Article", and a total of 2381 articles were found and retrieved. These 2381 articles will be applied to bibliometric statistical analysis.

2.2 Research methods

Cite space was independently developed by Dr. Chaomei Chen from Drexel University in the United States. It uses network algorithms to convert literature data into scientific knowledge graphs. The research object of scientific knowledge graphs is knowledge domain, and it shows the development process and knowledge structure of scientific knowledge. An image relationship of progress.[6] Therefore, it has both the properties and characteristics of "graph" and the properties and characteristics of "spectrum". So it contains both the knowledge system of graph and the knowledge sequence of spectrum. Knowledge graph is also an important means for scientific measurement and literature statistics, and it is also the main method for information visualization.

Cite space is an information visualization software based on Java language development. This research uses Citespace5.8R3 bibliometric analysis software, and converts the selected literature into data that can be recognized by Cite space, and sets the "Time Scaling" The value is 1, select the corresponding node type, and draw the scientific knowledge map of online learning investment research from 2017 to 2021 on this basis, reproduce the evolution of online learning investment, and analyze the time of publication, research institutions, authors, Knowledge graphs such as keyword co-occurrence, keyword clustering, and time series graphs are analyzed in detail.

3. Knowledge graph visualization analysis of research status and hotspots of online learning investment

3.1 Publication date analysis

Based on the WOS visual analysis, taking the time of publication as the horizontal axis and the number of publications as the vertical axis, the screened 2,381 articles are organized into a line chart. The characteristics of literature changes can reflect the trend of online learning investment in the past five years.

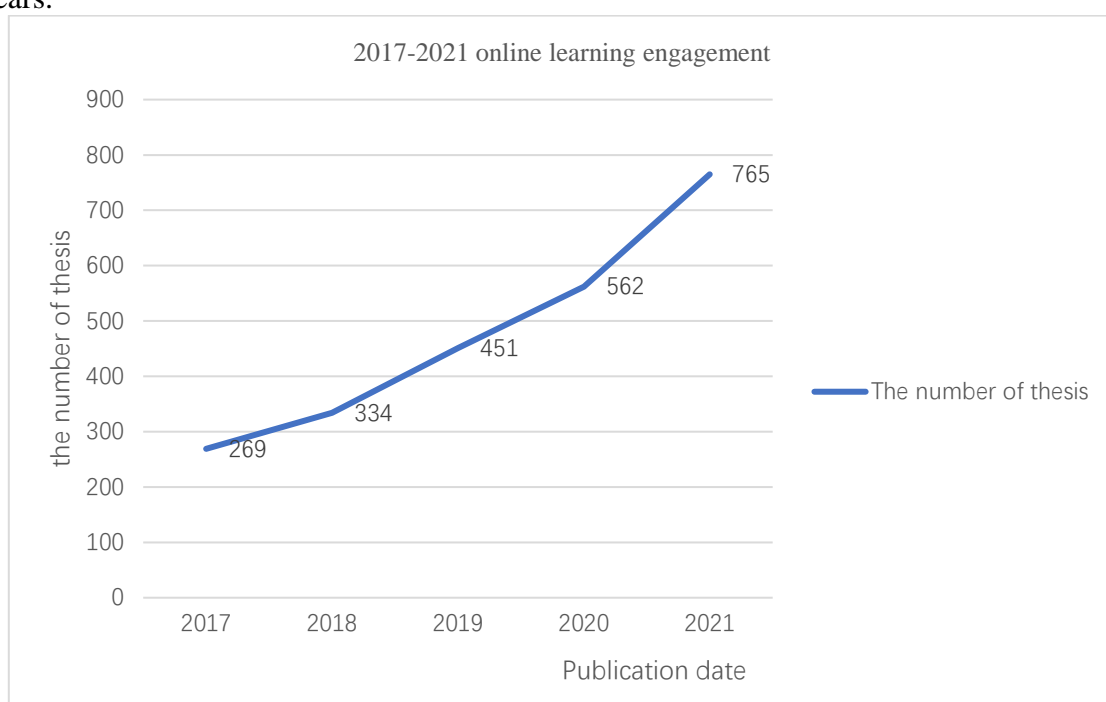


Figure 1 2017-2021 online learning engagement

As shown in the figure, the research on online learning investment has been on the rise year by year in the past five years, and the growth trend has been flat from 2017 to 2020. Especially after the new crown epidemic, the research trend of online learning investment has increased significantly. It can be seen that the research on online learning investment has received more attention from scholars, and also combined with the current situation, the research on online learning investment has increased significantly.

3.2 Research Institution Analysis

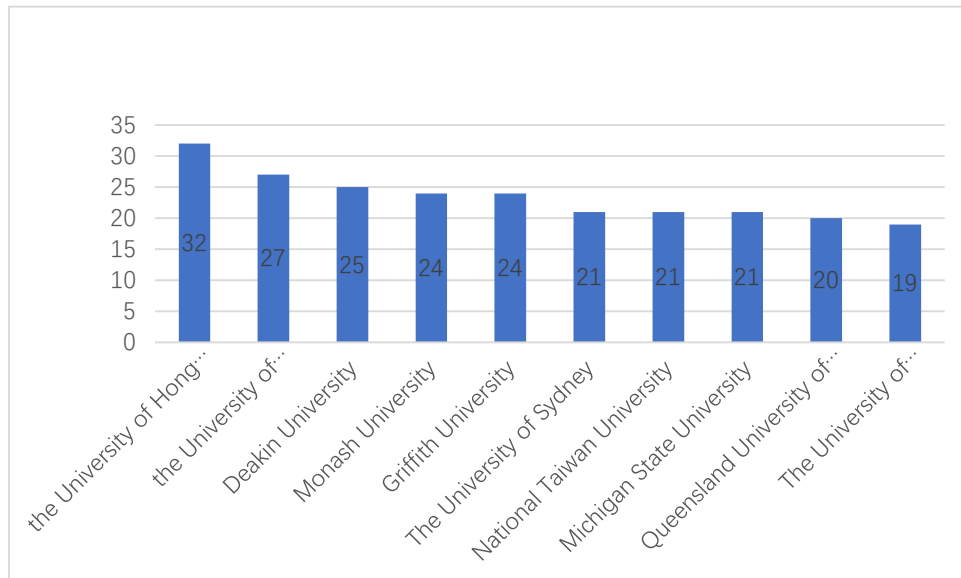


Figure 2 Research institution

This is a research institution that has published papers on online learning investment in the past 5 years. It can be seen from the figure that the University of Hong Kong has published the most papers, with a total of 32 papers, accounting for 1.3 % of the total; the second is the University of Queensland, with a total of 27 papers, accounting for 1.1 %, ranking in The third place is Deakin University, with 25 papers published by research institutions, accounting for 1 %. It can be seen from the table that the top 10 universities are the universities. This shows that the university is the core organization to study the investment in online learning, because the function of the university is to cultivate talents.

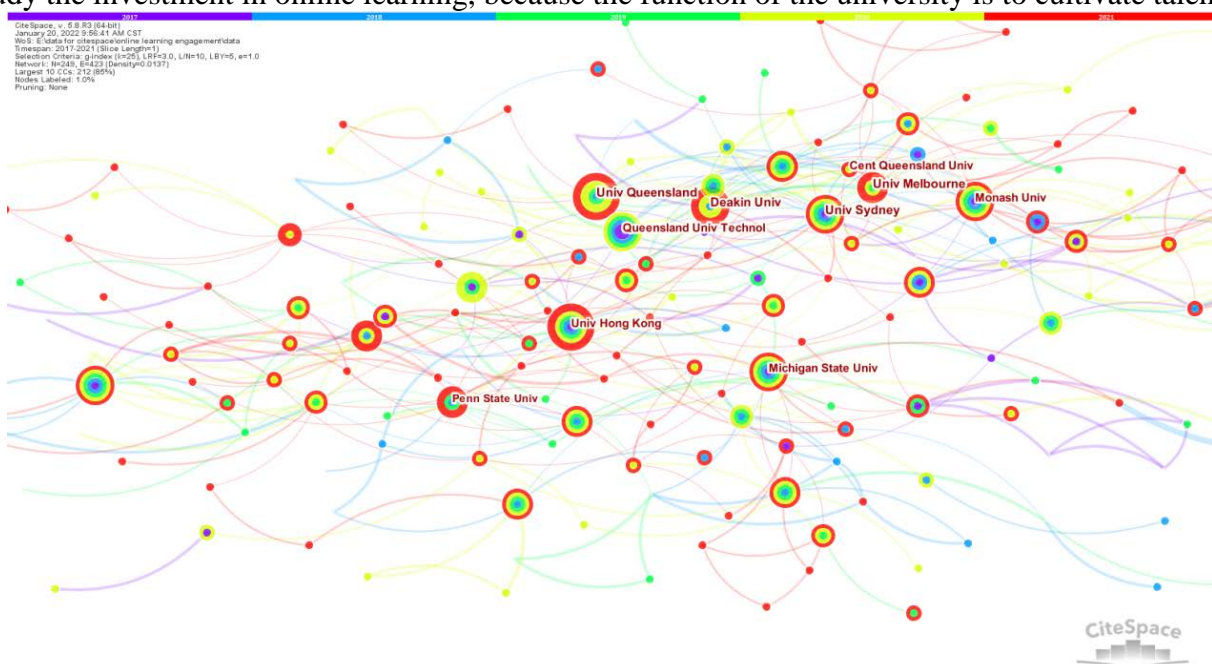


Figure 3 Distribution of research institutions

Perform visual knowledge graph analysis on research institutions invested in online learning, perform data analysis in Cite space, select the network node as the "Institution" option, and generate a map of research institutions invested in online learning. A total of 249 nodes and 423 connections are generated. The density is 0.0137, which means that there are 249 research institutions in total, and colleges and universities account for a large part, and the relationship between research institutions needs to be further strengthened.

3.3 Author situation

A total of 217 authors have published papers on online learning engagement in SSCI in the past five years. The author with the largest number of published papers is Qiu Qihong from the University of Hong Kong, who has published 7 papers in total, accounting for 0.29% of the total number of papers; his research includes "How to Predict Students' Satisfaction with MOOCs", "Flipped Learning and Traditional Classroom Learning" Comparisons of "Understanding Student Participation in Massive Open Online Courses", "Effect of Comparison of Digital Badges and Classroom Marking Systems in English Classroom Behavior and English Learning of Primary Students", "Implications for Student Participation in Large-scale Online Courses", "Examining Learning Engagement in MOOCs with a Hybrid Approach", "Adapting Traditional Flipped Courses to an Online Flipped Format During the COVID-19 Pandemic". The second is Ouyang Fan from China University of Mining and Technology, who has published a total of 6 articles, accounting for 0.25% of the total; these 5 authors with the highest number of published papers in SSCI are all from universities, which is not only Again, it shows that universities are active research institutions on online learning engagement, and it further proves to us that university teachers are active authors of online learning engagement. This is not only because the responsibility of university teachers is to teach and educate people, but it is also directly related to the fact that university teachers can study online learning more closely.

3.4 Source publications

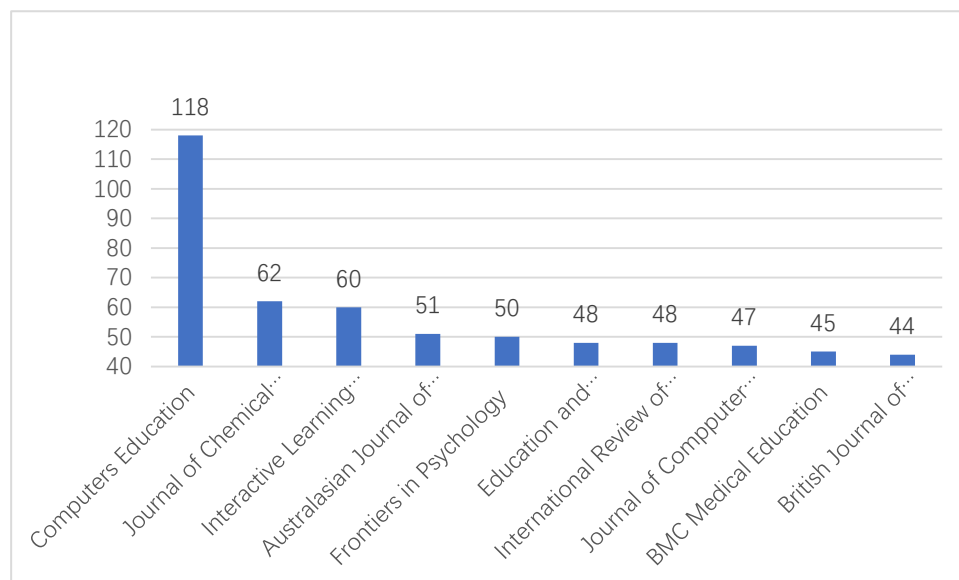


Figure 4 Online learning investment research key publications

The 2381 papers on online learning input published in SSCI in the past 5 years are derived from 198 publications. As shown in Figure 4, "Computer Education" ranks first in terms of the number of published papers, with 118 research papers related to computer education published, accounting for 4.9% of the total number of papers published, indicating that computer education occupies an important position in online investment research; The second largest number of papers published is the Journal of Chemistry Education, which published 62 papers on chemistry education, accounting for 2.6% of the total number of papers. It can be seen that chemistry education is also an important area of online learning investment; The third largest number of papers published is "Interactive

Learning Environment", with a total of 60 papers published, accounting for 2.5% of the total number of papers published. In addition, the most prominent publications include Oceania Journal of Educational Science and Technology, Frontiers in Psychology, Educational Information Technology, International Review of Open Learning and Distributed Learning Research, International Peer-Reviewed Journal, BMC Publications such as Medical Education and the British Journal of Educational Technology. From these high-volume publications, it can be seen that online learning investment mainly involves computer, chemistry, psychology, information technology, medicine, education technology and other fields.

3.5 Country (region) situation

In the past five years, SSCI has published papers on online learning investment research distributed in 103 countries (regions). It can be clearly seen from Figure 5 that the United States has an absolute advantage in the number of published papers. A total of 803 papers have been published in online learning investment research, accounting for 34% of the total published papers. This fully reflects the United States' participation in online learning investment research. leading position. In second place is Australia, with 295 research papers, or 12% of the total. In third place is the UK, with a total of 269 papers, accounting for 11% of the total. The above three countries published a total of 1,367 research papers on online learning investment, accounting for 57% of the total published papers. It can be seen that the three research centers for online learning investment are the United States, Australia, and the United Kingdom. my country has published a total of 236 research papers on online learning investment, accounting for 10% of the total published papers, ranking fourth, which also proves that my country is in a leading position in academia. Due to the impact of the new crown epidemic, coupled with my country's emphasis on education, it is an effective measure to strive to improve the level of education in my country.

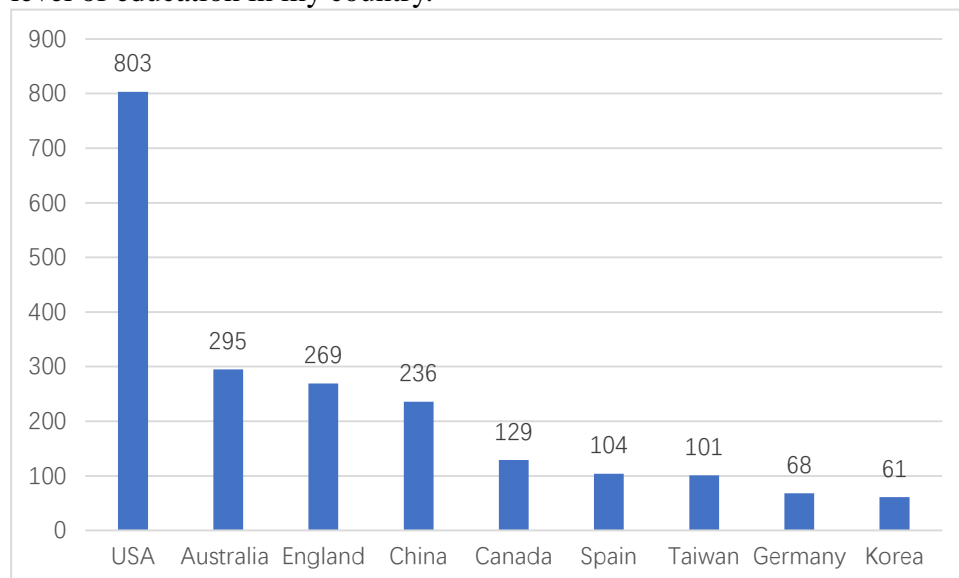


Figure 5 Key countries (regions) for online learning investment research

4. Keyword Analysis of Online Learning Investment

Generally speaking, the keywords of a paper can reflect the main problems and main aspects of the research of the paper. Secondly, keywords with high frequency and centrality can represent the academic research hotspots in a certain period of time in the field, online learning Input keywords. It is a high-level summary and summary of the impact of online investment research. This paper introduces the data of 2381 related papers into cite space software, sets the network node as keyword, and runs it to obtain the time zone distribution map of "online learning investment" research hotspots (see Figure 6), and exports the data to obtain an information table based on the frequency of research hotspots .

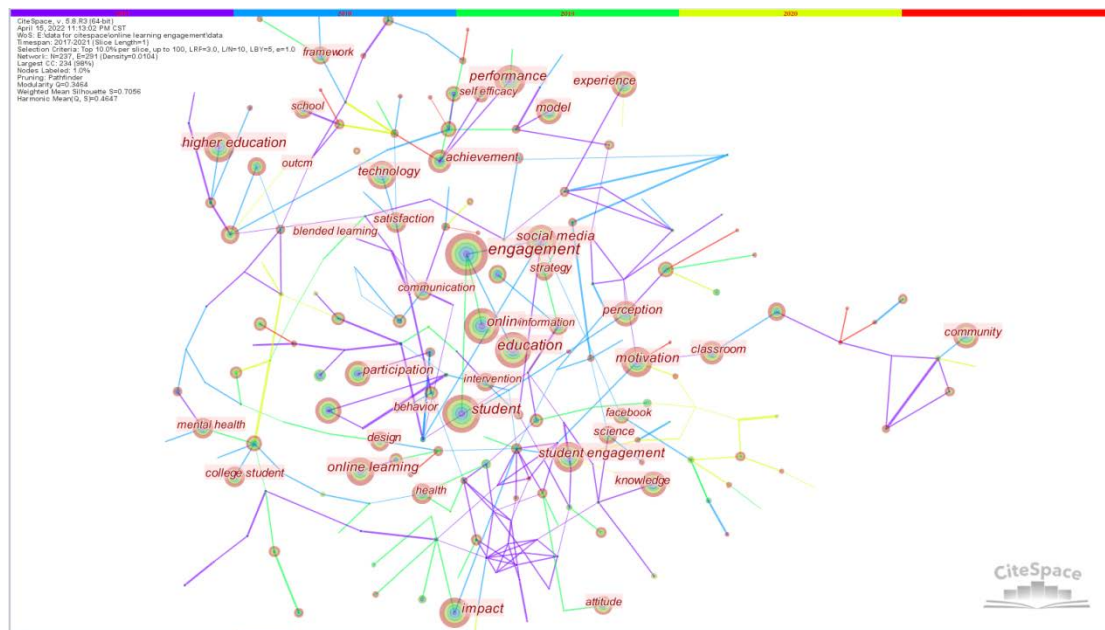


Figure 6 Distribution map of research hotspots in online learning investment literature from 2017 to 2021

The nodes of each small circle in Figure 6 represent keywords, a total of 237 nodes are obtained, and there are 291 connections between them. The number of keyword occurrences is closely related to the size of the node. The larger the node, the more keywords it appears, and it also means that it is one of the research hotspots for online learning investment. From Figure 7, we can see the top 10 keywords for online learning investment research frequency. Among these high-frequency keywords, we can see the basic content of online learning investment, which basically includes the trend of online learning investment research, which further proves Outline the basic laws and characteristics of online learning investment. It can be seen from Figure 6 and Figure 7 that the keyword with the highest frequency of online learning investment is learning investment, and the frequency of occurrence is 498 times. These high-frequency keywords can also show that the research hotspots of online learning engagement mainly include "learning engagement", "students", "education", "online", "higher education", "online learning", "performance", "motivation" ", "mass media" and "students' learning engagement" are symbolic symbols of online learning engagement, and they are also the most frequently cited keywords by scholars.

Frequency	Key words
498	engagement
276	education
247	online
240	student
205	higher education
189	online learning
187	performance
175	motivation
170	social media
169	blended learning

Figure 7 Top 10 keywords for online learning investment research frequency from 2017 to 2021

4.1 Keyword Cluster Analysis

With the outbreak of the new crown epidemic, online learning has become a popular new situation. Online learning is a kind of online learning. Teachers can teach students through different online forms. Earth-shaking changes, and compared with traditional learning methods, it has more obvious advantages. It uses the Internet as a tool to change our learning methods. The power of this change is

the driving force behind the popularity of online learning. Online learning not only makes self-directed learning a reality. Compared with traditional learning methods, it is a teacher-centered penetrating learning method. Most students cannot use their own learning methods to learn. Online learning has just changed this situation. You can study independently and arrange your time reasonably. Online learning unites college libraries and postgraduate students on the Internet, allowing students to better access resources. It can also bring together famous experts from all over the world for online guidance, anyone can visit and study at any time, and the time and place of students can be changed at will, so online learning has become one of the mainstream methods. Based on reality, this paper focuses on the hotspots and difficulties of online learning investment research, and conducts new research accordingly.

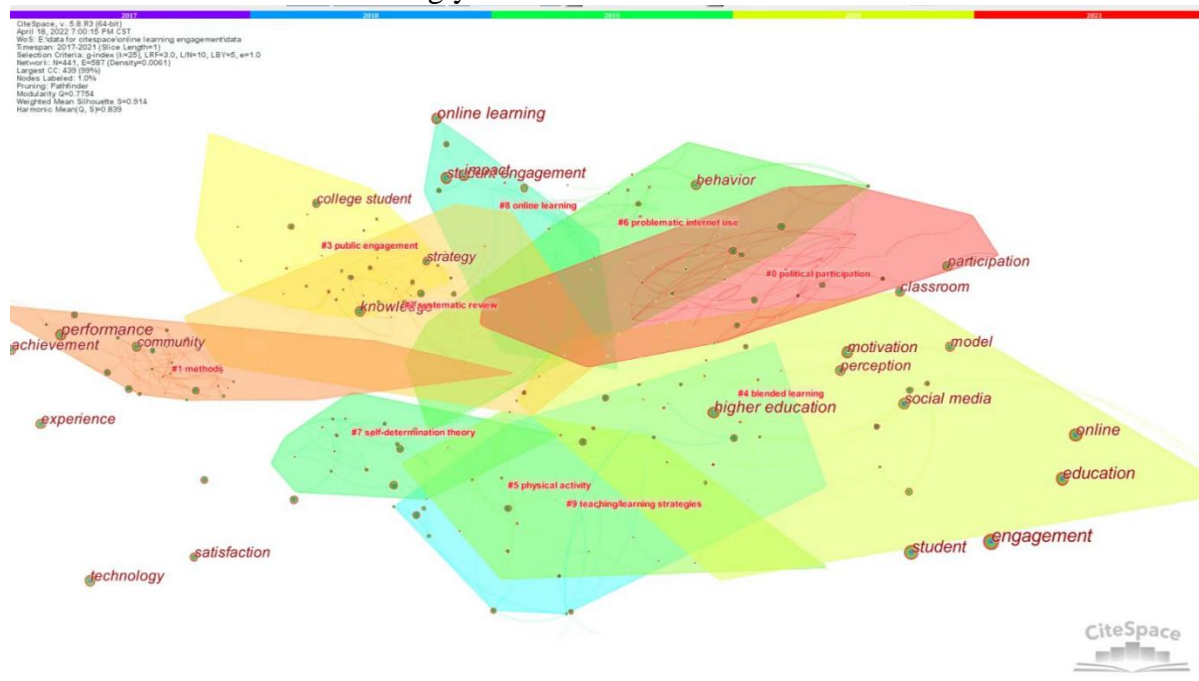


Figure 8 Clustering view of research hotspots in the online learning investment literature from 2017 to 2021

Figure 8 is a clustering view of research hotspots about online learning investment literature. There are 11 clusters in the figure. The similarity index within the cluster is 0.833. The value range of this index is 0 to 1. It represents a higher degree of similarity within clusters. Analysis from the size of the clusters: The largest cluster in the figure is political participation, followed by method, followed by public input. It can be seen from Figure 8 that the research hotspot clustering view of the online learning engagement literature cannot reflect the main content of the literature research, such as "political participation", "public engagement", "physical activity", etc., which have nothing to do with the research topic. So no analysis is done. Combined with Figure 7, the relevant hot topics in the field of online learning investment are analyzed:

4.1.1 E-learning

With the advancement of science and technology, the education industry has also undergone tremendous changes. Remote video teaching and electronic document sharing are realized through Internet virtual classrooms, so that teachers and students can form a kind of interaction between teaching and learning on the Internet; With the continuous development, our previous learning mode has also been impacted, and various new learning modes have appeared in our field of vision. Among all modes, online learning occupies a leading position with the technological development of the Internet. This mode is called online learning. It is a brand-new way for students to use the Internet for online learning by establishing an educational platform on the Internet. This online learning method is a brand-new learning environment composed of multimedia network learning resources, online learning communities and network technology platforms. Compared with other learning modes, it has

unparalleled advantages.

4.1.2 Blended learning

The sudden new crown epidemic last year triggered an unprecedented large-scale online teaching practice. Education seems to have more possibilities, which can integrate online and offline, blur the boundaries of schools, families and society - "Where the students are, education can be there".

After this year's training, many students should no longer be unfamiliar with the term "hybrid learning". Hybrid learning, also known as blended learning, is not a new word, but a learning method derived from the integration of the digital field into the real world.[7]

5. Analysis conclusion

This paper uses the Cite space tool to visually analyze the research in the field of online learning investment in the SSCI database of the Web of science core set. Through the publication year, research institution, author, source publication, country (region) of the relevant literature in the past five years The situation and the distribution characteristics of keywords can make a preliminary analysis of the online learning investment field, and provide a general direction for the future research hotspots of online learning investment. This paper draws the following conclusions:

(1) Judging from the publication year, the research field of online learning investment is paying more and more attention, and the publication of online learning investment papers is also an increasing trend. Among them, the growth trend from 2018 to 2020 tends to be flat, especially after the new crown epidemic, the trend of online learning investment research has increased significantly. It can be seen that the research on online learning investment has received more attention from scholars, and also combined with the current situation, the research on online learning investment has increased significantly.

(2) From the perspective of the distribution of research institutions , the authors with the highest number of SCI papers are all from universities, which not only shows that universities are active research institutions for online learning investment, but also proves to us that university teachers are engaged in online learning. Active author.

(3) From the perspective of countries (regions), the three research centers invested in online learning are the United States, Australia, and the United Kingdom. my country has published a total of 236 research papers on online learning investment, accounting for 10% of the total published papers, ranking fourth, which also proves that my country is in a leading position in academia.

(4) From the perspective of keyword distribution, these high-frequency keywords can also show that the research hotspots of online learning investment mainly include "learning investment", "students", "education", "online", "higher education", "online learning". "Learning", "performance", "motivation", "mass media", "student learning engagement", etc. are symbolic symbols of online learning engagement, and they are also the most cited keywords by scholars. The index of similarity within the cluster all points to 0.833 . The largest cluster in the figure is political participation, the second is method, and the second is public investment.

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