Visualization Analysis of the Current Research Status and Action Paths of Learning Spaces in China

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Abstract: The visualization analysis of the current research status and action path of learning space in China's "Ten Year Development Plan for Education Informatization" (2011-2020) clearly proposes to "promote the widespread application of subject tools and platforms, cultivate students' awareness and ability to learn, manage, and serve independently", that is, to achieve better self-learning and self-development of students through the help of information technology. Online learning space is a virtual learning environment based on the Internet. Nowadays, online learning space has become the main battlefield for teachers to teach and the preferred platform for students to showcase themselves. Based on the concept of cultivating students' innovation ability, combined with modern information technology, visual analysis tools such as UCINET and CITESPACE V are used to visually analyze the current situation and future direction of learning space, summarize its advantages and disadvantages, and promote its subsequent development and research.

Key word: Learning Space; Research Hotspots; Research Trends; visualization;

Introduction

From 2015 to 2022, the Horizon Report of the American New Media Alliance proposed the reconstruction of learning space, the creation of flexible learning areas, the integration of physical and virtual learning Spaces, the integration of formal and informal learning Spaces, and hybrid learning Spaces for eight consecutive years, revealing that learning space has become one of the changing trends in the field of education. Its created learning space aims to better support students' flexible learning, proactive learning, collaborative learning, and finally deep learning. In March 2012, the Ministry of Education officially promulgated the "10-year Development Plan for Education Informatization (2011-2020)", and then in September, at the national education informatization work video conference, Vice Premier Liu Yandong proposed that the core goals and symbols of China's education informatization construction "Twelfth Five-Year Plan" are "three links and two platforms". One of the three links is the network learning space for everyone (referred to as "everyone"), which has led to the network learning space research upsurge. To sum up, this study aims to describe the current research status of learning space in our country, explore its future development trend, and apply to practical teaching with the help of existing research.

1. The definition of concept

For the concept of Learning Space (Learning Space) has been debated in the academic world, summed up nothing more than two points of view: one is the "environment", the other is the "system". "Environment theory" believes that learning space refers to the place used for learning, that is, it implies that learning can happen in any place, including physical space and virtual space. For example, Professor Zhu Zhiting believes that learning space is a learning environment where formal learning and informal learning, teaching and learning bilateral relations are fully interactive by using information technology (Zhu Zhiting, Guan Jueqi, Liu Jun, 2013). Scholars such as Guo Shaoqing advocate that learning space is a learning resource environment that integrates virtuality and reality by focusing on digital intelligence resources and educational resources through the continuous evolution and integration of emerging information technologies (Guo Shaoqing, Zhang Jinliang, Guo Jiong, He Xiangchun, Shen Junru, 2017). The "system theory" holds that the learning space is a system that provides personalized services for different users. For example, Zhong Shaochun proposed that it is an application system that provides personalized services for different role subjects (Zhang Zishi, Jin Yifu, Wu Tao, 2015). Later, many researches add a lot of qualifiers on the basis of the previous ones, such as online learning space, mixed learning space, and technology-enhanced learning space, etc. In China, learning space, online learning space and future classroom are the main ones. Now, under the background of "Internet +", the research on learning space has shown a blowout development.

2. Research program design

1. Data source

Using CNKI(China National Knowledge Network) as the source database of journal literature data, and using "Learning space" as the title for search and analysis, a total of 1750 relevant journal literature articles were retrieved on January 6, 2022. By reading all the retrieved literature titles, abstracts, keywords and other information, and selecting the literature related to the field of education, preliminary data cleaning and screening were carried out, and irrelevant academic literature such as meetings, notices, and visits were excluded. Finally, 924 valid literature were selected as data samples.

2. Research tools

The bibliographic co-occurrence system Bicmob2, social network analysis software Ucinet and its own visualization tools Netdraw, Citespace V and Excel are used as research tools in this study. On this basis, the research should be carried out in combination with the sample literature content.



3. Research ideas and methods

(1) Import the data source exported in the form of Notefirst into the bibliographic co-discovery system Bicomb2, analyze the annual number of published documents, published journals, published institutions and representative data of the exported study space related research, and visualize the data chart with the help of Excel;

(2) With the help of the social network analysis tool Ucinet6 and its own visualization software NetDraw, the keyword co-occurrence network and the center degree data description research content were obtained;

(3) The data source exported in the form of Refworks was imported into CiteSpaceV, and the clustering chart and research time trend chart for the research field of learning space were obtained with the help of this tool, and the research clustering and research trend were also comprehensively described in combination with literature samples.

3. Analysis of current research situation

1. Annual quantitative analysis of literature

The statistics of the annual number of published papers and the trend of published papers in the learning space within a specific time can directly reflect the status quo and popularity of the research. In this paper, the data of published papers in the data sources are statistically analyzed and the analysis results are visualized to obtain the annual trend chart of the number of published papers in the domestic learning space, as shown in Figure 1.





As a whole, 2012 is the turning point of China's learning space research, that is, the watershed node. According to this time node, the study of China's learning space can be divided into two stages. The first stage, from 2003 to 2012, was a stage of slow growth, which experienced the design and planning of physical learning space from the perspective of architecture at the beginning, and then learning space gradually became a special research perspective in the field of pedagogy. Many scholars in normal universities in China focus on the theoretical research of learning space, the specific development and design framework of learning space and the application research of learning space. The second stage is the stage of rapid growth after 2012, which is closely related to the teaching informatization and the proposal of "three links and two platforms". Scholars' research on learning space is not only a generalized learning space, but focuses on specific content, and the research on learning space is more detailed. Many new terms have been derived from the network learning space, such as knowledge storage and shared learning space, interactive and knowledge generation learning space, personalized learning space, intelligent learning space, etc.

In general, the number of research papers on learning space in China shows an increasing trend, and it is expected that the research on learning space will show an upward trend in 2022.

2. Source analysis of literature and periodicals

Through statistical analysis, there are a total of 60 journals in the research field of learning space, among which the journals with 10 or more papers are shown in Figure 2.



Figure 2. Source distribution of journals published in learning space

It is found that the journals published by learning space are mostly concentrated in the core journals in the field of education technology, such as China Audio-visual Education, Audio-Visual Education Research, Modern Educational Technology, Journal of Distance Education, etc. It can be seen from this that the study of learning space has changed from the original physical space design of architecture and library to the perspective of education. That is, the study of learning space is concentrated in the field of education, especially in the field of educational technology, which also better reflects the current reconstruction of learning space is bound to incorporate more technical elements, in order to better promote students' learning and teachers' teaching.

3. Publishing institutions and representatives

As shown in Figure 3-1, the institutions with a frequency of 6 or more publications on China's learning space research focus more on normal colleges and universities, and most of the institutions with the highest number of publications are key normal colleges and universities in China, such as East China Normal University and Central China Normal University. This also explains the reason why the study of learning space in China has become increasingly hot in the field of education in recent years.



Figure 3-1 Source distribution of publishing institutions in learning space

Figure 3-2 shows the representatives of China's learning space research whose publication frequency is 6 or more, that is, the authors of high frequency. Among them, Xu Yafeng published 13 papers, ranking the first. He published the title "Future Classroom: Smart Learning Environment began to study learning space, from the initial framework design of learning space to the impact of learning space on students' learning, the impact on teachers' use, and then to the latest research on the change of learning space in the era of artificial intelligence, the articles published are in the core journals of education technology, promoting the study of learning space in China; In addition, Shen Shusheng, Li Yubin, Zhong Shaochun and others conducted research on learning space from multiple perspectives such as flipped classroom, education cloud, cloud computing, and smart campus. Zhang Jinliang, Guo Shaoqing and He Xiangchun are the long-term co-authors of the study, which explores the development of online learning space and school education from six dimensions.



Figure 3-2 Publication distribution of authors with high productivity in learning space

4. Research content and hotspot analysis

In this paper, the social network analysis tool Ucinet6 is used to analyze the research hotspots of published journals in the learning space with keywords as the node. In order to ensure the centrality of the research, the data source threshold of the keyword co-word matrix is set to 3, and the resulting keyword co-occurrence network is shown in Figure 4.



The square in the keyword co-occurrence network represents the keyword node, and its centrality and central potential are the two characteristics of the node. The centrality of the node refers to the position of each keyword in the network as shown in Figure 4. The centrality reflects the degree of difference of each node in the whole keyword network. It can be seen that "learning space" and "network learning space" are the main keywords, which are interrelated with other keywords; Secondly, "everyone", "flipped classroom" and "smart classroom" constitute important keywords, which also reflects that the study of learning space tends to the application and practice of network technology tools in specific teaching to a certain extent.



Figure 4. Co-occurrence network of keywords in learning space (Graph)

(1) Clustering of all literatures

Keywords are usually words or terms selected from academic articles to represent the subject content and information entry of the full text for literature indexing. After keyword clustering statistics are carried out on the journal data source, six co-occurrence keyword clusters as shown in Figure 5 appear, which are: Network learning space, educational equipment, self-efficacy, university library, mobile learning, big data.





(2) Literature clustering of nuclear journals

The clustering of co-occurrence keywords obtained by analyzing the sample literature of core journal C in the data source in Citespace V is shown in Figure 6. It can be seen that there are 5 clusters, which are "learning space", "network learning space", "personal learning space", "smart education" and "mobile learning".



FIG. 6 Clustering distribution of key words in nuclear journals

4. Research trend analysis

In order to explore the stage development of China's learning space research, and then more accurately understand the context of China's learning space research, this paper takes the literature of nuclear journal C as the data source, and analyzes the literature with the help of CiteSpace V, as shown in Figure 7.

It can be seen from the figure that the corresponding keywords in different years, such as 2010 learning space design, 2013 personal learning space education informatization, 2014 network learning space, flipped classroom, Everyone, mobile learning, university library and teaching mode, 2016 knowledge sharing, smart learning space, smart education, cloud architecture, etc. After 2018, instructional design, empirical research, learning activity design, personal online learning space, autonomous learning, personalized learning, and artificial intelligence are the main research trends.



FIG. 7 Distribution map of keyword timeline

According to the research, the general distribution of the development stage of China's learning space research is as follows: From 2010 to 2013, it can be seen from the corresponding keywords that the study of learning space in this stage mainly focused on the design of physical learning space. Many studies mentioned the content of education informatization in China, which provided the foundation for the later study of online learning space; From 2013 to 2016, the upsurge period of online learning space research, in-depth analysis of the "three links and two platforms" behind the value implication, such as "everyone", in addition to pay more attention to the application of learning space in formal and informal places, such as "flipped classroom", "university library", "teaching mode", and actively explore the model of future classroom; Since 2016, the research on learning space has shown a variety of trends, and the research is more extensive, detailed and specific. For example, the intelligent learning space has been derived, and the reform of learning space has been studied from the perspective of artificial intelligence, indicating a development trend from the broad generalization level of the research theory to the research landing that is practical.

5. Summary and prospect

With the rapid development of technology, a new networked, virtualized and intelligent network learning space is bound to take shape. The construction of learning space, with the help of emerging information technology, will be more significant in research, and will change learners' learning mode, cognitive mode, educational relationship and learning ecology. It provides an open and free network learning environment for teachers and students, supports the combination of online and offline learning, promotes the interaction between teachers and students, teachers, students and families and schools, makes full use of information technology teaching means and network teaching platform, realizes the personalized development of teachers and students and the organization of collective wisdom development, improves the teaching effect and the quality of talent training. It will also be the key development direction of the in-depth application of education information technology in our country in the future.

References:

[1] Zhixing Liang, Xingjie Feng, Jia Li etal. Evolution and Reflection on the impact of new information Technology on higher Education -- Based on the Content analysis of Horizon Report 2004-2021 [J]. Contemporary Education Forum, 2021, No. 305(05):57-68.

[2] Ministry of Education of the People's Republic of China. Notice of the Ministry of Education on Printing and distributing the Ten-year Development Plan for Education Informatization (2011-2020)[EB/OL].(2012-03-13)[2018-04-11].

http://www.moe.gov.cn/srcsite/A16/s3342/201203/t20120313_133322.htm

[3] Bin Huang, Dan Wang. A Review of Domestic Research on Online Learning Space [J]. Open Learning Research, 2018,23 (04): 27-33

[4] Mingyang Chen, Yaping Yang, Ming Chen, Zhanhong Chen. Research on the construction and practice of Blended learning Space from the perspective of smart Education [J]. China Distance Education, 2019(11):79-85.

[5] Zhiting Zhu,Jueqi Guan,Jun Liu. Personal Learning Space: A new focus of digital learning environment design [J]. China Audio-Visual Education,2013, No.314(03):1-6+11.

[6] Shaoqing Guo, Jinliang Zhang, Jiong Guo, Xiangchun He, Junru Shen. The Path and Policy Guarantee of the transformation of School Education by E-learning Space -- The connotation of e-learning Space and the development of School Education, Part 7 [J]. Research on E-Learning, 2017, 38(08):55-62.



[7] Shaochun Zhong. Research on the definition and relationship of education cloud, smart campus and online learning space [J]. China Educational Informati zation, 2014, No. 321(06): 3-8.

[8] Zishi Zhang,Yifu Jin,Tao Wu. Planning and Design of online learning space platform: A case study of future Education Space Station [J]. China Audiovisual Education,2015,No.339(04):47-53.

[9] Yan Wang. Study on the characteristics of Learning Space in Modern Architecture Professional Education Buildings [D]. Hefei University of Technology, 2010.

[10] Weidong Chen, Xindong Ye, Yafeng Xu. Future classroom: Smart Learning Environment. Journal of Distance Education, 2012, 30(05):42-49.

[11] Yan Kou, Jinliang Zhang. A review of domestic research on e-learning space. Digital Education, 2017, 3(02):9-17.

[12] Yinzheng Ma,Xingzhou Su.A practical exploration of Promoting the popularization and application of online learning space -- A case study of Linze County, Gansu Province [J]. China Modern Educational Equipment,2022(16):16-19.

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