

Education Meta-universe Research Knowledge Base Transfer and Research Analysis of Hotspot Evolution—Based on the CiteSpace Visualization Analysis

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Abstract: With the help of CiteSpace visualization software, this paper analyzes all the literature in the period from 2020 to 2022, and analyzes the research hotspot and trend of home and abroad at the present stage from the author cooperation network, keyword hot spot analysis, keyword time distribution and other directions. The results show that: (1) the research and attention to the educational meta-universe are on the rise.(2) The research focus of the educational universe is mainly focused on the county medical community, county medical service community, county medical community, etc.(3) From the perspective of the evolution process of keywords, domestic hot keywords mainly appear after 2020, and hot keywords keep up with the trend of The Times, including digital twin, virtual reality, etc.

1. Introduction

The term "metauniverse" was coined by Neil Stephenson in his 1992 scientific description novel "Avalanche". The launch in 2021 was a landmark event that gained widespread attention. My "meta-universe" is becoming more and more popular, and this year 2021 is called the zero point of the meta-universe^[1]. With the development of information technologies such as 5G, AI, VR, AR and digital twin, the metauniverse has emerged. Both national and local governments have incorporated this concept into the 14th Five-year Development plan, focusing on digital empowerment, integrating new scenarios, and creating a new ecosystem of content, resources, technology, and services. With the development of the Meta era, the new infrastructure of Chinese education, the cultivation of students' advanced thinking and the future development of education have opened up new opportunities. At present, there is no unified definition of "metauniverse". There are four main theories: the embodied Internet, social ecology, the combination of virtual space and time, and virtual reality. According to the study, the meta-universe is a virtual space parallel to the real world, supported by artificial intelligence, big data, and HCI, which can meet people's needs for experience, immersion, sharing and inventiveness, and can be used in a wide range of fields.

The concept of educational metacology combines pedagogy with metacology. It was an

interdisciplinary discipline that emerged in the mid-1970s^[2-5]. It mainly studies the law and mechanism of the interaction between education and the meta-universe, and opens up a new field for educational research. From the macro and micro perspectives, learning from the principles and methods of the meta-universe, studies the process, law and ecological balance of the interaction between education and information, people and environment, uses educational resources to improve students' cognitive ability, improve the level and function of the entire educational system, and make it enter a virtuous cycle.

The educational meta-universe has three basic characteristics: overall correlation, coevolution, and dynamic balance^[6]. The intelligent education ecosystem is also based on the above basic theories. The concept of smart education originated here in 2008, when IBM first appeared on The Smart Planet: My Next Leadership Agenda^[7]. When the concept of smart Planet. The concept later spread to various fields and inspired new ideas, leading to the emergence of intelligent education. The core of intelligent education is to realize the perception, interconnection and intelligence of everything through the use of information technology. With the development of smart technology, especially 5G technology, China has issued a package of policies to reform its education model and accelerate the development of smart education^[8]. In summary, the educational meta-universe is a "symbiotic, dynamic, balanced, and sustainable" system that integrates effector, interconnected, and educational elements. It uses information technology to organically link educational subjects (teachers and students) with educational ideas, teaching design, teaching resources, teaching evaluation and other factors, aiming to realize intelligent and ecological education. This paper makes a visual analysis of the medical community literature based on CiteSpace software to see the current research hotspot and trend of educational meta-universe, and hopes to provide strong support for enriching the discourse system of educational meta-universe.

2. Data source

The Chinese data are from the Chinese full-text database of China (CNKI). The data collection time is January 7, 2023. In order to ensure the scientificity and accuracy of the research results, the advanced search is conducted in CNKI, with "education universe" as the theme word, the literature source is academic, and the journal search time is the default. Finally, 196 pieces of literature data were obtained. The data show that the annual distribution is in 2020, 0-2022.

3. The Author Collaborative Network

The author cooperative network can clearly reflect the academic status of the author in the medical field and the degree of contribution to the research field. At the same time, it can also reflect the core author group and its cooperative relationship. Citespace Knowledge graph software can draw the source author map of medical peer research literature. The larger the nodes in the map, the more publications; the cooperation between authors is shown by the thickness and color of the author connection, and the thicker connection indicates closer cooperation. In this study, Note Types was set to Author and Top value was set to 10. The knowledge map of major authors at home and abroad was drawn to view the importance index of authors in the cooperative network and related network attributes.

CiteSpace, v. 5.1.R6 (64-bit) Advanced
 January 6, 2023 at 9:16:43 PM CST
 CHN: E:\Data\topicalometer\keyword
 Timespan: 2020-2022 (Slice Length=1)
 Selection Criteria: g, m (w=25, L=3.0, LN=10, LB=5, em=1.0)
 Network: N=50, E=36 (Density=0.0218)
 Largest CC: 3 (15%)
 Nodes Labeled: 1.0%
 Pruning: None
 Modularity Q: 0.845
 Weighted Mean Silhouette S=0.9069
 Harmonic Mean(Q, S)=0.8899



Figure 1 Cooperative map of domestic research authors

According to Figure 1, 57 authors have studied several articles on the medical community in the domestic author cooperative network map. In the field of education, the number of authors is relatively small, with 74 connections between the authors. The cooperation of the authors is relatively loose, and a total of two research teams appear. From the perspective of the cooperation degree of the research authors, the cooperation degree of the main authors is relatively high, so it can be believed that a strict and mature cooperation network is locally formed in the related fields of the meta-universe of education. Among them, zhong Zheng and other authors have the largest scope of cooperation, including 6 research scholars. The joint research contents of the research group include: first, from the application perspective of educational meta-universe, explore its application potential, risks and challenges and future development, which can provide reference for the research and practice of educational meta-universe in China^[9]. First from the education of the virtual universe, virtual simulation, virtual integration and the linkage four application levels, analysis of the education yuan universe in situational teaching, personalized learning, gamification learning and teaching inquest into scenario application potential, and then points out that the education yuan universe in the industry standards, trust mechanism and application oriented challenges, finally from the government departments, education main body, industry and enterprise the perspective of multilateral coordination, develop industry standards, establish management system and foster typical cases such as propulsion strategy. Second, the educational universe will shape new forms of education and bring about profound changes in teacher development. The influence of the universe in the teaching environment, teaching resources, teaching methods, teacher-student relationship and teachers 'professional ethics has put forward new requirements for teachers' ability. How to create the teaching situation of virtual and real integration, customize interdisciplinary teaching resources, carry out all-factor process evaluation and human-machine collaborative teaching and research, and improve the ability of strain and empathy has become a new challenge for teachers. To cope with this challenge, it is necessary to comprehensively promote the "meta-universe + teacher education", mobilize the enthusiasm of the government, enterprises, schools and teachers, scientifically layout the teacher education system, establish a large platform of

education meta-universe, cultivate typical cases of teacher development, and encourage teachers to actively adapt to the development of the meta-universe of education^{[10][11]}. The second is a research cooperation team centered on Zhao Xing and other authors, which is composed of three research scholars. The research contents of the research group include the application of "digital sapiens" in commercial activities, industrial production, cultural education and smart cities, to explore the direction of its governance, and to provide ideas for subsequent exploration^{[12][13]}.

4. Keyword hotspot analysis

Key words are representative words to describe the core content of the article. The higher the frequency, the higher the research heat. The high-frequency keywords can reflect the hot issues in the research field. Common word analysis is to reflect the strength of correlation between keywords through the co-occurrence of word pairs or noun phrases in statistical literature, and then determine the research hotspots, composition and paradigms of the disciplines or fields represented by these words, and analyze the development process and structural evolution of disciplines horizontally and vertically. Therefore, in the Citespace visualization software, the method of keyword co-occurrence network is mainly used to generate the keyword co-occurrence map of domestic and foreign medical community research (Figure 2).

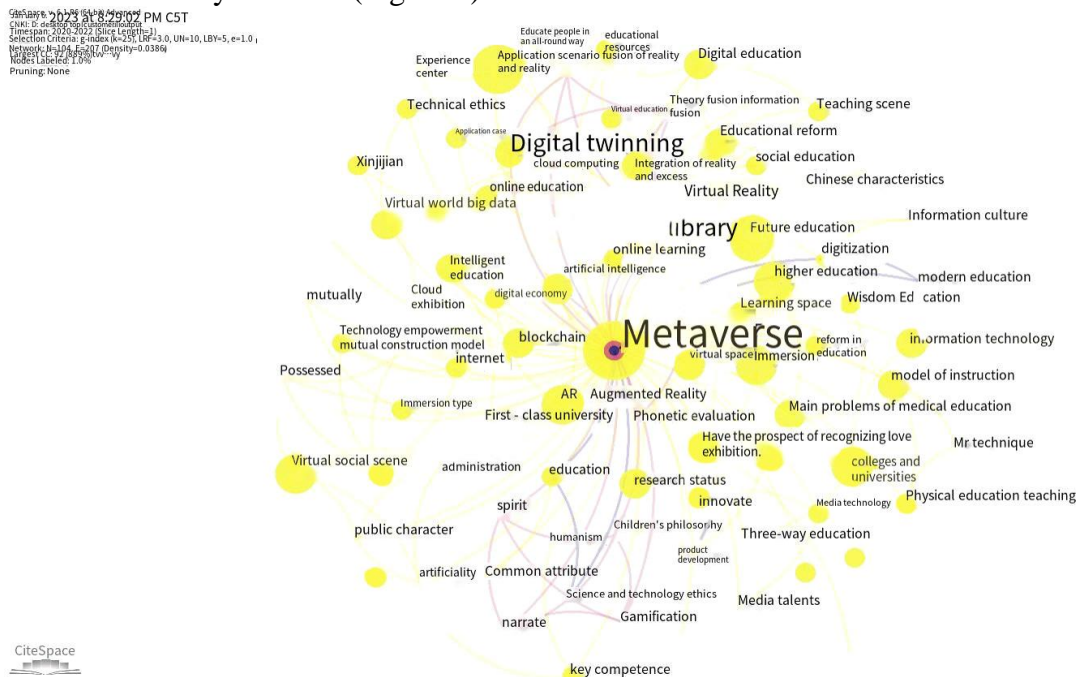


Figure 2 Hot spot knowledge map of domestic research keywords

(1)The node is the largest with a maximum of 126 times. The purple circle is the most obvious, with centrality up to 1.43. Other keywords related to the meta-universe include digital twin (8.74, 0.005); university (6.77,0.01); education (5.4,0.05); learning space (4.32,0.05); big data (4.32,0.05), etc.

(2)Key words include library (9.53, 0.005); large-scale hyperdomain collaborative learning (4.54, 0.05); blockchain technology (4.54,0.05); immersion theory (4.54,0.05), etc.

(3)Keywords about virtual reality such as digital education (8.88, 0.005); educational reform (8.88, 0.005); higher education (8.88,0.005), and educational resources (4.41,0.05).

5. Keyword time distribution

The time eline of keywords is on the basis of keyword clustering, expanding each type of keywords according to the occurrence time from left to right, and the keywords contained in each cluster are at the bottom of the cluster name. In the Citespace visualization software, click Timeline to generate a cluster-based keyword time line map, which can more intuitively understand the evolution process of research topics in the field of educational meta-universe.

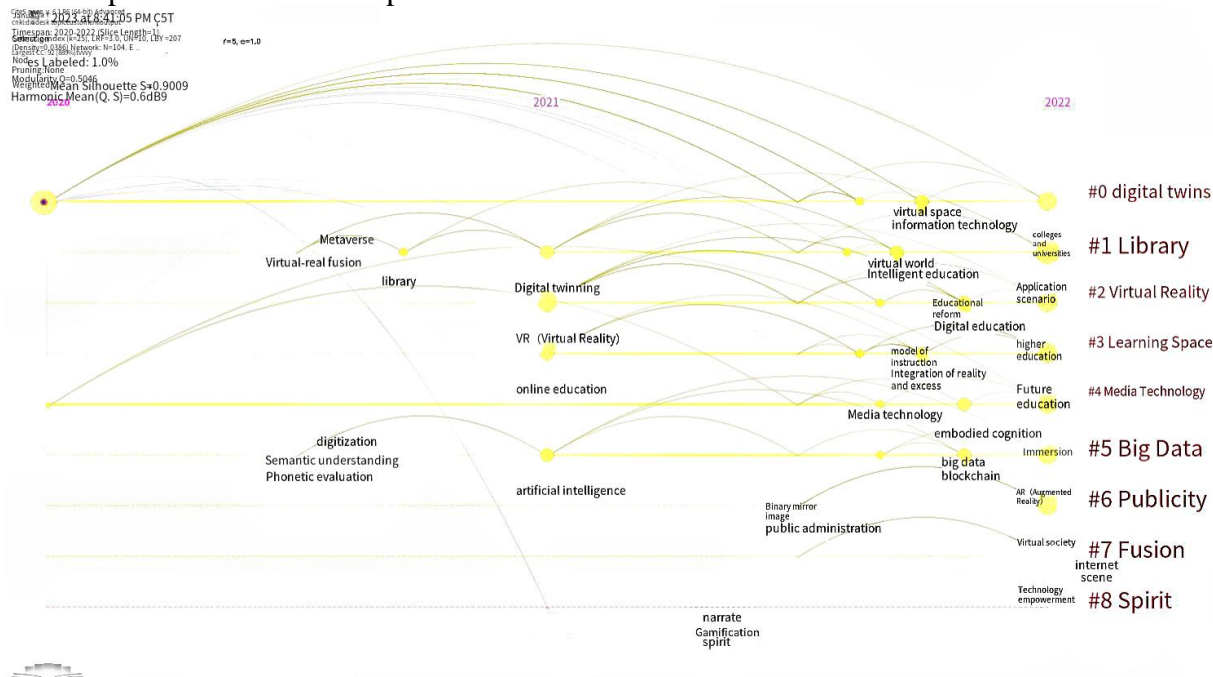


Figure 3 Time distribution of key words in domestic studies

As can be seen from Figure 3, in the domestic education universe, there are a total of eight clusters, which also represent eight research directions. These six clusters are # 0 digital twin, # 1, library, # 2 virtual reality, # 3 learning space, # 4 media technology, # 5 and big data. The module value Q size of the clustering is correlated with the density of the nodes, due to $Q=0.5046$, indicating that the network structure has a good clustering effect and can be used for scientific clustering analysis. The average profile value S size can be used to measure the homogeneity of clusters, $S=0.9009$, indicating high homogeneity and better division of different clusters.

From the perspective of the time distribution of keywords, keywords first appeared in 2020, including high-frequency words such as meta-universe and digitalization. Most of the keywords appeared in the past three years, indicating that at this stage, the research heat of domestic scholars on medical communities increased significantly, and the number of studies increased rapidly. The key words include digital twin, virtual reality and other keywords, as well as intelligent education, augmented reality and other technologies, indicating that scholars use a variety of research methods to study the universe of education^[14].

6. Conclusion

This paper uses CiteSpace and information visualization software to organize and visually analyze the research literature of education universe, sorting out the frontier hotspots and evolution process of research in this field in recent years, including research authors, research hotspots, evolution analysis, etc., to provide reference for the related research of education universe.

(1) The research and attention to the yuan-universe of education continues to rise. According to the author publication map, the number of authors in this field in China is not large, with more than 50 scholars. Domestic authors cooperation, relatively loose, a total of two research teams appeared. The largest research team is a research team centered on Zhong Zheng, which consists of seven research scholars. The second is a research cooperation team centered on Zhao Xing and other authors, including three research scholars. The rest of the cooperation teams are small, and the top publications include Li Zhengtao, Jiang Zheng and Jiang Fengguang.

(2) From the perspective of the research hotspot of the education universe in China, it mainly focuses on virtual reality, digital twin, virtual reality, artificial intelligence, online education, future education and other aspects.

(3) From the perspective of the evolution of keywords, the evolution of international hot keywords, in general, keywords concentrated in 2020-2022, after 2020, the number of keywords began to increase, and appeared, including digital twin, intelligent education and other keywords in line with the characteristics of The Times.

We review the applied research of intelligent education based on the meta-universe in China from the CNKI database, and find as follows: Most scholars began to study the meta-universe in 2020, and began to study the intelligent education ecosystem in 2013, and the research results have increased year by year. In the field of meta-universe education, previous studies mainly explain the development trend of meta-universe intelligent education, discuss the necessity of new space of future education, and describe the potential of meta-world for the development of education in the virtual world^[15]. The new state of education development in the future believes that the education element will lead to the future form of education, taking the education element and the physical world as the core of interstellar civilization^[16]. In *Open Another Door to Education — Application, Challenges and Prospect of the Metta Universe*, the author presents the problems and challenges facing the universe and proposes solutions for the early development of the meta-verse from mechanism, technology and teaching^[17]. In terms of intelligent education and ecosystem theory and application, previous research mainly discusses the "Internet +" application in intelligent education, it uses information technology to influence and change the education mobile information system ecosystem AI + education-intelligent education ecosystem to promote the realization of education fair, put forward through information-based methods to improve the availability of education resources, and through intelligent learning education fair^[18-21]. Research on the ecological path construction of online education in universities under 5G proposes to develop online education with the support of 5G and improve the online education ecosystem in universities under 5G^[22]. Various research results show that in the universe era, information technology has developed rapidly and become more diversified, and the intelligent education ecosystem is humanistic, intelligent, interactive, immersive and collaborative. The future research direction is to develop a new intelligent education ecology.

With the development of information technology, the emergence of intelligent education and the profound transformation of traditional education. My use of digital multimedia and other mobile methods has led to different forms of learning, allowing students to customize their learning patterns. Technology creates a learner-centered education ecology, digitizes education, and promotes the cultivation of intelligent talents. Intelligent education is a new form of education under the background of the advanced development stage of informatization and digital education and the ubiquitous educational information ecosystem.

With the emergence of the meta-era technology, intelligent education has presented a new trend and view while promoting the digital transformation and intelligent upgrading. The *universe Development Report* points out that the universe integrates virtual Internet applications and real social forms generated by various new technologies. It uses extended display technology to provide

an immersive experience, uses digital twinning technology to generate mirrors of the real world, and uses blockchain technology to build an economic system. It closely integrates the virtual and real worlds in terms of economic systems, social systems, and identification systems, and allows users to produce content and edit the world^[23,24].

Simulate the actual teaching scenario. Through information technology, it breaks the boundary of space and time in the physical world, expands the traditional learning space, and creates a virtual learning space that simulates the real setting. It gives teachers and students digital identities, allowing them to communicate synchronously in the physical and virtual worlds. Students and teachers interact and influence to develop together, making up for the deficiency of physical education teaching, and showing a better teaching mode.

Create immersive teaching experiences. In the meta-language-based learning scenarios, teachers can use efficient teaching methods to directly and intuitively display videos and images related to the teaching content. Reality and virtuality are seamlessly connected, allowing students to customize learning services and enjoy learning experiences in real life. The three-dimensional interactive presentation method is adopted to generate diverse and comprehensive sensational experience of vision, hearing and touch, to realize multi-modal learning and create a sense of "being". "Rich experience in 3 D teaching can stimulate students' curiosity, improve the teaching effect and quality, and improve the learning efficiency."

Promote students' cooperation and personalized learning. Teachers can carry out flexible teaching activities. In the metamuniverse, teachers customize learning scenarios to meet the needs of students. Teachers and students interact in real time in the meta-universe, and students can study together in different places. Moral inquiry and discussion, real-time sharing of information and resources, as well as in-depth communication, students can better absorb and internalize knowledge. Teachers can also modify and introduce new learning resources for learning activities, create personalized learning space, and improve students' thinking ability and reading and writing level.

To promote interdisciplinary research. Intelligent education goes beyond the single medium and linear teaching process of traditional teaching, solves the limitations of the original talent training system, breaks the correlation between curriculum systems, promotes STEM education as well as interdisciplinary teaching and innovation, and gives students greater freedom to engage in various forms of teaching. Therefore, in the meta-cosmic era, intelligent education is characterized by virtual-reality integration, collaborative interaction and resource collaborative construction. Compared with traditional education, it breaks the boundaries of time and space, improves students' cognitive ability and scene-based experience, and creates a collaborative, interactive and dynamic educational ecology.

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