



Research on the Informatization Development Trend of Higher Education in the Internet Era

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Abstract

Higher education informatization is an important measure to implement the action plan for education informatization 2.0. This paper retrieves 384 core journals on the topic of "informatization of higher education" from 2011 to 2021 using CNKI as the data source and the Internet as the background. Using Cite Space software and data analysis method, quantitative analysis was conducted in four dimensions: informatization status, informatization teaching, informatization research and keyword knowledge map of universities. The analysis shows that there are large gaps in informatization facilities and technologies in different levels of universities. Therefore, the development of informatization in higher education should accelerate the equalization of Internet infrastructure construction, strengthen the support level of information technology for scientific research team and teaching team, and enhance the deep integration of emerging artificial intelligence, block chain, cloud computing and other Internet technologies in higher education.

Keywords: *Internet; higher education; informatization.*

1. INTRODUCTION

1.1. Research background

In the development process of education informatization, the rapid development of information technology has led to the mutual integration of Internet technology and higher education. In recent years, the state has issued major documents such as "China Education Modernization 2035" and¹ "Implementation Plan for Accelerating Education Modernization (2018-2022)", and the national Ministry of Education also issued "Digital Campus Construction Specifications for Higher Education Institutions (for Trial Implementation)" on March 12, 2021, which aims to promote the development of higher education informatization and guide the national Higher education institutions make full use of cloud computing, big data, artificial intelligence and other technologies to create a networked, digital, intelligent and personalized education and teaching environment, and complete the digital transformation of campus environment as well as

the digital transformation of core business [1]. At present, the development of higher education informatization cannot be separated from Internet information technology, and the future trend of higher education informatization is a necessary means to promote the modernization of higher education.

1.2. Study data and methods

1.2.1. Data sources

Using China Knowledge Network (CNKI) as the literature search platform, an advanced search was conducted with the theme of "higher education * informatization", and the publication period was set from 2011 to 2021, and a total of 2838 documents were retrieved. We narrowed the search scope to CSSCI core journals, excluded conferences and academic literature of little relevance, and obtained a total of 384 valid documents. Secondly, we extracted the sample data from China University Informatization Development Report (2020) and made some analysis charts.

1.2.2. Research Methodology

Excel and Cite Space (version 5.8. R3) are mainly used to measure and analyze the content of the collected higher education informatization samples and literature data. Excel is used for the statistics of the sample data, such as informatization status, informatization teaching ratio, informatization research ratio and so on. Cite Space is used to generate keyword knowledge graph and keyword emergence for the data retrieved from CNKI data platform.

2. ANALYSIS OF THE DEVELOPMENT STATUS OF HIGHER EDUCATION BASED ON MOBILE INTERNET

In 2018, the Ministry of Education issued the Education Informatization 2.0 Action Plan, which plans to basically realize the coverage of teaching applications for all teachers, learning applications for all school-age students, and digital campus construction for all schools by 2022, and to generally improve the level of information technology applications and information literacy of teachers and students, and to build a large "Internet + Education" platform [2].

2.1. The development status of information technology in universities

Based on the sample data of the Report on the Development of Informatization in Chinese Universities (2020) released by the Science and Technology Development Center of the Ministry of Education in 2020, it is summarized in the following figures.

Figure 1 shows the informatization development status of universities at all levels from six dimensions: informatization scientific research, informatization teaching, information system, network security, infrastructure and institutional mechanism construction; from the figure, we can observe that top universities are leading in all six dimensions in informatization development, except for the small gap in informatization teaching, all other informatization construction has achieved good results.

secondly, the ordinary universities informatization development status is very close to the national average level of colleges and universities, with outstanding performance in information system construction; while the construction level of other colleges and universities is obviously lower than the national average level, and there are large shortcomings in informatization research and infrastructure.

from the national average level of informatization of colleges and universities, the most difficult to break through is the direction of informatization teaching, which has a low overall level, and then the level of infrastructure in colleges and universities varies greatly, which is not conducive to creating a fair environment for education; lastly, informatization supports scientific research, and it is obvious that the lower the level of colleges and universities have less applications at the scientific research level. Therefore, based on the technological innovation in the Internet and 5G era, the future change of higher education informatization should accelerate the equalization of infrastructure construction and strengthen the level of information technology to support the research team.

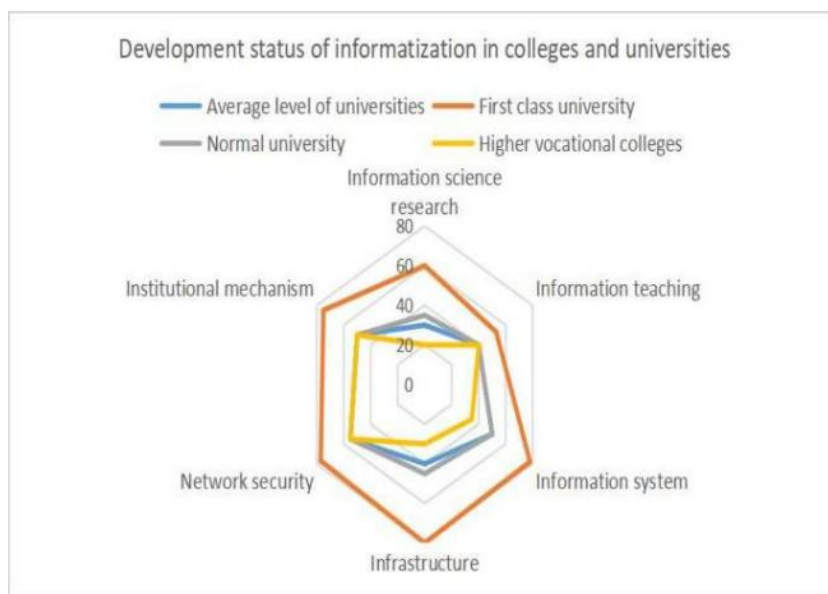


Figure 1 Radar chart of information technology data in higher education

"Teaching" and "scientific research" have been the two pillars of the development of higher education institutions in China, and the use of new information

technology to broaden the information development of teaching and scientific research in the Internet era is a top priority.

In the collected teaching sample data, the teaching work of colleges and universities has a high proportion of informatization application in online teaching platform and teaching resource platform, reaching 80%-90%; Next is the virtual simulation experiment platform, which plays an irreplaceable and important role in teaching construction and curriculum setting of science and technology disciplines, so the construction ratio reaches about 70%; in terms of student examinations and faculty assessment work, the construction of test bank system and teaching evaluation system to replace the traditional assessment method can collect performance data and feedback problems in a more scientific, accurate and extensive way; it is obvious that the teaching database has a certain deficiency in the construction of informatization, and only less than 40% of national universities have carried out database preparation work. It can be seen that colleges and universities generally pay attention to the construction of the platform of informatization to support teaching, and at present, online teaching and teaching resources are the main construction aspects, but the proportion of teaching database construction is low.

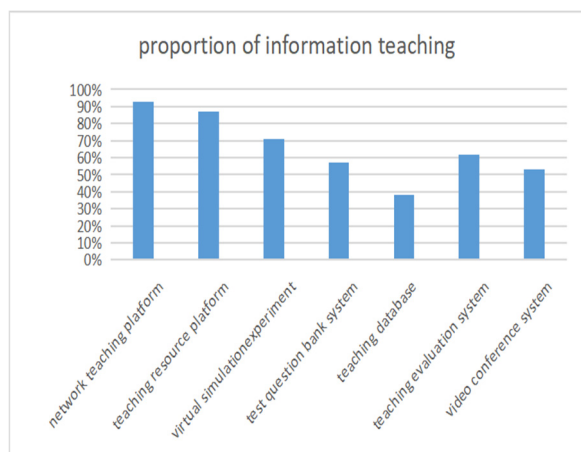


Figure 2 Proportion of information-based teaching

"Research" is a discipline activity to support national innovation and conquer top technology, and the development of various R&D software and data sharing can greatly reduce the workload of research and accelerate the progress of R&D. Therefore, it is essential for universities to build information technology to support research. From the chart, we can see that academic literature sharing is the most popular information technology research, accounting for about 65% of the total. followed by professional tools and software, scientific data sharing and large equipment sharing, but the proportion is less than 50%; the lowest construction ratio is high-performance computing services and project collaboration platform, in which the first-class universities may have more resource advantages and infrastructure advantages.

On the whole, the work of informatized scientific research is currently well developed in academic

literature sharing and professional tools and software, while other large equipment sharing, high performance computing services and project collaboration platforms have huge room for development. And to solve the problem of equipment and high performance computing requires more information technology research funding. In the future, more attention should be paid to the construction of information technology research capacity in general higher education institutions to provide more favorable research fertile ground for innovation in more disciplines.

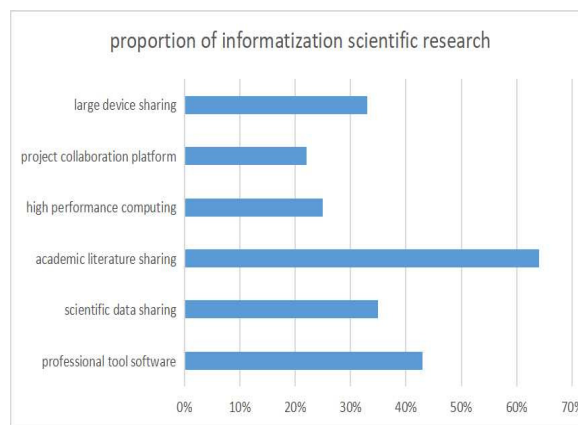


Figure 3 Proportion of information-based research

2.2. Statistical analysis of the literature

Using Cite Space software, 384 core journals about higher education informatization from 2011 to 2021 were screened to generate keyword emergence, which were used to analyze the research hot spots and development trends of higher education in the field of informatization in the past ten years.

Among the keywords studied by cite space, the number of nodes is 278, the number of connecting lines is 325, and the density is 0.0084. It contains more than 500 keywords in 384 papers. In particular, higher education, informatization, information technology, question and answer, talent training, Internet +, big data, network education and artificial intelligence are most closely related. To a certain extent, it also shows the hot trend of future higher education informatization development. For example, in the network teaching, there is a question and answer platform for sharing teaching resources, which includes the teaching resources of many famous teachers and promotes academic exchange and sharing; In the application of big data, colleges and universities attach great importance to the construction of academic literature databases and databases. Only with a complete data platform can students obtain more external information; The construction of "smart campus" is to use Internet technology to realize all-round service and management of the campus, so as to make teaching, scientific research and management of the university can be more efficient.

Cite Space provides burst detection, which refers to words that appear more frequently or are used more frequently in a short period of time, and based on the change of word frequency of burst words, we can determine the frontier and trend of the research field [3]. Setting the minimum duration parameter of Burstness panel to 0.4, and get 13 words with burst increase keywords.

The red segment indicates a rapid increase in the occurrence of the keyword in the education informatics research literature during the beginning and end years, which means that the frequency of the topic literature suddenly increased during this period; the greater the intensity of the keyword emergence during the same period of time, the more important the content it reflects [4]. For example, in the period 2015-2021, "Internet+" "artificial intelligence" is more important than "big data" "Blockchain" and "smart campus" have a greater emergent intensity of 1.95, This indicates that "Internet+" has a strong growth in the field of higher education informatization research; followed by "artificial intelligence", "Blockchain", "Smart campus" "Big Data", "MOOC" and other emerging keywords constitute the cutting-edge themes of higher education informatization, and also indicate that the academic community has paid more attention to the application of emerging information technology.

Top 13 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2011 - 2021
UNIVERSITIES	2011	2.75	2011	2012	
CLOUD COMPUTING	2011	1.46	2012	2013	
CLOUD SERVICES	2011	1.07	2012	2013	
DEVELOPMENT STRATEGY	2011	1.07	2013	2014	
TEN TOPICS	2011	1.07	2013	2014	
MOOC	2011	2.94	2014	2015	
LEARNING ANALYSIS	2011	1.71	2014	2016	
BIG DATA	2011	2.07	2015	2017	
INTERNET +	2011	1.95	2016	2019	
BLOCKCHAIN	2011	1.03	2017	2021	
INTELLIGENCE CAMPUS	2011	1.03	2017	2021	
VISUALIZATION	2011	1.01	2017	2018	
ARTIFICIAL INTELLIGENCE	2011	1.91	2019	2021	

Figure 4 Higher education information technology keywords emerge

3. DEVELOPMENT TREND OF HIGHER EDUCATION INFORMATIZATION

First, in the post-epidemic era, universities will deeply integrate Internet technology and intelligent technology into teaching and management, forming a hybrid teaching mode combining online and offline teaching, providing a learning environment where teachers and students can learn all the time and everywhere [5]. the opening of "online study rooms" is the best example.

Second, deepen the integration of information technology and scientific research innovation, strengthen the sharing of large instruments and equipment and the collaboration of scientific research projects in various universities, build a smart campus and database, use big data technology to help scientific research decision-making and academic evaluation, and use the construction of smart campus to optimize the teaching management, scientific research management and life management of universities [6].

Third, through the statistical analysis of the literature in the past ten years, we found that the emerging Internet technologies and higher education are gradually integrating and developing, such as "artificial intelligence", "block chain", "MOOC", "big data" and other aspects of information construction is receiving attention from the academic community, which is the frontier theme of higher education information construction in the future.

4. CONCLUSION

In general, the future change of higher education information technology should accelerate the equalization of infrastructure construction, especially in the construction of university database system, scientific research tools and software development and application, and high-performance computer services, and strengthen the level of information technology support for scientific research team and teaching team; secondly, we should pay attention to the deep integration of emerging Internet information technology with teaching and scientific research, such as the project design and cooperation in blockchain, cloud computing, artificial intelligence and other fields in universities.

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