

Status Analysis of Special Education Informatization in China ——the visualization analysis based on CiteSpace

Jian Jie

Hunan Normal University, China
jianj287@hunnu.edu.cn

Xiong Mimi

Hunan Normal University, China
Gzxmm966@163.com

Chen Sailong

Hunan Normal University, China
2106230456@qq.com

China has started the process of informatization of special education since the 1990s. From then on, special education informatization has been concerned by researchers from different disciplines. Using bibliometric analysis method and CiteSpace, this study focused on the temporal and spatial distribution, research objects, research types, thesis topics, hotspots and trends of 180 sample literatures. It was concluded that the modernization of special education has been effectively promoted in the era of rapid development of informatization.

Keywords: Special Education; Education Informatization; Research Status

Introduction

In the late 1990s, China began to pay attention to the development of special education informatization. Ministry of Education of the PRC issued a paper in 2001 that they should encourage and accelerate the informatization process of special education, and promote the modernization of special education by informatization. This is the first time that “special education informatization” has been written into the national policy document. Then this ministry issued a paper to speed up the process of informatization in 2007, realize the leap-forward development of special education, put the education informatization project into the key construction projects of special education, and promote the modernization of special education with informatization. In 2009, General Office of the State Council of the PRC proposed to speed up the process of special education informatization, promote the sharing of high-quality special education resources, and improve the literacy and ability of disabled students to use information technology. It was proposed to strengthen the construction of resource room for special education and accessible facilities to provide distance education services for special children in 2014 by Ministry of Education of the PRC, and it was emphasized strengthening the construction and application of special education informatization in 2017. Then, the ministry proposed in 2021 that information technology and special education should be integrated deeply and encouraged to make full use of new technologies such as the Internet, cloud computing, big data, virtual reality and artificial intelligence to promote the construction of smart campuses and class for special education.

Since 1999, China has issued 6 papers to speed up the process of special education informatization, which means that it is necessary to develop informatization in the area. The development of special education informatization has become an important measure to promote the modernization of special education.

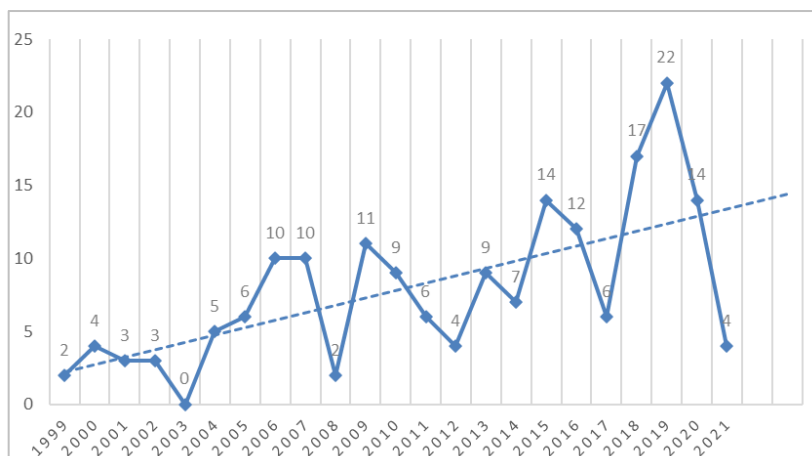
Method and Process

This study selected 180 sample literature, using bibliometric analysis method, combined with citespace visualization analysis of literature(Li Jie et al.,2016). Here are the results of the analysis.

Temporal and Spatial Distribution

Time distribution. As shown in Figure 1, the number of papers shows a linear growth trend. The development of literature quantity is divided into three stages based on the year when relevant policies are issued by the state. (1) Embryonic stage (23 papers), from 1999 to 2005, the academic community explored the informatization of special education, focusing on the exploration of special education resources and the infrastructure of special schools(Chen Lin,2001).(2) Growth stage (61 papers), 2006-2013, the research object became more accurate and specific. At this stage, scholars began to study and explore the development strategy of special education informatization for autistic children(Qi Yuan,2013). (3) Vigorous stage (96 papers), the number of relevant research papers increased significantly from 2014 to 2021 and peaked in 2019 (22 papers). Researchers focused on the special education informatization, conducted comprehensive studies for different subjects, and conducted integrated studies on artificial intelligence and special education(Liming Guo et al.,2019).

Figure 1
Time distribution of samples



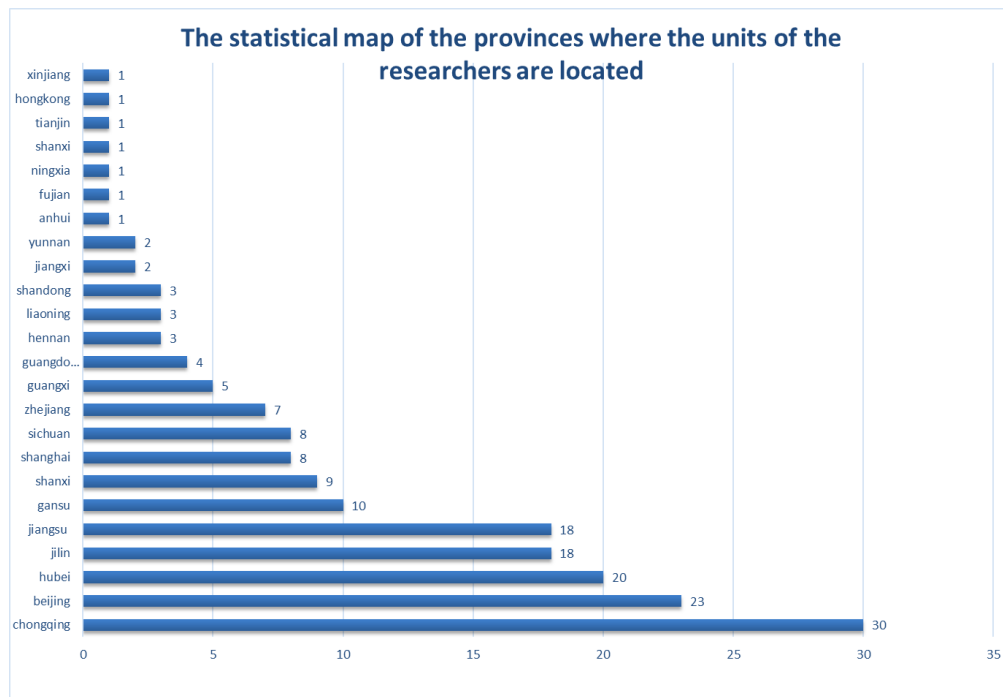
Spatial distribution. In order to understand the spatial distribution of special education informatization research in China, the provinces where the research units of the authors are located are counted. As shown in Figure 2, the authors of 30 articles belong to Chongqing, whose research focused on the application of assistive technology in special education(Zheng Jian,2007). The research units of 23 papers belong to Beijing, and they mostly studied the application of information technology to promote the development of special education. For example, some scholars studied the development countermeasures of special education from the perspective of informatization(Qi Yuan,2013) .The authors of 20 articles belong to Hubei Province. Their research focused on the development level of special education informatization in some areas of China(Yu Xiaorong et al.,2018). The author’ s research units of 18 papers belong to Jilin Province. They paid attention to the application of CSCL in special education in the early stage and paid more attention to deaf students(Sun Jinghua,2011). The authors of 18 articles belong to Jiangsu Province, which is the first to carry out related research for autistic children(Dou Yanhui,2011). Northwest China, represented by Gansu and

Shaanxi, focuses on the development of special education informatization at the macro level(Guo Jiong & Zhong Wen-ting,2016).

It can be seen that the research areas of special education informatization in China are mainly distributed in the northeast region represented by Jilin, the north China represented by Beijing, the eastern region represented by Jiangsu, the central region represented by Hubei, the southwest region represented by Chongqing and the northwest region represented by Gansu and Shaanxi, and there are still many provinces with research gaps.

Figure 2

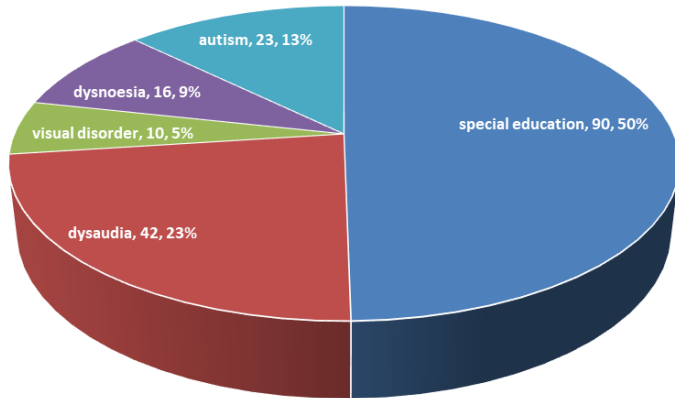
The statistical map of the provinces where the units of the researchers are located



Research Object Analysis

According to the research questions in the literature, from the functional level of the research questions, the research subjects involved in the literature are classified as: special education (without distinguishing the subjects), dysaudio, visual disorder, dysnoesia, autism, extremity disability. Among the literature samples studied, a large number of papers did not clearly distinguish the research objects, and the research objects were placed on a wide range of “special education”. The study on dysaudio began in 1999. Wu Yonghong proposed to use modern educational technology to help deaf-mute children overcome learning disabilities (Wu Yonghong,1999), which is an important starting point in the field of special education informatization. The research on special education informatization for autistic people first appeared in 2011 (Dou Yanhui,2011). Then the number of research for autistic groups has gradually increased. The continuous refinement of research objects marks that the development of special education informatization in China has paid more and more attention to the actual needs of special groups, and constantly tried to apply emerging technologies to improve the environment of special education, develop and create special education teaching resources, and help special groups overcome learning obstacles.

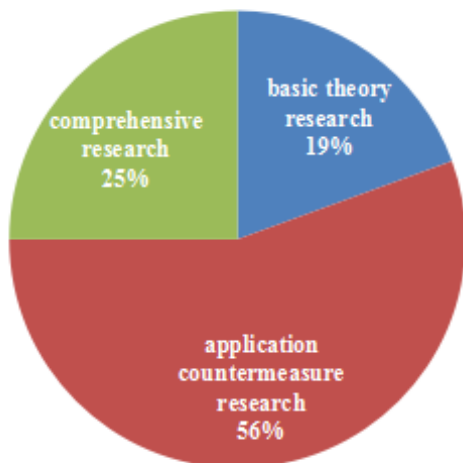
Figure 3
 Statistical Chart of the Number of Research Objects in Literature Sample



Research Type Analysis

In the literature samples, the basic theory research started in 2000, the research elaborated to the modern special education viewpoint, the significance and function of the modern special education resources construction. The focus of comprehensive research is the application design of special education under the theoretical support. In the field of special education informatization research, the application countermeasure research accounts for the highest proportion. It studies what technology and how to apply technology in the field of special education, and adopts different technical means for different research objects. For example, the development of visual learning resources for deaf students(Sun Jinghua,2011) and the application of virtual reality technology for children with intellectual disabilities(Zheng Quan,2019) to promote their educational rehabilitation are aimed at using appropriate technical means to help special groups overcome their own obstacles or reduce the negative impact of obstacles on learning, optimize the teaching process of special education and improve learning efficiency.

Figure 4
 Statistical Chart of Research Types of Literature Sample



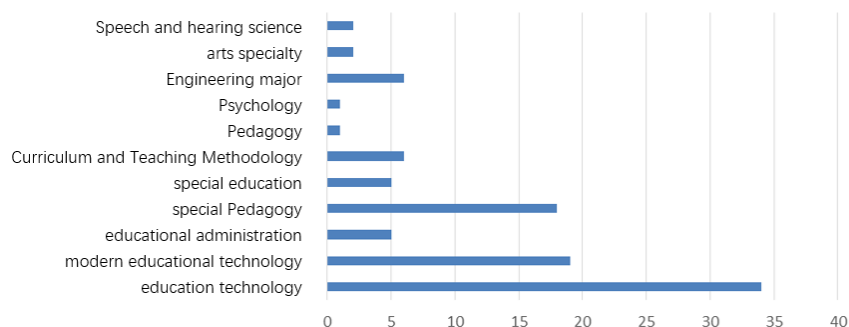
Subject Analysis of Dissertations

There are 99 academic papers in the literature sample, and the subjects and specialties of the authors are counted, as shown in Figure 5. Education technology (education technology, modern education technology) has a large number of research in this field. The number of studies on special education (special pedagogy, special education) is also large, especially in Chongqing Normal University. Their studies mainly involve special education auxiliary technology. Other majors in pedagogy, such as curriculum and teaching theory, education management, have also been involved in this research field. Some people have studied the information teaching mode of deaf schools, and others have studied the development of information technology courses for students with intellectual disabilities.

Some engineering majors, such as industrial engineering, electronic and information engineering, computer technology and so on, have also carried out relevant research. Their research has more technical characteristics, including the key technology research of autonomous human-computer interaction for autistic children's education and training tasks, the research of Braille recognition technology based on deep transfer learning method, and the design of educational rehabilitation game for children with ADHD based on virtual reality technology. Therefore, scholars in various fields have paid attention to the development of special education informatization. Scholars in different fields have carried out innovative and developmental research combined with their own discipline characteristics, and promoted the development of special education informatization.

Figure 5

Statistical Chart of Authors' Subjects in Literature Sample Dissertations



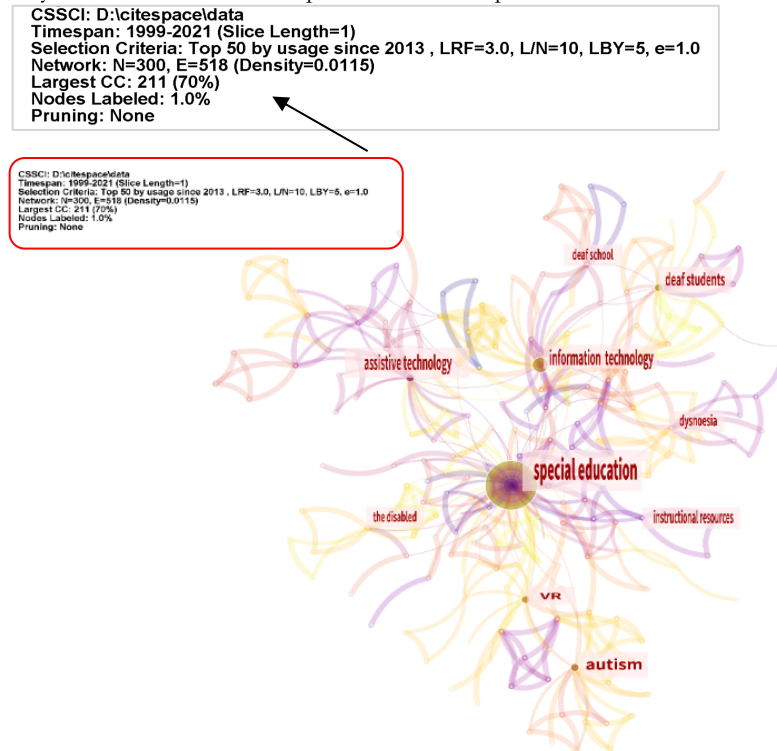
Hotspots and Trend Analysis

In citespace, the keywords are clustered to clarify the hotspots and development trends in this field(Li Jie & Chen Chaomei,2016). The results are shown in Figure 6. According to the different research significances represented by keywords, they are classified as follows. The first is the research objects: special education, deaf students, deaf school, autism, dysnoesia, the disabled. The second is the use of technology: information technology, assistive technology, VR, instructional resources. On the research object, scholars pay attention to the special groups of various types of disabilities(Guo Jiong & Zhong Wen-ting,2016), such as scholars study the construction status of special education information environment at the macro level, the construction of visual learning resources for deaf students, the use of modern technology to promote the education and rehabilitation of autistic children, and the use of scientific and technological means to promote the learning of children with intellectual disabilities. In technology, researchers pay attention to the application of information technology and auxiliary technology in the field of special education(Zheng

Quan,2019). Different types of special populations with disabilities require different types of technology. For example, researchers focus on applying virtual reality to the learning process of children with autism and intellectual disabilities.

Figure 6

Keywords co-occurrence map of literature sample



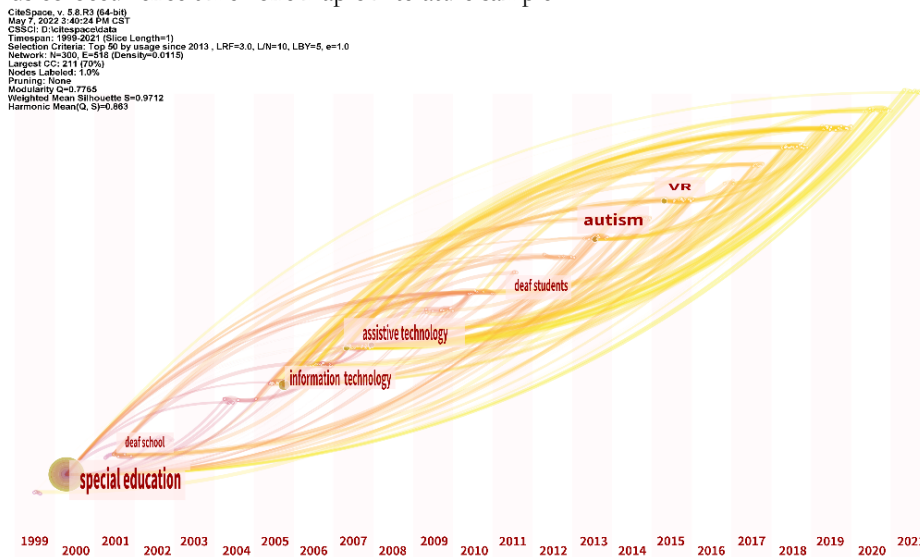
As shown in Figure 7, in terms of technology, from 1999 to 2004, scholars began to propose the use of information technology to optimize special education. For example, modern educational technology is used to help deaf or blind students overcome learning disabilities, and information resources are mainly carried out for deaf students(Wu Yonghong,1999) For example, the construction of special education resources, the production of deaf school television teaching materials, etc. Since 2002, people have begun to explore the integration of information technology and special education courses. Some scholars have studied the integration of information technology and Chinese curriculum in deaf schools and the application of multimedia technology in English classroom in deaf schools(Men Guojie,2004). Between 2004 and 2010, scholars paid more attention to using network and multimedia technology to optimize the process of special education(Zheng Quan,2010). Such as the use of campus network in special schools to build a resource platform, management of school curriculum resources, the use of multimedia technology to design and develop teaching resources, teaching, etc. After 2010, scholars have used a variety of emerging information technology tools, such as website development, 3D modeling, and virtual reality, to improve the teaching process of special education(Guo Jiong & Zhong Wen-ting,2016).

In the research object, researchers initially focused on the generalization of the object-special education. With the development of society, researchers gradually refine the research object, pay attention to the deaf, blind, intellectual disabilities, autism and other specific special groups, create visual learning resources for deaf students.In order to overcome their hearing impairment, the application of modern information technology to optimize Braille learning, design educational game for autistic children

With the progress of society and the rapid development of information technology, scholars have continuously improved the research on special education informatization. The research objects have been gradually refined and the

technology we used has become more advanced. Today, with the continuous promotion of artificial intelligence, some scholars have used computer technologies such as ML and DL to explore the integration of artificial intelligence and special education(Liming Guo,2019).

Figure 7
keywords co-occurrence time zone map of literature sample



Conclusion

Through the analysis of the relevant literature in the field of special education informatization, it is concluded that the modernization of special education has been effectively promoted in the era of rapid development of informatization. In the study of special education informatization, we should start education with love and pay attention to the development of special education groups in the information environment. Researchers should make it clear that education is no special difference in terms of education, only good or bad, that is, in the face of any group, we can practice education harmonically(Liu Tiefang,2021). Continuously improve the information literacy of special groups, and avoid being submerged in the wave of the rapid development of the information age. In the research in this field, innovation and application should be taken as the standard to promote the application research of special education informatization. The related research should start from the real needs of applicable objects and pay more attention to group applicability, but highlight the technical height.

The modernization of special education is inseparable from the promotion of information technology. In the research of special education informatization, researchers use information technology to optimize the teaching process of special education, construct abundant special education resources, and create a new type of special education informatization environment to promote development by research. In the future research of special education informatization, we continue to promote the modernization of special education by informatization.

References

- Chen Lin. (2001). Application of Modern Educational Technology in Special Education. *e-Education Research* (11):67-69.doi:10.13811/j.cnki.eer.2001.11.016.
- Dou Yanhui.(2011). Study about How to Design Educational Games for Children with autism (master's degree thesis, Nanjing Normal University).
<https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD2012&filename=1011249959.nh>
- GUO Jiong & ZHONG Wen-ting. (2016). A Survey of ICT Facility Construction and Its Applications in Special Education. *e-Education Research* (04):26-35.doi:10.13811/j.cnki.eer.2016.04.004.
- Li Jie & Chen Chaomei. (2016). *CiteSpace:Text Mining and Visualization in Scientific Literature*(2nd ed).China,Capital Economic And Trade University Press.
- Liu Tiefang(2021).Cultivating the Beauty of Human Nature--Summary Statement of Practice Inspection In Changsha Peizhi Special Education School. Humanistic Education of Professor Liu Tiefang.https://mp.weixin.qq.com/s/pyifg3QsijHRD1zgIywjKA?scene=25#wechat_redirect.
- Liming Guo, Xianmin Yang, Xiaolian Duan and Beibei Xing. (2019). Integrated design of artificial intelligence and special education. *Distance Education in China* (08):10-19+92-93.doi:10.13541/ j.cnki.chinade. 20190226.003.
- Men Guojie(2004). Research on the integration of relevant information technology and deaf school language teaching (master's degree thesis, Northeast Normal University).
<https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CMFD0506&filename=2004120117.nh>
- Qi Yuan. (2013). On Strategies for the Development of Special Education from the Perspective of Educational Informationization. *Chinese Journal of Special Education* (10):60-64.
- Sun Jinghua.(2011). Application of CSCL in Higher Special Education. *China Educational Technology* (07):21-25.
- Wu Yonghong.(1999). Using Modern Educational Technology to Overcome Learning Disabilities of Deaf and Dumb Children. *China Educational Technology* (06):32-33.
- Yu Xiaorong, Wu Di, Li Haolong, Deng Liu, Lu Chun, Cao Qinglin. (2018). Research on the Development Level and Influencing Factors of ICT in Special Education in Central and Western Regions of China. *China Educational Technology* (11):24-32.
- ZHENG Jian. (2007). A Comparative Study on Assistive Technology Higher Education in Universities between China and USA. *Chinese Journal of Rehabilitation Theory And Practice*, (10):989-991.
- Zheng Quan. (2019). *The Teaching Research Based on the Virtual Situation for Children with Intellectual Disabilities* (Ph.D. Dissertation, Shanxi Normal University).<https://kns.cnki.net/KCMS/detail/detail.aspx?dbname=CDFDLAST2021&filename=1020005638.nh>
- Zheng Quan(2010). Online Resources for Special Education: Status Quo, Problems and Development Strategies. *Distance Education in China* (05):28-31+79.DOI:10.13.