

Technical Analysis Research in the Field Of Education Based On Patent Data

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ABSTRACT: *With the rapid development of educational informatization, the technological innovation ability in the field of education is constantly improving. This paper takes the technology patents in the education field in the INCOPAT patent database as the research object, and makes an in-depth analysis of the technology patent data in the education field from the aspects of application trend, IPC technical field composition, patent applicants, geographical distribution and so on. Based on this, we find out the problems existing in the development of technology in the field of education in China, and give corresponding countermeasures and suggestions.*

KEY WORDS: *Education field; Technology; Patent data; Analysis*

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I. INTRODUCTION

At present, countries all over the world take rejuvenating the country through science and education as an important policy, pay high attention to technological innovation in the field of education, and take the development of educational technology as an important force to promote national development. In recent decades, the field of educational technology has developed rapidly, and educational technology is of great significance to promote educational informatization and the combination of teaching and learning. The Outline of China's National Medium - and Long-term Education Plan for 2010-2020 clearly states that "information technology has a revolutionary impact on the development of education and must be attached great importance to". However, there are still some problems in the development of educational technology. It wants to gradually change the traditional teaching mode and learning mode, promote the comprehensive reform of teaching concept, method, content, tool and evaluation structure, facilitate the creation of new learning environment, and promote the comprehensive innovation of education and teaching. All these make the status of technological innovation in the field of education more prominent. The establishment of educational technology informatization has become the only way to realize education modernization and build a learning-oriented society.

II. CONCEPTS RELATED TO EDUCATIONAL TECHNOLOGY AND PATENTS

2.1 Concept of educational technology

The term "Educational Technology" originated in the US, and the field grew out of the need to train large numbers of soldiers during the Second World War, who "organized experts in various fields, including psychology, audiovisual education, communication and film art, to develop training plans, design training courses and train films." Since then, the educational technology of the United States has been beyond the application of traditional basic education and higher education, involving the application of different fields such as commerce, industry, military, health and so on [1].

Educational technology refers to the theory and practice of optimizing education and teaching through the design, development, utilization, management and evaluation of teaching and learning process and related resources by using various theories and technologies. Its main research areas can be summarized from the design, development, utilization, management and evaluation of teaching and learning processes and related resources. The design mainly includes: teaching system design, content and information design, teaching strategies, learner characteristics analysis, etc. Development mainly includes: printing technology, audiovisual technology, computer application, technology and other comprehensive technology; Utilization mainly includes: the utilization of media, the promotion of innovative technologies, the implementation and institutionalization, policies and regulations, etc. Management mainly includes: project management, resource management, teaching system management, information management, etc. The evaluation mainly includes: problem analysis, reference standard evaluation, formative evaluation, summative evaluation, etc. [1].

2.2 Patent Concept

Patent (patent), usually by a government authority or regional organizations representing several countries according to the application and issue a file, the file recorded the content of the invention, and in a certain period of time to produce such a state of law, namely the patented invention in the general case to others only with the permission of the patentee can be implemented. In China, patents are divided into three types: invention, utility model and exterior design. Patent literature is the most effective carrier of technical information, containing more than 90% of the world's latest technical information. Most inventions and creations are only made public through patent literature and are not seen in other scientific and technological literature. Therefore, compared with other forms of literature, patents have more novel and practical characteristics.

III. PROCESS OF TECHNICAL ANALYSIS AND RESEARCH IN THE FIELD OF EDUCATION

3.1 Analysis Method

The patent analysis method refers to the method of screening, statistics and analysis of relevant patent documents to transform them into usable information [2]. In this paper, a quantitative analysis method is adopted to retrieve, count and sort out the technical patent data in the field of education through IncoPat patent retrieval database. A total of 114,753 patent data are retrieved. Then, the application trend, technical composition, applicant ranking and geographical distribution and other information recorded in the patent literature are explained and analyzed from different angles through charts and other means [3].

3.2 Analysis of results

3.2.1 Analysis of technology patent applications in education field year by year

This paper makes a statistical analysis of technology patent applications in the field of education to reflect the distribution of the number of patents in each year. Figure 1 shows the development trend of technology patent applications in the field of education. From the perspective of application trend, we can grasp and analyze the change of patent application heat in this field from 1980 to 2017 at a macro level. This period can be roughly divided into three stages.

The first stage is from 1980 to 1999. Compared with the later stage, the number of educational technology patent applications in this stage is always at a low level, with an average level of about 700. However, with the change of time, it presents a small increase trend.

The second stage is from 2000 to 2010, during which the number of patent applications has been greatly improved compared with the average level of the previous stage. The reason is that with the continuous development and extensive application of information technology in the 21st century, governments of all countries begin to realize the key role of educational technology in promoting educational innovation. For example, in 2001, the "No Child Left Behind" Act of the United States proposed to take information technology as an important resource to support teaching and learning. This act will provide guidance in ensuring that schools can effectively use technology to support high-quality teaching and learning activities [4]. China deepen the strategy relying on science and education, the Ministry of Education in China issued by the education facing the 21st century revitalization action plan "and" the deepening education reform, promoting quality-oriented education regulations such as the file to the development of modern distance education, construct lifelong learning system is put forward clear requirements, puts forward relevant policies to promote information technology and education teaching depth fusion, to promote quality education resources sharing, etc. All these play a role in promoting the technological development in the field of education at this stage.

The third stage, from 2011 to 2017, is a relatively rapid development stage, with the number of patents doubling compared with the previous two stages. Investigate its reason, put forward with the education informationization day by day. In order to achieve the teaching means of science and technology, education dissemination of information, teaching methods of modernization for education technology innovation put forward higher requirements. With the rapid development of global Internet technology and the continuous promotion and implementation of quality-oriented education, the number of patent applications has been developing rapidly.

It can be seen from this that the rapid development of technology research and development in the field of education started in the past decade, so relevant governments still need to increase relevant support. In order to further promote the innovative RESEARCH and development of patents in the field of education, the government should continue to strengthen the support for the innovative research and development of core technologies in the field of education, and make the long-term development of education informatization through relevant policies and economic support.

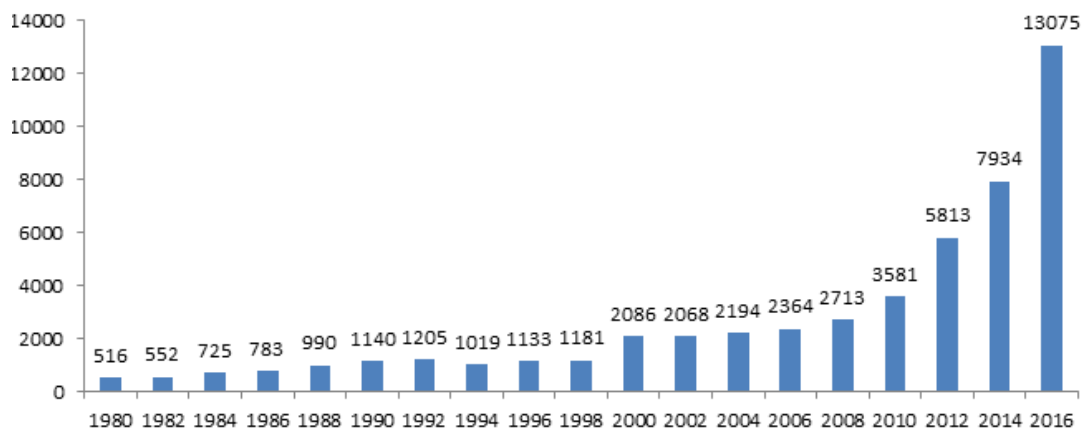


Figure 1. Year distribution of technology patent applications in the field of education

3.2.2 Composition analysis of IPC technical field

IPC (International Patent Classification system) is a special method to classify patents from all over the world. It has been adopted in many countries. Through the analysis of the IPC (International Patent Classification) classification number involved in technology-related patents in the field of education, the hot fields of technology-related patents in the field of education can be analyzed, which is more helpful for us to understand the current development status of technology in the field of education [5].

According to the International Patent Classification Number and Technology Field Comparison Table of the World Intellectual Property Organization, this paper makes an in-depth analysis of the technology patent data in the field of education according to the IPC classification number (small category).

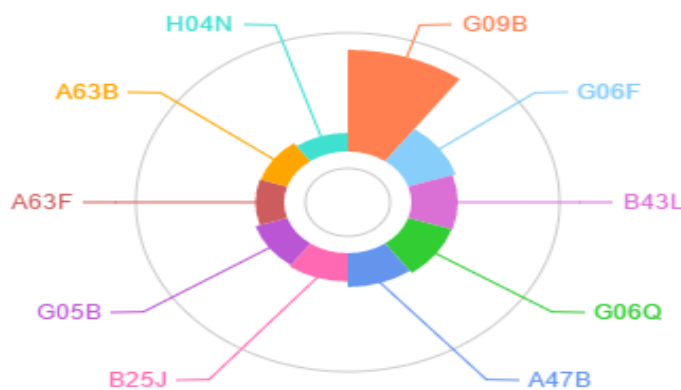


Figure 2. Rose chart of technology patent data area in the field of education

Legend: G09B, G06F, B43L, G06Q, A47B, B25J, G05B, A63F, A63B, H04N

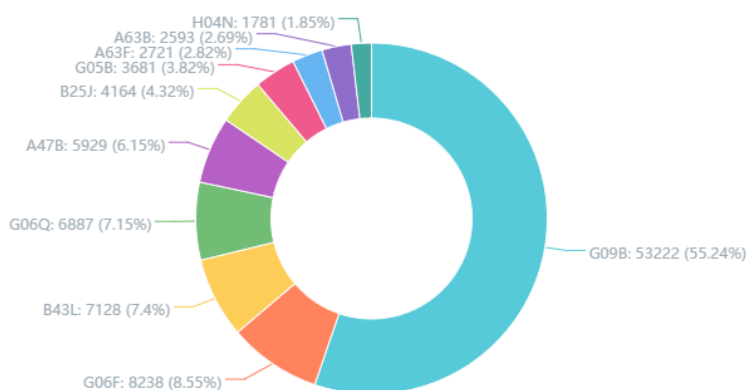


Figure 3. Distribution diagram of the proportion of main IPC subcategories in educational technology

It can be seen from the data in Figure 2 and Figure 3 that although educational technology patents are distributed in different fields, G09B (educational or demonstration appliance; Apparatus for teaching or for communicating with the blind, deaf or dumb; Model; Planetarium. The globe; The map; Charts (devices used for mental techniques or to test reaction times; (recreational equipment), the largest number of technology, has occupied half of the education sector. So the main technological inventions in education today are educational or demonstration devices; Tools and models for teaching and communication. For example, Little Genius Technology Co., Ltd. in Guangdong, China, focuses on the Chinese children market, innovates and applies excellent children's education concept and modern science and technology, and provides edutainment products that meet the needs of modern children. The company's products such as: learning machine and cassette tape, language repeater, electronic dictionary, audio and video player, e-book, tutor machine, early education machine, point reading machine, point reading pen, learning computer, electronic building blocks and so on are the model of technological innovation in the field of education.

However, through analysis, it can be seen that most of the technologies involved in the education field are demonstration appliances and models, and the core technology products that really promote the development of education are not many, but mainly peripheral products such as educational demonstration appliances that promote education facilitation. The number of patents involved in basic theoretical research and practice in the field of education and the in-depth research on specific teaching issues should be improved.

3.2.3 Analysis of patent applicants

The first is FANUC LTD of Japan, the second is HITACHI LTD of Japan, and the third is Harbin Normal University of China. The top two of the top three were Japanese companies.

Fanuc is the most powerful enterprise in research, design, manufacture and sales of numerical control systems in the world today, with a total of 4,549 employees and 1,500 scientific research and design personnel. The company has such a high proportion of educational technology because of its own emphasis on the cultivation of talents. The company has a complete set of advanced personnel training system, innovative a number of research to teach the staff, in the vocational education and training this aspect has done very well. As a global leader in social innovation, Hitachi engages in the fields of electricity, energy, industry, circulation, water, urban construction, finance, public, medical and health care, and provides high-quality solutions through cooperation with customers. The reason why the company has such a high proportion in the field of educational technology is that its products developed in different fields have strong teaching ability, and many products can be extended to education and training fields for learning. All these indicate that technology in the field of education is relatively strong in terms of vocational education and vocational training.

The top ten universities in the field of education, including Harbin Normal University, Qiqihar University, Northeast Petroleum University, Harbin University of Science and Technology, Heilongjiang Institute of Engineering and Harbin Institute of Finance, are listed on the list, indicating that Chinese universities have certain technological innovation ability in the field of education technology. However, patent achievements are concentrated in universities, and there are few leading enterprises, indicating that the scientific research level of Chinese enterprises in this field needs to be improved.

IV. COUNTERMEASURES FOR TECHNOLOGICAL DEVELOPMENT IN THE FIELD OF EDUCATION

Based on the above analysis of technology patent data in the relevant education field, this paper has analyzed the problems existing in the development of technology in the education field, so the corresponding countermeasures are given as follows.

4.1 The government should strengthen its support

As can be seen from the number of technology patent applications in the field of education, the number of technology-related patent applications in the field of education began to rise at a rapid rate from 2010 to 2017 in the recent seven years. This trend explains that the current technological innovation in the field of education is in a relatively rapid growth period, and it will have a great space for imagination and play in the long term. Therefore, governments and enterprises of all countries should step forward together, increase the support for r&d funds of technology patents in the field of education, create a good development environment for the future development of education, and promote the long-term circular development of education technology industry. The government should also introduce relevant policies constantly to guide technological innovation in the field of education, so as to truly realize the spurt development of educational technology R&D and innovation.

4.2 Enterprises should strengthen innovation in core technologies

From the analysis of IPC technology field, it can be seen that the current technology research and development in the field of education mainly involves demonstration appliances, models, etc., and the core

technology products that really promote the development of education are not many, but mainly peripheral products such as educational demonstration appliances that promote education facilitation. The number of patents involved in basic theoretical research and practice in the field of education and the in-depth research on specific teaching issues should be improved. Therefore, while expanding the peripheral technology of education, enterprises should strengthen the research and development of core technology in the field of education so as to play a decisive role in promoting the development of education.

In addition, the data analysis of the proportion chart of the types of technology patent applicants in the field of education in China shows that there are few technology patents in the field of education in China, which is not conducive to the production development of enterprises. Science and technology are the primary productive forces. At present, the explosive development of knowledge and the rapid updating of technology make the market competition increasingly fierce. Therefore, technical enterprises in the field of education in China should strengthen their technological innovation. Chinese enterprises should conduct more in-depth cooperation and exchanges with their counterparts in other countries, learn from their advanced experience, introduce high-quality R&D teams, and promote their product r&d, so as to improve their comprehensive strength and accelerate their industrialization development.

4.3 Chinese enterprises should attach importance to vocational education and training

In the era of knowledge economy, the knowledge cycle is updated and shortened. It can be seen from the analysis data of the top ten technology patent applicants in the field of education that the leading enterprises with good technological development in foreign countries all attach importance to vocational education and training. Chinese enterprises should find the entry point for the application of enterprise education technology and the training of enterprise employees, strengthen the r&d of patents such as multimedia, online learning education and industry domain knowledge, effectively promote the training efficiency of employees, improve the quality of employees and enhance the competitiveness of enterprises [6].

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