



Research Paper

Research on patent data Mining in educational technology

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ABSTRACT: Taking the technology patents in the field of education as the research object, this paper makes an in-depth analysis of the data of technology patents in the field of education from the aspects of IPC technology field composition, patent applicants, geographical distribution and so on. In combination with the existing problems in the development of technology in the field of education in China, corresponding countermeasures and suggestions are put forward from enterprises, universities and governments.

KEY WORDS: Instructional Technology; Patent Analysis; China

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I. INTRODUCTION

Instructional Technology is the theory and practice of design, development, utilization, management and evaluation of processes and resources for learning. The definition of the education technology research object expressed as on "learning" and "learning resources", a series of theory and practice problem, change the idea of the "teaching", embodies the modern concept of teaching from the teaching as the center to learning as the center, from imparting knowledge to develop students' ability to learn.

Learning process is a cognitive process in which learners acquire knowledge and skills through interaction with information and environment. Learning resources are all kinds of information and environmental conditions to be used in the process of learning. The new teaching theory requires students to change from passive recipients of external stimuli to active learners who can process information actively, and teachers should provide information resources and learning environment that can help and promote students' learning. Starting from the needs of social development and human development in the 21st century, we should build a social education system that can support comprehensive learning, independent learning, collaborative learning, creative learning and lifelong learning.

II. DATA SOURCES

2.1 Overview of IncoPat patent Retrieval and analysis platform

IncoPat patent database selected in this paper is the first platform to integrate the world's top invention wisdom and translate it into Chinese, which can provide scientific and technological innovation intelligence for Chinese project decision makers, r&d personnel and intellectual property managers. IncoPat patent database is a complete collection of more than 100 million basic patent data from 102 countries/organizations/regions, including the United States, The United Kingdom, China, Japan, South Korea, Germany and other countries. The special collection and processing of patent data from 22 major countries makes the data fields more perfect and the data quality is higher. Therefore, the patent database has a good advantage in the study of technology patent data in the field of education. Because the development of education is in the early stage, the data retrieval time in this paper is 1950/1/1-2017/12/31. (Although the patent data is updated in real time, there is a lag in the disclosure of patent applications. Generally, invention patents are made public 3 to 18 months after the filing, and utility model and design patents are made public 6 months after the filing. These provisions will lead to the delay of some patent data in the last two years, resulting in inaccurate data, so the data of the last two years is for reference only.)

2.2 Patent retrieval expression

According to the main research fields and required keywords and logical operators, the following patent retrieval expressions are constructed:

(TIAB=(teaching and projection)) or (TIAB=(teaching and projection)) or (TIAB=(teaching and projection)) or (TIAB=(teaching and projection) (TIAB=(teaching and video playback)) or (TIAB= teaching model) or (TIAB=(teaching and experiment)) or (TIAB=(education and students)) or (TIAB=(teaching and students) Or (TIAB=(teaching and digital)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(teaching and instruction)) or (TIAB=(Teaching and Network)) or (TIAB=(teaching and interactive system)) or (TIAB=(teaching and management)) or (TIAB=(teaching and intelligence)) or (TI= display board or TI= display rack or TI= desk AND (AD=[19500101 to 20171231]) AND (AD=[19500101 to 20171231]) AND (AD=[19500101 to 20171231])

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

3.1 Analysis Methods

Patent analysis method refers to the method of screening, statistics and analysis of relevant patent documents and transforming them into usable information . In this paper, the IncoPat patent retrieval database was used to search, count and sort out the technology patent data in the field of education with the method of quantitative analysis. A total of 114,753 patent data were retrieved. Then, the application trend, technology composition, applicant ranking and geographical distribution recorded in patent literature are explained and analyzed from different angles through charts and other ways .

3.2 Result Analysis

3.2.1 IPC technical field composition analysis

IPC (International Patent Classification System) is a special method to classify patents from all countries in the world. It has been adopted in many countries. By analyzing the IPC classification numbers mainly involved in the data of 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.

According to the Comparison Table of International Patent Classification Number and Technology Field issued by WIPO, this paper makes an in-depth analysis of technology patent data in education field according to IPC classification number (subcategory). The top ten with a large proportion of patent data are selected for explanation, as shown in Table 1.

Table 1. Top ten technology IPC categories in education

IPC Subcategory	Patent number	The main meaning
G09B	53222	Educational or demonstration equipment; Equipment used for teaching or for communicating with blind, deaf or mute persons; Model; Planetarium. The globe; The map; Charts (devices used for psychological techniques or to test reaction times; Recreational equipment
G06F	8238	Electrical digital data processing; Computer Systems based on specific computing models (teaching)
B43L	7128	Writing or drawing supplies; Writing or drawing AIDS
G06Q	6887	A data processing system or method specifically designed to teach administrative, commercial, financial, managerial, supervisory or forecasting purposes
A47B	5929	Table; The desk; Office furniture; The cabinet; The drawer; General parts of furniture
B25J	4164	Manipulator; Container with control device (demonstration)
G05B	3681	A general control or regulation system; A monitoring or testing device for a system or unit
A63F	2721	A card, board, or roulette game; Parlor games with small moving objects; A data processing device that features a specific application of a game
A63B	2593	Equipment for physical exercise, gymnastics, swimming, mountain climbing or fencing; Ball games; Training equipment
H04N	1781	Image communication

But through the analysis, it can be seen that the main technology involved in the field of education is mostly demonstration tools, models and so on. The core technology products that really promote the development of education are not many, mainly some educational demonstration tools and other peripheral products to promote education facilitation. The number of patent r&d involving basic theoretical research and practice in the field of education and in-depth research on specific teaching problems needs to be increased.

3.2.2 Analysis of patent applicants

See Figure 1, Looking at the top ten universities in the field of education technology, Harbin Normal University, Qiqihar University, Northeast Petroleum University, Harbin University of Science and Technology, Heilongjiang Institute of Engineering and Harbin Institute of Finance are on the list, indicating that Chinese universities have a 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 Enterprises in this field in China needs to be improved.

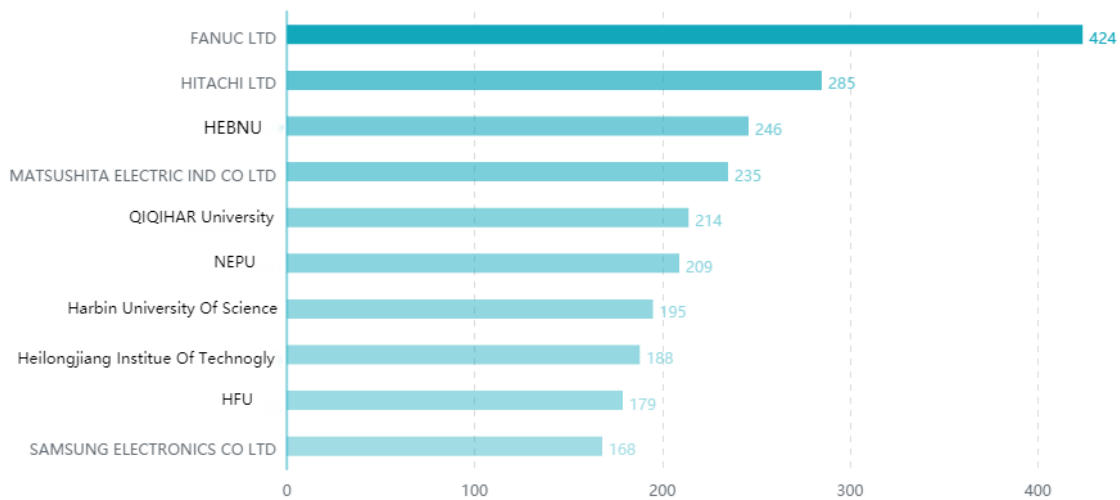


Figure 1. Top ten technology patent applicants in education field

It can be seen from figure2 that the number of individual applications for technology patents in the field of education is 27,300, accounting for 44.57%. The number of college applications was 18,861, accounting for 30.79%; 14,103 cases were from enterprises, accounting for 23.02%; The rest are government organizations and scientific research institutes. According to the data, the applicants for educational technology patents in China are mainly individuals and universities, and the proportion of enterprises is relatively low. This shows that most of the educational technology in China is still in the basic research, less commercial application. Most patents are held by individuals and universities, which is not conducive to the transformation of scientific and technological innovation achievements. Enterprises should strengthen their own scientific and technological innovation ability in this field, promote their own industrialization development, but also purchase suitable r&d patents from individuals and universities, accelerate the transformation of patent innovation results, and enhance their own competitiveness.

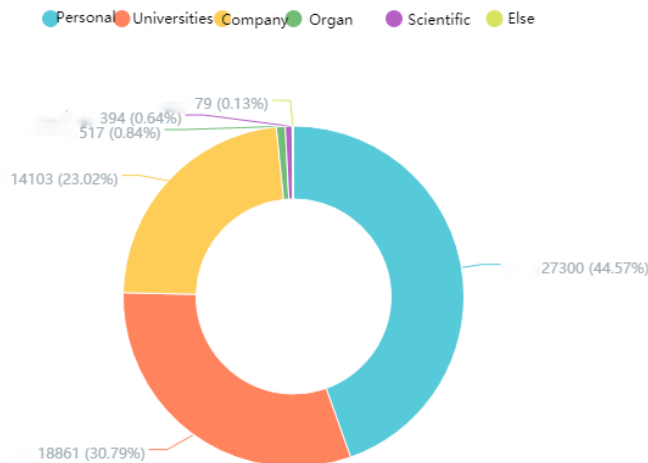


Figure 2. Composition ratio of Patent Applicants (China)

3.2.3 Analysis of patent distribution in various provinces and cities in China

In order to further understand the patent status in the field of education technology in China, this paper makes a statistical summary of patent distribution in various provinces and cities in China, as shown in Figure 3 and figure 4. Comparative analysis found that Shandong ranked first in the field of education and technology in China. Shandong University of Science and Technology, Shandong Vocational College of Technology, Shandong University and other shandong colleges and universities, Shandong Star Intelligent Technology Co., LTD. (company products involved in higher vocational colleges, colleges and industry training and other fields of teaching products, virtual simulation products, network platform class and other three series. Among them, the company has a variety of research and development products to fill domestic gaps, computer simulation technology, a variety of training products in the domestic leading level, can provide users with perfect training solutions and information management services. And other companies as the main force for shandong education field technology development to make great contributions.

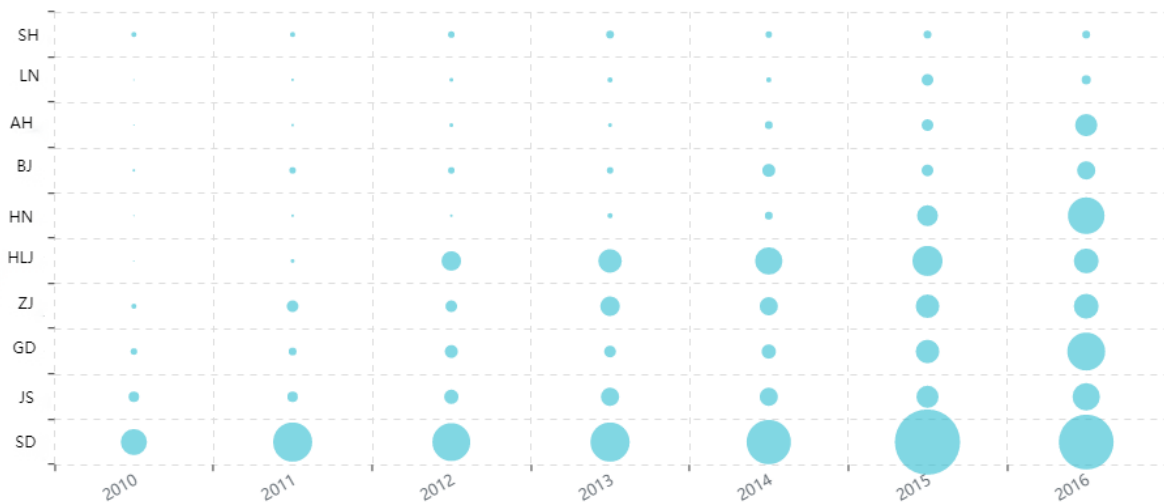


Figure 3. Top 10 in education technology patent applications by provinces and cities in China

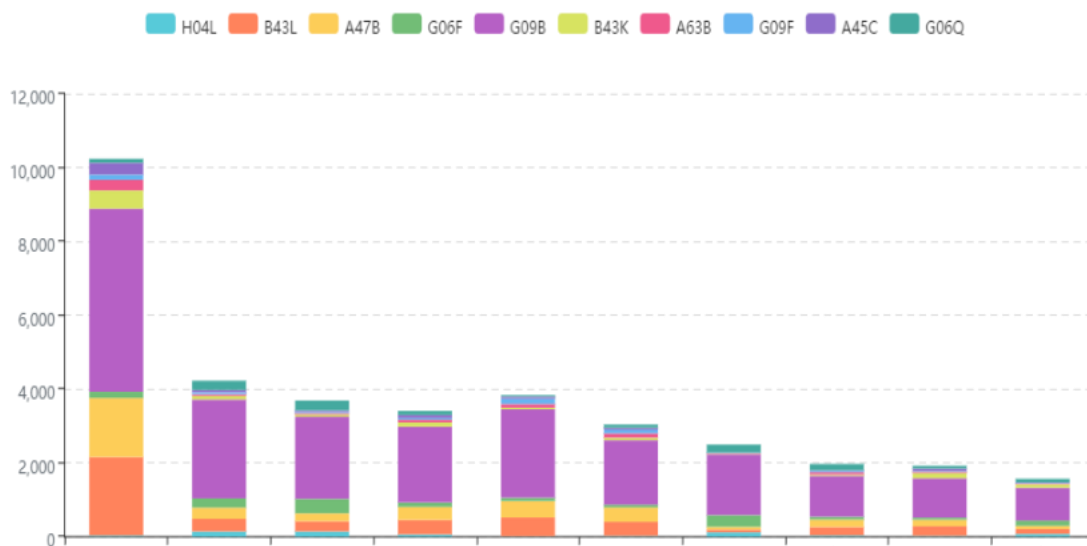


Figure 4. The quantity distribution map of each technology direction in provinces and cities of China

As can be seen from the data in the figure, the number of educational technology patents in China is unevenly distributed among provinces and cities, and Shandong province plays a strong leading role.

IV. Measures for technological development in education

Through the above data analysis of technology patents in the field of education, this paper has analyzed

the relevant problems existing in the development of technology in the field of education, so the corresponding countermeasures are given as follows.

4.1 Enterprises should strengthen core technology innovation

From the analysis of IPC technology field, it can be seen that the current educational technology research and development mainly involves demonstration tools, models and so on. The core technology products that really promote the development of education are not many, mainly some educational demonstration tools and other peripheral products to promote education facilitation. The number of patent r&d involving basic theoretical research and practice in the field of education and in-depth research on specific teaching problems needs to be increased. 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 really play a decisive role in promoting the development of education.

4.2 Colleges and universities should combine with enterprises to transform industrial achievements

It can be seen from the proportion chart of the type composition of educational technology patent applicants that most of the educational technology patents in China are held by individuals and universities. In the face of this situation, individuals and universities in the field of education technology patent should actively establish industrial ideas and dare to interact with enterprises. Many large companies in the field of modern education have good development advantages and rich experience in performance technology, knowledge management, project management, talent training and other aspects. If universities and enterprises cooperate to establish educational technology practice alliance, on the one hand, the application of scientific research can be brought into full play. On the other hand, it can provide impetus for enterprises' research and development of science and technology, give full play to the advantages of enterprises' capital and technology, and then form a benign interaction between enterprises and universities. For example, the College of Education Technology of Beijing Normal University and "Wenqixing" have strongly combined to create the "Educational Technology Industrialization Application Innovation Platform", which has set a model for the cooperation between universities and enterprises.

4.3 The government should strengthen horizontal contact and cooperation among provinces

The regional development of educational technology in China is unbalanced, and the provinces with lower educational technology development (Hunan, Jiangxi, etc.) should learn more from the advanced experience of provinces with higher educational technology development (Shandong, Zhejiang, Guangdong, etc.). The government to promote the province between the transverse contact cooperation between universities and enterprises, improve the level of technological innovation in education between the provinces and the education informatization, take the provinces are truly through the development of education technology to achieve the leap development of quality education overall eventually make the national education informatization level has reached a higher level. At the same time, we hope that the government of Henan province can see the advantages of Shandong province, pay more attention to the enterprises engaged in educational research and development in our province, improve the level of technical research in the field of higher education in our province, and promote the rapid development of education informatization in our province.

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