

Application of Big Data to Innovative Mechanism of Education Management Information System in Colleges and Universities

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Abstract: The task of colleges and universities is to cultivate talents and reserve talents for the society and the country. Therefore, it is very important to introduce big data technology into education management and build a college education big data management system adapted to the modern educational context. Big data can help college education management to be more scientific and refined, and the management quality is also more efficient. The paper presents application of big data to innovative mechanism of education management information system in colleges and universities. The application of big data to education management will effectively improve the efficiency of college education activities.

1. Introduction

The smooth operation of college education and teaching and related affairs cannot be separated from effective college education management. Only by taking effective management measures for students can universities ensure their smooth study and life in college [1]. It can be said that education management is one of the most important links in university management. In essence, the healthy development of university education and teaching cannot be separated from scientific and efficient teaching management.

Big data is a phenomenon on the Internet. It can be effectively processed after accumulating data information and obtaining the desired knowledge content through data analysis [2]. Big data involves a wide range of, with diversity, and relatively high-speed characteristics.

Education managers can give full play to the advantages of big data platform, collect relevant information in a comprehensive way, and classify and summarize the information. According to the results of data analysis, a more personalized training mode is formulated for the situation of different students to realize more personalized education management and enhance the timeliness of management.

The introduction of digital technology for college students quality and society needs comprehensive quality talent training, and through the construction of the development of digital simulation system, planned prospective planning for colleges and universities, form a long-term macro education concept and development direction, education talents and educated talents for point-to-point precise management. Mobilize the work enthusiasm of all education practitioners that can be mobilized to ensure the generation and maintenance of information update and construction in the university system.

The emergence of big data technology has provided strong technical support for the education management of universities. Under the background of big data technology, universities also have more abundant management methods for students. In the traditional college education management work, a unified management is implemented for students [3]. The advantages of unified management are obvious, that is, the ability to achieve the highest management efficiency under the minimum management cost, but its disadvantage is also very prominent, that is, to erase the differences of individual students. This "one size fits all" unified management mode can no longer meet the needs of today's education management work.

Based on the complexity of education management work, in the process of data and information collection, it usually needs to face the problems of diverse information sources, large volume, redundant structure, etc. How to efficiently and accurately process it has become a major difficulty. In addition to the information in regular classroom teaching, education management also needs to involve students' personal information, key information in online learning platform and social software, and due to the change of individual behavior, it further aggravates the difficulty of data information collection and integration.

The university has the responsibility to provide students with an excellent education and teaching environment so that students can learn knowledge and skills in their study and life, and which are related to the future development of students, which shows the importance of the university education environment. Excellent education management is closely related to the professional education management team. University education management is cumbersome, which involves all aspects of study and life.

Under the background of the era of big data, the education in universities needs to be more strictly control for informatization. The education management system of universities needs to constantly improve the level of information management, maximize the flexible use of big data technology, effectively realize the data analysis and mining, and save the data and information of each university, but also to maximize the level of data and information management.

2. Innovative Research and Analysis of Building College Education Management Information System

As an inevitable trend of social development, informatization has become an important indicator of a country's modernization level and comprehensive national strength. The informatization development of education management is an important component of the informatization development of the whole society and the soul of the development of social informatization. In a sense, the degree of informatization development of education management has a direct impact on the development of social informatization.

The education system has also achieved long-term and stable development, and has gradually transformed from the original elite education stage to the mass education stage, but also promoted the further reform of the higher education management system [4]. However, there are still some unreasonable problems in the process of education management of universities in China, which leads to full attention from the public. Specifically, in the general environment, the continuous

expansion of colleges and universities and increasing the number of students will lead to the increasing burden of running schools and the serious uncoordinated proportion of teachers and students.

With the application of Internet technology and the popularization of smart phones, college students have more and more ways to obtain information, and sometimes they may be disturbed by bad information, forming wrong ideas and affecting the healthy growth of body and mind. Therefore, in order to correct the unhealthy thoughts of some college students and improve the moral cognition level of college students, college education management must integrate the concept of "people-oriented". The concept of "people-oriented" can let teachers understand the ideological dynamics of class students in time, find out students with psychological problems in the first time, and take effective strategies to solve them to help students form a sound personality and establish a correct world outlook, outlook on life and values.

In Today's increasingly fierce international competition for science and technology and talents, mass entrepreneurship and innovation directly points out China's demand for innovation and entrepreneurial talents at the current stage [5]. This demand has been directly related to the future development of China's economy, and it requires the active cooperation of various institutions of colleges and higher learning to actively implement the goal of cultivating innovative and entrepreneurial talents. The active implementation of innovation and entrepreneurship related strategies is directly reflected in the student education management system of universities. Among them, the first need to be clear is that the function of the education management system is to serve students.

Colleges and universities should actively build a perfect education management system, use practical strategy management of every teacher, constantly improve the teacher's education character and cultural accomplishment, and with the help of emotional communication and improve teachers' salary and many other ways to attract and retain more teachers, and then play an important role in stabilizing the ability of teachers. At the same time, new performance management strategies can also be used to reward and punish teachers, and the elimination system should also be adopted, so as to maintain the purity of the university teacher team, so as to establish a high-level and high-quality modern team of teachers, as is shown by equation(1).

$$\Delta I(p_i) = \log(1/p_i) = -\log(p_i) \quad (1)$$

In equation (1), where p is to the general law of higher education management. If the education management data is abnormal, through the analysis of data and compared with the general law, problems can be found more accurately found, so as to take targeted measures to effectively avoid the occurrence of problems. When using educational big data, critical points can be established for a variety of key data, warn the administration of higher education when the information data is beyond the acceptable range, and take reasonable measures to correct them.

There are many problems in the traditional management mode. Take student file management and examination results as an example, the traditional educational affairs system is not complete, the content setting is simple, and the specific situation of students is very different. Therefore, there will be many mistakes or mistakes in the process of management. The arrival of the information age makes university education management more convenient, and big data ensures the comprehensive accuracy of management content. Completion of these tasks requires newer infrastructure and management equipment to change the difficulties of data acquisition, analysis, storage methods, and data changes.

The construction and development of higher education management information has changed the traditional teaching management with manual operation as the main way, and built a new management platform based on information technology [6]. The teaching management platform

based on information technology can realize the unification of data collection standards, processing methods, query methods and other aspects, realize the standardization and institutionalization of education management with unified standards, and change the inaccuracy and arbitrariness problems existing in education management in the past. In the management of information education, various teaching data can be processed automatically, and then get scientific information feedback and conclusions, to provide the basis for relevant educational decision-making.

The teaching management mode of colleges and universities is to set up majors and organize teaching according to the traditional management mode, so as to realize the whole work process from the traditional management mode to the specific implementation. In this process, colleges and universities make the specific teaching plan, teaching mode and syllabus and curriculum system are relatively single, lack of flexibility and practicality, also cannot according to the characteristics of students' own targeted teaching, which leads to the teaching management of colleges and universities can only be implemented in strict regulations, difficult to reflect the scientific, dynamic management mode.

In order to improve the level of education management, it is first necessary to change the management concept, abandon the "exam-oriented education" management mode, and do not take the test results as the only standard to judge students. As college teachers, we should improve the understanding of the concept of "people-oriented", realize the importance of "people-oriented", adopt democratic management, and improve the democratic management system. We should be student-centered, start from the actual situation of the students, consider the problems from the perspective of the students, pay attention to respect the students' main position in the teaching process, and pay attention to the students' emotional experience, so as to promote the personalized development of the students.

Focus on the construction of university information courses, committed to comprehensively covering new teaching methods to the society [7]. In addition to the establishment of the related construction of information technology, the relevant departments of the German Federation connect with the most widely used education system in China, so as to provide relatively personalized innovative education courses according to each person's professional knowledge and different level of knowledge. Make students easier to accept, and make learning more relaxed. Review the overall control of the establishment of the German education management system and the construction of the related quality evaluation. Let students innovate education and talent market demand for linkage, and build a lifelong learning network on the basis of the existing education management system.

Under the background of the new era, there are also higher requirements for college students' theoretical knowledge reserve, social practice level, innovation consciousness and ability. Therefore, for colleges and universities, they should keep pace with The Times, fully innovate the talent training mechanism, cultivate students' practical ability and innovation ability as an important indicator, and include them in the talent evaluation system. In the education management, the Chinese government departments are also required to vigorously support and cooperate with this, and can form a joint force between colleges and universities to clarify the important concept of serving each student.

3. Analysis Impact of Big Data on Education Management in Universities

The process of collecting big data involves personal privacy, and its risks cannot be underestimated. In addition, big data can explain some problems, but it is likely to cover up other important issues that cannot be recorded and analyzed by the data. First of all, the collection of big data and privacy protection are different to some extent. If the two cannot be well balanced, they

will trigger the aversion of data subjects [8]. They will resist and evade data collection, or deliberately release false personal information, so that big data cannot be established on a legal and effective basis.

Under the background of the era of big data, college education management should keep pace with The Times, fully realize the characteristics of information technology, combine the current situation of its own education and teaching management, constantly innovate the education and teaching management mode, and fundamentally solve the problems existing in the management of university education. Big data management has great advantages and value, while the traditional university management mode has certain disadvantages.

Under the background of the big data era, university education management has entered the era of high technology. Only by changing the concept of education management can we improve the teaching efficiency and quality. As the guiding direction of university education management, traditional education management introduces the concept of innovative education management, especially in the process of education and teaching, conducts student-centered education management, and makes classroom teaching more independent. The increase of practical teaching activities effectively reflects students' autonomy in learning.

It is the inevitable trend of big data in the process of college education for social development. In the traditional educational process, teachers use a single teaching method, and it is difficult to stimulate students' interest in learning [9]. In addition, teachers also lack of communication and communication with students, so that students cannot meet their personalized learning needs. To make the classroom no longer boring, students can learn through learning platforms such as online courses and MOOC education.

Mass entrepreneurship and innovation education in colleges and universities can help students to improve their ideological and cognitive ability and social practice ability, further enhance students' comprehensive quality, and promote the better development of students in the future society. At the same time, it can also combine the current economic structure adjustment in China's social transformation period, to actively optimize China's social and economic structure, effectively alleviate the severe social problem of college students 'difficult employment difficulties, and is conducive to the sustainable development of China's economy.

There are still many teachers and education managers who lack an understanding of big data technology and applications. Therefore, it is necessary to strengthen information education management teacher training, which can apply diversified management methods to modern society, and further improve their big data interpretation and management quality, such as how data will be used, distributed, and analyzed, and how data is protected, visualized and shared in universities, as is shown by equation(2).

$$u_i = \frac{1}{\sqrt{\lambda_i}} Av_i \quad i = 1, 2, \dots, r \quad (2)$$

Where u is in equation (2), that Educational informatization is not a concept generation, but a detail project under the guidance of the macro ideology completed by the relevant educational talents. Educational talents are each supporting node in the information construction structure. Only by constantly enriching the talent reserve and talent training, can we remain invincible in the face of the constantly changing digital technology. Colleges and universities should formulate corresponding talent recruitment and training systems and long-term plans, match the talent information database with the educational resource structure of colleges and universities, and enrich the departments with relatively weak strength.

In the era of big data, the innovation and development of university education management informatization can realize the effective improvement of university education management level. In

the traditional college education management work, the management workers mostly manage the school affairs according to their past management experience, but it is difficult to realize the scientific and efficient management work in a long time span based only to their personal management experience. In the information innovation of education management in universities in the era of big data, we can understand and formulate scientific management measures through the frequency of students logging on to the school learning platform or students' evaluation of teachers' teaching courses.

The correct awareness of big data application is the basis of the transformation of college education management, and also the premise of the value of big data [10]. First of all, with the help of college education platform, the basic theoretical knowledge of the importance, application path, and value prospect of big data should be popularized to teachers and students, so as to help college teachers and students to establish a scientific data application concept and form information education management thinking. Secondly, targeted training should be conducted to have a comprehensive understanding of big data technology and learn to analyze the correlation and continuity between different categories of data information.

The application of big data to the education management is the general trend. In the past, education management was mainly administrative management, relying on the experience of professionals for making decisions, which is an efficient choice under the constraints of information scarcity. The application of big data makes decision-making more scientific. Education management changes from administrative management to service-oriented management, and the experience decision of professionals moves to data-based decision-making.

In the era of big data, education management and standardize the development of education management, strengthen the top-level design of big data education management, that is, the management design framework to support the development of the whole reform work. The adoption of intelligent analysis can help decision makers to make better decisions, provide them with the right information, and improve the level of education management.

Some universities have fully applied big data in the process of education management, but there are still problems in the specific application process. The most serious problem is the lack of awareness of using big data. The active use of big data in college education management is not mature enough, because managers do not fully realize the importance of big data. Due to the shallow application of big data, the role of big data cannot be fully reflected. Some universities do not comply with the corresponding standards of a specific application, with an impact on the application of big data in university education management.

In the process of double gen education teaching management, many colleges and universities based on the one-sided understanding of double gen education, just for the students' basic theoretical knowledge of innovation and some practice entrepreneurial project guidance, teachers just to students theoretical knowledge and guide students how to choose entrepreneurial project, how to operate business model, how to expand financing channels, how to launch marketing, etc..

4. Using Big Data to Innovative Mechanism of Education Management Information System in Colleges and Universities

Under the background of the era of big data, college education management should keep pace with The Times, make better use of and tap the value of big data, and fundamentally improve the quality and efficiency of college education management. Combined with the background of The Times and the current situation of our own education and teaching management, we will constantly innovate the research of college education management mode, fundamentally solve the problems existing in the management of college education, and contribute to improving the education

management level of colleges and universities.

Using the power of science and technology to improve the work, study and life has become one of the indispensable contents of the university in the context of the era of big data, big data helps the university education management is more scientific and refined, and the quality of management is more efficient. At present, although many universities still have some problems in education management, but with the more and more improvement of university education management, the quality of universal education management in Chinese universities has been greatly improved.

We will enhance our safety early warning and emergency response capabilities, and form a data security guarantee system adapted to the development of information technology. Secondly, technical measures should be taken to make reasonable use of various data protection technologies and professional equipment, such as static desensitization, data encryption, database audit, database firewall, etc., to strictly prevent data leakage from the technical level, and ensure the security of big data and cloud data security. Through both institutional measures and technical measures, as is shown by equation (3), where $F(a,b)$ is a good education management and protection system is constructed to ensure the safety and stable development of education management in colleges and universities.

$$F(a,b) = \sum_{i=0}^n \varepsilon_i^2 = \sum_{i=0}^n (y_i - ax_i - b)^2 \quad (3)$$

Colleges and universities need to provide accurate guidance for teachers, so that teachers can consciously apply big data, and realize teaching practice and teaching reform. Teachers also need to evoke the importance of big data in the teaching evaluation, and successively collect large amounts of feedback information in the data, and constantly improve their teaching work. For talents engaged in big data research, colleges and universities also need to increase the training of technical and professional personnel, in-depth study and mining teaching data, focus on cultivating university comprehensive analysis talents, can use international exchange visits, study, cooperation, the big data research talents to big data development good national learning, strengthen talent training.

Through the digital information provided in all aspects provided by big data, understand the market development dynamics and social needs, so as to form various cooperation modes on the basis of communication and understanding, and find cooperation opportunities for students with entrepreneurial intention and enterprises with innovative needs. And to provide them with data support and technical support, so as to help them to integrate high-quality resources in all aspects of the society, and give full play to their own resource advantages, to promote the further development of entrepreneurial projects, as shown in Figure 1.

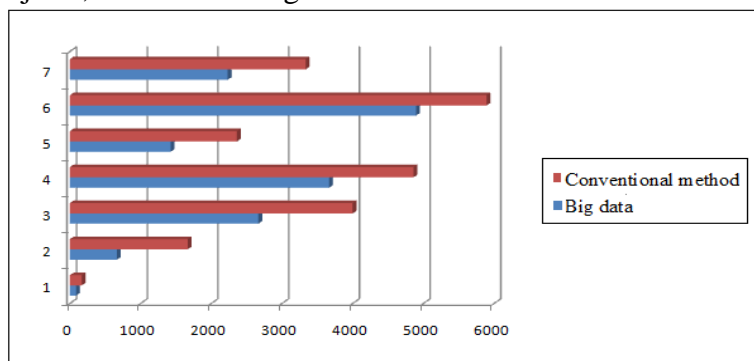


Figure 1: Comparing the results of big data with Conventional method in education management mode

College education covers its own distinctive specialties, and students' interests and

professionalism are also different. Single-subject universities and comprehensive universities can further collect students' information, carry out personalized education, and improve the educational effect. To emphasize the operating characteristics of the school, management can be used with big data. For example, schools can use big data to collect the learning situation of students' selected subjects, including the changes of professional subjects in the last three years, the listening rate of candidates, and study the guidance plan of the selection of courses in the next year. Big data can analyze the courses favored by college students, exclude a few subjects, and make the courses selected by universities more distinct, stimulate students' interest in learning, broaden their learning horizons, and improve their comprehensive quality.

In the process of carrying out school-enterprise cooperation project, to strengthen the cooperation between universities and other institutions, to education resources, human resources in exchange for technical resources, at the same time as far as possible to social investment and capital introduction channels, the introduction of data information processing ability stronger cloud computing server, etc., so as to more efficiently process all kinds of data information. In addition, it is necessary to get away from the blindness of conventional data processing mode as far as possible, that is, by purposeful and targeted screening of data information, the collection information under the premise of ensuring sufficient representativeness and effectiveness, so as to facilitate subsequent extraction and relieve the pressure of the huge data volume.

In the era of big data, we should change the traditional education concept, strengthen the information training of the staff, and improve the management quality. At the same time, we should make full use of big data technology to scientifically and reasonably allocate and integrate the existing data and information, strengthen data security protection, and promote the harmonious development of the management of college education and universities.

5. Conclusions

In the era of big data, Colleges and universities at home and abroad are constantly trying to reform the education management system. Education management has taken place in tremendous changes. So take the problem with a long-term view. Innovate the education management mode according with their own situation. A deep understanding of the connotation of big data. Enhance the application awareness of big data technology. And with education management goals as the core. With big data technology as the channel. Analysis the problems existing in the modern innovation of university education management. The paper presents application of big data to innovative mechanism of education management information system in colleges and universities. By constructing the data acquisition criteria, Establish a data integration and sharing platform, Strengthen the access to social data and information, In order to give full play to the technical advantages of big data in the university teaching management activities, Promote the continuous development and progress of education in China.

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References

[1] Chen Luming. *Big Data Analysis of the Reform Way of College Education Management Mode. Journal of Shandong Agricultural Engineering College*, 2018, 35 (06): 111-112.

- [2] Hongsheng Xu, Ganglong Fan, Yanping Song, "Novel Key Indicators Selection Method of Financial Fraud Prediction Model Based on Machine Learning Hybrid Mode", *Mobile Information Systems*, vol. 2022, 2022.
- [3] Zhang Lei, et al. "Weather radar echo prediction method based on convolution neural network and Long Short-Term memory networks for sustainable e-agriculture." *Journal of Cleaner Production*, 298 (2021): 126776.
- [4] Hongsheng Xu, Yanqing Lv, "Mining and Application of Tourism Online Review Text Based on Natural Language Processing and Text Classification Technology", *Wireless Communications and Mobile Computing*, vol. 2022, 2022.
- [5] Bian Xiangyu. *Research on University Information Management and Decision-making Mechanism in the Era of Big Data*. *Wireless Internet Technology*, 2020 (23): 48-49.
- [6] Hongsheng Xu, Ganglong Fan, Yanping Song, "Application Analysis of the Machine Learning Fusion Model in Building a Financial Fraud Prediction Model", *Security and Communication Networks*, vol. 2022, 2022.
- [7] Zhang Lei, Shiyu Tang, and Lingling Lv. "An finite iterative algorithm for sloving periodic Sylvester bimatrix equations." *Journal of the Franklin Institute* 357.15 (2020): 10757-10772.
- [8] Lu Qiuling. *Influence of Big Data on Chinese University Education Management and Countermeasures*. *Theoretical Research and Practice of Innovation and Entrepreneurship*, 2020, 3 (2): 178-179
- [9] Zhang Lei, et al. "Improved Dota2 lineup recommendation model based on a bidirectional LSTM." *Tsinghua Science and Technology*, 25.6 (2020): 712-720.
- [10] Hongsheng Xu, Huijuan Sun, "Application of Rough Concept Lattice Model in Construction of Ontology and Semantic Annotation in Semantic Web of Things", *Scientific Programming*, vol. 2022, 2022.