

# Innovative Research on Higher Education Management Model in the Big Data Era

Meng Chen, Chuntao Li\*

Shandong University of Traditional Chinese Medicine, Jinan, Shandong, China

\* Corresponding Author: 56028325@qq.com

**Keywords:** Big data era, Higher education, Management

**Abstract:** Colleges and universities, as an important base for talent training and export in China, based on data and information technology, deepening the innovation of teaching management mode in colleges and universities is of great significance for improving the teaching level, scientific research level and core competitiveness of colleges and universities. Data goes hand in hand with human civilization, and the wheel of history goes through the initial data age, sampling age and information age, and enters the big data age supported by W Internet, cloud computing and Internet of Things. For higher education, its management mode and efficiency affect the level of education and teaching to a certain extent. With the continuous development of Internet information technology and the advent of the big data era, the influence and scale of the Internet are expanding, and the development trend shows diversified development. This paper puts forward a modern higher education management model in the era of big data mainly by improving education quality, but this model will encounter some challenges in the implementation process due to the influence of some factors.

## 1. Introduction

Big data technology has been widely used in many industries, and its impact on education industry is even more remarkable. Colleges and universities, as an important base of talent training and export in China, based on data and information technology, deepening the innovation of teaching management mode in colleges and universities is of great significance to enhance the teaching level, scientific research level and core competitiveness of colleges and universities [1]. Under the background of big data era, 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[2]. In the management of higher education, the use of large data technology and methods can significantly improve work efficiency, and the management and decision-making level of higher education can reach a new height. In related theory, we know that modern education advocates the combination of big data technology, and improves the quality of education by using big data technology [3]. However, in fact, the implementation of big data education is prone to difficulties due to many reasons. Under the background of big data, University courses, university teaching methods, university management and assessment are all facing “strong shocks”. Although this kind of change will be painful, it can not be rejected. A silent revolution has just begun... [4].

Data goes hand in hand with human civilization, and the wheel of history goes through the initial data age, sampling age and information age, and enters the big data age supported by W Internet, cloud computing and Internet of Things [5]. Big data has brought many benefits to higher education management, while higher education management is also facing a new round of challenges. How to take effective measures to deal with these challenges is an urgent problem to be solved in the management of higher education [6]. As far as higher education is concerned, its management mode

and efficiency affect the level of education and teaching to a certain extent. With the continuous development of Internet information technology and the arrival of the era of big data, the influence and scale of the Internet are expanding, and the trend of development shows a diversified development [7]. The informational development of management teaching mode in Colleges and universities provides technical support. From the perspective of education development in the big data era, it is not ideal, there is inconsistent pace of development [8]. In order to make full use of big data technology to promote educational management, it must be applied reasonably. Therefore, in order to improve the implementation of big data education, we need to first understand these issues, and then put forward corresponding strategies.

## 2. The Value of Education Management Model Reform in the Era of Big Data

### 2.1 Make the Education Process More Flexible

The value of educational management mode reform in the era of big data is very significant. Through Internet information technology and big data information management system, it is of great significance to change the traditional teaching management mode and meet the needs of students, so as to enhance students' interest in learning and improve teaching level [9]. The application of big data in higher education can accomplish many tasks that could not be accomplished before, and at the same time, it can also improve the efficiency of education management under big data, which is of great significance to modern higher education management [10]. There are many types of data in the data age. From the comprehensive analysis, there are three distinct data types, namely structured data, semi-structured data and unstructured data. The relationship between the three can be clarified by the inclusion and the included diagram. As shown in Figure 1.

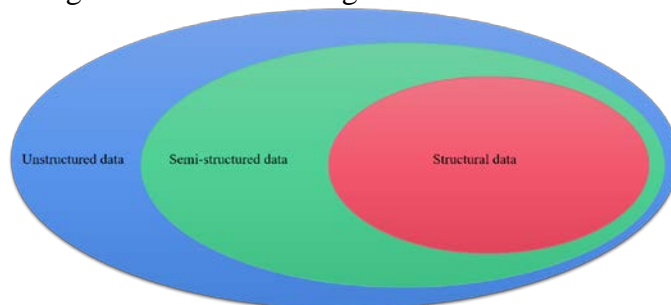


Fig.1 Schematic Diagram of Structured, Semi-Structured, and Unstructured Data

Data mining technology is a kind of big data technology, and its application in teaching is very helpful for teachers to deeply analyze the complicated information in the teaching process, and can provide corresponding prediction [11]. However, in the field of education, most of the fields that teachers learn are subject specialty and teaching technology. However, there is not much knowledge about big data technology, so it is difficult to operate it in practice. Under these conditions, the implementation of higher education management mode for big data is undoubtedly hindered, so it needs to be improved. Data is the mother of information, the beginning of knowledge, and the source of wisdom.

Intelligentization is the latest vision of informatization development. Big data gathers and stores information assets. Data mining and learning analysis technology are the bridge connecting informatization and intellectualization [12]. Since the era of big data has come in all directions, and China pays great attention to the development of Internet technology, the popularity of computers has changed the way of teaching knowledge, and everyone can acquire knowledge according to their own needs. In the process of choosing teaching methods in colleges and universities, it is of great significance to choose the teaching methods that students like and choose the appropriate teaching platform to improve the teaching quality. The main function of big data is not to acquire huge data, but to accurately process the acquired huge data and screen out the information you need [13]. However,

as far as the implementation of higher education management is concerned, the informationization process is generally lagging behind, mainly in two aspects: the lagging of infrastructure construction and the lagging of soft environment construction of university informationization platform [14]. Any link of large data is different from the traditional small data processing method, and all aspects of large data collection, storage, processing and analysis must rely on new technical support. Therefore, some scholars believe that the core of big data is technology, then industry, resource, methodology and discipline. As a result, the arrival of the big data era has made the modern educational process more flexible [15].

## 2.2 Promote the Efficient Popularization of High-Quality Educational Resources

The arrival of big data era makes quality education resources more popular. As far as the current educational reality is concerned, science and technology have developed to a great extent, and the application rate of computers has been continuously improved, showing a steady growth trend at the same time. University teachers can collect students' interests and hobbies in professional courses through big data information system, so as to connect teaching content with students' preferences and improve teaching quality according to students' preferences while maintaining the teaching quality of professional courses. For this reason, this paper analyses the problems and puts forward some suggestions and Countermeasures for the development of university education management: to establish a sound university data management system, and to improve the data quality. Combining with the utilization of some colleges and universities, and comprehensive analysis of College Students' ideological and political education in the era of big data, this paper attempts to design the mode of College Students' ideological and political education. As shown in Figure 2.

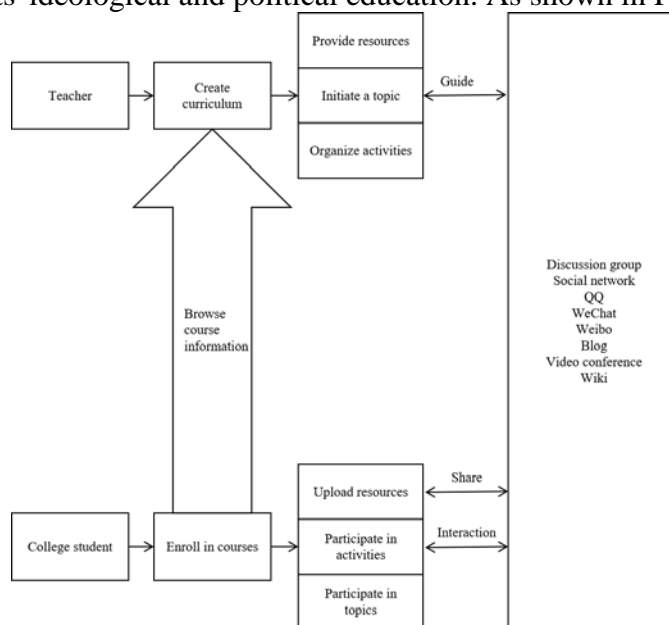


Fig.2 The Mode of Ideological and Political Education for College Students

In the era of big data, data acquisition is very important, and deep data mining is even more important. Deep data mining refers to the design of data search, collation, analysis, algorithm, model creation and other links of data processing, giving scientificity to data statistics. To improve the professional level of big data, it is recommended to adopt training methods, that is, according to the application characteristics of big data technology, to develop appropriate training content. Then select trainees for training, but it is between the professional level requirements of big data and the learning difficulty. With the calculability and knowledge of large data, scientific research functions such as theoretical modeling, state description, data analysis can be achieved.

At present, the information construction of colleges and universities in management is insufficient, which on the one hand increases the management and operation costs of colleges and universities, on the other hand is not conducive to the improvement of management and operation efficiency of

colleges and universities. From the current situation, colleges and universities lag behind in basic system construction, and many colleges and universities are not ready for big data application. Some universities have not yet established a data platform for higher education management. First, big data promotes the transformation and upgrading of traditional industries. The progress of big data technology, the development of industry and the deep integration of big data with other industrial fields will fundamentally promote the transformation and upgrade of traditional industries. Therefore, in order to promote the balanced application of educational resources, give full play to the technical advantages of big data, and make the dissemination of high-quality resources wider.

### 3. Reform Countermeasures of Educational Management Model in the Big Data Era

#### 3.1 Emphasize the Transformation of Teaching Management Thinking and Promote the Improvement of Big Data Management Literacy

The arrival of the era of big data provides more possibilities for modern education management. Therefore, educators must seize the opportunities, make full use of the advantages of big data, emphasize the change of education and teaching concepts, and promote the improvement of big data management literacy. At present, according to the network questionnaire survey, most teachers in colleges and universities use simple multimedia courseware in teaching. The content of the teaching courseware, which is issued uniformly by the Ministry of Education, only plays a role in knowledge transfer. It does not care whether the students have a flexible understanding and acceptance. At present, the construction of university data platform is more difficult, and lags behind in personnel training and talent reserve. Structurally, the big data teaching mode of College Students' ideological and political education is composed. As shown in Figure 3.

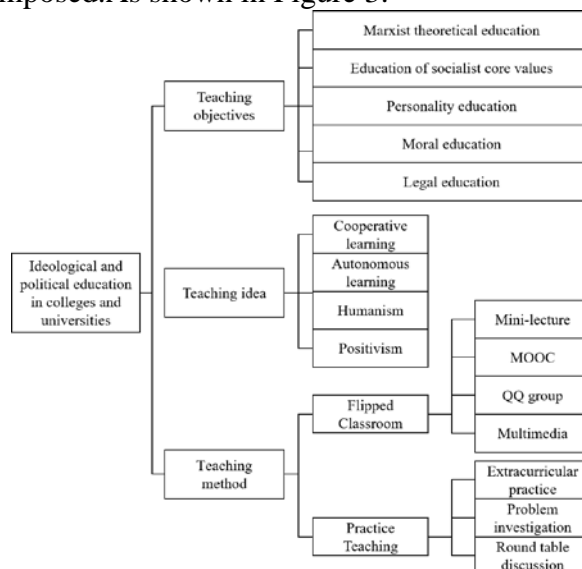


Fig.3 The Composition Diagram of the Big Data Teaching Model

Under the background of big data, although the way to obtain data is very important, we should pay more attention to the in-depth mining of data. Although the construction of higher education management data platform lags behind due to the consideration of capital and talents, we need to make clear that the development trend of higher education management is closely related to big data. Specifically, students' points of interest can be obtained by using the above platform applications, so there can be a lot of extension development around the characteristics of each point of interest.

The application of big data technology and the provision of big data services will bring thorough innovation to various management such as public management, enterprise management, business management, education management and health management, and realize the transformation from "authoritative governance" to "data governance". Combining with the existing educational research data and analyzing, it is found that this process is a process of interpreting and analyzing a large

number of data. Colleges and universities should combine their own development and characteristics, and effectively integrate scattered data information based on existing data platform resources. Therefore, under the premise of incorrect concepts, there will also be problems in teaching methods, but traditional teaching methods can not be called incorrect teaching methods, they just ignore the students' interests in details. Educational administrators also need to be hard at managing big data, so they can be more active in analyzing data, collecting data, and reflecting on relevant decisions.

### 3.2 Give Full Play to the Advantages of the Big Data Platform, Realize the Personalized Management of Education, and Improve the Timeliness of Management

Educational administrators should give full play to the advantages of big data platform, collect relevant information of students in all directions, and classify and summarize the information. According to the situation of different students, we should formulate a more personalized training mode, realize more personalized education management and enhance the timeliness of management. Educational and teaching work in Colleges and universities is the main component of setting up courses and is responsible for by full-time teachers. However, according to the actual assessment of teaching work and teaching results, the educational and teaching workflow in Colleges and universities is superficial and not enough attention is paid to it. In China, the higher education management system has been dominated by the government. Administrative control and political directives are issued to educational institutions under their jurisdiction to implement, control and evaluate educational resources. As shown in Figure 4.

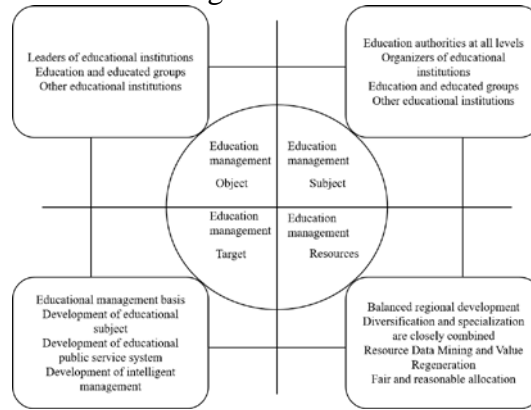


Fig.4 Logical Model of Big Data Higher Education Management

A key step in decision tree algorithm is to select test attributes. General decision tree algorithm uses entropy-based measure of information gain as heuristic information to select the most suitable test attributes.

Set  $S$  to be a collection of  $s$  data samples. Assuming that the class label attribute has  $m$  different values,  $m$  different  $C_i (i = 1, \dots, m)$  values are defined. Set  $S_i$  to be the number of samples in class  $C_i$ . The expected information for a given sample classification is given by the following:

$$I(s_1, s_2, \dots, s_m) = \sum_{i=1}^m p_i \log_2(p_i) \quad (1)$$

Among them,  $P_i$  is the probability that any sample belongs to  $C_i$ , and is estimated with  $S_i / S$ .

Let attribute  $a$  have  $v$  different values  $\{a_1, a_2, \dots, a_v\}$ . Attribute  $a$  can be used to divide  $S$  into  $v$  subsets  $\{S_1, S_2, \dots, S_v\}$ . In which  $S_j$  contains the sample with value  $a_j$  on  $a$  in  $S$ . If  $A$  is selected as the test attribute, these subsets correspond to the branches growing from the nodes containing set  $S$ . Let  $S_{ij}$  be the number of samples of class  $C_j$  in subset  $S_j$ . According to the entropy or expected information divided into subsets by  $a$ , it is given by the following formula:

$$E(A) = \sum_{j=1}^v \frac{S_{1j} + \dots + S_{mj}}{S} I(S_{1j}, \dots, S_{mj}) \quad (2)$$

Item  $\frac{S_{1j} + \dots + S_{mj}}{S}$  acts as the weight of the  $j$ th subset and is equal to the number of samples in the subset divided by the total number of samples in  $S$ . The smaller the entropy value, the higher the purity of subset division. For a given subset of  $S_j$ .

$$I(s_{1j}, \dots, s_{mj}) = -\sum_{i=1}^m p_{ij} \log_2(p_{ij}) \quad (3)$$

Among them,  $\frac{S_{ij}}{|S_j|}$  is the probability that the sample in  $S_j$  belongs to class  $C_j$ .

The coding information obtained by branching on  $a$  is:

$$Gain(S, A) = I(s_1, s_2, \dots, s_m) - E(A) \quad (4)$$

$Gain(A)$  is the expected compression of entropy due to knowing the value of attribute  $A$ .

The algorithm calculates the information gain of each attribute. The attribute with the highest information gain is selected as the test attribute of the given set  $S$ . Create a node, mark it with the attribute, create branches for each value of the attribute, and divide the sample accordingly.

Under the background of modern education reform, the traditional educational concept has reached the edge of being eliminated. Therefore, in order to realize the management of big data higher education, it is necessary to emphasize the advanced teaching concept. Management has changed from the traditional direct management of people to the management of data and service for people, which improves service efficiency and quality. This is the most fundamental management change caused by big data. Finally, big data drives management effectiveness from emergency to early warning. In the new era, colleges and universities must constantly innovate the teaching management mode, improve the comprehensive quality of college students from multiple channels, and clarify the teaching objectives of colleges and universities. At this time, big data technology can get the interest of students according to each student's operation habits, and with the help of its own mining function, get the extension application of students' interest, and finally feedback the results to teachers. Educational managers need to supplement the information obtained by the data sharing platform, establish a good psychological warning mechanism, and track the students' psychology in an all-round way to ensure more efficient psychological guidance.

#### 4. Conclusions

To sum up, the educational management model in the era of big data is facing great changes, so it is necessary for the majority of educational administrators to deeply reflect on the opportunities and challenges faced by the era of big data. In recent years, this economic model, which relies more on people's subjective consciousness, has become an important part of people's daily life. Therefore, we should look at the problem from a long-term perspective, innovate the education management mode according to our own situation, deeply understand the connotation of big data, enhance the application awareness of big data technology, and take the education management goal as the core. In the era of big data, college education management is facing a change, which is based on the comprehensive, self-cultivation and individualized development of others. Through the deep and sincere combination of information technology and education, the value, structure, procedure, power and culture of traditional education can be reconstructed, and the intrinsic quality of education can be improved in an all-round way. The analysis of challenges in the implementation of higher education management of big data shows that there are difficulties in the collection of interest, professional level, concept and method in the implementation of modern higher education management of big data, that is, there are challenges in the implementation of representative. In view of the difficulties, the corresponding countermeasures are put forward.

## References

- [1] Yang Yingying. Problems and countermeasures in the education management model of college students in the era of big data. *Western Quality Education*, vol. 3, no. 014, pp. 92-93, 2017.
- [2] Chen Fei, Zhou Lingjun, Ding Li, et al. Challenges of higher medical education in my country in the era of big data. *Chinese PLA Hospital Management Journal*, no. 3, pp. 263-265, 2016.
- [3] Du Wei, Zhang Xin. The influence and optimization of big data on higher education management. *China Management Informationization*, vol. 021, no. 002, pp. 216-217, 2018.
- [4] Zhang Qianli. Management Accounting Teaching Curriculum Reform Based on the Application-oriented Talent Training Mode. *Chinese Township Enterprise Accounting*, vol. 000, no. 003, pp. 269-270, 2019.
- [5] Hu Xia. Exploration of Higher Education Model Transformation and Innovation Path in the Big Data Era. *China Adult Education*, no. 1, pp. 36-38, 2017.
- [6] Jin Long, Zhang Hongling. Innovative exploration based on the education management model of colleges and universities in the era of big data. *Knowledge Economy*, vol. 469, no. 14, pp. 156-157, 2018.
- [7] Chang Ming. Research on the Management Mode of Colleges and Universities in the Big Data Era. *Electronic World*, vol. 487, no. 01, pp. 59-61, 2016.
- [8] Li Weihui. On the Smart Management of Higher Education in the Big Data Era. *Academic Weekly A Edition*, vol. 009, no. 009, pp. 3-4, 2020.
- [9] Tong Yanfen. Discussion on the Information Construction of Higher Education Management in the Big Data Era. *Think Tank Era*, vol. 192, no. 24, pp. 8-9, 2019.
- [10] Chen Wen, Pu Qingping, Zou Fangming. The transformation of college student education management model and countermeasures in the era of big data. *Jiangsu Higher Education*, no. 1, pp. 67-69, 2017.
- [11] Zhao Weiyu. Research on the Impact of Big Data on Educational Management in my country's Universities and Countermeasures. *China Management Information*, vol. 021, no. 013, pp. 222-223, 2018.
- [12] Hong Lei, Zhang Pei. Construction of a grid management model for college students under the background of big data. *Modern Education Management*, no. 12, pp. 96-101, 2017.
- [13] Sun Yanhua, Ma Shengtai, Li Dan. Research on the Innovation of Financial Information Management Models in Higher Art Colleges in the Era of Big Data. *Finance and Economics*, vol. 000, no. 015, pp. 81-82, 2018.
- [14] Dang Ligang, Wang Yongwei. Refined management of college student work in the era of big data. *Quality Education in Western China*, vol. 2, no. 018, pp. 24-25, 2016.
- [15] Meng Dongdong, Zhang Yiwei, Cai Yanan. The impact of big data on higher education and countermeasures. *Heilongjiang Higher Education Research*, no. 1, pp. 34-37, 2020.