

# Research on Innovative Strategies for Online Education Management in Universities in the Era of Big Data

Wen HUANG<sup>a,1</sup> and Yonghui GUO<sup>b</sup>

<sup>a</sup>*School of Literature and Journalism, Xiangnan University, No. 889, Chenzhou Avenue, Chenzhou 423000, China*

<sup>b</sup>*School of Physics and Electronic-Electrical Engineering, Xiangnan University, No. 889, Chenzhou Avenue, Chenzhou 423000, China*

**Abstract:** In the era of the Internet, the continuous development of information technology represented by 5G, big data, artificial intelligence, etc. has driven the transformation of university education from traditional offline education mode to digital, networked, and intelligent online education mode. Online education in universities has become an important way to promote educational reform and innovation. However, in the process of Digital transformation of education, there are still many problems such as solidification of teaching management mode, insufficient integration of online resources, lack of intelligent education practice platform, etc., so it is urgent to improve the online education management ability of colleges and universities. In the future, university education management needs to use big data tools to improve management level, explore educational resources, unify teaching and learning, and achieve the transformation and upgrading of online education management mode.

**Keywords:** Big data, universities, online education, administration

## 1. Introduction

Big data relies on the Internet as the basic data material, with the characteristics of scale and diversification, and can provide the required large amount of data in a short period of time. Education is constantly updating and improving with the development of the times. The arrival of the big data era has brought about significant changes in modern education, and big data will inevitably become the driving force for education reform. Promoting and improving the current online teaching management mode in universities has become an important issue that needs to be urgently solved [1-2]. At present, there is a shortage of professional talents in the field of big data technology in China, and most university teaching management personnel have not fully mastered the relevant technology, resulting in a relatively poor application of big data [3-4]. How to

---

<sup>1</sup> Wen Huang, School of Literature and Journalism, Xiangnan University, No. 889, Chenzhou Avenue, Chenzhou 423000, China; E-mail: 450558724@qq.com.

This research was funded by: The Mixed Teaching Reform and Practice of Huxiang Intangible Cultural Heritage Blended with Ancient Chinese Literature under STEAM Education Concept (Grant Number: HNJG-2022-1083); Research on Optimizing the Teaching Content of Motion Control System Course under the OBE Concept (No. 22).

effectively apply big data in teaching management, help educators establish big data thinking and master relevant technologies, analyze scientific, reasonable, and efficient teaching management methods for college students' data information, and improve the quality of teaching management has become an urgent issue to be solved.

## 2. Advantages of Online Education Management in Universities in the Era of Big Data

### 2.1. Improving Teaching Efficiency

Applying big data and artificial intelligence data to teaching management can break traditional inherent thinking and open up new prospects. Compared to previous work modes, this emerging method of combining artificial intelligence and big data has led to a rapid improvement in work efficiency. The application of big data technology can fully enhance the teaching and management capabilities of schools, improve the quality of talent cultivation, and become an irreversible development trend in today's era [5]. From the current development status, big data is gradually being applied to different teaching types, as shown in Table 1.

**Table 1.** Data source types of big data education.

Learning categories	APP	Data source
Self study	Wisdom Study Companion, Discussion and Answer	Homework data, Exam data
Homework Q&A	Homework Help, Afan Question	Homework data, Question bank data
Language learning	Fluent in English speaking, proficient in a hundred words	English speech database, Word database
Teaching	Rain Classroom, Mu Ke	Interactive data between teachers and students

Teaching managers use different teaching platforms to guide teachers and students to apply online resources to self-study, homework, and classroom teaching. And through data sources such as homework, exams, knowledge, etc., grasp the teaching level of teachers and the learning situation of students, in order to further improve teaching management.

### 2.2. To Meet the Teaching Requirements of Individualized Teaching

By utilizing technologies such as big data processing and deep reinforcement learning, learners' digital portraits can be calculated and depicted. Through dynamic data learning, students' psychological states and behavioral patterns can be calculated, providing personalized teaching services for each student. Teaching managers need to adapt faster to the ever-changing teaching environment, fully understand students' learning behavior through the analysis and screening of teaching data information, so as to achieve individualized teaching and propose targeted teaching plans for different students, in order to improve the quality of talent cultivation and promote students' comprehensive development.

### 2.3. Reforming the Teaching Evaluation Model of Curriculum

The application of big data in teaching management can bring great opportunities for the reform of teaching quality evaluation, allowing students to fully absorb the knowledge and energy of different disciplines and apply them to the deep learning process, promoting students' comprehensive development. In terms of evaluation standards, evaluation methods, and content, the teaching evaluation model in universities can innovate by using big data to collect a large number of students' learning situations, and analyzing data through computer and other technologies, ultimately forming visual teaching suggestions [6-7]. Based on the above concept, a procedural evaluation system is formed, as shown in Figure 1.

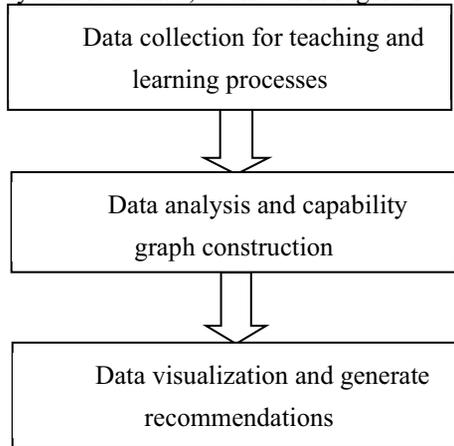


Figure 1. Process evaluation system diagram of big data application.

## 3. The Problems in Online Education Management in Universities in the Era of Big Data

### 3.1. Insufficient inTegration of Teaching Management and Technology

Chinese universities have integrated big data technology into their teaching management, but generally remain focused on data integration, such as counting the number of students on campus, registering for exams, and counting the number of students in each score segment. The application of technology is relatively limited. After some universities introduced big data technology into teaching management, the application direction did not align with their actual needs, resulting in a small scope of technology application and poor effectiveness. In the teaching management work of universities, it is necessary to break away from the teaching management itself and simply rely on data for teaching management and innovation. Among numerous data sources, blindly educating college students through data is not conducive to achieving teaching effectiveness. To make good use of data information, as a teaching management worker, it is necessary to have strong data screening ability, high level of informatization, perfect integration of teaching management and emerging technologies, and achieve innovation in management methods and means. In addition, there is insufficient emphasis on information security protection, a lack of awareness of

security management, and insufficient protection of data information, which affects the stable operation of the system and disrupts the order of teaching management.

### *3.2. Lack of Service Awareness in Traditional Teaching Management Models*

Some university teaching management systems focus on the management of basic information for teachers and students, neglecting the service function for teachers and students. Only some of the daily teaching affairs of teachers and students can be completed in the system, and more still need to be solved offline. For students, they can query their grades, select courses, and browse their schedules in the system, but they cannot apply for leave, leave cancellation, or modify their academic status. The traditional management model, which sets up management systems from the perspective of managers, neglects the user experience of teachers and students, hinders the maximization of teaching management functions, and also makes big data technology unable to be applied.

### *3.3. Insufficient Information Technology Capabilities of Teaching Management Workers*

Decision makers in the management process of universities are not aware of the importance of big data technology for educational curriculum reform, making it difficult for various departments in universities to have a correct understanding of the importance of big data. This skeptical attitude at the decision-making level directly raises the threshold for big data to enter the education industry, blocking its development process. This reflects a prominent issue in the application of big data in university teaching management, and is also the main reason for the narrow application field of big data in university teaching management.

## **4. Strategies Adopted for Innovation in Online Education Management in Universities in the Era of Big Data**

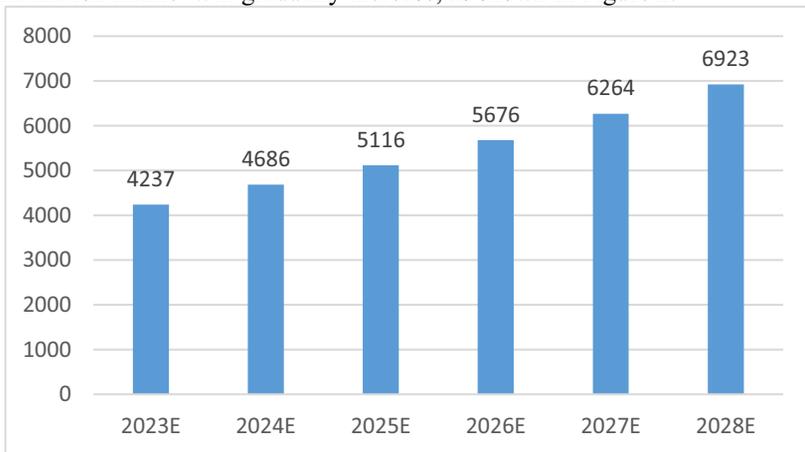
### *4.1. Deepen the Integration of Teaching Management and Big Data Technology*

In the context of big data, using big data technology to construct relationship models, identifying relevant relationships through data, and predicting college students' thoughts and behaviors is beneficial for mastering student dynamics in the first time and better teaching management. Firstly, change the existing teaching management methods, implement teaching management prediction models, and establish predictive thinking for teaching managers. Education managers should establish data awareness, scientifically establish student behavior models using mastered data, and analyze students' thinking patterns and behavior predictions based on scattered data and information. By analyzing the results, a reasonable talent development plan, course arrangement, and credit point setting can be formulated to better understand how to manage teaching. Predict students' future behavior based on data, understand their future development trends, and respond quickly and skillfully to emergencies. Secondly, strengthen the ability to collect and analyze student data information. Data collection and analysis are the basic tasks of educational informatization, and the

efficiency and accuracy of data collection will directly affect the effectiveness of data analysis and modeling. Furthermore, it is necessary to strengthen risk management and information assessment. By collecting and processing data, not only can educational resources be excavated from the data, but also early warning judgments can be made through data analysis. Finally, strengthen technical support to ensure data and information security.

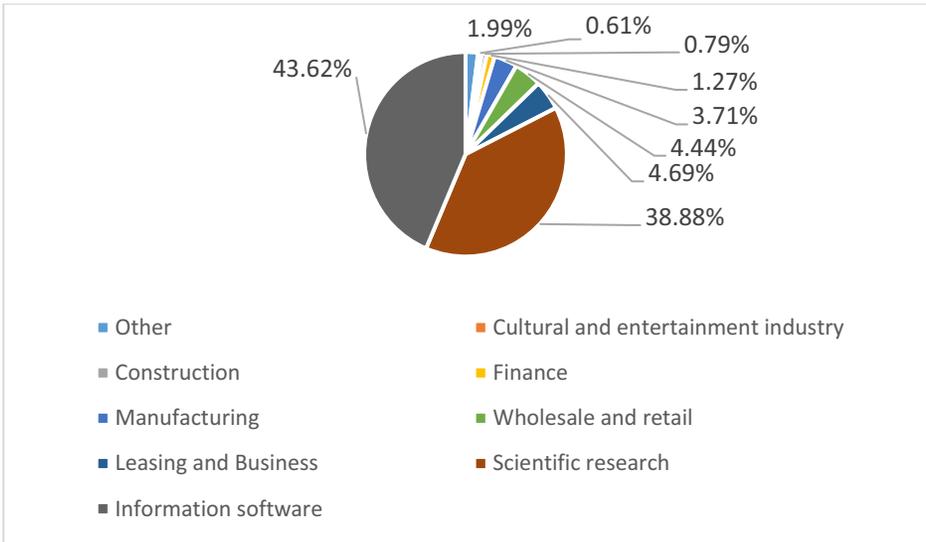
#### 4.2. Innovative Teaching Management Mode

Teaching management is a process of coordinating and managing various elements of the teaching process, making it operate effectively and improving efficiency. At present, from the current application status of big data in teaching management, it cannot be separated from infrastructure construction. Infrastructure construction is a very important organic part of the expansion of big data in the field of education. For service innovation, schools should inject the educational concept of comprehensive quality and comprehensive development into students' education work, and promote infrastructure construction, in order to better establish service functions and teaching quality evaluation paradigms. The basic education work of students cannot be separated from the guarantee of infrastructure, in terms of investment and construction of infrastructure guarantee [8-9]. According to the research results of the Zhongyan Puhua Industry Research Institute, it is predicted that the scale of China's education industry informatization market will gradually increase, as shown in Figure 2.



**Figure 2.** Supply Forecast for China's Education Industry from 2023 to 2028 (100 million yuan).

In the era of the Internet, the construction of resource sharing in university teaching management under the background of big data is an inevitable trend. This helps to achieve a teaching management model of information integration in university teaching management systems and integration of university information equipment, providing means for exploring teaching laws and opportunities for the construction of management decision-making levels in universities [10]. According to the data released by big data trading, the application of big data in the education field does not have an advantage, as shown in Figure 3.

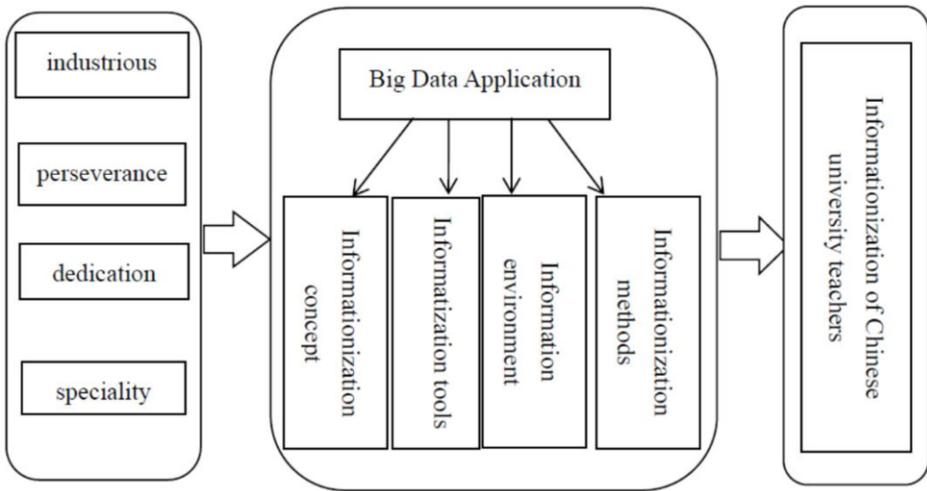


**Figure 3.** Proportion of Big Data Enterprises by Industry.

Universities should establish correct values in a timely manner, increase the investment budget for introducing big data into infrastructure construction, and improve the service quality and level of school teaching. This is an important development requirement for university teaching management in the new era.

*4.3. Strengthening Teaching Management and Cultivating Teachers*

Innovative and efficient teaching management models can orderly carry out teacher training activities in the process of education and teaching reform and comprehensive management work. This can enable teachers to fully utilize big data technology to achieve curriculum education and comprehensive quality education for students, which will greatly benefit teaching quality. The importance of big data for education lies in promoting the modernization of teachers and the informatization of teaching. Through the application of information technology concepts, tools, environments, and methods, promote teachers to adapt to changes in the times and achieve modernization and transformation of teachers [11]. The information technology elements of Chinese university teachers are shown in Figure 4.



**Figure 4.** Elements of Informationization for Chinese University Teachers.

## 5. Conclusions

Traditional classroom education in Chinese universities should adapt to the changes of the times and make reasonable use of big data to strengthen teaching management. The innovative development of online education must be combined with the advantages of the times, and the integration of big data technology and artificial intelligence technology has become an inevitable trend in the reform of education methods and education systems. Starting from the teaching quality management mechanism, big data organization framework, and smart teaching platform, we aim to innovate the online education model, in order to achieve healthy, stable, and sustainable development of the online education model, and create a free and flexible intelligent teaching method for citizen education.

## References

- [1] Sun JP, Wang XT, Zhen XY. On the innovation of online education mode in the era of "internet plus". *Journal of Shanxi radio & TV University*. 2021; 125: 36-40.
- [2] Yang XM, Yang KF, Zhang YR. The potential dilemma and response strategies for the effective implementation of the "double reduction" policy: Also on the construction of the public online education service system. *Journal of Sichuan Normal University (Social Sciences Edition)*. 2021, 48(6): 53-61.
- [3] Shao LF. Research on online teaching management in vocational colleges under the background of big data. *Technology Style*. 2022, 14(5):25-27.
- [4] Zhang J. Big data: A new way for vocational colleges to modernize teaching management. *Journal of Educational Modernization*. 2019, (101):222-223.
- [5] Fang MS, Liu BB. Innovation in university teaching management under the background of big data. *Industry and Technology Forum*. 2021, 20(24): 283-284.
- [6] Gong YQ. Research on innovation of teaching management in universities under the background of big data. *Research on Higher Education of Nationalities*. 2022, 10(4):88-92.
- [7] Yang SN, Li GR. Research on online teaching management in vocational colleges under the background of big data. *Wireless Internet Technology*. 2022, (3):134-135.

- [8] Cui Y. Analysis of innovation in teaching management in universities under the background of big data. *China Management Informationization*. 2020, 23(17):222-223.
- [9] Chen L, Ren PP, Zhang WM. A new perspective on educational innovation and development in the post pandemic era and China's outstanding exploration: Reflections on attending the 2020 global conference on artificial intelligence and education big data. *China Educational Technology*. 2021, (412): 1-9.
- [10] Mao YB, Li XY, Zhang L. Research on the improvement of online education quality in the digital transformation of education. *Digitalization of Education*. 2022, (428):38-42.
- [11] Song M. The ongoing and future tense of online education. *Media Culture*. 2022, (7):62-65.