ISSN 2616-7433 Vol. 5, Issue 13: 71-77, DOI: 10.25236/FSST.2023.051312

Intelligent Campus Informatization Management Model Based on BD and AI

Guangjian Ma

Henan Province IUR Artificial Intelligence Research Institute, Zhengzhou, Henan, 450046, China
lilili@ncwu.edu.cn

Abstract: *Schools are the gathering centers of knowledge and information resources in the information society. In the new media environment, the traditional teaching method with paper textbooks as the main carrier cannot keep up with the pace of modern information technology (IT). The "Internet plus" smart campus model has become an inevitable trend of future university reform. This paper combined artificial intelligence (AI) with Big data (BD) and other advanced theories, used data mining to analyze students' learning, teachers' teaching behavior and the impact of related factors on education and teaching quality, and built a new generation of information platform. By utilizing various technological means to achieve resource sharing and interactive communication between teachers and students, as well as between different groups, a truly intelligent teaching service system was formed. School A, which deployed a smart campus information management system model based on BD and AI, was compared with School B, which used a traditional campus management platform. The experimental results showed that the average total score of students in Class A of School A was about 81.527 points, while the average total score of students in Class B of School B was about 77.979 points. Class A was about 3.548 points higher than Class B. This to some extent indicates that the application of AI and BD analysis technology can have a positive impact on education and teaching work, making teaching and management more refined. The introduction of BD and AI is driving the transformation of the entire society from an industrial economy to a knowledge-based economy. The personalized needs of students are gradually expanding and showing a diversified trend. Education concepts and teaching models have also undergone changes, bringing opportunities and challenges to schools.*

Keywords: *Big Data, Artificial Intelligence, Smart Campus, Information Platform, Management Model*

1. Introduction

Modern information technology, with its highly integrated and networked characteristics, has greatly changed the environment in which people live, work, and learn. As an important base for cultivating college students' information literacy and improving their comprehensive quality, colleges and universities also undertake the mission of higher and higher social requirements for talent quality. Campus management information system is one of the powerful means to ensure the smooth progress of school education and teaching and strengthen teaching management. Traditional campus management methods often face problems such as information silos, data fragmentation, and a lack of scientific basis for decision-making, which provides huge development space for information construction based on BD and AI technologies. Especially in the context of deepening education reform, smart campuses have become a new educational philosophy and management model.

As a high-end form of smart education systems, smart campuses are receiving increasing attention worldwide [1]. Smart campuses are a campus environment that provides efficient technology and infrastructure, supporting and improving teaching processes, research, and student experiences. Universities around the world are actively implementing smart campuses to improve workflow and environment [2]. Through the research on the construction of smart campus in higher vocational colleges in the "Internet plus" era, its significance is grasped. An advanced comprehensive information query system can be constructed, and an internet learning and communication platform can be built to reasonably allocate information based teaching resources [3]. As the main practice venue for education and teaching, campuses become the protagonist of the transformation of educational informatization, transitioning from digital campuses to smart campuses to meet the needs of future education [4]. A smart campus should not only enhance the quality of life for teachers and students, but also improve the quality of teaching.

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Smart campuses utilize new generation information technologies such as the Internet of Things (IoT), cloud computing, and BD to perceive, store, manage, and analyze all critical information in campus systems, achieving secure and accurate end-to-end services [5]. The intelligent campus teaching system based on ZigBee wireless sensors has improved the estimation algorithm for students' specific positions and directions within the campus, and constructed a three-layer teaching structure system according to the actual needs of intelligent teaching, which has good results [6]. In the IoT era, everything is interconnected, and smart campuses gradually connect and actively integrate with IoT, achieving positive interaction and exchange between teachers and students [7]. The transformation from traditional campuses to smart campuses requires the support of information technologies such as the Internet, mobile communication, social platforms, and BD, providing teachers and students with a more comprehensive, convenient, and intelligent learning environment and information services [8]. The application of AI and BD has built an information-based foundation for smart campuses, making them an open and shared world.

At present, the application rate of digital teaching resources in most universities is low, making it difficult to meet the growing demand for course learning among college students. However, due to the continuous maturity and widespread application of emerging information technologies such as cloud computing and mobile communication in various fields, people's demand for educational resources is becoming increasingly diverse and personalized. The construction of smart campuses cannot be separated from the support of digital technology [9-10]. Starting from solving practical problems, this article utilizes intelligent information processing methods based on BD and AI to integrate and optimize existing resources, and designs a new network platform called "Smart Campus" that integrates online classrooms, remote training, and library automation management. It has good scalability, flexibility, and scalability, providing efficient and convenient solutions for universities to carry out networked teaching activities.

2. Drawbacks of Traditional University Information Service Models

In the past few decades, school education has been the main way for students to acquire various subject knowledge, skills, and practical experience. With the increasing demand for talent quality in society, people have begun to attach importance to investing more energy in talent cultivation. The era of information explosion has also arrived, and the drawbacks of traditional teaching methods have gradually become prominent.

Information asymmetry is a common phenomenon in the education industry. Generally speaking, information is often released under the leadership of schools or relevant departments, but the dissemination channels are narrow and time is limited, making it easy to be influenced by external factors, making it difficult to accurately convey information to others and unable to be effectively utilized in a timely manner. This reflects the serious waste of information resources and affects students' decision-making.

Information silos are one of the main reasons for low educational efficiency, including individuals being unable to obtain the necessary information in a certain field and lacking the need to communicate with other users. They also exhibit isolation and exclusion among individuals, hindering the sharing of high-quality educational resources, increasing the workload and time consumption of students and faculty, and hindering the mutual growth of teachers and students.

The lack of gender and differentiation is also a key factor that makes traditional teaching models difficult to sustain, especially in the increasingly high demand for teachers in the information environment. At present, many schools still use the old teaching model, which leads to insufficient satisfaction of individual needs and characteristics, and restricts the improvement of the efficiency of the entire education system.

The rapid growth of IT has led to the subversion and breaking of many existing teaching concepts, leading to the emergence of a new teaching style, from traditional teaching methods to modern teaching methods and means, from closed teaching to open teaching, and from single knowledge transmission to multi-disciplinary infiltration and development. The curriculum reform centered on students and focusing on cultivating and improving learning abilities is being deeply promoted. Smart campuses are no longer just a theoretical concept, but become a tangible and achievable practical goal [11-12]. However, the construction of smart campuses not only aims to improve students' learning outcomes, but also to enable them to learn to manage their own lives independently, cultivate lifelong development abilities, and enable them to adapt to the requirements of the times faster and better.

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3. Informationization Support for Smart Campuses

BD and AI are new trends in the combination of IT and education, bringing profound changes to school management. In the process of building a smart campus, using cloud computing and BD analysis methods to carry out teaching assistance decision-making and intelligent analysis processing can improve the knowledge mastery and problem-solving abilities of teachers and students. The establishment of a remote video interaction platform can enhance the communication experience between teachers and students. The establishment of an open collaborative innovation system provides students and faculty with a better learning and working environment, which helps schools improve education quality, optimize resource utilization, and provide personalized learning support [13].

BD technology collects, stores, and analyzes massive amounts of student information and teaching data, and makes decisions on a data-driven basis. It can more accurately understand student needs to improve teaching effectiveness, and reveal school development trends and potential problems to optimize the decision-making process and promote scientific and efficient management of schools [14].

AI provides support for teaching innovation, using virtual laboratories, personalized learning platforms, and intelligent teaching assistants as carriers to integrate classroom teaching with the Internet and transform from "teaching" to "learning". It can also be applied to the processing of scientific research data and model construction, providing new ideas and methods for researchers while ensuring the accuracy of experimental results, accelerating the scientific research process and improving the quality of research results.

The widespread application of the two in the field of education provides rich information support for the construction of smart campuses, which greatly promotes the progress and development of higher education. However, they cannot completely replace the role of teachers, and they need to leverage their respective advantages and complement each other to make contributions to the overall reform of schools [15].

4. Construction of Smart Campus Information Management Model

The smart campus system is a crucial part of the informationization construction of school education, and also a key way to improve students' comprehensive quality and cultivate their comprehensive development ability. Through the integration and application of BD, AI, IoT and other advanced technologies, various resources, facilities and services in the campus are transformed and upgraded digitally, intelligently and interconnected, so as to build a new intelligent campus that is open, transparent, interconnected, functional, safe, reliable and sustainable, and provide a more convenient, efficient and personalized campus environment for students, faculty and managers. The specific information management model is shown in Figure 1.

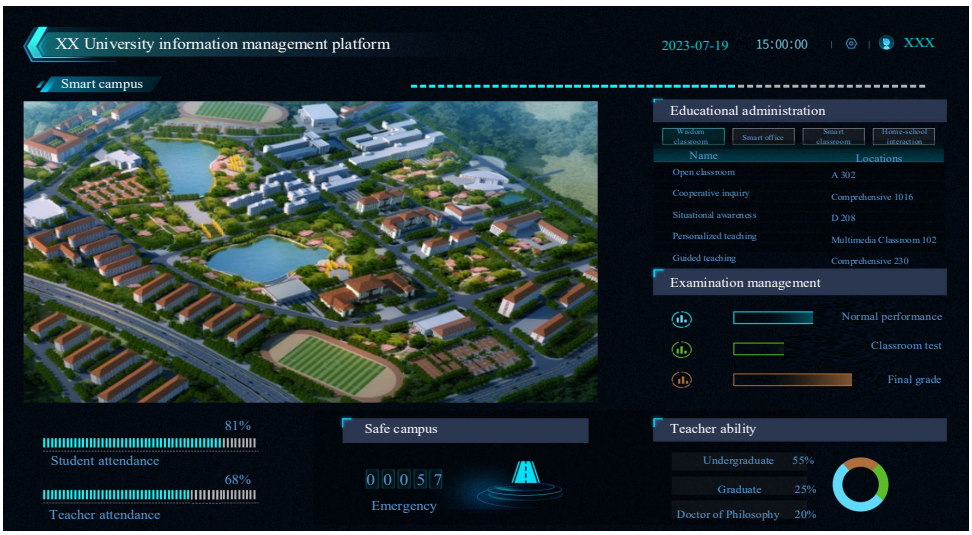

Figure 1: Smart campus information management model

This model mainly includes five modules: academic administration management, exam management, teacher competence, secure campus, and attendance center. Among them, academic

ISSN 2616-7433 Vol. 5, Issue 13: 71-77, DOI: 10.25236/FSST.2023.051312

management covers four functions: smart classroom, smart office, smart classroom, and home school interaction. It provides teaching and administrative information services for teachers, and supports students in learning and life. It can also establish a good communication channel with parents to help children grow up healthily [16-17]. Examination management achieves multiple operations such as score statistics, score queries, and test paper classification by collecting and analyzing candidate information, which can effectively improve school management level and strengthen teaching quality control. Teacher competence is the cornerstone of ensuring educational quality. This model can also assist schools in introducing accurate and high-quality talents, utilizing data analysis and prediction to make reasonable use of excellent teacher resources, improving teaching management mechanisms and assessment and evaluation systems, and enriching the teaching staff. Campus security management is mainly used to detect whether there are security risks. Through intelligent monitoring systems and data analysis, the security status of the campus can be monitored in real time, and abnormal events can be promptly warned and measures taken to ensure the personal and property safety of teachers and students [18].

This model integrates teaching, learning, management, evaluation, and examination, achieving modernization of university teaching and management. It can be applied to daily teaching activities, scientific research, and various public services. It improves the common problems of outdated online teaching models and unsatisfactory teaching effects, helps to improve the efficiency and quality of classroom teaching, and enhances students' innovative spirit and practical ability, so as to promote the transformation of teaching management methods, and promote the process of quality education [19-20].

5. Realization of Intelligent Campus Informatization Management Model Based on BD and AI

5.1. Experimental Design

Two schools in the same region were selected as experimental locations. The deployment of a smart campus information management system model based on BD and AI in one of the schools and ensuring the normal operation of the system is called School A, while the other school that continues to use the traditional campus management platform is called School B. From the perspectives of both teachers and students, the teaching level of the two schools was evaluated to verify the application effect of smart campus informatization.

5.2. Data Analysis

5.2.1. Precision of Talent Introduction

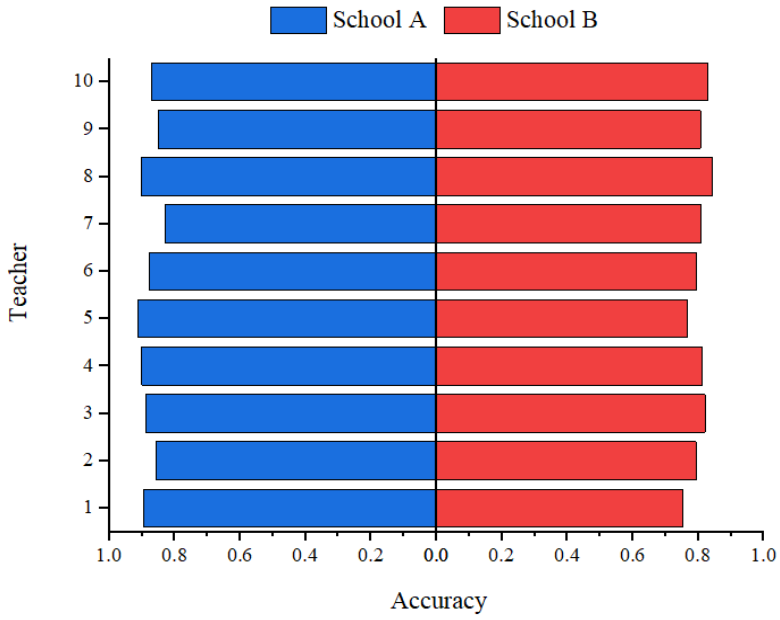

Figure 2: Comparison of the precision of talent introduction between two schools

ISSN 2616-7433 Vol. 5, Issue 13: 71-77, DOI: 10.25236/FSST.2023.051312

Two models were used to introduce 10 teachers from different majors to two schools. The accuracy of talent introduction was determined based on the recommendation results and actual investigation, as shown in Figure 2.

The horizontal axis in Figure 2 represents accuracy, while the vertical axis represents each teacher introduced. The blue color in the picture represents School A, while the red color represents School B. From the data distribution on both sides of the image, it can be seen that the accuracy of School B was basically between 0.7 and 0.9, which was already at a high level, indicating that the school has a strong ability to control the teaching staff and can introduce excellent and suitable teachers into the classroom. However, the accuracy of introducing teachers to School A reached a range of 0.8 to 1, which had a significant advantage compared to School B, demonstrating the significant effectiveness of smart campus management under the influence of BD and AI, laying a solid foundation for achieving high-quality teaching and high-intensity growth.

5.2.2. Teaching Ability

Ten students and ten other teachers were randomly invited, and the teaching abilities of teachers in the same major from two schools were evaluated separately, with a maximum score of 100, as shown in Figure 3.

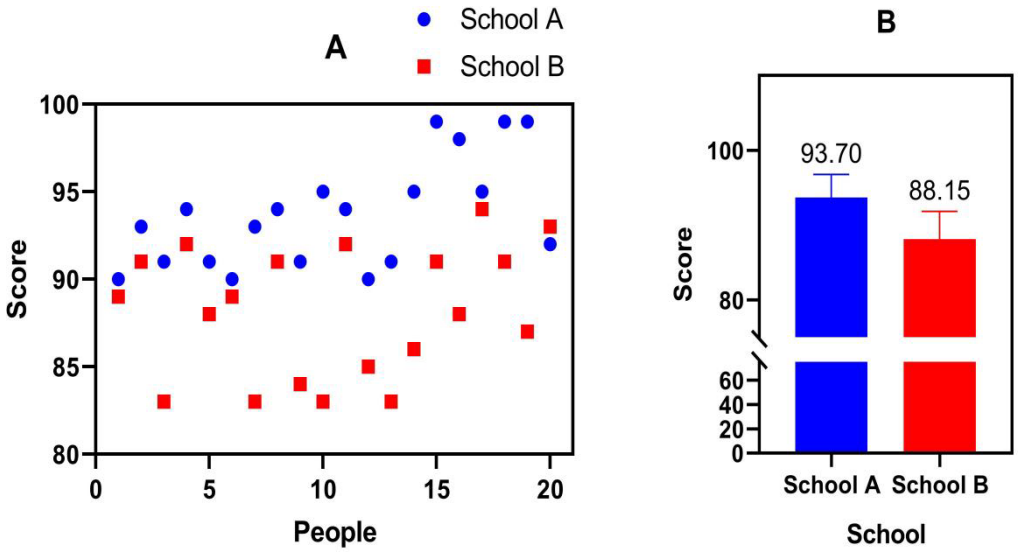

Figure 3A: Distribution of teacher's teaching ability evaluation
Figure 3B: Average score of teaching ability of teachers in two schools

Figure 3: Comparison of teaching abilities of teachers in two schools

The horizontal axis in Figure 3A represents the students and teachers participating in the evaluation, with 1-10 students and 11-20 other teachers, and the vertical axis represents the scoring results. The horizontal axis of Figure 3B shows the two schools A and B, while the vertical axis shows the average score. Combining the two images, it was not difficult to see that the teaching ability of School A teachers was more recognized by evaluators, indicating that the construction of a smart campus has played a certain role in improving the quality of education and teaching.

5.2.3. Student Grades

From two schools in the same grade and major, a class was randomly selected and named Class A and Class B based on the school. There were 19 students in Class A and 23 students in Class B. Class A conducted intelligent teaching based on the smart campus information model, using various methods such as MOOCs, remote online classrooms, and flipped classrooms. Class B adopted a regular class teaching method. According to the ratio of daily grades, classroom tests, and final grades of 3:2:5, the academic performance of the two classes was evaluated, as shown in Figure 4.

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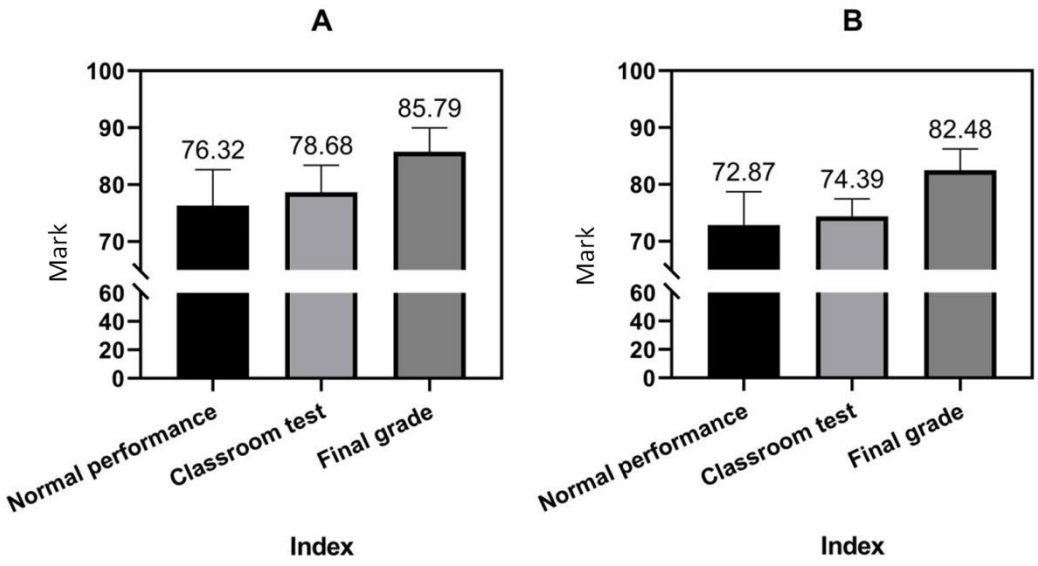

Figure 4A: Average grade of Class A students *Figure 4B: Average grade of Class B students9*

Figure 4: Comparison of student grades between two classes

The horizontal axis of Figures 4A and 4B represent three different evaluation indicators: regular grades, classroom tests, and final grades, while the vertical axis represents students' grades. Among them, the average grades of Class A were 76.32, 78.68, and 85.79, respectively. After proportional conversion, the grades of the class were 22.896, 15.736, and 42.895. Similarly, the grades of Class B were converted into 21.861 points, 14.878 points, and 41.24 points. Therefore, the average total score of Class A was about 81.527 points, while Class B was about 77.979 points. Class A's score was about 3.548 points higher than Class B. Therefore, the application of smart campuses has also played a good role in improving students' academic performance.

6. Conclusions

In the information environment, school education is constantly exploring and practicing in the transformation of service innovation. Smart campus is a typical application model, especially with the support of AI and BD, which greatly improves teaching level and enhances teaching efficiency. This article analyzed the drawbacks of current campus construction, elaborated on the key points and specific implementation methods of smart campus construction in the context of AI, and created favorable conditions for promoting the improvement of students' learning methods and thinking quality.

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