

Research on Visualization Platform of University Student Management under the Background of Big Data

Jing Zhou*

zhouj882@126.com*

School of Information Engineering, WuHan Business University, WuHan, HuBei, 430056, China

Abstract: With the progress of the times, people's requirements for all aspects of life are constantly improving, and more and more attention is paid to the cultivation of personal accomplishment. Under the background of smart campus, we can combine educational resources with modern information technology to create a networked, personalized and intelligent campus environment by analyzing a large amount of data and related information on the Internet. The concept of visual management is introduced to study the influence of students' daily study. Based on the student big data accumulated in colleges and universities, this paper analyzes the necessity of introducing visualization technology, puts forward the hierarchical structure of student management objectives, and establishes a visualization platform for student management. Through three levels of visual analysis means, such as query and browsing, statistical analysis and auxiliary decision-making, the platform can meet the needs of users at different levels in colleges and universities, and promote the scientific and innovative development of student management. To sum up, the visualization platform of student management combines student management with scientificity and innovation by integrating visualization technology, which provides powerful tools and methods for university administrators. The application of this platform not only meets the needs of different users, but also promotes the further development of student management, making it more scientific, efficient and innovative.

Keywords: Big data; Student management; Data visualization; Aid decision making

1 Introduction

With the improvement of people's living standards and the rapid development of information technology, the construction and improvement of infrastructure equipment has become an important issue. By improving these infrastructure facilities, we can make more effective use of limited resources and improve people's life and work efficiency. The progress of science and technology enables us to produce and live in a smarter and more efficient way. In the field of education, the application of science and technology can make campus teaching and management more scientific, intelligent and efficient, and help students to master knowledge more easily. In the field of education, the application of information technology is very important to promote the construction and development of smart campus. Smart campus refers to the digital, networked and intelligent transformation of all links within the school by means of information technology to improve the quality and efficiency of teaching and management [1]. Specifically, information technology can play a role in the following aspects:

(1) Teaching AIDS: Information technology can provide multimedia teaching resources, such as e-books, teaching videos, online courses, etc., to provide teachers and students with richer learning resources and diverse learning methods. Students can learn and interact online through electronic devices to improve their understanding and mastery of knowledge.

(2) Educational administration: Information technology can realize the automation and digitization of students' information management, curriculum arrangement, examination score entry and other educational administration work, reduce tedious manual operations and improve work efficiency and accuracy. Teachers and students can access and update relevant information through electronic devices to provide convenient educational services.

(3) School resource management: Information technology can be used for intelligent allocation and management of school resources. Through the Internet of Things technology and sensor equipment, intelligent monitoring and management of campus facilities, such as intelligent lighting system and energy-saving equipment, can be realized, so as to improve resource utilization efficiency and reduce energy consumption.

(4) Teaching evaluation and personalized education: Information technology can assist students in learning evaluation and personalized education. Through the learning management system and data analysis technology, students' learning situation can be monitored and evaluated in real time, which can provide personalized guidance and feedback for teachers and help students develop their potential and interest better.

(5) Campus security and monitoring: Information technology can be used for the construction and management of campus security monitoring system. Through video surveillance, intelligent access control system and other technical means, campus security can be improved, adverse events on campus can be prevented, and the personal safety of teachers and students can be guaranteed.

To sum up, information technology has great potential in the construction and development of smart campus. By effectively applying information technology, we can improve the quality and efficiency of education and create a better learning and working environment for students and teachers. However, promoting the construction of smart campus requires comprehensive consideration of technology, education, management and other factors, and requires the joint efforts and support of the government, schools and education-related institutions.

2 Related concepts

2.1 Data visualization

Data visualization, also known as data presentation, reveals the complex relationship, potential information and development trend of the original data through a visual presentation platform in an easy-to-access and interactive way by means of reports, key performance indicators, graphs and queries. After comparing the tools of four major software companies, namely Oracle, Microsoft, SAP and IBM, it is found that compared with the other three development platforms, Microsoft provides comprehensive, integrated and easy-to-use development tools in system development and application architecture, which can meet the processing scale and visualization requirements of big data in colleges and universities^[2].

2.2 Hierarchical model of student management objectives

The goal of student management is to reasonably analyze and utilize students' overall data, provide data browsing and query services for teachers and students, meet the business management needs of various departments, and provide overall data statistical analysis and decision support for leaders. People at every level in the organization should benefit in order to effectively promote management support decision-making, so a pyramid model as shown in Figure 1 is established.

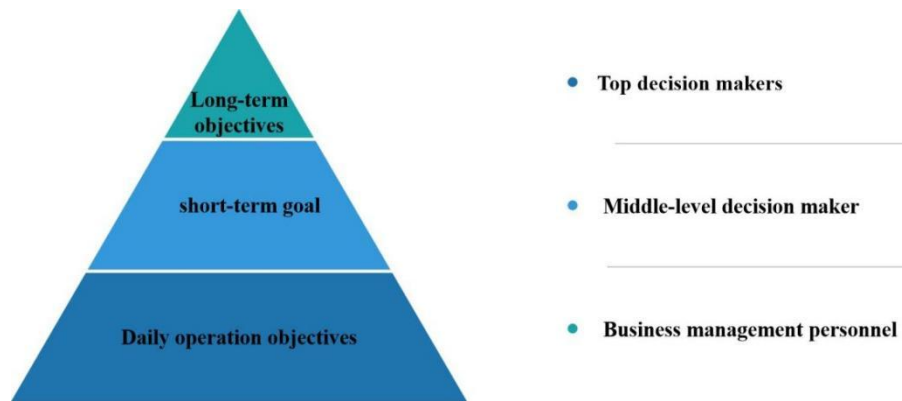


Figure 1 Specific objectives at different levels in the organization

It can be observed from Figure 1 that there are different levels of decision makers and managers in student management. As the top decision-maker, school leaders are responsible for establishing the long-term goals of the school and making the overall development plan. They have a global vision and pay attention to the overall development direction and strategic decision-making of the school, but they don't involve many specific details. The leaders of the student management department play the role of middle-level decision makers. They are responsible for formulating the short-term and medium-term goals and operational plans of the student management department. These goals and plans are formulated to achieve the long-term goals set by school leaders. Similar to school leaders, they pay more attention to the overall direction and the operational strategy of the department, rather than the specific business details that are too in-depth. The staff, class teachers and counselors of the student management department are specific business managers. They are responsible for the daily management of students and pay close attention to every detail, such as students' study, behavior and living arrangements. They have direct contact with students and carry out specific management tasks and operations according to the instructions of school leaders and department leaders. Generally speaking, school leaders, leaders of student management departments and specific business managers play different roles and responsibilities in student management. They work together to form a clear-cut management system to ensure that the overall goal of the school can be achieved and the efficient operation of student management can be ensured [3-4].

3 Student management visualization platform architecture

The architecture of student management visualization platform is shown in Figure 2, which applies data visualization technology to support student management. The architecture includes data acquisition layer, data integration layer, visual analysis layer and user access layer. In the visual analysis layer, there are three main functional modules: display browsing, statistical analysis and decision-making assistance. The display browsing module is used for intuitive query of students' static data. This includes students' basic information, learning experience, political outlook, academic performance, comprehensive evaluation, student league cadres, certificate examination, scientific and technological achievements, etc. Through this module, users can browse and inquire about the information of students conveniently, so as to fully understand the background and learning situation of students. The statistical analysis module mainly reprocesses students' electronic behavior information such as campus card information and online information, and generates readable information and overall situation. Through the statistics and analysis of these data, we can get students' behavior trends, preferences and habits in campus activities and network use. This will help school administrators and teachers to better understand students' behavior patterns and needs, and provide a basis for formulating corresponding strategies. The assistant decision-making module generates analysis reports by comprehensively analyzing students' information and combining with multiple dimensions, providing information and value hidden in data. These reports can help school administrators and teachers make decisions and plans. For example, by analyzing students' academic performance, social activities and behavior data, we can identify students' potential problems, advantages and characteristics, and provide guidance for personalized education and counseling. The whole student management visualization platform architecture is designed to help school administrators, teachers and related personnel make better use of data, and obtain detailed information and insight about students through intuitive visual interface and analysis function. This will help to improve the efficiency and quality of student management, support schools to formulate targeted education and management strategies, and promote the all-round development of students [5-6].

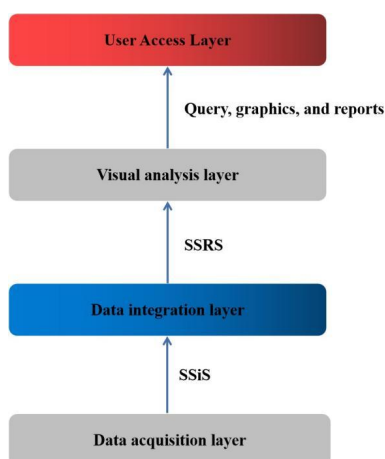


Figure 2 Architecture of Student Management Visualization Platform

At present, most colleges and universities have formed application systems such as student behavior management system, educational administration system, students' independent study selection system, excellent course platform, quality development platform, book lending system, students' online authentication system, campus access control system, campus financial system, campus card system, alumni system, etc. By integrating a large number of information management systems related to students mentioned above and using data warehouse technology, all information from students entering school to leaving school is defined in advance by SSIS, and automatically extracted, sorted and standardized into the shared data center on time to form a student subject database, which contains students' basic data, learning data and behavior data; Finally, a visual platform for student management is built, and all the data and information obtained in the visual analysis layer are available to users^[7].

4 Result analysis

4.1 Statistical analysis

After long-term exploration and practice, combined with data warehouse and visual analysis technology, statistical analysis and in-depth utilization of data have been carried out to generate various "ranking lists" such as the monthly ranking of campus card consumption and the monthly ranking of students' online time. Based on practical experience, threshold values are set and repeatedly corrected. Once the critical range is reached, the system will automatically issue an alarm and achieve student abnormal behavior warning. For example, students with internet addiction, students with abnormal consumption, impoverished students, students who are not in school, and students who may not be able to graduate normally, taking the warning function of students not in school as an example, the necessary behaviors of students on campus card consumption and on campus internet access are used as information monitoring points. If a student has neither campus card consumption behavior nor on campus internet access records for several consecutive days, it is preliminarily determined that the student may not be in school, forming a "blacklist", Promptly notify the counselors of these 'problematic students' information, and the counselors can compare it with the list of students on sick leave, personal leave, or internship, and pay targeted attention to the students' movements. Various types of student early warning not only help the student management leadership to set work goals and clarify work priorities, but also help student management workers respond to various situations in a timely manner, increase management initiative, prevent problems before they occur, clarify management direction, achieve targeted goals, and continuously improve student management level^[8].

The operation of the student management visualization platform ensures the authenticity and accuracy of data collection through real-time updates of student information. Student management departments and managers can obtain the most accurate and effective student information, reducing the work pressure of grassroots counselors and improving the efficiency of information collection; In terms of data sharing, various student work departments can share data, effectively promoting collaborative work between departments; In terms of data statistical analysis, through comprehensive analysis of overall student data, it provides reference standards for individual management of student managers, assists leadership in

scientific decision-making, formulates goals and policies that are in line with student management reality, promotes school development, and improves school quality.

4.2 Display browsing

The visualization platform of student management is displayed layer by layer according to "whole school-departments-grades-majors, classes-individuals", which comprehensively and concretely shows the number of students in the whole school, the number of departments, majors, classes and their composition, including the number and details of students who failed to graduate normally. The platform collects the basic information of individual students and their dynamic behaviors during the school period, including basic information, study experience, family members, political outlook, academic performance, comprehensive evaluation, reward and funding, honorary punishment, experience of cadres in the student league, participation in social work, certificate examination, scientific and technological achievements, financial information, book borrowing, campus card consumption, online records, access control and so on. On the one hand, it serves students, so that students can inquire about their information, grades and electronic behaviors in time; on the other hand, it enables student managers to obtain all the relevant data of students at school in a "one-stop" way, which is convenient for counselors to quickly and comprehensively grasp the detailed information and potential trends of each student and find and solve problems in time^[9].

4.3 Auxiliary Decision-making

Establish a stable and comprehensive wireless network connection within the campus, so that students, faculty, and visitors can access the internet and campus internal resources anytime and anywhere. In addition to information inquiry, browsing and classified statistics, a large number of statistical reports are used to study students' school behavior, assist students' management, and help other school administrators to carry out related management, as shown in Figure 3, such as monitoring the rationality and balance of network utilization rate, fault points and signal points through network behavior statistics, and supervising the layout and setting rationality of network infrastructure. In addition, the work is simplified and the efficiency is improved, which successfully solves the management problem that the number of college students is so large that it is out of balance with the grass-roots student managers year-on-year, overcomes some blind spots in management, and also provides decision support for the school leadership to optimize teaching resources and formulate a work plan in line with the actual situation of the school^[10].

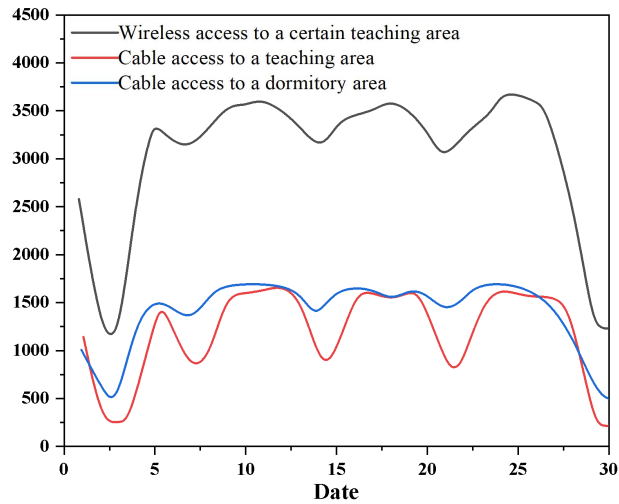


Figure 3 Wired wireless access in different areas of the campus in June 2022

According to the graph of wired and wireless access in different areas of the campus in June 2022 (Figure 6), through statistical monitoring of network behavior, we can evaluate the rationality and balance of network usage, fault points, and signal coverage to ensure that the layout and setting of network infrastructure are reasonable. This analysis method can help us gain a more detailed understanding of the allocation and utilization of network resources, as well as potential bottlenecks or deficiencies. By comprehensively considering the network access situation in different regions, we can optimize the allocation of network resources, improve signal coverage, and thereby improve overall network performance and user experience.

5 Conclusion

The construction of visual management information system for college student management under the background of big data can effectively promote the intelligent and scientific development of campus management. This system visually links teaching, health, medical care, security, logistics and other campus management fields with the life behavior of teachers and students, and becomes a comprehensive application platform of key intelligence based on big data. However, to realize this system construction, we need to correctly understand big data, smart campus and their relationship, and actively practice and explore. The construction of visual management information system for college students management aims to provide comprehensive information and insight for school administrators through visual display and comprehensive analysis of data, so as to make better decisions and management. Through the visual management information system, school administrators can know important information such as students' learning status, behavior habits and health status in real time, and

help them evaluate students' development and needs more accurately and take targeted measures and interventions.

In addition, the visual management information system can also provide the optimal utilization and management of campus resources. Through big data analysis, the system can predict students' needs and tendencies, reasonably arrange the use of resources such as classrooms and libraries, and improve the efficiency of resource utilization. At the same time, the system can also monitor the use of campus facilities, timely maintenance and management, to ensure the comfort and safety of students' learning and living environment. However, to realize such a visual management information system, we need to fully understand the concepts of big data and smart campus, and constantly explore and innovate in practice. Building such a system requires the close cooperation between university administrators and information technology professionals, as well as the active participation and support of faculty and students. Only with such joint efforts can the visual management information system really play its role in promoting the construction of smart campus.

Acknowledgments. WuHan Business University 2020 school-level Scientific Research Project, Research on Improving the Effectiveness of Ideological and Political Education in Universities Based on Big Data -- A Case Study of Wuhan Business University, 2020KY020

References:

- [1] Bian, F. , & Wang, X. . (2021). The effect of big-data on the management of higher education in china and its countermeasures. *International Journal of Electrical Engineering Education*, 002072092110020.
- [2] Li, Y. . (2021). Application of intelligent sensor algorithm in student management information fusion. *Scientific programming*(Pt.14), 2021.
- [3] Xie, H. , He, Y. , Wu, X. , & Lu, Y. . (2022). Interplay between auditory and visual environments in historic districts: a big data approach based on social media:. *Environment and Planning B: Urban Analytics and City Science*, 49(4), 1245-1265.
- [4] Medeiros, M. M. D. , & Macada, A. C. G. . (2022). Competitive advantage of data- driven analytical capabilities: the role of big data visualization and of organizational agility. *Management decision*(60-4).
- [5] Zhu, W. . (2021). A study of big-data-driven data visualization and visual communication design patterns. *Scientific programming*(Pt.12), 2021.
- [6] Su, Y. , & Wang, X. . (2021). Innovation of agricultural economic management in the process of constructing smart agriculture by big data. *Sustainable Computing: Informatics and Systems*(4), 100579.
- [7] Chen, H. , Xie, J. , Wang, S. J. , Ramanathan, S. , & Mutegeki, R. . (2021). Research on intelligent management system of meteorological archives based on big data framework. *Advances in Data Science and Adaptive Analysis: Theory and Applications*(3/4), 13.
- [8] Tang, C. , Zhang, J. , Wang, S. , Zhang, L. , Wang, H. , & Liang, H. . (2021). Application and implementation of big data visualization technology in network security system. *Journal of Physics: Conference Series*, 1955(1), 012002 (6pp).

- [9] Xu, L. , Francisco, A. , Taylor, J. E. , & Mohammadi, N. . (2021). Urban energy data visualization and management: evaluating community-scale eco-feedback approaches. *Journal of Management in Engineering*, 37(2).
- [10] Huizhong, Z. , Fanrong, M. , Gui, W. , Mago, B. , & Puyalnithi, T. . (2022). Research on the automation integration terminal of the education management platform based on big data analysis. *Advances in Data Science and Adaptive Analysis: Theory and Applications*(1/2), 14.