References

1. Cheng, A., & Xu, Q. (2025). VR and Programming Robots Enter the Classroom: Guangzhou Huaxia Vocational College Assists Rural Education. Southern Metropolis Daily.
2. Chu, L., Chen, W., Tan, Y., et al. (2023). Reshaping Experience: Prospects of Extended Reality (XR) Technology and Its Educational Application—Also on the Direction of "Integration of Education and New Technology". Journal of Distance Education, 41(4), 3-15.
3. Niu, Y., Wang, Y., & An, T. (2024). VR Teaching: Unlocking New Dimensions of Knowledge, Exploring New Learning Experiences. Modern Educational Technology, 34(2), 45-52.
4. Chen, L., & Wang, H. (2025). A Systematic Review of Evidence-based Design and Pedagogical Principles in Educational Virtual Reality Environments. Educational Research Review, 15(2), 100676.
5. Müller, S., & Weber, F. (2025). Implementing Augmented Reality Models in the Classroom Environment Using Merge Cubes: A Quantitative Study of the Effects on Students' Cognitive Load and Motivation. Education Sciences, 15(4), 414.

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DIGITAL ANALYTICS FOR INSTITUTIONAL PERFORMANCE IMPROVEMENT IN CHINESE UNIVERSITIES

Abstract. This article examines the development of digital analytics infrastructure in Chinese universities, revealing a hierarchical model driven by differences in funding, technological capabilities, and government support. Analytics are successfully applied to improve educational quality, reduce student dropout rates, and optimize management, thereby enhancing students' academic and employment prospects.

Keywords. education; digital model; hierarchical model; technological base; analytics: management optimization.

Most existing studies focus on European and American universities, while there is a lack of systematic research on the application of digital analytics in the context of China’s higher education system, which has distinctive institutional

characteristics and development paths.

This study covers 20 representative universities in China, including 10 Double First-Class universities (such as Tsinghua University, Peking University, and Zhejiang University), 5 regional undergraduate universities (such as Jiangsu Normal University and Hubei University of Technology), and 5 vocational colleges (such as Beijing Polytechnic College). The research time span is from 2018 to 2024, which covers the key period of the implementation of China's Educational Informatization 2.0 Action Plan, ensuring the timeliness and representativeness of the research data.

In the early stage of development (before 2018), the data collection systems of Chinese universities were mostly independently built by various departments, resulting in serious data silos. After 2018, with the popularization of cloud computing technology, most key universities have begun to build centralized data platforms. The data integration rate of the school has increased from 45% in 2019 to 92% in 2024, which has significantly improved the efficiency of data sharing [1].

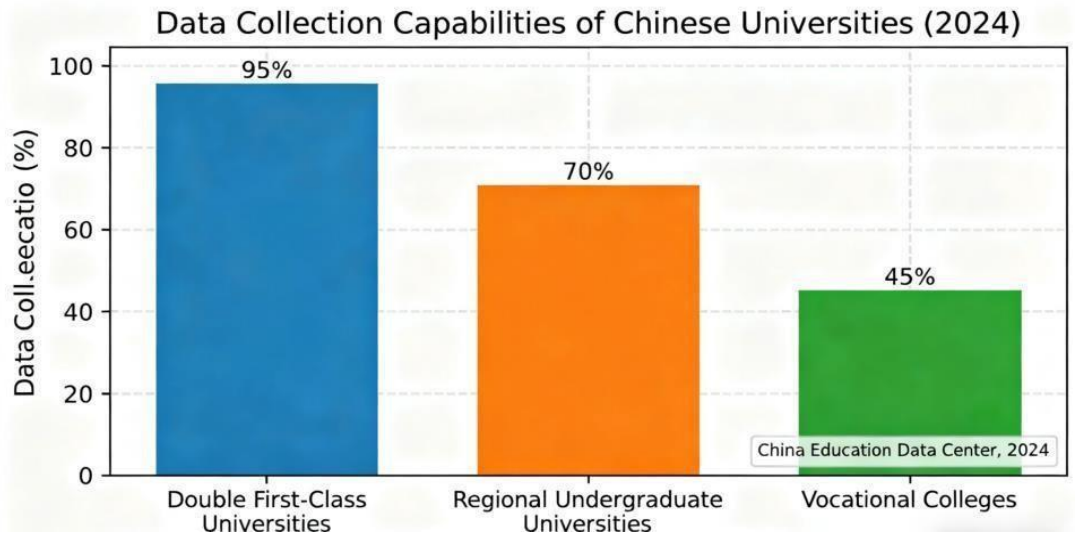

Figure 1. Data Collection Capabilities of Chinese Universities

In recent years, emerging technologies such as edge computing and blockchain have also been gradually applied to data collection systems. Edge computing enables data to be preprocessed at the collection terminal, reducing the pressure of data transmission and storage. For example, the smart campus project of the University of Science and Technology of China uses edge computing technology to process the video data collected by classroom cameras in real time, extracting key information such as student attendance and attention, and only transmitting the processed structured data to the cloud platform, which reduces data transmission volume by 60%. Blockchain technology, on the other hand, ensures the security and traceability of data. Nanjing University has applied blockchain technology to the management of academic achievement data. Each academic achievement record is recorded on the blockchain, which prevents data tampering and ensures the authenticity of the data used for evaluation and awards.

There are significant differences in data collection capabilities among different

types of Chinese universities. According to the survey data of the China Education Data Center in 2024, the data collection coverage rate of Double First-Class universities reaches 95%, which can collect almost all types of data related to school operations. In contrast, the data collection coverage rate of regional undergraduate universities is about 70%, and that of vocational colleges is only 45% [2].

The first level is basic analytical tools, which are mainly used for descriptive analysis and are widely used in grass-roots departments such as teaching and administrative offices. Common tools include Microsoft Excel, WPS Spreadsheets, and basic BI (Business Intelligence) tools such as FineReport. These tools have the advantages of simple operation and low learning costs. Teachers and administrative staff can use them to complete basic data statistics, such as counting student exam scores and calculating course attendance rates. A survey shows that 98% of teachers in Chinese universities can use Excel for basic data analysis, and 75% of administrative staff use basic BI tools to generate regular work reports. However, these tools have obvious limitations. They can only process small-scale structured data and cannot meet the needs of complex analysis such as large data mining and trend prediction.

The second level is professional analytical tools, which are mainly used by the school's data analysis team and research institutions to conduct diagnostic and predictive analysis. Representative tools include data visualization tools (Tableau, Power BI), statistical analysis software (SPSS, R), and programming languages (Python). These tools can process large-scale data and mine potential patterns and trends. Tableau is used by the Academic Affairs Office to make interactive dashboards of teaching evaluation data, which can intuitively display the changes in teaching quality of different departments and courses. According to the 2024 survey data, 85% of Double First-Class universities have equipped professional analytical tools, and 60% of regional undergraduate universities have begun to introduce Tableau and Power BI to improve their analytical capabilities [3].

The third level is customized intelligent platforms, which are independently developed by top universities or jointly developed with technology companies for core strategic needs. These platforms integrate multiple technologies such as machine learning, natural language processing, and big data computing, and have strong professionalism and adaptability. For example, Peking University has jointly developed the "Student Success Prediction Platform" with Alibaba Cloud.

In recent years, emerging technologies such as artificial intelligence and big data have been deeply integrated into analytical tool platforms, significantly improving the efficiency and accuracy of analysis. Artificial intelligence technology has been widely used in predictive analysis scenarios.

Big data technology has solved the problem of processing unstructured data. Universities generate a large amount of unstructured data every day, such as video recordings of courses, audio of academic lectures, and text of student essays. Traditional analytical tools are difficult to process these data. Hadoop and Spark big data processing frameworks have been introduced by many universities to store and analyze unstructured data. For example, Shanghai Jiao Tong University uses Hadoop

to process course video data, extracting key teaching links and students' interaction behaviors, and evaluating teaching effects from a multi-dimensional perspective.

In addition, the combination of digital twin's technology and analytical platforms has become a new trend. Wuhan University has built a digital twin model of the campus, which integrates real-time data of facilities, personnel flow, and teaching activities. Through the model, the school can simulate the operation of the campus under different scenarios, such as predicting the usage of classrooms during the exam period and optimizing the route of campus transportation. This technology expands the application scope of digital analytics from post-analysis to pre-simulation, providing stronger support for decision-making.

Similar to data collection systems, there are obvious regional and hierarchical differences in the application of analytical tools among Chinese universities. Double First-Class universities in Beijing, Shanghai, and other first-tier cities take the lead in applying customized intelligent platforms and emerging technologies. For example, 100% of Double First-Class universities in Beijing have built professional data analysis laboratories and equipped with the latest analytical tools. In contrast, most universities in central and western regions are still in the stage of applying basic and professional tools. For example, a survey of 30 undergraduate universities in Henan Province shows that only 30% of them have introduced Python and R for data analysis, and none of them have independent customized platforms. The main reasons for these differences are the uneven distribution of technical resources and the gap in talent reserves. First-tier cities have more cooperation opportunities with technology companies, and it is easier for universities to obtain the latest tools and technical support. At the same time, top universities can attract high-end data talents, while universities in central and western regions face difficulties in recruiting and retaining talents [4]. Industry cooperation funds have become an important supplement to funding. Many universities have established strategic partnerships with technology companies such as Huawei, Alibaba, and Tencent. These companies provide funds and technical support for universities to build digital analytics platforms, and in return, they obtain the right to use anonymized educational data for technological research and development.

References

1. Alibaba Cloud. (2023). White Paper on Smart Education Analytics. Hangzhou: Alibaba Cloud Press.
2. Beijing Polytechnic College. (2024). Annual Report on the Application of Digital Analytics in Vocational Skill Training. Beijing: Beijing Polytechnic College Press.
3. Chen, L., & Wang, H. (2023). Data-Driven Optimization of Faculty Resource Allocation in Chinese Universities. Journal of Higher Education Management, 18(4), 78-95.
4. China Education Data Center. (2024). Data Quality Status and Improvement Strategies of Chinese Higher Education Institutions. Shanghai: East China Normal University Press.