

Optimization Measures of University Education Management in the Era of Big Data

Jianing Liu

Krirk University, Bangkok, Thailand

Abstract: In the context of big data era, college education management is facing new challenges and opportunities. This paper aims to explore effective ways to optimize college education management in the context of big data. It first describes the impact of big data on college education management and analyzes existing problems, and then puts forward optimization measures from five aspects. Finally, it summarizes the significance of optimizing college education management in the era of big data.

Keywords: Big Data Era; University Education Management; Intelligent Management Platform; Teaching Quality Control

1. Introduction

The development of big data technology has brought new means and ideas to education management and injected new impetus to improve the efficiency of education management. How to use the advantages of big data to solve the problems existing in college education management is an important issue to be solved urgently. The importance of optimizing college education management in the era of big data and specific optimization measures will be expounded below. Hope to provide reference for related management work.

2. Build An Intelligent Management Platform Based on Big Data

2.1 Building the Data Collection and Storage System

Building an intelligent management platform based on big data first requires the establishment of a sound data collection and storage system. College education management involves all aspects, including teaching, scientific research, student affairs, human resources, finance and other fields, which produce a large number of data resources. These massive heterogeneous

data are scattered in different business systems and platforms, lacking a unified collection and management mechanism. It is difficult to fully integrate and utilize data resources, so it is imperative to build a unified data collection and storage system. This first requires the establishment of a data collection network covering the whole school, the integration of structured and unstructured data generated by various existing business systems, teaching platforms, network equipment, etc., the adoption of distributed architecture and the use of advanced technologies such as the Internet of Things and cloud computing to achieve efficient collection of multi-source heterogeneous data. It is also necessary to build a unified data center equipped with large-capacity storage facilities and high-performance computing resources for storing and processing massive data. The data center should have good scalability and reliability to meet the growing demand for data storage and computing. At the same time, it is also necessary to formulate reasonable storage policies for different data types and realize data classification, sorting and standardized management. Strict data security and privacy protection measures are also indispensable, and it is necessary to establish a sound access control mechanism to ensure data security and privacy.[1]

2.2 Development of Management Decision Support System

Based on the built data collection and storage system, a management decision support system can be further developed to provide intelligent decision support for education management. The decision support system will use big data analysis and artificial intelligence technology to mine valuable information contained in the data and provide scientific decision basis for managers. Specifically, the decision support system first needs to clean, transform and integrate massive data to build a unified data warehouse or data lake to prepare for subsequent

data analysis. Then, data mining, machine learning and other technologies are used to analyze education and teaching, student learning, scientific research management, financial operation and other data from multiple dimensions to find the potential laws and trends behind the data. On this basis, the system can model and simulate different scenarios to predict possible problems in the future and give corresponding decision schemes and countermeasures.[2] In addition, the decision support system also needs to be deeply integrated with the existing management information system and office automation system of colleges and universities to form a closed-loop management decision chain. Administrators can fully grasp the key indicators and risk points of the school's operation through visual decision AIDS, so as to formulate scientific development plans, optimize resource allocation, improve management processes and improve management efficiency. At the same time, the decision support system can also dynamically adjust and optimize the previous decision scheme according to the feedback data of the implementation effect, which is conducive to the construction of an accurate and efficient education management system.

3. Establish Teaching Quality Monitoring System

3.1 Collection and Analysis of Students' Classroom Learning Data

Optimizing the quality of college education and teaching is the core of education management, and the establishment of teaching quality monitoring system is an important means to achieve this goal. In the course of students' classroom learning, comprehensive collection and analysis of students' learning behavior and learning state should be carried out through modern information technology means to provide data support for teaching quality monitoring. Video capture devices can be installed in multimedia classrooms, laboratories and other scenes to record students' classroom performance, learning status, expression, gestures and other data. At the same time, the learning behavior data of students on the online learning platform, such as learning time, homework completion, test scores, etc., can be comprehensively obtained from students' pre-class preparation, class participation,

after-class review and other aspects of learning data. These multi-dimensional data will be uniformly stored and managed to lay the foundation for subsequent data analysis. On the basis of data collection, it is necessary to use artificial intelligence and big data analysis technology to dig deeply into students' learning data. By building a learning behavior model, students' learning interest, learning style and knowledge mastery can be evaluated, problems existing in learning can be found and early warning can be given to confusing knowledge points and links prone to knowledge blindness. The system can also be combined with students' historical learning records and performance data to achieve personalized learning diagnosis, and tailor-made learning plans and counseling measures for each student. Based on the analysis results of students' learning data, the teaching quality monitoring system can form a course teaching quality assessment report to evaluate the teaching effect of teachers, and provide references for improving teaching methods and optimizing teaching design. Through the feedback of learning data, teachers can timely find and solve the difficulties and problems in students' learning, and finally achieve the purpose of improving teaching quality and optimizing learning experience.[3]

3.2 Monitoring and Feedback of Teachers' Teaching Behavior

The teaching quality monitoring system should also focus on teachers' teaching behaviors, collect and analyze teachers' teaching process data in an all-round way, and provide reference suggestions for improving teaching quality. The system can record teachers' teaching behaviors through classroom video collection, virtual classroom and other technical means, and use video analysis technology to identify and evaluate teachers' performance in class. The possible defects and deficiencies in the teaching process were found, such as incomplete explanation of important and difficult points, poor classroom atmosphere, unreasonable design of blackboard writing, etc. The system can also monitor the teaching resources and activities of teachers on the online teaching platform, such as the design quality of course resources, the difficulty and distribution of homework and tests, the depth and frequency of teacher-student interaction, etc., so as to comprehensively

evaluate the quality of teachers' online teaching. On the basis of data collection and analysis, the system needs to form a teaching quality evaluation report for individual teachers and timely feedback the evaluation results to

teachers. Teachers can objectively understand their own teaching performance through the data-based feedback mechanism, find out the shortcomings in teaching and make targeted improvements and optimization.[4]

Table 1. Parameter Table of Optimization Measures of University Education Management in the Era of Big Data

The parameter name	current state	targeted value	corrective actions	Expected effect	Expected effect
Frequency of data acquisition	Once a week	Two times a day	Increase the acquisition node	Real-time data analysis	three months
Data storage capacity	100TB	500TB	Upgrade the storage system	Improve your data-processing capabilities	six months
Analytical model accuracy rate	80%	95%	Introducing a machine-learning algorithm	Improve the accuracy of decision support	one year
Teacher participation	60%	90%	Provide online training	Improve teacher skills	six months
student satisfaction	70%	95%	Optimize the course content	Improve the quality of teaching	1 The semester
Update the frequency of teaching resources	Two times a semester	Once a month	Introduce more digital resources	Enrich learning materials	three months
Network platform response time	5 Seconds	1 Seconds	Optimize the server configuration	Improve the use experience	Two months
Data security accident	Two cases a year	0 Every year	Strengthen your data security policies	Ensure data security	Continue to implement
Student data utilization	50%	90%	Carry out data mining projects	Precision learning support	one year
Budget utilization efficiency	70%	95%	Optimize resource allocation	Improve the efficiency of the use of funds	FY 1

4. Tracking Students' Learning Status Throughout the Whole Process

4.1 Integrate Heterogeneous Learning Behavior Data From Multiple Sources

In order to fully grasp students' learning status and realize whole-process tracking, multi-source heterogeneous data from different channels and platforms must be integrated, which first requires the collection and integration of students' learning behavior data generated in classroom teaching, including classroom performance, attendance records, classroom interaction, etc. At the same time, students' use of digital teaching resources such as online learning platforms, MOOCs and virtual simulation laboratories, such as learning time, homework completion, test scores, etc., should also be included in the scope of data collection for students' extracurricular independent

learning activities. After data acquisition, it is necessary to clean, transform and standardize these multi-source heterogeneous data, solve data format, coding and other problems, and build a unified data set. Due to the privacy and security issues of students, the data processing must comply with relevant laws and regulations and formulate strict data management and access control mechanisms. Through the integration of comprehensive learning behavior data, students' learning trajectory and process at different times and in different scenarios can be restored, and their learning habits, learning styles and learning strategies can be revealed, which lays a solid data foundation for subsequent learning diagnosis and personalized tutoring.[5]

4.2 Build A Personalized Learning Diagnosis Model

Colleges and universities can build personalized learning diagnosis models based on integrated

multi-source learning behavior data, conduct comprehensive analysis and evaluation of students' learning status, and provide support for accurate learning guidance. This requires data mining, machine learning and other technologies to analyze and model students' learning behaviors and find key factors affecting learning effects. For example, the model can analyze the degree of influence of students' independent learning time, homework completion quality, review strategy, etc., on learning effect, and provide basis for proposing personalized learning strategies. Then, based on students' personal characteristic data, individual learning portraits are constructed to assess and diagnose students' knowledge mastery level and weak links, etc. By comparing learning objectives with actual learning states, the model can find problems in the learning process, such as which knowledge points are not thoroughly understood and which skills are not proficient, and provide timely warning and intervention suggestions. In addition, the personalized learning diagnostic model should also have the ability of self-adaptability and dynamic adjustment. With the advancement of students' learning process, the model will dynamically update the diagnosis results and optimize the learning plan according to the new learning behavior data, and provide personalized tutoring strategies and incentive measures for different types of students' models to help students maximize their learning potential.

5. Strengthen the Construction and Management of Teaching Staff

5.1 Big Data Analysis of Teacher Career Development

Strengthening the construction and management of university teaching staff is inseparable from a comprehensive analysis and evaluation of the status of teacher career development. With the help of big data technology, universities can dig deeply into the activity data of teachers in various dimensions such as teaching, scientific research, service and training, and provide decision-making support for the formulation of teacher development policies and measures. Specifically, a data platform for teacher career development can be built to integrate data resources of teachers' personal information, teaching quality evaluation, scientific research projects, social services,

training and further study, performance appraisal and other aspects. Through data modeling and analysis, various key factors affecting teacher career development can be insight into and the development status of different professional titles, ages, disciplines and other groups can be subdivided and analyzed. For example, based on data such as teaching quality evaluation and supervision feedback, differences between different teacher groups can be found in teaching design, classroom organization, and teacher-student interaction, and targeted teaching training plans can be proposed. For another example, deviations in scientific research directions and outcomes of teachers in different disciplines can be found from scientific research data, providing references for the implementation of targeted scientific research incentive policies. Finally, the data analysis of teacher career development can also identify the needs and difficulties of teachers at different stages of their career. The establishment of a career development model can provide systematic guidance for teacher training, training and performance appraisal, etc. Colleges and universities can provide personalized career training plans for teachers at different stages of career development. To ensure the continued development of his career.

5.2 Optimize Teacher Allocation and Incentive Mechanism

Based on the big data analysis of teacher career development, colleges and universities can optimize the allocation structure of teachers and establish a scientific and reasonable teacher incentive mechanism to fully mobilize the enthusiasm and initiative of teachers and inject lasting impetus into the sustainable development of schools. In terms of teacher allocation, big data analysis can be used to find teacher gaps or imbalances in the existing team structure. For example, the age structure of teachers in some disciplines is too simple and the distribution of educational background is not equal. By introducing outstanding talents from scarce disciplines and selecting teachers with different backgrounds and experiences, the overall structure of the team of teachers can be optimized and the strength of teaching and research can be improved. Colleges and universities should also formulate reasonable promotion channels and post rank evaluation and appointment mechanisms based on the data

of teachers' career development, and establish a fair and just performance appraisal system through quantitative evaluation of teachers' teaching, scientific research, service and other aspects, so as to provide clear direction and path for teachers' career development. In addition, colleges and universities need to improve the incentive mechanism for teachers, including salary, career development space, honor incentive and other aspects to mobilize the enthusiasm of teachers. For example, performance-based salary distribution can be conducted according to teachers' academic contributions, teaching quality, social service and other performance, and corresponding material rewards can be given to teachers with outstanding performance. It is also necessary to provide teachers with opportunities to visit and study at home and abroad to broaden their professional horizons. For teachers with outstanding performance, policy incentives such as administrative appointment and professional and technical promotion should be given to create more space for their career development.

6. Improve the Campus Security Control System

6.1 Campus Risk Warning Based on Big Data

Ensuring campus safety is the top priority of education management in colleges and universities. In the era of big data, colleges and universities can build a risk warning system based on big data to detect and prevent various security risks in advance and safeguard the stable operation of schools. The system needs to integrate multi-source heterogeneous data, including campus video surveillance data, teacher and student location data, student behavior data, social media data, etc. Through big data analysis and artificial intelligence modeling technology, these massive data can be deeply mined and integrated to find potential risk factors and security threat signals. For example, the system can analyze the flow trajectory and gathering area of teachers and students, and find some suspected abnormal behaviors such as fighting, illegal crimes and other abnormal behaviors combined with video surveillance data. At the same time, based on student behavior data and social media public opinion data, it can also warn some students of potential crises such as psychological problems and deviant behavior tendency. After finding

potential risks, the system will immediately trigger an early warning and notify the relevant security management personnel, and provide risk assessment reports and response suggestions. The management personnel can take timely measures to effectively prevent and control the occurrence and expansion of risk events. The risk early warning system can also predict possible security risks in the future through modeling and simulation analysis, and assist in the formulation of security countermeasures. The system will backtrack the risk events in the historical data and find the key incentives for the occurrence of the events, so as to provide decision support for improving the safety management mechanism and optimizing the emergency plan.

6.2 Video Surveillance Combined with Mobile Location Services

Efficient video surveillance is the basis of campus security control, first of all, the video surveillance system needs to cover all key areas of the school and equipped with advanced video analysis technology, through license plate recognition, face recognition, behavior detection and other functional systems can intelligently identify suspicious personnel and abnormal behavior, automatically trigger the alarm and notify the security personnel. The video surveillance system should also be integrated with mobile location services to monitor and track the real-time location of teachers and students, for example, when students leave school or enter the forbidden area, the system can obtain their location information and issue an early warning, if a crisis event occurs, the system can also quickly lock the location according to the location data, and guide security personnel to deal with. Of course, while ensuring campus security, it is also necessary to pay attention to personal privacy protection. Video surveillance and location services should strictly follow relevant laws and regulations to formulate clear data collection, use and management norms, prevent data abuse and disclosure, safeguard the legitimate rights and interests of teachers and students, and create a good education and teaching environment for teachers and students.

7. Closing Remarks

The era of big data has brought new opportunities for change in college education management. Comprehensive optimization

measures such as systematically building an intelligent management platform based on big data, improving the teaching quality monitoring system, tracking students' learning status throughout the process, strengthening the management of teachers and improving the campus security control system can effectively improve the level of college education management and improve the quality of education. In order to provide a solid guarantee for training innovative talents, college administrators should attach great importance to the application value of big data in education management and seize the major development opportunities in the era of big data to promote education management to a new stage of intelligence and precision.

Reference

- [1] Tang P. Research on the optimization approach of University education management under the background of big data era [J].Public Relations World,2023,(19):114-116.
- [2] Wang Haoran. Discussion on the optimization path of University education management in the era of big data [J].Education Informatization Forum,2023,(07):15-17.
- [3] Dong Jue. Research on Optimization measures of University Education Management in the era of Big Data [J].Intelligence,2023,(20):139-142.
- [4] Hao Yihui. Analysis on Optimization measures of University Education Management in the era of big Data [J].Modern Vocational Education,2023,(15):157-160.
- [5] Dong Chunsheng. Research on the optimization path of University Education Management in the era of Big Data -- Review of Research on University Education Management Based on Big Data [J].Educational Development Research,2020,40(02):87.