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Research on the Innovation of Educational Teaching Management in Colleges and Universities Under the Background of the Big Data Era

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Abstract: Currently, the vigorous development of big data technology has accelerated the digital transformation process of various industries. Against this backdrop, the educational teaching management work in colleges and universities has also ushered in new development opportunities. Educators in colleges and universities should transform their educational teaching management thinking and innovate information-based and intelligent management models. Based on this, this paper briefly analyzes the importance of the innovation of educational teaching management in colleges and universities under the background of the big data era, and explores the innovative strategies for educational teaching management in colleges and universities in the context of the big data era [1].

Keywords: Big data era; Higher education; Teaching management

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1. Introduction

In the new era, colleges and universities should innovatively apply big data technology in educational teaching management to improve the efficiency of management work and the quality of higher education. This can address issues in traditional educational teaching management in colleges and universities, such as heavy reliance on manual labor, the need to enhance data transparency, and the lack of personalized teaching. By doing so, higher education institutions can cultivate and deliver more high-quality talents to society in the new era [2].

2. The importance of innovating educational teaching management in colleges and universities

2.1. Meeting the needs of development in the Internet era

In the Internet era, under the impact of emerging scientific and technological advancements such as big data and cloud computing, changes are taking place at all levels of society, including but not limited to production models

and social ways of thinking. Coupled with the increasingly prominent personalized needs of college students and the growing diversity of educational forms, the intelligence level of educational teaching management in colleges and universities is gradually increasing. This makes it urgent to innovate and reform the traditional educational teaching management model in colleges and universities [3]. Therefore, as the main front for cultivating high-quality talents and builders of socialism, educators in colleges and universities should keep pace with the times, grasp the core of information technology development, embrace the new changes brought by information technology represented by big data, and use this opportunity to promote the transformation and upgrading of their educational teaching management. Only in this way can they meet the needs of talent cultivation in the Internet era and thus promote the sustainable development of higher education [4].

2.2. Improving the quality of educational teaching management in colleges and universities

Big data, with its characteristics of massive information, diverse forms, rapid iteration and high value, has opened up new paths for the innovation of education management in colleges and universities. Faculty and staff in colleges and universities can use data mining technology to innovate the traditional management model and significantly improve teaching efficiency and resource utilization. Specifically, a personalized teaching system based on the analysis of students' learning behaviors can be constructed to achieve a refined analysis of students' cognitive characteristics and learning trajectories, to provide "personalized" teaching plans. At the same time, a decision support model relying on educational big data can be established to provide a scientific basis for the management decisions of education and teaching in colleges and universities through in-depth data mining. In addition, big data technology also helps to promote the establishment and improvement of an intelligent teaching management platform and realize the automated and accurate operation of the educational administration management process [5].

2.3. Optimizing the top-level layout of educational resources in colleges and universities

Given the lack of standards in the allocation of traditional educational resources in colleges and universities, as well as the problems of uneven allocation and low resource utilization, leveraging big data technology can help colleges and universities solve the problems existing in the resource allocation process, enabling them to more accurately obtain students' learning status and adjust resource allocation plans. Specifically, colleges and universities can use big data technology to collect data on different students, teachers, and courses, thereby eliminating information errors and providing more accurate criteria for resource allocation. In addition, through research on students' learning situations, preferences, abilities, needs, as well as learning habits and effects during the process of educational resource allocation in colleges and universities, a construction of curriculum resource arrangements based on students' actual situations can be achieved, thus improving the effectiveness of teaching resource allocation [6]. Finally, by collecting data on different types of teaching resources and teaching effectiveness, colleges and universities can make more reasonable decisions on teaching resource allocation based on the collected data, thereby improving the utilization rate of educational resources.

3. Innovative strategies for educational teaching management in colleges and universities in the context of the big data era

3.1. Building a data processing system to improve data processing efficiency

Building a data processing system is an important guarantee for colleges and universities to innovate educational

teaching management in the big data era. Especially when the scale of college data is becoming increasingly large, technologies such as cloud computing and artificial intelligence can significantly enhance the ability to manage and analyze data and promote rapid and accurate decision-making. Cloud computing can provide powerful computing power and storage space for big data. Based on meeting the data processing requirements of different needs, it can flexibly allocate and adjust resources such as computing power or storage space to ensure that the system can operate stably even under high-intensity pressure [7].

Artificial intelligence, on the other hand, uses advanced algorithms and models to automatically process massive amounts of data to form valuable information and further conduct in-depth mining and prediction. This initiative has significantly enhanced data processing capabilities while expanding the dimensions and levels of information analysis. Even in the face of complex data environments, it can still form effective judgment bases, enabling various industries to fully unleash their data potential. Taking the practice of artificial intelligence technology in educational management as an example, AI can assist educational administration departments in completing information processing and analysis tasks, and optimize the allocation efficiency of teaching resources. With the help of powerful algorithms and computing power, teaching staff can systematically collect and evaluate students' academic performance, covering multiple dimensions such as classroom participation, homework quality, and examination results, while analyzing their learning patterns and behavioral characteristics to tailor learning plans for each student. Through in-depth mining of teachers' teaching data, AI can also objectively evaluate teaching effectiveness, provide improvement suggestions and optimization strategies, and help teachers refine teaching methods and improve teaching standards [8].

At the educational administration level, AI can automate the processing of many routine tasks, including but not limited to course scheduling, attendance statistics, resource allocation, etc., effectively reducing the workload of administrative staff and improving overall operational efficiency. Taking colleges and universities using cloud computing platforms as an example, teaching data can be safely stored in the cloud for anytime, anywhere access and analysis. Even in the face of massive data, it can quickly respond and form decisions. These practices fully demonstrate the broad prospects of intelligent processing technologies in the education sector. Through the collaborative application of cloud computing platforms and artificial intelligence, the efficiency of information processing and analysis has been comprehensively strengthened, providing a solid technical foundation for educational decision-making [9].

3.2. Optimizing the data management process to promote data transparency

Promoting data transparency is the essence of educational teaching management in colleges and universities. Establishing strict data management procedures can ensure the transparency, openness, and fairness of data. The development of data transparency helps to strengthen the trust and cooperative relationships within the organization and improve the scientific nature and accuracy of decision-making. Strict data supervision procedures include clear data collection, storage, and sharing procedures to ensure data integrity and standardization, and the use of authorization control and cryptographic technologies to protect data. At the same time, data transparency enables all parties to communicate and make decisions based on the same information, preventing misinformation and conflicts caused by information asymmetry. In addition, data transparency also contributes to the development of the accountability system, clarifying the responsibilities of various roles, improving work efficiency, and outcomes. In this system, leaders can more easily monitor and evaluate the performance of various tasks, identify and solve problems on time, thus continuously optimizing the management process [10].

Regarding the management of teaching staff in college education and teaching, data transparency can effectively solve many problems in management work. By building a scientific and effective teaching staff data management system in colleges and universities, comprehensive statistics and collection can be carried out on teachers' basic information, teaching data, training experiences, etc. While ensuring the privacy of teachers' data, the data can be made public to teachers, superior managers, and other parties. Based on this, targeted teacher assessments and evaluations can be conducted, and corresponding incentive measures and training plans can be formulated to promote the continuous improvement of the teaching level of the teaching staff in colleges and universities. Teachers can use the transparent and open teaching staff management data to understand their teaching achievements and areas for personal improvement, and thus be more proactive in participating in teaching and research work. At the same time, this transparent teaching staff data can serve as a reference for students and parents, enhancing their trust and satisfaction with college education and teaching [11].

3.3. Strengthening training for faculty and staff and fostering a university-wide awareness of big data

Strengthening the training of faculty and staff and cultivating a university-wide awareness of big data serve as the foundation and guarantee for the innovation of educational teaching management in colleges and universities. Therefore, colleges and universities need to continuously enhance the awareness of big data among faculty and staff through various means and create a favorable atmosphere in which all teachers and students attach importance to big data technology and its applications, thereby providing a solid foundation for teachers and students to apply big data in teaching and educational administration. First, colleges and universities need to clarify the crucial role of big data [12]. University leaders and administrators should fully recognize the significant implications that big data can bring to education and teaching, and deeply understand how big data provides massive amounts of data, powerful analytical capabilities, and automated decision-making assistance for management work, helping colleges and universities improve management efficiency, quality, and effectiveness.

Second, it is essential to develop a thinking mode centered around data analysis. Colleges and universities should regard data as a core strategic resource and use data analysis as an important reference for teaching management decision-making. They should actively explore the application scenarios, methods, and processes of big data in teaching management, promoting the transformation of educational teaching management from manual processing to data-based management. Finally, data literacy education should be strengthened [13]. Colleges and universities should offer courses related to big data, organize data skills competitions, and adopt other forms to educate and train faculty, staff, and students in data knowledge and skills, enabling them to master how to effectively use, collect, analyze data, and apply data in teaching and administrative management. Through these measures, data can be better utilized to analyze and improve educational teaching management in colleges and universities, enhancing the efficiency of teaching management work [14].

3.4. Developing online teaching platforms to enrich educational resources in colleges and universities

First, when developing online teaching platforms, big data technology can push customized learning resources and tutoring plans based on students' learning behaviors and needs, helping improve learning efficiency. Meanwhile, the platform provides instant feedback and intelligent guidance for both teachers and students, assisting students in quickly identifying knowledge gaps and taking remedial measures to explore more efficient learning paths. Second, teachers can use online teaching platforms to obtain detailed student learning data,

enabling precise adjustments to teaching strategies and personalized instructional guidance, thereby enhancing the accuracy and effectiveness of teaching activities. The promotion of this new teaching model not only accelerates the digital transformation of higher education but also facilitates the balanced development of higher education. Take NetEase Cloud Classroom as an example: The platform uses big data algorithms to create personalized learning platforms, which have positively impacted students' learning outcomes. By collecting multi-dimensional data such as browsing records, study duration, progress, and interaction behaviors, the platform can accurately grasp students' learning habits and knowledge needs through in-depth mining, and then push more relevant academic resources and video courses [15].

4. Conclusion

In summary, the use of big data technology to innovate educational teaching management in colleges and universities has become an inevitable trend in higher education reform. With the continuous advancement of information technology, educational teaching management in colleges and universities will become more precise and efficient, making education and teaching more transparent and fairer, providing students with a higher-quality learning and service experience, further enhancing the effectiveness of talent cultivation in colleges and universities, and promoting the innovation and development of higher education.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Li B, 2023, Exploration of the Current Situation and Path of the Development of Smart Party Building in Colleges and Universities from the Perspective of "Internet +". Unknown Journal, 2023(7): 360–362.

[2] Wu Y, 2024, Exploration on the Construction of Informatization System of College Education Management in the Big Data Era. Journal of Jilin Radio and Television University, 2024(3): 125–127.

[3] Gao S, 2021, Discussion on the Innovative Development Path of Informatization of College Education Management under the Background of the Big Data Era. Unknown Journal, 2021(16): 155–157.

[4] Li Q, 2021, Research on the Informatization Construction of Administrative Management in Colleges and Universities in the "Internet +" Era, thesis, Dongbei University of Finance and Economics.

[5] Xian X, Lu Y, Lü J, 2021, Opportunities and Paths for University Libraries to Serve Smart Party Building. Chinese & Foreign Corporate Culture, 2021(2): 59–60.

[6] Feng X, Tian G, Xu R, 2024, The Theoretical Logic and Practical Path of "Smart Party Building" in Colleges and Universities Serving the Enhancement of the Digital Economy Level. Huoli, 2024(10): 4–6.

[7] Li X, 2024, Exploration and Practice of the Integrated Construction of Smart Party Building and Ideological and Political Education in Colleges and Universities in the Big Data Era. Shijiqiao, 2024(13): 37–39.

[8] Yang Y, 2024, Research on the Current Development Situation and Improvement Path of Smart Party Building in Colleges and Universities in the Digital Age. Journal of Jiangxi Vocational and Technical College of Electricity, 37(5): 154–156.

[9] Xie H, 2023, Construction of the Theoretical Model and Exploration of the Path of Smart Party Building in Colleges

and Universities in the “Internet +” Era. Huoli, 2023(5): 46–48.

[10] Dou Y, 2024, Research on the High-Quality Development Path of Smart Party Building in Colleges and Universities in the New Era. Journal of Liaoning Economy Vocational and Technical College. Journal of Liaoning Economic Management Cadre College, 2024(4): 82–84.

[11] Xu B, 2022, The Realistic Dilemmas and Breakthrough Paths of “Smart Party Building” in Colleges and Universities. Journal of National Academy of Forestry and Grassland Administration, 21(4): 6–9.

[12] Yang H, Li J, Li S, et al., 2023, Construction Path of the “Smart Party Building” Work Model in Colleges and Universities Based on New Media. Office Operations, 2023(19): 40–42.

[13] Ha Y, Liu T, Cui G, 2022, Research on the Construction and Practical Path of the Smart Party Building Model in Colleges and Universities from the Perspective of Converged Media. Journal of Baoding University, 2022(2): 88–91.

[14] Yue L, Nie H, 2022, Dilemmas and Breakthroughs in the Intelligent Upgrading of “Smart Party Building” in Colleges and Universities in the Digital and Intelligent Age. New Silk Road: Lower Half, 2022(12): 0142–0144.

[15] Han J, 2022, Exploration of the Practical Path of Smart Party Building Work in Colleges and Universities from the Perspective of “Internet +”. Research on Logistics Support in Higher Education, 2022(2): 60–62.