Research on the Application of University Teaching Quality Based on Big Data Technology

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Abstract: In the popularization stage of higher education, the development of education is not only the change of scale and quantity, but also the reality and deepening of quality connotation. This paper expounds the practical needs of high-quality development of education and university's teaching under the background of the new era and new development pattern, investigates and analyzes the construction and use of teaching quality monitoring platforms in 34 undergraduate universities in Nanjing. Combined with the concept of educational data governance, this thesis aims to build a development path of "interconnection, co construction and sharing, integration and innovation, quality and efficiency improvement, upper and lower linkage and excellence", so as to promote the integration of teaching resources in universities, promote the investigation of management mechanism and improve the quality of building morality and cultivating people.

1. Introduction

Under the globalization background of "big data + artificial intelligence", information technology is deeply integrated with college education to offer technical support and protection for talent cultivation in universities. Instruments such as 2018 keynote of E-Learning technology and network security and education informatization 2.0 action plan are important policy foundations to give impetus to the best integration of big data technology and college education [1]. Devedzic,V.&Devedzic,M(2019) put forward that technology enhanced assessment is a concept. It is a broad term, including various methods. Through these methods, technology can be used to support the assessment management in the fields of educational institutions, lifelong learning, professional training and educational development. Its main purpose is to establish a powerful teaching and learning evaluation method through technical methods for improving the quality and efficiency of education [2]. Under the guidance of the state to create a new way to realize precise governance and multi-party coordination, the realization of data governance must be the due meaning of the modernization of governance system and governance ability in the field of education in the domain of big data. How to draw support from big data to obtain development information, provide decision-making basis, improve system design, carry out quality evaluation, and build an intelligent education governance system with multi-agent collaboration, data-driven and

information sharing has become the key to the modernization of governance system and governance capacity in the field of education. Based on this, this study focuses on the goal of realizing the modernization of governance ability in the field of education, analyzes the current state, by researching on the utilization of big data in teaching quality evaluation system of universities, explains the connotative development ideas, and explores the development path of modernization.

2. Utilization Background of Big Data in College Teaching Quality Evaluation System

2.1. Big Data Complies with the New Requirements of Higher Education Quality Development in the New Age

At present, China's higher education has officially entered the popularization development phase. In the new development stage, improving the quality of higher education is the core link to realize the connotative development of higher education. With the continuous change of social needs, the quality standards in the new development stage are also tending to diversify. How to accurately locate the core literacy, quality standards and evaluation mode of talent training, and steadily elevate the quality of higher education, big data, as an I.T. in the new age, can help higher education tap its development potential and explore new development paths. When studying the big data governance scheme of colleges and universities, scholars Li Wei and Shao Liang proposed to explore the development mode of "taking data as the core asset and driving business innovation with data". If all kinds of data can be used reasonably, it is possible to provide a new turning point for the reform of universities. Actually, education basic state database is equivalent to a university's core asset. It involves data in education and teaching in colleges and universities. For example, with the assistance of big data statistical analysis technology, we can realize the informatization and intelligence of education evaluation mode, deeply analyze and diagnose education quality, tap the development advantages of colleges and universities, highlight development characteristics and condense development forces.

The integrated development of big data and university teaching quality evaluation system provides a decision-making basis for the high-quality development of higher education. Zhang H, Fang M (2021)indicated that big data is a data set with large capacity, diverse types, fast query speed and high hidden application value. It is gradually developing into an emerging technology and service industry that collects, stores and analyzes a large amount of data from scattered sources and various types, and finds new knowledge, estimate the monetary worth, and enhances new capabilities through deep mining. The flow and the continuous enrichment of information resources may support for university leadership decision-making. The application of big data in education can be broadly interpreted as "data governance". Its essence is mining data , depth analysis and comprehensive evaluation of education quality, use big data to "discover new cognition, create new value and improve new ability", and use the obtained valuable information to assist effective governance and do decision-making on a scientific basis in education. In general, the collection of big data in the context of education is often process. It pays attention to the whole life cycle of teachers' and students' school data, and every micro performance of teachers' teaching and students' school life and learning. Big data can analyze teachers' teaching level, students' individual learning status and achievements, and can be used to adjust educational behavior and realize personalized education.

2.2. Big Data Meets the Information Needs of Teaching Quality Evaluation in Universities

Big data makes it possible to monitor the quality of the education process. Currently, the extensive use of big data gradually replaces the traditional manual statistics and sorting, transfers

the more complicated educational administration management and services to the network, makes the matters that cannot be communicated due to distance and process more convenient and efficient, and enables the heavy paper information to be stored in the cloud for ages. Up till now, universities generally use the information-based educational administration management and service platform to carry out basic teaching management, mainly including course information, student information, suspension of classes, teaching classes, course scores, etc. Although they all have educational administration intelligent management platforms, most of the resources and data they cover are phased cut-off point data, and most of their functions are biased towards the teaching operation process, which can-not realize real-time quality monitoring, record the development and growth process of teachers and students, and provide decision-making basis for school development and reform. In monitoring the learning management system (LMS) throughout the teaching process, the system has proven to be a very effective technique for assessing the effectiveness of helping students learn. At the same time, learning risks can be avoided [3].

Big data realizes the efficiency and convenience of evaluation data collection. The opinions of the Ministry of education on undergraduate teaching evaluation in universities in 2011 indicates that China has established a new "five in one" undergraduate teaching evaluation system in terms of policy, including self-evaluation, college evaluation, professional certification and evaluation, normal monitoring of higher education quality and international evaluation. To do a good job in various evaluation work, it must face mass data collection and sorting. For enhancing the efficiency and accuracy of data collection, the application of big data in the evaluation of teaching quality in universities is becoming more and more important. In terms of self-evaluation, some colleges and universities have established information-based evaluation systems and basic teaching status databases, but the contents covered by the systems are different (specifically involving professional evaluation, curriculum evaluation, teaching evaluation, etc.). Because they involve much data collection of evaluation index data, most colleges and universities are willing to develop or introduce intelligent management platforms to reduce a large amount of human and material investment. In terms of college evaluation, because college qualification evaluation and audit evaluation mostly take the forms of self-evaluation report, basic teaching state data analysis report and supporting materials. Some colleges and universities issue statistical tasks by decomposing task indicators to quantitatively reflect the school's teaching operation, school running conditions and teaching effect; Some colleges and universities establish the basic teaching state database through R & D or cooperation with third-party institutions, form the analysis report of the basic teaching state in the school through information data collection, and carry out self-evaluation and self-construction in the school. In terms of professional certification and evaluation, some colleges and universities establish their own professional certification and evaluation system through R & D or cooperation with third-party institutions, and carry out online data collection through creating instructions to realize automatic measurement of achievement degree, one click export of application and self-evaluation report, etc.; Part is to form professional self-assessment or certification materials through the establishment of working groups and collective wisdom and strength. In terms of normal monitoring of higher education quality, colleges and universities have not yet established a normal monitoring system for the whole process of education quality by using I.T. Most of the daily education quality monitoring stay in the stage of students' teaching evaluation, supervision and lectures, and leading cadres' lectures. The quality monitoring of the whole process of students' learning and teachers' teaching is mostly reflected by students' academic achievements and the results of multi-agent evaluation of teaching, and the quality monitoring of practical teaching is very hard to achieve. In terms of international evaluation, most universities may carry out international professional evaluation or certification by using the basic teaching state data in combination with the professional construction in the University. Combined with the top-level

design of China's higher education quality assurance system, it can be found that the establishment of internal basic teaching status database is an essential and important content of each university. Colleges and universities should speed up the information construction of normal monitoring of education quality, accelerate the liberation of human and material resources, help achieve scientific and accurate decision-making, and promote the evaluation of teaching quality into a new era of intelligence.

2.3. Core and Main Characteristics of College Teaching Quality Evaluation System Based on Big Data

Due to using big data in evaluation system of teaching quality, the essence can be summarized as "data governance", that is, data governance in the field of education and teaching in universities. The core is "Building Morality and cultivating people". With the help of information technology in the age of big data, we can realize the reform and innovation of talent training mode and improve the quality of talent training. Big data has the characteristics of large amount of data, many types, and low value density, while the effective information related to the operation of universities is overwhelmed by massive data resources [4]. At present, big data in educational sector in China generally has the characteristics of massive data, diversified latitude, continuous process and hidden value. At the same time, it also shows the advantages of Resource Co Construction and sharing, convenient and efficient use, scientific and accurate management and so on. China's educational modernization 2035 points out that we need accelerate the educational reform in the information age, make an overall plan to build an integrated intelligent teaching, management and service platform. Among them, the innovation of education service formats, the establishment of digital education resource co-construction and sharing mechanism, and the improvement of new education service supervision system also reflect the important role of I.T. [5] The features of teaching quality monitor system based on big data are mainly reflected in three aspects: resource collection, platform application and education management. In teaching quality evaluation, the data mining technology can realize the prediction of students' scores and the feedback of teaching quality [6]. Universities mainly realize the collection, storage, integration and sharing of education and teaching data by making best use of I.T, realize the timeliness, convenience and authenticity of education effect feedback with the help of the platform, and promote the accuracy, scientifically and rationality of education decision-making through data integration and analysis [7].

Resource co-construction and sharing. The biggest hidden feature of the university teaching quality monitor system based on big data is that it has massive data resources, which is equivalent to the storage center of teaching data. Relevant basic teaching status data, such as student teacher ratio, student information, class opening, teaching software and hardware resources, teaching achievements, etc.; Relevant teaching assessment, such as teachers' evaluation of learning, students' evaluation of teaching, multi subject evaluation of teaching, special inspection of teaching, etc.; opinions and suggestions on teaching handling, such as the self-assessment report on the basic teaching status of the school, the report on the rectification of teachers' teaching situation, the opinions and suggestions of teachers and students' Symposium, the opinions on the handling of teaching accidents, etc.; these storable, valuable and sharable information are generated through the cooperation, establishment and sharing of Academic Affairs Office, student office, personnel office, scientific research office, secondary college, evaluation center and other departments. These data information can realize the sublimation of value under certain integration and intelligent analysis, and provide powerful assistance and guarantee for operation and management of universities, resource allocation and educational decision-making.

Convenient and efficient use. The most significant external feature of the university teaching

quality assessment system based on big data is the "information integration platform". Under the multi-dimensional data statistics and development, driven by the information integration platform, it realizes the in-depth integration and mining of resources, expands the service space of education and changes the service mode of Education [8]. Multiple teaching subjects in the school can carry out teaching consultation, teaching guidance or teaching information retrieval at different times and places; Multi subject teaching evaluation information can be filled in or queried in real time, teaching questions can seek help and guidance online, and teaching improvement can be continuously tracked and archived. In the age of technology, the teaching quality evaluation of universities no longer needs a long wait, and the statistics, sorting and analysis of data do not need to expend lots of manpower and resources. The data governance model of the new era leads the teaching quality evaluation of universities into the modern paperless quality assurance era.

Scientific and accurate management. The "direct dividend" of the construction of university teaching quality evaluation system based on big data is to give impetus to the transform of educational management, pick up speed the formation of modern educational administration and monitoring system, propel accurate management and scientific decision-making forward, and promote the modernization of educational governance system and ability. Through the use of intelligent teaching services and platforms, formulate quality standards, analyze early warning data, tap construction potential, monitor teaching quality standards, make up weaknesses, strengths and weaknesses, provide decision-making basis and direction for the construction and optimization of mechanisms such as student learning, faculty construction, excellent curriculum cultivation and teaching service management, and further improve teachers' teaching level, improve students' learning effectiveness, establish an internal independent governance mechanism, and form a personalized talent training model.

3. Application Analysis of Big Data in College Teaching Quality Evaluation System

For the sake of understanding the utilization of big data in the teaching quality assessment system of universities in Nanjing, this paper investigates the data collection, management and application of 34 undergraduate colleges and universities in Nanjing. It is found that the informatization level of teaching quality evaluation in universities is different, the functions of management institutions are diverse, and the connection between teaching quality assessment and improvement is not close. It has to further quicken the deep integration of big data technology and teaching quality assessment system.

3.1. The Level of Informatization Varies

At present, with the different progress of informatization development in universities, the types of data collection channels for teaching quality supervisory control and evaluation are becoming more and more diversified. The collection of data information has evolved from traditional paper and manual analysis to artificial intelligence. Most of the data collection channels are self-developed monitoring and management platforms, educational evaluation or management systems provided by third parties, etc. As early as the 1990s, after China introduced the European and American student evaluation system, in order to improve the efficiency of students and teaching administration in universities, universities began to develop or introduce the online student evaluation system around 2005. The information system is an information system used to manage students' evaluation, which can provide convenient evaluation functions for students. Most colleges use the teaching and learning evaluation system provided by the third party. The width and breadth of the system functions are gradually enriched. A comprehensive teaching evaluation system for teachers is composed of modules such as students' teaching evaluation, teachers' self-evaluation and

comprehensive evaluation. At present, the most widely used data collection platforms in universities are officially provided, such as the "national data platform for higher education quality monitoring", which is jointly developed by the higher education teaching evaluation center of the Ministry of education and Sun Yat-Sen University, and provides data reporting services for colleges and universities and provincial education administrative departments free of charge; The "monitoring and evaluation management information system of educational modernization in Jiangsu Province" and the "comprehensive evaluation system of undergraduate majors in Colleges and universities in Jiangsu Province" are mainly data collection platforms built by the provincial education evaluation center in conjunction with colleges and universities. These platforms can help universities carry out internal self-evaluation while collecting national or provincial college data. With the rapid development of information technology in the era of big data, colleges and universities began to research and develop intelligent and information-based internal management platform for teaching evaluation. At present, according to the survey data, the quality evaluation departments of 34 undergraduate colleges and universities in Nanjing mainly use the following three types of data collection platforms: first, national, provincial and ministerial data platforms; Second, the teaching evaluation and quality inspection data platform independently developed by colleges and universities; The third is the third-party data management and service platform, which involves rich contents and functions, such as teaching evaluation, professional evaluation, curriculum evaluation, basic teaching status database, professional certification, etc.

3.2. Management Mechanism Fault Not Fine

Table 1: Implementation and management of teaching quality evaluation institutions in 34 universities in Nanjing

Administrative department	Independent or joint units	Number of colleges and universities
Independent department	Evaluation Center	8
Academic administration	Teaching Evaluation Section	15
Joint office	Teacher Teaching Development Center	5
	Institute of Higher Education	3
	Office of Academic Research	1
	Development Planning Division	1
	Double First-class Construction Office	1

As matters stand, the teaching quality evaluation of higher education is mostly implemented and managed by the teaching evaluation center, or quality and evaluation center. Nearly half of them are independent departments directly under the academic affairs office, a few are independent departments working alone, and some are working together with other functional departments (teacher (teaching) development center, Higher Education Research Institute, scientific research office, development planning office and double first-class construction office). Under the guidance of the quality center or the academic affairs office, carry out teaching evaluation, special evaluation (test paper and graduation thesis evaluation, course evaluation, professional evaluation), teacher-student symposium, professional certification, basic teaching data collection, etc. With regard to data collection and management, most colleges and universities have established an intelligent campus network adapted to the new normal, adopted the information officer management system, and designated special personnel to be responsible for relevant teaching evaluation or data collection, sorting, verification, filling in and verification. The heads of various departments are the

first responsible person for data collection and feedback, but they basically have not formulated relevant management measures or mechanisms for data collection and management. Among them, there are still some problems in the collection of relevant data, such as cross content and responsibility shifting. The systematization and accuracy of data need to be considered, and a good circulation mechanism has not been formed in the management and application of data (table 1). If we properly manage data information, it will be conducive to data statistics and ensure (data) science. This is a strict data quality inspection process. In addition to data collection, we will also review data conceptualization, data preprocessing, data collection and data sources [9].

3.3. Diagnosis and Improvement are Difficult to form A Closed Loop

Universities are the main battlefield of higher education. Establishing morality and cultivating people is the highest goal of higher education. Grasping the key link of talent training - "the whole process of education" is particularly significant to guarantee the quality of talent training. At present, universities improve the teaching quality assessment system to ensure the internal teaching level, improve the quality of talent cultivation and speed up the connotative development of higher education. The internal teaching quality assessment system generally adopts multiple subjects to listen to and evaluate courses (students, supervisors, peers, leading cadres' evaluation of teaching, teachers' self-evaluation, etc.), graduation thesis (Design) guidance and inspection, scientific research training, experimental teaching, innovation and entrepreneurship training management, teachers' teaching file management, etc.; The external teaching quality evaluation system mainly involves qualification and audit evaluation, professional comprehensive evaluation, normal data monitoring (basic teaching status data monitoring, Jiangsu education modernization monitoring), professional certification, etc. The application of data presents a multi-level cycle of "diagnosis and improvement". With the help of modern service platform, the data collection of teaching evaluation is becoming more and more convenient, and the diagnosis of teaching quality is becoming more and more objective and scientific. However, in view of the relatively large number of functional departments and secondary colleges involved in the teaching process, complex influencing factors and diversified subjects involved, it is difficult to implement the teaching improvement in most colleges and universities. After investigating 34 undergraduate universities in Nanjing, it is found that one of them adopts various forms such as internal quality monitoring platform, quality control briefing, talent training quality report, diagnosis and reform work network to realize a virtuous cycle of teaching diagnosis and improvement. By establishing a normalized internal quality security system and a sustainable or improvement diagnosis and working mechanism, build, maintain and update the school central database, build an early warning and automatic push system, and provide real-time self-diagnosis data in time.

4. Implementation Path of College Teaching Quality Evaluation System Based on Big Data

4.1. Interconnection and Interworking, Co Construction and Sharing, and Integration of Teaching Resources

Promoting network interconnection and strengthening the construction and sharing of educational information is an important bridge to improve the highly efficient and accuracy of educational administration. The implementation path of college teaching quality evaluation system based on big data is to establish a one-stop service platform with online and offline, virtual and real combination. To realize network interconnection, we should first clarify the network structure of teaching responsibilities and authorities, make an overall plan for the collection and feedback of information resources of the whole school, simplify the complexity, break the barriers, reduce the

problems of multiple declarations and feedback of the same business between superior and subordinate units, and establish a more convenient, efficient and friendly intelligent campus service and management platform. Second, establish a data management mechanism, set up a big data comprehensive service center (the data of the center includes talent training plan and planning, curriculum teaching information, teacher growth files, teaching files, teacher teaching evaluation, student learning process evaluation, special evaluation, etc.)[10], and designate professionals to be responsible for information technology maintenance and data analysis; Establish an information officer system to be responsible for resource sharing, information declaration and feedback of other functional departments or secondary colleges; Emphasize the objectivity and scientificalness of data, ensure the accuracy of information declaration and feedback, and promote the effectiveness of information use of educational resources.

4.2. Integrate Innovation, Improve Quality and Effectiveness, and Improve the Reform of Management Mechanism

In the stage of connotative higher education development, the integration and innovation of university administration mechanism should adapt to the long-term goal of educational modernization, comprehensively promote the development of the modernization of educational governance ability, comprehensively sort out the functions and responsibilities of relevant teaching institutions, reasonably set posts and promote the interconnection of relevant business departments in combination with the University's educational and teaching philosophy and development characteristics, aggregate financing business functions, break communication barriers, smooth operation mechanism, and improving the quality of personnel training with the reform of management mechanism. The reform and innovation of university management mechanism should focus the whole process of education, follow the law of education, form a benign closed loop between teaching "service management evaluation", strengthen internal coordination among departments, refine teacher-student service and management, and improving the sufficiency of teaching. The orientation of management function should focus on the center of "moral education", carry out research on education planning and development, formulate talent training system and scheme, take care of our educational development and management, establish education and teaching information database, utilize teaching quality evaluation and monitoring, and promote the continuous improvement of education planning and development, form a benign closed loop of education management mechanism and realize the connotative, characteristic and sustainable development of education. For example, in order to implement the "Furnace project" and the "three elements and four dimensions" new talent training system, Nanjing University has deepened the reform of undergraduate education, innovated the undergraduate management mechanism, established a one-stop comprehensive data service center, integrated undergraduate education resources, improved the quality of serving teachers and students, created an undergraduate college, adhering to the concept of "great education", create a high-quality undergraduate education, just like "Chinese characteristics, world-class and NTU style", and create the "first brand" of "the first NTU".

4.3. Interlock from Top to Bottom, Seek For Greater Perfection, Improve the Quality of Moral Education

First, implement the two-level management system of schools and colleges to ensure that the teaching indicators and standards are implemented in place. Taking care of the construction of quality standards for various teaching links, and strictly implement the two-level management system of schools and colleges. Clarify the quality standards and normative requirements of teaching links, refine the normative documents of various links, including training plan, curriculum

construction, classroom teaching, textbook construction and selection, experimental and practical teaching, achievement assessment, student status review, teaching reform project management, and form the whole process and quantifiable quality evaluation standards. The second is to build an all-round supervision and evaluation management system throughout the whole process, and ensure that the improvement is implemented in place. According to the school's own security system, build a multi-level and all-round teaching management system framework from the principals in charge, the school teaching committee, the academic affairs office and the college as appropriate, with the assistance of big data platform, teaching step is integrated and analyzed from training plan formulation, classroom teaching spot check, mid-term teaching inspection, teaching performance assessment, student teaching evaluation, examination inspection, test paper spot check and graduation design inspection, so as to form teaching quality report, teaching supervision briefing, professional self-evaluation report, basic teaching status data self-evaluation report, etc., make full use of the analysis of various work indicators in the report, focus on observing the achievement of indicators, screen the indicators that fail to meet the standards and still need to be improved, grasp the key links of teaching quality, refine education management and decision-making, continuously deepen education reform and nurture higher-quality talents.

Acknowledgments

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