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Implementation and Effect Analysis of Big Data Technology in Teaching Quality Evaluation in Undergraduate Universities

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Abstract:

This paper discusses the implementation and effect of big data technology in the teaching quality evaluation of undergraduate universities. With the advent of the era of big data, the application of big data technology in teaching evaluation is increasingly extensive. By analyzing the implementation strategies of big data technology in the evaluation of teaching quality in undergraduate colleges and universities, including data collection, analysis, visualization and feedback mechanism, this paper reveals the important role of big data technology in improving the accuracy of teaching evaluation, optimizing teaching management and supporting personalized teaching. At the same time, this paper also analyzes the actual effect of big data technology in the evaluation of teaching quality in undergraduate colleges and universities through specific cases, and shows the positive role of big data technology in improving the teaching effect and improving students learning results.

Keywords: Big Data Technology; Teaching Quality Evaluation; Data Collection; Data Analysis; Personalized Teaching

1. INTRODUCTION

In todays era of rapid development of information technology, big data technology has become an important force to promote the reform of all walks of life. The field of education is no exception. The introduction of big data technology has brought unprecedented opportunities for teaching quality evaluation. Through in-depth mining and analysis of massive educational data, various rules and characteristics in the teaching process can be more accurately grasped, providing scientific basis for optimizing teaching strategies and improving teaching quality. This study aims to explore the implementation and effect of big data technology in the evaluation of teaching quality in undergraduate universities, in order to provide new evaluation tools and methods for educators and promote the dual improvement of educational equity and quality.

In recent years, big data technology has been increasingly widely used in the field of education. From the personalized recommendation of online education platform to the development of intelligent teaching system, big data is playing an indispensable role. It can not only help students to realize personalized learning, but also help teachers to teach accurately and improve the teaching effect. At the same time, big data also provides strong support for education management, which makes education decisions more scientific and reasonable. As an important base for cultivating high-quality talents, the teaching quality of undergraduate colleges and universities is directly related to the future of the country and the hope of the nation. Therefore, it is particularly important to make a scientific, objective and comprehensive evaluation of the teaching quality of undergraduate colleges and universities. Through evaluation, the problems and deficiencies in teaching process can be found in time to provide the basis for improving teaching, encourage teachers to improve the teaching level and provide better education service for students.

2. IMPLEMENTATION STRATEGY OF BIG DATA TECHNOLOGY IN TEACHING QUALITY EVALUATION IN UNDERGRADUATE COLLEGES

With its powerful data processing and analysis ability, big data technology has brought about revolutionary changes to the evaluation of teaching quality in undergraduate universities. To ensure the integrity and accuracy of data; with the help of accurate data analysis technology, dig into the rules and characteristics of the teaching process; use intuitive data visualization method to present the advantages and trends of teaching effect; build an effective feedback mechanism, timely transfer the analysis results and guide relevant personnel to improve and optimize. Big data technology not only improves the accuracy and efficiency of teaching quality evaluation, but also injects new vitality into the sustainable development of undergraduate universities.

2.1. DATA COLLECTION

Data collection plays a vital role in the evaluation of undergraduate teaching quality. It is the cornerstone of the application of big data technology, which is directly related to the accuracy of subsequent analysis and the effectiveness of the evaluation system. In order to ensure the comprehensiveness and reliability of data, undergraduate course colleges and universities need to build a multi-dimensional data collection system, the system covers the classroom interaction, student homework, test scores, satisfaction survey, at the same time pay attention to the timeliness and authenticity of data, avoid data lag or distortion have adverse effects on the evaluation results.

In terms of data collection methods, undergraduate colleges mainly rely on their internal databases, online education platforms, questionnaires, classroom observation, and students homework and test scores. The internal school database provides students basic information and course scores, while the online education platform records students learning behavior, interactions and learning progress. Questionnaires can obtain the subjective evaluation of students and teachers, classroom observation can capture the details of the teaching process, and homework and test scores are important indicators to measure students learning results.

In order to ensure the integrity and accuracy of data, universities should formulate strict data collection norms and standards, clarify the scope, format and accuracy requirements of data collection, and conduct data cleaning and preprocessing to remove outliers and noise. In addition, regular checkand validation of data are also essential steps to ensure data consistency and accuracy. Through the implementation of strict monitoring and management, undergraduate colleges can ensure the authenticity and reliability of data, provide solid data support for teaching quality evaluation, and then improve the accuracy and efficiency of evaluation.

2.2. DATA ANALYSIS

Data analysis plays a core role in the evaluation of teaching quality in undergraduate colleges and universities. It accurately analyzes the teaching process like a scalpel and reveals the hidden rules. With the help of statistical analysis, machine learning and data mining, as well as Python, R programming languages, SPSS and SAS software, undergraduate universities can efficiently process and analyze large-scale data, gain insight into students learning habits, preferences and results, and provide a scientific basis for optimizing teaching strategies.

The application of the data analysis results is crucial. It can not only find teaching problems and deficiencies, provide teachers with personalized teaching suggestions, evaluate teaching effects, optimize resource allocation, but also provide support for education decision-making, reveal the development trend of education, and help policy formulation. In order to improve the ability of data analysis, undergraduate universities need to strengthen talent training and introduction, improve professional skills through training and seminars, and introduce high-level talents. At the same time, we will strengthen cooperation with scientific research institutions and enterprises to jointly research and develop advanced technologies and tools, actively apply new technologies and new methods, and promote the innovation and development of data analysis work. In short, data analysis plays an irreplaceable role in the evaluation of teaching quality in undergraduate colleges and universities, and is the key to improve the teaching quality and effect.

2.3. DATA VISUALIZATION

Data visualization is essential in the assessment of teaching quality in undergraduate institutions. It transforms the complex data analysis results into intuitive graphics and images, so that the teaching rules and characteristics at a glance. With exquisite charts, management and faculty can quickly capture key information such as learning effectiveness and course popularity, thereby providing a deep understanding of the teaching situation and providing visual support for improvement. When choosing the visualization method, it should be determined according to the analysis results and purpose, such as line chart display trend, bar chart display distribution, etc., and personalized methods can also be customized to meet specific needs. Visual data plays a significant role in teaching evaluation, which can intuitively show the advantages and changes of teaching effect, provide feedback and improvement suggestions for teachers, help students understand the learning content and progress, and improve the effect. At the same time, it provides a comprehensive overview for education managers to support scientific decision-making. The form of presentation should be determined according to the purpose and the

audience. For teachers, simple charts to quickly understand the effect, for students, interesting animation or interactive interest, comprehensive and systematic reports to help fully understand the situation. In short, data visualization is an important tool for teaching quality evaluation and promotes the improvement of teaching quality.

2.4.FEEDBACK MECHANISM

Feedback mechanism plays a key role of bridge and link in the evaluation of teaching quality in undergraduate colleges. It ensures that school management, teachers and students can timely obtain the accurate results of data analysis and have a clear understanding of the advantages and disadvantages in teaching. The establishment of a feedback mechanism needs to clarify the subject, content and method, and pay attention to the timeliness and accuracy of information. When processing the feedback information, it is necessary to sort out and analyze, clarify the problems, formulate improvement and optimization measures, and timely feedback the processing results. When applying feedback information, we should pay attention to pertinence and effectiveness, formulate personalized measures, and strengthen supervision and evaluation. Optimizing the feedback mechanism is an important means to improve the evaluation level of teaching quality. It is necessary to strengthen communication and cooperation, improve the system and process, strengthen training and education, and strengthen the supervision and evaluation work. Through these measures, the feedback mechanism can be continuously improved and optimized to ensure its smooth operation and effective implementation. To sum up, the implementation strategy of big data technology in teaching quality evaluation in undergraduate colleges and universities covers many aspects of data collection, analysis, visualization and feedback mechanism, providing strong support for optimizing teaching strategies and improving teaching quality.

3. EFFECT ANALYSIS OF BIG DATA TECHNOLOGY IN THE TEACHING QUALITY EVALUATION OF UNDERGRADUATE COLLEGES AND UNIVERSITIES

With the rapid development of information technology, big data technology is gradually infiltrating into the field of education, especially in the evaluation of teaching quality in undergraduate universities shows great potential. Through deep mining, intelligent analysis and visualization presentation of massive data, big data technology not only improves the accuracy of teaching evaluation, but also promotes the optimization of teaching management, and provides strong support for personalized teaching. The following will discuss the application effect of big data technology in undergraduate evaluation from four aspects: improving the accuracy of teaching evaluation, optimizing teaching management, supporting personalized teaching and specific case analysis.

3.1. IMPROVE THE ACCURACY OF TEACHING EVALUATION

Big data technology has brought about revolutionary changes to the evaluation of teaching quality in undergraduate colleges and universities. Different from the traditional subjective data that relies on manual collection, big data technology integrates multi-source data, such as school internal database, online education platform records, questionnaire survey results, classroom observation notes, student homework and test scores, etc., to build a comprehensive and objective data system. This system not only covers all aspects of the teaching activities, but also through automated processing and analysis of these data, ensuring the objectivity and impartiality of the assessment process. In addition, the application of big data technology makes the evaluation no longer limited to a single dimension, but can comprehensively consider the multi-dimensional and multi-level information, so as to obtain more comprehensive and accurate evaluation results. Through the in-depth analysis of students learning behavior data, the potential laws and trends in the teaching process can also be revealed, providing scientific basis for teaching improvement, and further improving the reliability of the evaluation results.

3.2. OPTIMIZE TEACHING MANAGEMENT

3.2.1 Scientific and intelligent teaching management

Big data technology has brought unprecedented science and intelligence to teaching management. Through real-time monitoring and analysis of teaching data, the school management can timely understand the teaching trends and grasp the changing trend of teaching quality. For example, using big data analysis technology, we can

predict the pass rate of a certain course, and take interventions in advance to reduce the failure rate. In addition, big data technology can also help schools to identify the shortage or surplus of teaching resources, such as whether the allocation of classrooms, laboratories, books and materials is reasonable, so as to provide decision support for the optimal allocation of teaching resources.

3.2.2 Reasonable allocation of teaching resources

With the help of big data technology, the allocation of teaching resources becomes more accurate and efficient. Through the analysis of historical data, the school can predict the enrollment scale and students needs of each major in the future period of time, so as to reasonably adjust the curriculum setting, teacher allocation and teaching resources input. This can not only effectively avoid the waste of resources, but also ensure the adequate supply of teaching resources to meet the diversified learning needs of students. At the same time, big data technology can also help schools to find the bottleneck problems in the teaching process, such as the insufficient teachers in some courses, the aging of some experimental equipment, etc., to provide data support for the upgrading and updating of teaching resources.

3.3. SUPPORT PERSONALIZED TEACHING

Big data technology has brought unprecedented opportunities to undergraduate institutions, making it a reality to accurately analyze each students learning data. Through the extensive collection of students learning behavior, grades, interest preferences and other multi-dimensional data, big data technology can build a detailed portrait of students personal learning. The portrait not only reveals the learning characteristics and needs of students, but also provides valuable data support for teachers to help them develop more accurate and personalized teaching strategies.

Based on the students individual learning portrait, teachers can customize the personalized learning plans for each student. These programs not only cover the careful selection and arrangement of the course content, but also include personalized suggestions on learning methods, flexible adjustment of learning progress, and accurate recommendation of learning resources. Through the implementation of this personalized teaching mode, students interest and motivation in learning are fully stimulated, and their learning efficiency and performance have been significantly improved.

More importantly, the application of big data technology makes the evaluation of students learning results more comprehensive and in-depth. The traditional test scores are no longer the only standard, but are replaced by a comprehensive evaluation of the learning process, ability development, emotional attitude and other aspects. Through the continuous tracking and analysis of students learning data, teachers can timely find and solve the problems and deficiencies encountered by students in the learning process, so as to take more targeted teaching measures to remedy them. This personalized teaching intervention based on data not only effectively improves students learning outcomes, but also promotes their all-round development and lays a solid foundation for their future career path.

3.4. SPECIFIC CASE ANALYSIS

When promoting the reform of teaching quality evaluation system, a certain undergraduate university chose the introduction of big data technology as a breakthrough point. The school has a sound information technology infrastructure and rich data resources, but the traditional teaching quality evaluation method mainly relies on manual collection and collated data, leading to the lack of comprehensiveness and accuracy of the evaluation results. This table 1 clearly shows the various links and specific contents of the school when reforming the teaching quality evaluation system with big data technology.

Table 1 Application of big data technology in teaching quality evaluation

Application link	Concrete content
Data integration and cleaning	Using big data technology, realize data integration and cleaning from different systems to ensure the accuracy and consistency of data
Data analysis and mining	Through big data analysis technology, the data of students learning behavior, grades, interest

	preference and so on are deeply mined and analyzed to build students personal learning portrait
Construction of the teaching evaluation model	Based on the data analysis results, a scientific teaching evaluation model is constructed
Feedback of evaluation results	The evaluation results will be timely feedback to teachers and students to guide them to improve and optimize
Allocation and optimization of teaching resources	According to the data analysis results, the allocation of teaching resources should be adjusted to ensure sufficient supply and efficient utilization of resources

This reform measure has achieved remarkable results, and the teaching evaluation is more comprehensive, objective and accurate, which provides a scientific basis for teaching improvement. At the same time, the application of big data technology promotes the optimization of teaching management and the implementation of personalized teaching, and improves the teaching quality and students learning results. However, the application of big data technology also faces some challenges, such as data privacy protection, data security protection, and the update and iteration of data analysis technology, which need to be highly paid more attention to and effectively solved. In addition, the application of big data technology should be combined with the actual situation of the school, and the schools educational characteristics, teaching resources and students needs should be fully considered. In short, big data technology plays an important role in the evaluation of teaching quality in undergraduate universities and provides strong support for the improvement of teaching quality. In the future, with the continuous development and innovation of big data technology, its application prospect in the teaching quality evaluation of students in undergraduate colleges will be broader, but at the same time, it needs to be constantly improved and optimized to cope with new challenges and problems.

4. CHALLENGES AND COUNTERMEASURES OF BIG DATA TECHNOLOGY IN TEACHING QUALITY EVALUATION IN UNDERGRADUATE COLLEGES AND UNIVERSITIES

Although the application of big data technology in the evaluation of teaching quality in undergraduate universities has brought many advantages, it also faces a series of challenges. These challenges involve data quality and privacy protection, technology and talent support, and institutional and policy support. In order to give full play to the role of big data technology in the evaluation of teaching quality in undergraduate colleges, effective measures must be taken to deal with it.

4.1. DATA QUALITY AND PRIVACY PROTECTION

4.1.1 Importance of data cleaning and preprocessing

In the application process of big data technology, data quality is the key factor in determining the accuracy and reliability of analysis results. However, undergraduate institutions are often faced with problems, such as incomplete, inconsistent and inaccurate data, when collecting and processing teaching data. These problems may lead to bias in data analysis results, which in turn may affect the accuracy of teaching quality assessment. Therefore, it is very important to strengthen the data cleaning and pretreatment work.

Data cleaning and pre-processing mainly include data weight removal, missing value processing, outlier value detection and processing, data format conversion and other steps. Through these steps, data integrity, consistency and accuracy can be ensured, providing a high-quality data base for subsequent data analysis. At the same time, data cleaning and preprocessing can also improve the efficiency of data analysis and reduce unnecessary computational resources and time consumption.

4.1.2 Strengthening of privacy protection measures

In the application process of big data technology, privacy protection is a problem that cannot be ignored. When collecting and dealing with personal data such as students and teachers, undergraduate colleges and universities must strictly abide by relevant laws and regulations to ensure that personal privacy is not leaked. In order to

strengthen the privacy protection, the following measures can be taken. For example, Table 2 further subdivides the data privacy protection measures into four categories, and lists the specific measures and descriptions under each category, which helps to more fully understand and implement the data privacy protection work.

Table 2 Table of data privacy protection subdivision measures

Class	Measure	Description
Data encryption	Transfer encryption	Sensitive data transmission is encrypted through SSL / TLS protocol to ensure data transmission security.
	Store encryption	Encrypts the sensitive data on the server to prevent illegal access.
Access control	Identity verification	Authentication ensures authorized access to sensitive data by user name, password, or biometric.
	Authority management	Assign data access according on user roles and responsibilities, restrict unauthorized people to accessing and operating data.
	Audit log	Monitor user data access and operation to facilitate the tracking and location of data leakage or illegal access events.
Data desensitization	Part of the desensitization	Desensitize sensitive data, such as hiding phone numbers and addresses, to protect personal privacy.
	Completely desensitized	Desensitize sensitive data to ensure that individual identity cannot be identified while retaining information value.
privacy policy	Obligation to disclose	Clarify the privacy policy, inform users of the collection, use and protection of data, and protect users right to know.
	The user agrees	Before the collection and use of sensitive data, explicit user consent must be obtained to ensure the legal compliance of data processing.
	Policy update	Update privacy policy to comply with regulations and user needs changes ensure its effectiveness and applicability.

4.2. TECHNICAL AND TALENT SUPPORT

4.2.1 Continuous update of big data analysis technology

With the continuous development of big data technology, new analytical algorithms and tools are constantly emerging, providing more possibilities for the evaluation of teaching quality in undergraduate colleges. However, this also puts forward higher requirements for the technical renewal ability of undergraduate colleges. In order to maintain the advanced nature of big data technology, undergraduate universities need to continuously pay attention to the latest progress of big data technology, introduce new analysis algorithms and tools in time, and improve the accuracy and efficiency of data analysis.

At the same time, undergraduate universities also need to strengthen cooperation and exchanges with scientific research institutions, enterprises and other external institutions to jointly promote the innovation and development of big data technology. Through cooperation and exchange, technical resources, experience and methods can be shared, and the wide application of big data technology in the teaching quality evaluation of undergraduate colleges and universities can be promoted.

4.2.2 Training and introduction of data analysis talents

The application of big data technology needs professional talents to support it. However, there is a general shortage of data analysis talents in undergraduate universities. To address this issue, Table 3 provides an overview of the strategies adopted by undergraduate institutions in developing big data analysis talents and details the specific implementation steps under each strategy. The implementation and effectiveness of these strategies provide an important reference for the continuous improvement and optimization of talent training programs.

Table 3 Detailed measures of talent training for big data analysis in undergraduate universities

Measures category	Specific action	Description
Strengthen internal training	Organize regular training	Big data analysis training is held at least once a month, including theoretical and practical operations.
	Introducing online courses	Introduce well-known big data analysis online courses for teachers to teach themselves.
	Practical project drill	Teachers participate in big data actual combat projects to improve their operational skills.
Introducing external talent	Recruitment plan	Develop a big data analysis talent recruitment plan to clarify the needs and conditions.
	Talent introduction policy	Develop preferential policies to attract high-level talents in the field of big data analysis.
	Talent evaluation mechanism	Establish a talent evaluation mechanism to ensure the quality of talent introduction.
Establish a cooperation mechanism	Cooperation between scientific research institutions	Establish collaboration and jointly study big data analysis.
	Corporate cooperation	Establish cooperation and jointly cultivate data analysis talents.
	Academic exchange	Organize academic conferences and seminars to promote academic exchanges and cooperation in the field of big data analysis.

4.3. INSTITUTIONAL AND POLICY SUPPORT

4.3.1 Preparation and improvement of relevant policies

In order to promote the wide application of big data technology in the evaluation of teaching quality in undergraduate colleges and universities, relevant policies need to be formulated and improved. These policies should include the application scope of big data technology, standards for data collection and processing, privacy protection measures, etc. By formulating relevant policies, it can provide clear guidance and norms for the application of big data technology, and ensure that they play an active role in the evaluation of teaching quality in undergraduate universities.

At the same time, the policy should also encourage undergraduate universities to strengthen the research and development and application of big data technology, to provide a strong policy guarantee for the development of big data technology. In addition, the policy should also strengthen the supervision and evaluation of the teaching quality evaluation in undergraduate colleges and universities to ensure that the application effect of big data technology is fully played.

4.3.2 Implementation and supervision of system guarantee

In order to ensure the implementation and effect of relevant policies, it is necessary to establish an effective institutional guarantee mechanism. This includes the formulation of detailed implementation plans, clarifying the division of responsibilities, and strengthening supervision and inspection. Through the implementation of the system guarantee mechanism, big data technology can be widely applied and effectively implemented in the teaching quality evaluation of undergraduate colleges and universities.

At the same time, it is also necessary to strengthen the supervision and management of the institutional guarantee mechanism to find and solve problems in time. For example, a regular inspection and evaluation mechanism can be established to evaluate and give feedback on the application effect of big data technology, so that it can adjust and optimize relevant policies and measures in a timely manner. In addition, a complaint and reporting mechanism can also be established to encourage teachers and students to put forward opinions and suggestions on the application of big data technology, so as to promote the continuous improvement and development of big data technology.

To sum up, big data technology faces many challenges in the evaluation of teaching quality in undergraduate universities, but it can be effectively met by strengthening data quality and privacy protection, technology and talent support, system and policy support. In the future, with the continuous development and improvement of big data technology, it is believed that its application in the evaluation of teaching quality of undergraduate colleges and universities will be more extensive and in-depth, to provide strong support for the improvement of teaching quality and level of undergraduate colleges and universities.

5. CONCLUSION

Through the big data technology in undergraduate course colleges and universities teaching quality evaluation of the effect of in-depth analysis, we found that big data technology not only significantly improve the efficiency and accuracy of teaching quality evaluation, also for education managers provides a more comprehensive and in-depth data support, help them more accurately grasp the teaching situation, formulate targeted improvement measures. Through mining and analyzing a large number of teaching data, big data technology reveals the potential laws and problems in the teaching process, and provides a strong guarantee for the continuous improvement of teaching quality.

At the same time, we also realize that the potential impact of big data technology on the future teaching quality assessment will be profound. With the continuous progress of technology and the increasingly rich data resources, big data technology will play an increasingly important role in the teaching quality evaluation, and promote the development of the evaluation system to a more intelligent and personalized direction.

Looking forward to the future, the application prospect of big data technology in the field of education is broad. It will not only continue to deepen the application in teaching quality evaluation, but also expand to all aspects of education management, such as curriculum setting, teaching method innovation, student management and so on. In addition, the future development direction of teaching quality evaluation in undergraduate colleges and universities will be more diversified and intelligent to meet the needs of educational development in the new era. e believe that under the promotion of big data technology, the teaching quality of undergraduate universities will reach a new level.

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