Analysis of the Effectiveness of Online Teaching Based on Big Data

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Abstract. Online teaching is a new teaching method that has emerged with the development of the Internet. Online teaching can realize remote teaching with the help of a network platform, which can not only meet the learning needs of students anytime and anywhere, but also achieve the purpose of teacher-student interaction and personalized teaching. Applying big data to online teaching can undoubtedly improve teaching efficiency to the greatest extent. This article will analyze the effectiveness of online teaching based on big data, and point out that the use of big data analysis can improve the pertinence of teaching and improve the effectiveness of online teaching. Effectiveness improves the quality of teaching.

Keywords: Big Data, Online Teaching, Effectiveness, Analysis

1. Introduction
The rapid development of Internet technology and education informatization has accelerated people's learning, changed the way of thinking and cognition, and online learning models have quickly emerged and been widely recognized. This new learning method and education model will surely drive the reform and innovation of education informatization. While online learning is developing rapidly, it is also facing some challenges. The low course completion rate and user churn in online learning platforms frequently occur. In order to find out the reasons for this situation, analyze the records in the online learning platform under the background of big data. A large amount of user learning behavior data can be analyzed by tracking various learning behaviors generated by users in the learning process, which can provide certain guidance and suggestions for teachers and platform managers to supervise and interfere with learners’ learning. Therefore, on the basis of summarizing the development status of online learning behavior and related theoretical research, this article first defines the connotation of online learning behavior, introduces artificial intelligence theory, and conducts online learning behavior from structural, functional and method dimensions. Based on the classification of categories, and on the basis of analyzing the related factors and driving forces of online learning behavior, the overall structure of the online learning behavior analysis model in the big data environment is given. Secondly, according to the overall structure of the analysis model, the online learning behavior analysis model in the big data environment is constructed from left to right and top to bottom. First, the online learning behavior data model is constructed from a multi-dimensional and multi-level perspective to determine data collection. The source, method and process of the online learning behavior analysis model were
then designed for the horizontal and vertical processes. On this basis, the specific algorithms involved in each link in the online learning behavior analysis model are implemented using big data processing technology. This article enriches behavioral science and artificial intelligence theoretical methods and applications, and deeply studies online learning behavior analysis models. It can not only provide theoretical foundations and data standards for behavioral data collection and analysis, but also facilitate teachers and platform managers to refine and professionalize Modernized teaching management has important guiding significance for promoting the rapid development of education informatization in our country.

In today's teaching, it is no longer enough to rely solely on teachers' under-class teaching. With the help of Internet platforms to carry out online teaching, many high-quality and valuable courses can be shared. At the same time, teaching itself has a strong purpose and consciousness. Through teaching, knowledge and skills can be transferred to students. In the teaching process, a lot of data will be generated. For example, in teaching, students’ mastery of a certain knowledge point and the answers to the exercises after class, the wrong questions and score information generated after each test, etc., contain a lot of fresh data, but it is easy to make people ignore. In the process of online teaching, these data can often be easily collected. These teaching data can guide targeted teaching well, and it is more conducive to improving the quality of teaching.

2. The Application of Big Data in Education

Big data is an interdisciplinary and multi-field research topic. Many scholars, professionals and institutions have explained the definition of big data from different perspectives. In this section, the author sorts out and summarizes the conceptual connotation of big data based on the various attributes of big data (technical attributes, social attributes, philosophical attributes, scientific research attributes and other attributes). EMC describes big data like this: "Big data is not an accurate term; on the contrary, it is a representation of the endless accumulation of various data (most of which are unstructured). It is used to describe those data sets that grow exponentially and are too large, too primitive, or too unstructured to be analyzed using relational database methods."

From the perspective of the value of big data, it can also be understood as a new research method. In scientific research, the theoretical basis, practice norms, and behaviors that a group of scientists follow together are not fixed, but change with the development of science and technology in a specific external environment. In 2007, Jim Gray, a computer Turing Award winner and database expert, pointed out in a speech that with the rapid innovation and progress of information technology, and the continuous growth and accumulation of data, the traditional scientific research paradigm has been unable to adapt to some New research fields require brand-new paradigms to guide scientific research under the background of the new era. Gray further proposed that big data will become the fourth paradigm of scientific research following the empirical paradigm based on observation and experiment, the theoretical paradigm based on modeling and induction, and the simulation paradigm based on simulating complex phenomena. Gray called it "Data-Intensive Scientific Discovery", which is a data-intensive computing paradigm that combines theory, experiment and simulation based on data investigation. Scientists not only solve difficult scientific problems through data collection and analysis, but also treat data as the objects and tools of scientific research to think, design and implement research. The fourth paradigm of scientific research calls on researchers to pay attention to the collection, description, preservation, analysis and reuse of data, while giving play to the interactivity and openness of the Internet. It is a data-based, open and collaborative research and innovation model.

In 2009, Microsoft Research published a monograph titled "The Fourth Paradigm: Data-intensive Scientific Discovery" (The Fourth Paradigm: Data-intensive Scientific Discovery). The book is based on Gray’s theory, from the perspective of research model changes. Analyze big data and its revolutionary impact on scientific research. The content covers data-intensive scientific discoveries in the environmental and scientific fields such as the earth, environment, and oceans, as well as in the fields of medicine, biological systems, and medical services; the challenges faced by digital information and scientific computing infrastructure in the era of big data: digital academic information exchange,
etc. Mass data scientific research activities, processes and methods; grasp the connotation and methods of the fourth paradigm, such as continuous collection of scientific research data, establishment of systematic tools and facility management data life cycles, development of data analysis and visualization tools based on scientific research issues, etc.

The internationally renowned consulting company McKinsey first proposed the arrival of the "big data" era. McKinsey pointed out: "Data has become an important factor of production and has penetrated into various industries and business sectors." Another name for big data is big data. As the name suggests, it refers to the huge amount of data, so that the current mainstream software cannot obtain, process and organize various information to help enterprises make decisions within a certain period of time. Big data mainly has the following four characteristics: big data volume, diverse types, high value and fast speed. The biggest meaning of "big data" is "value-added", it can improve the processing capacity of data, and can realize the value-added of data by processing the data, and help people make better decisions. Online teaching is not limited by time and space, and you can study independently according to your favorite learning method. The "Ten-Year Development Plan for Informatization of Teaching (2011-2020)" clearly pointed out that the reform of education and teaching in schools should focus on breakthroughs in the use of diversified and personalized learning methods by learners. Currently, online teaching has become a research hotspot in the fields of differential education, blended education and lifelong learning education. With the raging new crown virus that has occurred this year, many learners around the world have generally adopted online teaching methods, and the penetration rate of school education users has been greatly increased. Users of various groups have shown high enthusiasm for online education. How to apply big data to online teaching? How to use big data to mine the potential value of online teaching has become the focus of research. In fact, the use of data analysis can carry out targeted analysis of the characteristics and learning of each learner in the school and predict the future learning ability. At the same time, it can provide each learner with a personalized learning plan to adapt to different teaching levels. In the "Educational Data Mining and Analysis to Improve Teaching Overview", it is clearly pointed out that it is necessary to integrate educational big data in the field of education and teaching, and use data mining and data analysis techniques to achieve the purpose of improvement. teaching ability. In recent years, my country has successively promulgated the action plan to promote the development of big data, the "Internet +" action plan and the development plan of a new generation of artificial intelligence and other documents, clearly using big data to develop big data. Educational and cultural system.

3. Methods and Approaches of Big Data Analysis to Improve Teaching Effectiveness

The effectiveness of online education mainly refers to "education that can benefit the growth of students." But how to judge whether it is beneficial to growth is a very challenging problem. However, the improvement of students' academic level and the increase of knowledge are undoubtedly the strongest evidence for the effectiveness of online teaching. "Online teaching" should first be the effectiveness of knowledge learning, through the convenience, high efficiency, and wide sharing of online teaching, it can strengthen the effectiveness of learning and produce the effect of migration learning, so that online education can maximize the good environment for students' intellectual development and physical development.

The effectiveness of teaching requires corresponding evaluation standards, evaluation must involve measurement, and measurement needs to involve data and process data. Nowadays, with the advent of the Internet era, new information release methods using the Internet as the carrier continue to emerge, and the explosive growth of data has prompted the arrival of the era of data education. In terms of big data, its main characteristics are high speed, scale and diversity. From the perspective of high-speed analysis, in addition to mastering the learning data of students, teachers also need to dig out information hidden behind the data, such as information about teaching and learning, which can guide the formulation of targeted teaching decisions. The key to big data processing is data analysis, because only in the process of data analysis can the value of big data itself be tapped. There are two main processing modes for big data, namely stream processing and batch processing. The difference between the two is
that stream processing is directly processed while batch processing is stored first and then processed. In the process of online education, teachers can quickly grasp the learning information in student tests with the help of stream processing, and adopt compensation teaching or adjust teaching strategies based on the information obtained by processing. The main advantage of online education compared to traditional teaching methods is that it is easy to collect Data, and stream processing saves the teacher's analysis, so it will definitely help to improve the effectiveness of teaching. From the perspective of scale, compared with traditional classroom education, online education has a larger data scale. At present, the audience of online education is relatively large. There are usually dozens of students in traditional classroom education, which can be said to be a small group. Small groups often lack rigor in using data analysis, and online teaching will generate a lot of teaching data due to the large number of students. These data are relatively big data. From the perspective of diversity, all the behavioral data of teachers and students in online education can be understood as big data; the second is the personalization of students, the performance of different personalities is the data, and often these data are the most valuable.

Collecting data is a very important process in teaching. At present, data collection in the teaching process can be divided into "online data collection" and "offline data collection". For online education, we generally adopt online collection. The online collection process is mainly through the use of today's digital teaching platform and various terminal learning devices to obtain students' online classroom homework, questioning and interaction.

For the collected data, data analysis is required. Common data includes students’ test scores and some students’ test scores. The current analysis of academic performance should be multi-level. Using big data analysis, each student can be The academic performance of the time period and the performance comparison between each teacher and each subject are all important indicators used to judge the effectiveness of teaching. Of course, teaching evaluation is essentially a chaotic system, which is mainly characterized by nonlinearity and openness. There is inevitability in accident, which contains strange factors. Through the analysis and monitoring of unexpected effects, we can fully understand the information and improve the quality of classroom teaching design and implementation, thereby ensuring the effectiveness of classroom teaching. The evaluation of student learning effects in the online teaching process is essentially a chaotic system. It is necessary to fully understand the online teaching process to further improve the teaching effect.

This article summarizes specific methods and methods that rely on big data to improve teaching effects in the following three points.

3.1. With the Help of Big Data Analysis to Determine the Teaching Focus, Carry out Targeted Teaching
As we all know, teachers need to continuously learn to enrich their own knowledge and extensively absorb excellent teaching experience, methods, and results to achieve the improvement of teaching effectiveness. The most significant advantage of big data is that it provides rich and diversified data on practical activities. This provides a wealth of teaching materials for online education. Especially with the help of big data to organize and analyze the data, it can directly cut the weak links in the current online education process. For online education, through the rich teaching data resources, we can find and understand the weak links of students in the first time, so as to carry out targeted teaching to help students overcome the weak links, thereby effectively improving the effect of teaching.

3.2. Use Big Data Analysis to Obtain Typical Cases and Carry out Problem Teaching
In the online teaching process, you can use the teaching of typical problem cases to achieve multiple teaching effects. In the process of online teaching, teachers should be good at using big data analysis methods to find some typical teaching cases with common characteristics. Through these cases, students can learn to think about themselves and learn how to solve problems. It can be said that this can only be achieved with the help of big data analysis. Identify typical cases that have something in common.
3.3. Formulate Online Teaching Standards Based on Big Data Analysis

Although the application of big data analysis in online teaching can effectively improve teaching effects, it is necessary to formulate online teaching service standards in the context of big data analysis to make full use of the advantages of big data in online teaching. The establishment of online teaching standards mainly includes many teaching factors such as the goal, design and environment of online teaching. The establishment of various platforms in online teaching should provide users with integrated services of network, computing and storage. At the same time, if the results of online teaching can be shared, a unified standard for online teaching will enable users on different platforms to share resources.

How to use big data?

Since the new century, "technical ingenuity" has provided strong support for the use of big data in the practical teaching process. With the spread of the concepts and practices of "MO Classes" and "Small and Micro Classes", the storage, extraction and analysis of massive amounts of teaching data is not only technically possible, but also an inevitable requirement for teaching and research.

Data from the frontline of teaching indicate that the TRP platform can not only reduce the work intensity of writing teachers, but also improve the quality of composition evaluation. First of all, it takes 30 seconds to evaluate and modify an English composition of about 200 words on the TRP platform. The "error rate" is generally about 38%, and the "correct rate" is above 85%. Secondly, according to the content and level of the article, the system automatically generates English comments, covering the overall evaluation, whether off-topic, spelling errors, grammatical errors, length requirements, and late submissions. This is difficult for any English teacher Completed in a short time. Finally, for each article, the system will also provide a detailed "physical examination report" to stimulate learners' awareness of error correction and write correct and smooth English compositions. Teaching practices from Tsinghua University, University of Science and Technology Beijing, and China University of Political Science and Law show that through the use of the TRP platform, the concept and practice of big data in five aspects have a positive supporting role in the teaching of English writing.

3.4. Guided by the Frontiers of the Subject

In the past 30 years, the role and influence of teacher feedback has been the frontier issue of the subject. The analysis based on big data further proves that reflecting and strengthening this interactive relationship is the key to cutting-edge and innovative writing.

3.5. Adapt to the Changes of the Times

Throughout the domestic and foreign research on error correction feedback information and automatic evaluation systems, two conclusions can be drawn. First of all, error correction feedback is not only beneficial, but also necessary; secondly, technological advancement helps second and foreign language teaching.

3.6. Innovative Teaching Reform

The teaching practice of the university English teaching team of University of Science and Technology Beijing, which lasted for eight semesters, has proved that the teaching reform based on big data is more conducive to building a new teaching model suitable for social development. This teaching team, with the help of the TRP teaching platform, has constructed a 3 million Chinese student English writing corpus. Through the analysis of these authentic texts, a corpus of error types based on massive data has been formed, which has played a good role in teaching promotion for improving the accuracy of college students’ English writing.

3.7. Strengthen Scientific Research

What kind of evaluation method is more accurate, objective, economical, and effective? These issues are the main points of concern for teachers of second language and foreign language writing. An empirical study based on 35,000 pieces of big data from an engineering college in Beijing shows that: technology is not omnipotent, and purely automated evaluation and reform is not desirable. Ecological
college English writing teaching reform requires hardware (teaching conditions) and software (The organic combination of teaching system) and humanware (teacher input) can achieve better teaching results.

4. Conclusion
In the "Internet +" era, the development prospects of online education are very broad. What schools should consider is how to better conduct online education, how to make better use of new technologies, and to apply new technologies to the Internet to achieve changes in the field of education. This article analyzes the effectiveness of online teaching based on big data, and points out the methods and approaches to improve online education with the help of big data. Based on this, we can develop visual, differentiated and customized learning strategies. The efficiency of learners' online learning provides a feasible solution.

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