Scientific and Social Research, 2024, Volume 6, Issue 8
https://ojs.bbwpublisher.com/index.php/SSR
Online ISSN: 2981-9946
Print ISSN: 2661-4332

Research on Public Service Model Based on Cloud Computing Educational Resources Big Data

Shengtao Zhou*

Heilongjiang Ecological Engineering Vocational College, Harbin 150025, Heilongjiang Province, China

***Corresponding author:** Shengtao Zhou, 95821212@qq.com

Abstract: This paper discusses the public service model based on big data of educational resources in cloud computing, and first defines "big data of educational resources" and explains its main characteristics. On this basis, the architecture and design principles of this public service model are analyzed in detail, covering data collection, processing flow, and the realization mechanism of personalized education services. The importance of service quality assurance, performance monitoring, and security and privacy protection is particularly emphasized, and a cost-benefit assessment is conducted. Finally, in response to future trends and challenges, the article proposes topics that service providers, policymakers, and educators need to face together to promote continuous progress in the technological and regulatory environment.

Keywords: Cloud computing; Educational resources; Big data; Public service model

Online publication: August 23, 2024

1. Introduction

In the digital information era, big data of educational resources, as an emerging asset, is gradually transforming the way of understanding and practicing education. Cloud computing, as the core of technical support, not only makes data processing more efficient and flexible but also promotes the evolution of the education public service model. Through the deep integration of big data analysis and cloud computing, the efficiency of educational resource management and use can be substantially improved to achieve personalized educational services, which is the focus of this paper. This paper systematically studies the big data public service model of educational resources based on cloud computing, hoping to provide a scientific reference basis for the future direction of education.

2. Definition and characteristics of educational resources big data

In the modern educational environment, big data of educational resources refers to the collection, storage,

processing, and analysis of massive data involving the field of education using information technology, and they contain multi-dimensional information, such as learning behavior data, educational content data, management and operation data, and so on. This type of data is characterized by huge volume, diverse types, fast update speed, and high-value density. Because of this, its processing and analysis present unusual challenges against traditional databases and open up unique insights and application scenarios [1]. The characteristics are obvious, not only in its huge scale, but also in the variety, timeliness, authenticity, and broad value, which makes it an excellent demonstration of the capabilities of the cloud computing environment.

On the other hand, the practical application of educational resources big data is far more complex than simply piling up data, and it plays an irreplaceable role in promoting personalized teaching strategies, optimizing course structure, improving teaching quality and other fields through deep learning algorithms and intelligent analysis [2]. Imagine, that just by clicking the mouse or touching the screen, it is possible to access quality teaching resources in any corner, and the needs and progress of each learner are accurately captured and met, enhancing the learning experience while truly realizing the optimal allocation of resources. In this process, big data has become a bridge connecting learners, educational institutions, and resource providers, constantly outputting targeted solutions and innovative ideas.

3. The analysis of the public service model based on cloud computing educational resources big data

3.1. The basic structure and design principle of the public service model

In the public service model of educational resources supported by cloud computing, the design principle and basic architecture give the model its flexibility and expandability. Broadly speaking, this architecture is deployed on distributed cloud servers, and the core concept is to realize centralized storage, efficient processing, and universal accessibility of resources. Emphasis is placed on a modular design that allows for synergy between various components such as the user access layer, the business logic layer, the data processing layer, and the storage layer, each of which performs a specific function with precision in the context of big data. For example, the user access layer emphasizes the user-friendliness of the interactive interface and the high-speed response of access, while the data processing layer employs advanced algorithms to extract useful information from the massive amount of pedagogical data, and effectively transforms all of this into the services required by users through the business logic layer. The design principle always revolves around the three major requirements of reliability, security, and ease of use, in which reliability guarantees the continuous and stable provision of services, whether it is hardware redundancy or network optimization, all serving this goal [3]. Security controls data access rights, strictly manages user authentication and encrypted transmission, and ensures that data is not spied on or tampered with during transmission. As for ease of use, while providing to meet the needs of users, it also needs to simplify the operation process so that non-professional users can easily get started. It is only by adeptly designing a humanized service process that the public service model based on big data of cloud computing educational resources can ultimately be promoted to be widely used among learners of different ages and backgrounds.

3.2. Data acquisition and processing process

Data collection and processing constitute the key stages of the cloud computing-based big data public service model, and their accuracy and efficiency directly affect the quality of the final service. The process begins with extensive and in-depth data collection, which not only includes standardized test scores, online interaction logs, and classroom videos but also involves more obscure social media interaction information and data generated

in the learning management system (LMS), which converge to form a macro picture of the teaching and learning stock and provide rich materials for subsequent analysis. This data is then washed, cleaned, stripped of unwanted impurities, formatted, and prepared for the next turn under the powerful and secure processing capabilities of the cloud platform. The core of the processing process lies in transforming the raw data into meaningful information by applying machine learning algorithms and continuously training the data models to unearth the patterns and trends lurking behind the data [4]. For example, predicting students' academic performance, recommending personalized learning resources, or optimizing teaching programs all depend on the efficient execution of this process. In addition, real-time analysis of data is also significantly enhanced on cloud platforms, enabling teachers, school administrators, and education policymakers to gain instant insights to make more informed decisions. Only in this way is the cloud computing platform able to present users with a seamlessly connected digital education space, where data sharing and application crossover between each other becomes possible, and because of this, the shape and nature of teaching and learning are redefined, while the learning and educational experiences of teachers and students are made exceptional.

3.3. Mechanisms for realizing personalized education services

The realization mechanism of personalized educational services is the core of the big data public service model of cloud-based educational resources, which ensures that educational resources are delivered and utilized in a way that is most relevant to the needs of learners. This mechanism starts by recognizing the unique needs of each learner, taking learning styles, knowledge backgrounds, interests, and personal learning goals into account, and using data to draw a precise learning profile. These profiles are then transformed into customized learning paths and resource allocation solutions, empowered by the computational and analytical capabilities of the cloud computing platform. There is a wide variety of data involved, from test scores to online engagement, from homework submission records to forum discussion interactions, each data point is a key basis for understanding learners and optimizing services [5]. The presentation of educational resources also focuses on personalization. Through flexible content delivery and the combination of learners' real-time progress feedback, the cloud platform can adjust the resource allocation strategy, such as dynamically adjusting the difficulty of the course or recommending learning materials that meet the current ability level of the learners. At the same time, big data analytics can also help teachers accurately capture class conditions to provide differentiated guidance and support for different student groups [6]. In addition, the adaptive learning system in the mechanism relies on the powerful background processing capability of cloud services, which can gradually improve the personalized learning experience in the process of iterating the learning data. Such a cyclic evolution makes the realization of personalized education services not a static one-time layout, but a dynamic process that can be adjusted at any time and flexibly respond to changes in learner needs.

3.4. Quality assurance and performance monitoring

In seeking to operate a public service model based on big data of cloud computing educational resources, it is crucial to ensure high quality of service and stable monitoring of system performance. Quality assurance should start from all levels, including continuous investment in hardware resources to maintain their advancement, regular updating of software functions to weed out potential defects, and fine-polishing of service processes to enhance user experience. This requires the establishment of a comprehensive quality management system with standardized processes to cultivate user trust and ensure that each step of the operation achieves the desired results. Performance monitoring, on the other hand, is an indispensable part of guaranteeing smooth service operation, involving real-time tracking and analysis of key indicators such as system response time, resource

utilization, and service availability [7]. Through the use of intelligent monitoring tools and techniques, the cloud platform closely monitors all aspects of service operation and promptly identifies and disposes of potential failure points or bottlenecks. If the monitoring results show any signs of deviation from the normal range, an automated reporting mechanism is immediately activated and the relevant staff is summoned to resolve the issue, thus ensuring that the system does not affect end users due to sudden performance degradation [8]. Further, the quality and performance monitoring data itself provides valuable feedback that can be used for continuous service improvement. Combined with big data analytics, patterns of user behavior can be accurately depicted to detect and optimize system performance in various usage scenarios.

3.5. Security and privacy protection strategies

When exploring a public service model based on cloud computing big data for educational resources, security, and privacy protection strategies stand at the height of importance, as they are like the bottom line of service quality, ensuring the security of user information, data integrity, and inviolability of privacy. To build a secure digital education environment, the formulation of strategies must be built around the full cycle of data management, specifically the collection, storage, processing, and transmission of each data, all involving precise technical measures and strict management standards. Encryption technology plays the role of the gatekeeper, from the beginning to the end of the data, all through the strict encryption procedures to ensure that the data in the migration process is not prying or tampering [9]. Not only that, to further deepen security and privacy protection, it is necessary to introduce multiple layers of protection mechanisms, including but not limited to firewall settings, intrusion detection systems, security event management, and regular security audits. These strategies do not operate in isolation but are closely connected and together form a dynamically adapted defense system. Privacy protection that emphasizes user-centricity requires service providers to inform users of the purpose of data use, respect and enforce users' choices about the processing of their data, and follow the principle of minimum necessity in data collection, obtaining only information that is necessary for the provision of services. A long-term mechanism for privacy protection also requires a comprehensive legal and policy framework that goes hand in hand with technological innovation. The application of big data in education should be guided and regulated by continuously updated policy guidelines and legal provisions, and the relevant units and individuals should also take the responsibility of protecting data security [10]. Cloud computing platforms should invest corresponding resources to comply with the operational procedures, actively respond to regulatory requirements, and ensure that each service is operated on the track of the rule of law.

4. The future development trend and challenges of the public service model based on cloud computing educational resources big data

With the rapid development of technology, the public service model based on cloud computing educational resources big data is in a stage of rapid evolution. Future trends call for more advanced data analysis capabilities, integration of artificial intelligence algorithms, and more adaptive learning environments. With this will come the need for real-time updating of teaching content, and curriculum resources must also tend to be highly personalized and dynamic to better adapt to individual learning progress and levels of understanding. In addition, with the rollout of 5G and future network technologies, seamless connectivity between cloud-based services and mobile learning devices can be expected, which will greatly enhance the flexibility and accessibility of the learning process. Meanwhile, the convergence of technologies such as Virtual Reality (VR) and Augmented Reality (AR) will drive more immersive learning experiences and improve students' understanding of complex concepts and operational skills.

However, these trends are not without challenges, and data security and privacy protection will remain at the forefront. With the explosive growth in data volume, more sophisticated technologies and strict control systems are needed to ensure secure data transmission and storage and prevent data leakage and misuse. In addition, the reliability and stability of cloud services must be continuously improved to ensure uninterrupted and high-quality services. The balance and universality of educational resource services are also being tested, and how to ensure the quality of services while enabling them to benefit a wider range of users, especially in remote areas and disadvantaged groups, is a major issue.

In the face of these challenges, strategies, and decisions need to be formulated in a way that balances innovation and risk management, and education policymakers and technology service providers need to work together to formulate a scientific and reasonable blueprint for development. Strengthening the training of teachers and students in digital teaching and learning will be the key to enhancing the entire education system to cope with the challenges ahead. Educational resource developers must have a deeper understanding of the architecture and operation mechanism of cloud computing and big data technologies, and use them as a basis for creating safer and more effective learning tools. Relevant state departments and all sectors of society must also work together to build sound laws and regulations and ensure the vitality of technological innovation, to jointly promote the development of the education public service model in the direction of greater intelligence, efficiency, and equality.

5. Conclusion

To sum up, the big data public service model of educational resources based on cloud computing brings many challenges and problems while providing the possibility of personalized learning experiences. From security and privacy protection to quality control and cost-benefit assessment, each aspect requires meticulous research and innovative solutions. In the face of future trends and challenges in education, it is important to continue to optimize existing models, strengthen interdisciplinary collaboration, and create a healthy environment for technology adoption to continuously drive educational technology forward. It is expected that this paper will provide valuable insights for practitioners, policymakers, and researchers in the education industry to jointly promote the construction of an efficient, fair, and sustainable education ecosystem.

Disclosure statement

The author declares no conflict of interest.

References

[1] Li J, 2023, Application of Big Data and Cloud Computing Technology in Smart City Construction. Network Security Technology and Application, 2023(02): 102–103.

[2] Chang SH, 2023, Application Analysis of Big Data and Cloud Computing Technology in Smart City Construction. Commercial Exhibition Economy, 2023(01): 112–115.

[3] Cheng L, 2022, Ideas for Educational Reform under the Background of Cloud Computing and Big Data. Journal of Hubei Open Vocational College, 35(23): 170–172.

[4] Li YX, 2022, Characteristics and Risk Analysis of Cloud Computing and Big Data. Electronic Technology, 51(07): 100–101.

[5] Li S, 2022, “Big Data + Cloud Computing” Empowers Teaching Mode Innovation in Colleges and Universities.

Shanxi Youth, 2022(13): 40–42.

[6] Xiong SP, Tian ZC, 2022, Research on Online Education Platform of Informatized Civics and Politics Based on Big Data and Cloud Computing. Journal of Fujian Open University, 2022(02): 9–12.

[7] Wang L, Tian MQ, Gu RL, 2021, Research on the Application of Big Data and Cloud Computing Technology in Smart Campuses. Yangtze River Information and Communication, 34(12): 105–107.

[8] Lv ZF, 2021, Application of Big Data and Cloud Computing Technology in Smart Campus. Computer Knowledge and Technology, 17(35): 25–26.

[9] Niu JL, Song QY, 2021, Application of Cloud Computing Technology in the Era of Big Data. Network Security Technology and Application, 2021(10): 55–56.

[10] Yang SD, 2021, Analysis of the Impact of Big Data and Cloud Computing on the Construction of Education Informatization in Colleges and Universities. Network Security Technology and Application, 2021(10): 100–102.