Curriculum Teaching and Research Based on Cloud Computing and Big Data

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Abstract. This study investigates the integrated application of cloud computing and big data in the field of education and its impact on curriculum teaching. Through a comprehensive review of the fundamental principles, current applications, and relevant literature, the study reveals the advantages and challenges of cloud computing and big data in aspects such as curriculum design, learning analytic, and personalized teaching. It also explores their influence on aspects like the sharing of teaching resources, the construction of online learning environments, and the evaluation of student learning outcomes. Furthermore, through case analysis and empirical studies, this paper provides a more in-depth validation of the practical effects of cloud computing and big data in improving teaching effectiveness, promoting educational innovation, and cultivating students' information literacy. In summary, the integration of cloud computing and big data provides new perspectives and solutions for building smart education, while also laying a solid foundation for nurturing talents capable of meeting the demands of future society.

1. Introduction

The widespread application of cloud computing and big data technology across various domains has become a prominent feature of contemporary society. In the field of education, traditional models of curriculum teaching are facing increasingly complex challenges, including diverse student learning needs, rapid advancements in information technology, and the internationalization of education in a global context. To address these challenges, an increasing number of universities are incorporating cloud computing and big data courses into their teaching frameworks to enhance teaching effectiveness, personalize instruction, and better adapt to the developmental needs of students.the purpose of this study is to delve into the integration and application of cloud computing and big data[1] in curriculum teaching, aiming to reveal their potential value in enhancing teaching quality, innovating educational methods, and fostering students' comprehensive abilities. Through a systematic exploration of this field, our goal is to provide a profound understanding for education decision-makers, educational technology researchers, and practitioners, offering substantive insights for the future development of education.

1.1. The Importance of Cloud Computing and Big Data Courses

Cloud computing and big data courses are a crucial component in nurturing future leaders in the field of computer science. These courses provide a profound understanding of cloud architecture, distributed systems, and large-scale data processing, fostering students' ability to design, implement, and manage solutions in highly complex computing environments. Through hands-on experience in designing cloud services and processing large-scale data, students not only acquire advanced technical skills but also develop systemic thinking and engineering practices. This comprehensive education enables graduates to assume roles in various sectors, driving innovation[2] across the entire industry. Additionally, it cultivates students into future technology leaders. By deeply studying cloud computing architecture, big data algorithms, and analytical methods, students gain the capability to address complex contemporary issues. This includes not only technological challenges but also a profound understanding of aspects such as data privacy, security, and ethics. Students learn to extract information, identify patterns, and derive profound insights when dealing with real-world large-scale data. This well-rounded competency empowers students to

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continually explore the forefront of technological innovation, playing a crucial role in addressing challenges in the realms of society, business, and science.

1.2. The Curriculum Architecture of Cloud Computing and Big Data Courses

The Cloud Computing and Big Data course aims to delve into core concepts of cloud computing, such as virtualization, containerization, and microservices. Through theoretical study and practical case exercises, students develop skills in designing and managing cloud infrastructure. The focus of the Big Data component lies in data storage, processing, analysis, and visualization, covering areas like distributed databases[3]], machine learning, and data mining. This equips students to proficiently handle large-scale data and extract valuable insights. The course emphasizes interdisciplinary integration and practical applications, fostering students' systematic thinking and problem-solving abilities. Intersections with disciplines like network security,artificial intelligence, and business analytics enable students to apply their knowledge in complex and dynamic environments. In terms of practical application, students engage in real projects, industry collaborations, or independent research, implementing tasks such as building cloud platforms and constructing big data solutions. This translates theoretical knowledge into practical skills, laying a solid foundation for their future careers.

1.3. The development of cloud computing and big data courses in the education field.

The development of cloud computing and big data courses plays a crucial role in driving modernization in today's education sector. With the rapid advancement of information technology, educational systems are no longer confined to traditional teaching methods[4] but are gradually moving towards a new era of digitization and intelligence. As cutting-edge technologies, cloud computing and big data offer possibilities for more efficient information management, resource allocation, and personalized teaching within the education system. By cultivating students' abilities to analyze and utilize large-scale data[5], these courses help establish their adaptability, enabling them to better meet the future societal demands for technological proficiency.the development of these courses in the education sector is not merely an elevation of technological skills but also a comprehensive cultivation of students' overall competencies. Due to the widespread application of cloud computing and big data, students undergo training in an internationalized technological environment, fostering an international perspective. Furthermore, through engagement in interdisciplinary research and practical projects, students develop critical thinking, teamwork, innovative thinking, and other comprehensive skills, making them competitive computer professionals on the international stage. This developmental direction underscores the crucial role that cloud computing and big data courses play in promoting a more comprehensive and internationalized development in the field of education[6].

2. Teaching research methods and data analysis

In teaching research, we adopt an in-depth teaching research approach to analyze the theoretical and practical aspects of cloud computing and big data courses. In the theoretical courses, we evaluate students' grasp of theoretical knowledge through classroom observations and student questionnaires, focusing on their participation, depth of conceptual understanding, and problem-solving abilities. In the practical courses, we assess students' practical skills through project evaluations and analysis of their actual outcomes, with a particular emphasis on teamwork and the application of problem-solving skills. This comprehensive approach and data analysis help us gain a holistic understanding of students' learning status and provide support for optimizing teaching strategies.

2.1. The design of theoretical course teaching research

The course on Cloud Computing and Big Data[7] aims to provide in-depth knowledge of core theories and practices in the field of cloud computing and big data. Students will learn the basics of cloud computing, including service and deployment models, and the features, architecture, and technology stack of big data. The course emphasizes the integration of cloud computing and big data, including the application of container technology, to develop students' ability to process large-scale data in cloud environments. Through practical case studies and project experience, students will learn about the practical applications of cloud computing and big data in different fields and develop their problem-solving skills. The course also focuses on security and privacy issues, enabling students to become familiar with the technologies and regulatory compliance required to handle cloud security and big data privacy. Finally, students will explore emerging technology trends and career development directions to better prepare themselves for the future development of cloud computing and big data fields. Through in-depth data analysis, we comprehensively evaluate students' learning status and understand their needs through multiple dimensions of data, including grades, feedback, resource utilization, and project performance. We optimize teaching strategies and course design to ensure effective knowledge transmission and comprehensive student development.

2.2. Design of Practical Course Teaching and Learning Research

In undergraduate computer science programs, practical courses in the field of cloud computing and big data

focus on cultivating students' practical skills. Students actively engage in hands-on activities on cloud computing platforms, including deploying virtual machines, utilizing container technologies, and implementing automation deployment, to deepen their understanding of cloud computing fundamentals. In the context of big data, students build Hadoop[8] clusters, employ Spark for real-time data processing, and utilize NoSQL databases for handling large-scale unstructured data, enabling them to grasp core technologies in big data processing. Through comprehensive practical projects, students hone their abilities in project development, problem-solving, independent thinking, and teamwork, as they collaborate within teams. Additionally, the courses incorporate case studies of cloud computing and big data applications across various industries, providing students with in-depth knowledge of real-world business scenarios. By focusing on performance optimization, monitoring configuration, as well as security and privacy practices, students gradually develop practical skills in system performance optimization and security assurance. In summary, the practical courses in cloud computing[9] and big data aim to translate theoretical knowledge into practical operational skills, equipping students with comprehensive abilities to apply their knowledge in relevant fields and solve real-world problems.

In practical courses, thorough data analysis of students' hands-on work and project practice allows us to comprehensively assess their practical skills in the fields of cloud computing and big data. By analyzing students' performance in practical operations, such as their proficiency in using cloud service platforms and applying big data technologies, as well as their achievements in project practices, we gain insights into their problem-solving abilities, teamwork effectiveness, and more. Through analyzing data from monitoring and performance optimization projects, we further understand students' actual capabilities in system performance optimization and monitoring. The analysis of security and privacy practice data reveals students' understanding and application of cloud computing security configurations and big data privacy protection technologies. By delving into student feedback and survey data, we obtain detailed feedback on the course content and teaching methods, providing valuable suggestions for optimizing practical courses. This series of data analysis not only helps evaluate students' practical application abilities but also provides strong support for future course design and teaching improvements. Through such in-depth data analysis, our aim is to ensure the effective delivery of practical courses and cultivate students' comprehensive abilities in practical application and problem-solving.

3. Results and Discussion

In the teaching and research of cloud computing and big data courses, a series of insightful results have been obtained through comprehensive evaluation of students' academic performance and practical operational abilities.

3.1. Academic performance analysis

Through in-depth analysis of students' academic performance in theory courses, we have discovered that students' grades exhibit diversity, but overall performance is satisfactory. Exceptional students have made significant progress in comprehending the theories of cloud computing and big data, while some students may face challenges in grasping conceptual understanding. This suggests that the difficulty and depth of the course have a significant impact on students' academic performance. Student feedback and surveys indicate that the majority of students hold a positive attitude towards the course content and teaching methods. However, a few students have mentioned difficulties in comprehending specific concepts, providing valuable insights for further optimization of teaching methods, incorporating more examples, and case analyses.

3.2. Actual operational capability analysis

In terms of practical courses, students' practical skills have been significantly improved. The outcomes of practical projects demonstrate students' impressive progress in practical operations on cloud computing platforms, applications of big data technologies, and teamwork. This reflects the practicality of the practical course design and the cultivation of students' hands-on abilities. In-depth analysis of performance optimization projects reveals that students' practical abilities in system performance optimization and monitoring have been effectively honed. Additionally, data analysis on security and privacy practices showcases students' profound understanding of cloud computing security configurations and big data privacy protection technologies. This indicates significant progress in cultivating students' comprehensive practical abilities through practical courses.

3.3. Discussion

Through in-depth analysis of academic performance and practical skills, we are confident that the Cloud Computing and Big Data courses[10] have achieved a satisfactory balance between theory and practice. However, we are keenly aware of the difficulties some students face in understanding key concepts in theory courses, as well as the potential lack of personalized guidance in practical courses. In order to further enhance the quality of the courses, we have developed specific plans for teaching improvements.in future teaching improvements, we will optimize the teaching methods for theory courses in a more systematic way, with a focus on explaining key concepts, incorporating vivid examples and in-depth case studies, to better meet the needs of different students. Meanwhile, we plan to make more detailed adjustments to the practical courses, taking into account students' actual levels, introducing more practical projects and specific industry cases to enhance the practical applicability of the courses. These improvement plans aim to better facilitate students'

comprehensive development in both theory and practice. Overall, the teaching and research of the Cloud Computing and Big Data courses have achieved positive results in cultivating students' theoretical knowledge and practical skills. However, we are aware that there is still room for further improvement. These research findings provide valuable experience and insights for future course design and teaching methodology enhancements. Through ongoing teaching improvements, we aim to further enhance students' academic proficiency and practical application abilities, enabling them to better meet the challenges in the field of Cloud Computing and Big Data.

4. Conclusion

The in-depth research on Cloud Computing and Big Data courses has sparked a revolution in the field of education, providing new perspectives and creating new possibilities for cultivating future computer professionals. By combining theory and practice, we have nurtured students with a solid theoretical foundation and the flexibility to tackle challenges. This research is not just a course but also a starting point for students to step into the forefront of technology. In teaching, we deeply understand the breadth and depth of the discipline, and thus have developed detailed improvement plans. The theory courses will optimize methods and provide more specific examples to solidify the theoretical foundation. The practical courses will strengthen personalized guidance to ensure that students gain practical skills through projects. Despite facing challenges, we firmly believe that challenges are opportunities for improvement. Our goal is to cultivate more computer professionals with a global perspective, innovation, and teamwork skills. Guided by Cloud Computing and Big Data, we look forward to the outstanding achievements of students in the future. The research not only contributes experience to the discipline but also provides assistance to decision-makers, researchers, and practitioners. Through teaching improvements, we hope to enhance students' academic proficiency and application abilities, better preparing them to face the challenges of Cloud Computing and Big Data. All of these will push the boundaries of education and lay the foundation for cultivating future technology leaders.

Acknowledgment

This work was partially supported by the Science, Education and Industry Integration Program (2021PY02006 and 2021PY05001) of Qilu University of Technology,Teaching Reform Project（Z2021141） of Shandong Province,Natural Science Foundation (ZR2022QF010) of Shandong.

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