

The Application of Cloud Computing Technology in Basic Computer Teaching in Colleges and Universities

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Abstract: With the rapid development of information technology, cloud computing technology has become an important driving force for modern education informatization. The purpose of this paper is to discuss the application status, advantages and challenges of cloud computing technology in basic computer teaching in colleges and universities, and put forward corresponding solutions. By analyzing the characteristics and functions of cloud computing technology, combined with actual teaching cases, it shows its great potential in improving teaching efficiency, optimizing teaching resources, and promoting personalized teaching.

Keywords: Cloud Computing Technology, Computer Basic Teaching, College Education, Teaching Resources, Personalized Teaching

1.Introduction

With the rapid development of global information technology and the advancement of education digitalization, basic computer courses in colleges and universities play an important role in cultivating students' information literacy and computational thinking [1]. However, the traditional teaching model is increasingly inadequate in the face of problems such as diversified educational needs, decentralized teaching resources, and limited hardware equipment. The innovation of teaching methods and the optimal allocation of resources have become the core problems that need to be solved urgently [2-4].

In the past, the laboratory function provided by colleges and universities was relatively simple, and it may be difficult to meet the experimental needs of students, and with the help of cloud computing technology, the construction of virtual laboratories can be promoted, the experimental environment is deployed in the cloud, and the experimental resources are stored, and for students, they only need to be connected to the network and enter the network system to complete the related tasks of the basic computer experimental operation, including network programming and network configuration. There are also diversified links such as database management [5-7]. The virtual laboratory effectively enhances the utilization of experimental resources in the basic teaching of computer science in colleges and universities, and also reduces the cost consumption

brought by practical work and reduces the cost of maintaining the real computer experimental environment, which is a favorable attempt. In addition, for teachers, the virtual laboratory built on the basis of cloud technology provides great convenience for teachers, they can remotely monitor the entire experimental operation process without being on site, understand the students' completion of the experiment, judge the students' ability and the status of the students, and provide necessary guidance and help for students.

The introduction of cloud computing technology provides a new solution for university education. It realizes the on-demand supply of computing resources through the Internet, which creates the possibility of sharing and efficient use of teaching resources. At the same time, the virtual laboratory, online teaching platform and personalized learning system based on the cloud platform can effectively improve teaching efficiency, reduce education costs, and adapt to the learning needs of students at different levels. In recent years, many universities at home and abroad have begun to try to introduce cloud computing technology into basic teaching, and have achieved certain results, but they also face problems such as technical adaptability, data security, and teachers' technical adaptability.

Therefore, it is of great theoretical and practical significance to systematically explore the application value and challenges of cloud computing technology in basic computer teaching in colleges and universities, so as to promote the reform of teaching mode and

improve the quality of education. This paper will combine the technical characteristics of cloud computing with the actual application of education, and deeply analyze its application scenarios in the integration of teaching resources, teaching mode innovation and collaborative learning, so as to provide a reference for the informatization development of college education.

2.Cloud Computing Technology Theory

Cloud computing is an internet-based computing model that allows users to access shared computing resources, such as servers, storage, and applications, over a network. The core idea is to provide on-demand services over the network, so that users do not need to worry about the complexity of the underlying infrastructure [8]. Cloud computing features include on-demand services, elastic scaling, resource pooling, and cost-effectiveness. In terms of on-demand services, users can dynamically apply for and release computing resources according to actual needs without prior planning, thus greatly improving the flexibility of resource utilization. The elastic scalability enables cloud computing to quickly adjust the scale of resources according to changes in workloads to ensure the efficient operation of the system.

The implementation of cloud computing technology relies on a series of core technologies, such as virtualization technology, distributed storage, and big data processing. Virtualization technology significantly improves resource utilization efficiency by abstracting physical resources into multiple virtual resources. Distributed storage achieves efficient data access and fault tolerance by dispersing data across multiple physical devices. Big data processing uses the computing power of the cloud platform to support the analysis and mining of massive teaching data, thereby providing data support for educational decision-making and teaching personalization [9-11].

In the field of education, the application of cloud computing technology has achieved remarkable results. With the help of cloud computing, the online education platform can support real-time access and interaction of large-scale users, and provide a stable learning environment for learners. Relying on cloud technology, the virtual laboratory provides efficient and flexible experimental support for computer courses in colleges and universities. Through centralized storage and management, the teaching resource management system realizes cross-campus and even cross-school resource sharing. At the same time, with cloud-based

data analysis capabilities, educational institutions can provide students with personalized learning paths and recommended content, thereby significantly improving learning efficiency and effectiveness.

The wide application of cloud computing technology not only optimizes the allocation of educational resources, but also promotes the innovation of teaching mode and injects new vitality into the informatization construction of modern universities.

3.The Application of Cloud Computing Technology in Basic Computer Teaching in Colleges and Universities

The application of cloud computing technology in basic computer teaching in colleges and universities shows multi-level advantages and innovative scenarios, significantly improves the utilization efficiency of educational resources, and provides flexible teaching support for students and teachers. The following is a detailed description of resource sharing and optimization, virtual laboratory construction, personalized teaching support, and cross-school resource collaboration.

3.1 Sharing and Optimization of Teaching Resources

Cloud computing technology realizes the centralized management and sharing of teaching resources by building a cloud teaching resource library. Course materials, instructional videos, lab cases, and other content can be stored and distributed through the cloud, enabling students and teachers to access resources anytime, anywhere. This kind of cloud-based management of resources breaks through the physical limitations of traditional teaching resources, helps to update teaching content in real time and supports multiple terminals, and greatly improves the utilization and convenience of resources.

3.2 Construction of Virtual Laboratories

In terms of experimental teaching, the virtual laboratory based on cloud computing technology provides a flexible experimental environment for the basic computer courses in colleges and universities. Students can remotely access virtual labs over the network to complete programming, network configuration, and more without the need for high-performance local equipment. The virtual laboratory supports the rapid deployment of a variety of experimental scenarios and the dynamic adjustment of the experimental environment, which solves the teaching bottleneck caused by hardware limitations in

traditional laboratories. In addition, teachers can monitor students' lab progress in real-time through virtual labs and provide personalized guidance.

3.3 Personalized Teaching Support

Personalized instructional support is one of the highlights of cloud computing technology. With the data storage and analysis capabilities of the cloud platform, teachers can fully grasp the data of students' learning behavior, including learning progress, knowledge mastery, and learning preferences. Through this data, teachers can dynamically adjust teaching content and teaching strategies, and use the intelligent recommendation system to push teaching resources suitable for students' learning level, so as to improve teaching effectiveness. At the same time, students can also use the learning analysis platform to identify their learning weaknesses and conduct targeted review and practice.

3.4 Cross-school Resource Collaboration and Sharing

Cloud computing technology has also shown great potential in cross-school resource collaboration and sharing. Through the joint construction of the education cloud platform, different universities can share teaching resources, experimental data and course content, and realize the co-construction and sharing of resources. This cooperation mechanism not only optimizes the allocation of educational resources, but also effectively promotes educational equity and provides more possibilities for the teaching development of small and medium-sized universities. Cross-school collaboration can also facilitate distance teaching and academic exchanges, providing students with more diverse learning opportunities.

In general, the application of cloud computing technology in basic computer teaching in colleges and universities not only optimizes the allocation of resources, but also promotes the innovation of teaching modes and methods, and provides solid technical support and rich practical experience for the informatization development of modern college education.

4.The Advantages of Cloud Computing Technology in the Basic Teaching of Computer Science in Colleges and Universities

The application of cloud computing technology in the basic teaching of computer science in colleges and universities has not only brought far-reaching changes, but also demonstrated many advantages. The following will elaborate on its advantages from multiple

dimensions such as resource management, teaching mode, learning experience, and data-driven teaching.

4.1 Optimize Resource Management and Utilization

In traditional university education, teaching resources are often based on physical equipment, including servers, experimental equipment and multimedia teaching systems. This fixed pattern leads to uneven resource distribution and low utilization. Cloud computing technology integrates scattered resources into a unified cloud platform through virtualization and resource pooling, so as to achieve efficient scheduling and flexible allocation of resources. Teaching resources can be dynamically expanded on demand, avoiding waste caused by idle equipment. At the same time, this resource sharing model is especially suitable for small and medium-sized universities, making up for the shortcomings of their insufficient hardware resources.

For example, in the basic teaching of computer science in colleges and universities, the equipment of traditional laboratories is often unable to meet the needs due to the large number of students. Cloud-based virtual labs, on the other hand, can dynamically allocate compute and storage resources to ensure that every student receives adequate experimental support, whether for complex programming tasks or network configuration experiments for multiple devices. In addition, this method can also support multi-campus and cross-school resource sharing, making the optimal use of resources more efficient.

4.2 Improve the Flexibility and Efficiency of Teaching

Cloud computing technology has significantly increased the flexibility and efficiency of teaching and learning activities. In the traditional teaching model, teaching activities are usually limited by a fixed time and place, but the cloud platform breaks this limitation, allowing teachers and students to access teaching resources anytime and anywhere. This on-demand capability not only enables real-time interaction with online classes, but also enables teachers and students to participate in experiments and discussions through the remote learning platform.

In addition, cloud computing technology can reduce the preparation time for teaching. Teachers can quickly configure the teaching environment, such as experimental scenarios, development tools, and learning content, through the cloud platform, while students can complete experimental tasks directly

through a browser or a lightweight client without installing cumbersome software or configuring hardware devices.

4.3 Promote Personalized Teaching and Learning

With the data analysis capabilities of cloud computing, colleges and universities can achieve truly personalized teaching. Through the data collection and analysis of students' learning behaviors, the cloud platform can identify students' learning progress, knowledge mastery level and learning interests, and help teachers adjust teaching strategies. For example, practice questions or teaching videos are recommended according to students' knowledge weaknesses to provide targeted guidance for students with different learning abilities.

This data-based teaching optimization not only improves learning efficiency, but also allows students to be more actively involved in the learning process. In addition, the cloud computing platform allows students to plan their own learning progress. Through dynamic recommendations of personalized learning paths, students can choose the content that suits them, freeing themselves from the "one-size-fits-all" limitations of traditional teaching models.

4.4 Innovative Teaching Mode

Cloud computing technology provides technical support for colleges and universities to explore innovative teaching models. For example, in the flipped classroom model, teachers can upload teaching resources to the cloud platform, students can master the basic knowledge by watching teaching videos and completing online tests before class, and interactive discussions and practical operations will be held in class. The cloud-based platform's real-time data feedback capabilities enable teachers to dynamically adjust course content to ensure that each student's learning needs are met.

In addition, cloud computing technology is driving the development of blended learning. In blended teaching, cloud computing supports the seamless integration of online and offline teaching resources, where students can complete experiments, tests, or participate in discussions online, while offline focuses on in-depth communication and practice, forming a teaching model that combines theory and practice.

4.5 Support Collaboration and Shared Learning

The cloud-based collaborative learning model enhances interaction and cooperation between students

and between teachers and students. The cloud platform provides students with a real-time shared document and project development environment where students can collaborate on team tasks, such as developing a software project or co-designing a network topology. At the same time, teachers are able to guide students through tasks through real-time monitoring and feedback.

In addition, cross-school collaborative learning is enabled with the support of cloud computing technology. For example, different universities can jointly offer courses, engage students in the same teaching project through a shared cloud platform, or even achieve cross-border academic exchanges. This model not only broadens students' learning horizons, but also promotes the sharing of educational resources on a global scale.

4.6 Improve Data Security and Educational Equity

The built-in data security measures of the cloud computing platform enable the effective protection of teaching resources and student data. With permission management and data encryption, the privacy of students and teachers is guaranteed. At the same time, the spread of cloud computing is providing new opportunities for educational equity in under-resourced universities and regions. As long as there is an Internet connection, students can obtain the same high-quality teaching resources as students in colleges and universities in big cities through the cloud platform, which significantly reduces the regional differences in education.

To sum up, cloud computing technology has brought unprecedented opportunities and advantages to basic computer teaching in colleges and universities. It not only optimizes resource management and teaching efficiency, but also promotes the innovation of teaching models and the diversification of learning methods, providing students and teachers with a richer educational experience. In the future, colleges and universities can further deepen the application of cloud computing technology, continue to improve the quality of education, and help the development of modern education informatization.

5.Challenges and Coping Strategies

Although the application of cloud computing technology in basic computer teaching in colleges and universities has shown many advantages, it still faces a series of challenges in the process of implementation. These challenges are mainly from the aspects of

technology, management, user adaptability and policy guarantees. The following is an in-depth analysis of these problems and proposes corresponding solutions.

5.1 Technical and Infrastructure Constraints

Technical and infrastructural limitations are the main obstacles to the application of cloud computing, especially the insufficient network infrastructure and limited technical support of some universities. In this regard, colleges and universities need to strengthen capital investment in informatization construction, and at the same time cooperate with professional cloud service providers to improve technical capabilities.

5.2 Data Security and Privacy Issues

Data security in a cloud computing environment is a critical issue. It is necessary to ensure data security through technical means such as data encryption and access control, and at the same time formulate strict privacy protection policies to ensure data security and compliance.

5.3 Adaptability of Teachers and Students to New Technologies

The adaptability of teachers and students to new technologies is an important factor in the promotion of cloud computing. Teachers and students in the context of traditional education generally lack the ability to adapt to new technologies. Through special training and technical support, teachers and students can be familiar with and master cloud computing technology as soon as possible. In addition, the successful application of cloud computing also requires the optimization of teaching content and evaluation systems to better adapt to the characteristics of new technologies. Colleges and universities can combine the capabilities of cloud computing to improve teaching models and promote educational equity.

6. Conclusion

The application of cloud computing technology in basic computer teaching in colleges and universities has broad prospects. Cloud computing technology provides strong technical support and innovation opportunities for basic computer teaching in colleges and universities. Through the effective application of cloud computing platforms, colleges and universities can better meet diversified educational needs, improve the efficiency of teaching resources, and create a personalized learning environment for students. Although there are some technical and management challenges, these problems can be gradually solved,

driven by technological development and management optimization. In the future, with the continuous deepening of education informatization and the further maturity of cloud computing technology, the basic computer teaching in colleges and universities will develop in the direction of more intelligent, personalized and efficient, laying a solid foundation for cultivating a new generation of information technology talents.

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