Computer Experimental Course Teaching Reform Design Based on Cloud Computing

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Abstract. This paper begins with an analysis of the advantages of cloud computing technology in the teaching of experimental courses in colleges and universities. In order to make full use of the role of cloud computing technology in computer-assisted teaching, this paper combines the cloud computing technology with the teaching reform of computer basic courses in colleges and universities. The Design and Implementation of Computer Experiment Course Teaching in the Environment of Cloud Computing Technology. The program builds a computer experiment teaching environment on the basis of cloud computing technology and launches a new teaching reform model based on cloud computing technology. On the basis of cloud computing technology, this paper discusses the practical cases of collaborative learning model and shows that the teaching reform design of computer experiment courses based on cloud computing technology can achieve good experimental teaching effects, further improve the quality of computer experimental teaching, and make students' innovation and practice. The continuous improvement of capabilities is of great significance to the construction of a resource-saving experimental environment, curriculum teaching reform, and innovative experimental teaching modes.

1. Introduction
With the breakthrough in the improvement of computer performance, the development of cloud computing technology has become increasingly sophisticated. Various researches and applications based on cloud computing technology have been widely carried out. In the field of university education and research, cloud computing technology has received more and more attention, and its application scope has become more extensive. Cloud computing technology can dynamically allocate virtual resources, which can elastically burden the processing of big data [1]. The application of cloud computing technology in the teaching of experimental courses in colleges and universities enables rapid deployment of applications, increases the use of resources, and reduces the workload of installation and maintenance of laboratory-related equipment. Based on cloud computing technology to build a cloud computing platform, based on this, the reform and design of experimental courses teaching can effectively integrate teaching resources and further promote the reform of teaching practice system, so as to further improve students' innovation and practical ability [2].

2. Current status of computer experimental teaching
Practical teaching plays an important role in the teaching of college courses. Through practical teaching, students can firmly master scientific methods, can further improve students' practical ability in practice, and cultivate students' learning concepts that combine theory with practice. Especially in computer-related majors, with rich practical experience, the good habit of combining theory study and practice has become a professional quality that the relevant professional students must possess. At present, many
domestic universities and colleges have many problems in the teaching of computer practical courses [3], which are mainly reflected in the lack of curriculum experimental teaching resources, obsolete experimental contents, lack of reasonable teaching methods, etc., and eventually lead to experimental teaching activities of the course. It is difficult to obtain good practical results. Students do not improve their hands-on skills in experimental course practice, lack the in-depth experience of combination of theoretical study and hands-on practice, causing a disconnect with the needs of the job market, and there is a big gap between the requirements of the enterprises.

Cloud computing technology is an Internet computing model that has only emerged in recent years. The realization of pooling of IT resources and the distribution of on-demand use are typical features of cloud computing technologies [3]. Internet cloud storage links a large number of computing and storage, network, and software resources together to form a huge pool of resources, providing remote users with on-demand delivery in the form of services. Users access the cloud through the Internet using cloud tools to obtain the required resources and use them. The cloud virtual lab currently being built does not provide full support for the entire course teaching process. Based on cloud computing technology, this article explores the development and deployment of multiple practical teaching services in a cloud environment based on a cloud-based curriculum lab, thereby forming a comprehensive computer practice curriculum teaching system for computer practice courses. Teaching provides operational support for the entire process.

3. Cloud computing technology and its infrastructure

3.1. Cloud computing technology

Cloud Computing is based on the existing cloud service standards, uses the current Internet environment as an operation center, provides corresponding services for the needs of big data storage services, and adopts various technical measures to ensure the security of user data and the convenience and speed of service. Make the Internet cloud platform provide data storage and computing center for each netizen. In the online sharing and utilization mode of network resources based on cloud computing technology, applications or software required by users are not run on user's personal mobile phones and computer terminal devices but are provided on the Internet by large-scale cloud computing. The server cluster runs, does not store locally the data that the user needs to process, and stores the relevant calculation data in the cloud computing center database. Such a database is provided by the Internet cloud computing service provider. The user has flexible access to data and can access the cloud computing data anytime and anywhere. The access method is to connect the terminal device to the Internet and then access the cloud database to implement data access and use. On the one hand, cloud computing systems can provide users with software-level services (SaaS), platform-level services (PaaS), infrastructure-level services (IaaS), and other levels of services. On the other hand, cloud computing services can be used by users. The actual needs provide resources, users do not need to install and deploy their own servers, so that the use of resources is convenient and economical. Internet technology continues to accelerate development, and the scope and fields of application are becoming more and more extensive. Cloud's extensive interconnection, cross-domain collaboration and sharing will gradually be realized [4].

The application of cloud computing technology in curriculum teaching, the application of this field is gradually becoming a research hotspot. The application of cloud computing technology in education and teaching will be developed into a mainstream technology in colleges and universities, teaching of college teachers in the next few years. The way and the student's learning style will have a huge impact, leading to major educational changes. In the daily curriculum teaching and reform design, college teachers should take the actual situation of the students themselves and the school as the basics. Based on the full use of the existing educational resources, the college students should fully use the cloud computing technology to assist in the reform of the teaching of computer experiment courses. Advantages, which best embody the teaching effects of computer experiment courses, further reduce the cost of teaching resources, and make the teaching quality of colleges and universities as a whole further improved.
Cloud computing technology has been developed on the basis of universal application of the Internet. It virtualizes various computing resources, brings together computing resources in the Internet environment, and finally forms a cloud computing platform, reflecting the unity and efficiency of resource integration. Using distributed deployment and parallel computing methods, taking the actual business needs of users as the fundamental starting point, provide corresponding computing resources and services. The realization of resource sharing and flexible supply of resources is the main feature of cloud computing technology. The key technologies involved in cloud computing are briefly described below.

● Virtualization technology
With software and hardware virtualization tools, the computing resources in the Internet are managed, and then aggregated into a unified and efficient computing platform, to achieve transparency between the computing platform software and the underlying hardware.

● Data Distribution Storage Technology
By virtualizing a large number of computing resources and completing the formation of the cloud platform, the cloud platform data is stored in multiple resources in a distributed storage manner, and the data redundancy processing mechanism is fully utilized to ensure that the storage requirements of massive data can be satisfied. At the same time to ensure data storage fault tolerance and security.

● Resource Elastic Scheduling Technology
Elasticity is the most important feature of cloud computing technology. According to the real-time changes in user computing resource requirements, cloud platforms use methods such as load balancing management and resource scheduling to allocate resources to users in a timely manner to the greatest degree, satisfying basic user needs, and ensuring that the computing resources are not wasted, providing guarantee for the normal operation of the business that the user is engaged in.

3.2. Application of cloud computing in education
Being able to effectively integrate resources, perform flexible scheduling, and allocate on demand is an important advantage of cloud computing. Because cloud computing technology has these advantages, cloud computing has been widely used in various fields, and education is no exception. The application of cloud computing technology in the field of education is mainly reflected in the following aspects:

(1) The use of cloud computing technology enables the integration of all laboratory equipment resources in the university through virtualization. The experimental resource cloud is composed of these virtualized resources. Together, the cloud platform provides access methods based on Internet accounts, allowing online access to experimental equipment from multiple universities, effectively integrating laboratory equipment and other teaching resources among multiple universities, and completing the construction of a regional education resource cloud. The platform eventually achieved the sharing of educational resources among various universities.

(2) Educational enterprise groups or provincial and municipal education departments can uniformly purchase commercial software related to education and deploy these commercials software on the cloud platform. In this way, it is not necessary that every college and university is fully equipped with all kinds of experimental equipment. Colleges and universities can make full use of the advantages of cloud platform's resource sharing and rent relevant educational application software on the cloud platform, saving the cost of purchasing commercial education software and avoiding management and maintenance. These educational software is saved on capital investment due to manpower and other costs.

(3) The use of cloud computing technology to complete the establishment of cloud computing data storage platform, unified storage of data resources of various universities, while safeguarding the fault tolerance and security of data resources. Various universities only need to manage their own private data and store a large amount of non-confidential data in the cloud platform, which further reduces the cost of data management.
4. Construction of experiment teaching platform based on cloud computing

The use of cloud computing technology for computer experimental course teaching reform design, build a cloud-based computer practice teaching system is an essential part. The structure of computer practice teaching system based on cloud computing technology platform is shown in Figure 1. Using cloud computing technology to build a resource platform layer, this part is in the lower level of the practice teaching system. On the basis of hardware resources such as servers, network devices, and storage devices, the cloud platform is constructed through virtualization software, physical and virtual device management software, middleware, and cloud computing system software such as Hadoop. The resources required by the cloud platform to provide upper-level practice teaching services are mainly provided in three forms, including: Infrastructure as a Service, IaaS, Platform as a Service, PaaS and Software as a Service, SaaS.

![Figure 1 Computer experimental teaching system structure diagram based on cloud platform](image)

Development and deployment of multiple practical teaching services based on the cloud platform, deployed on the upper level of the platform, mainly including: curriculum management, laboratory management, teaching evaluation, and virtual labs, virtual machines, virtual desktops, training environment, graduation design environment, etc. lab environment. Experimental equipment such as virtual equipment, physical equipment, and cloud platform are mainly completed through laboratory management services. The laboratory management service is also responsible for tasks such as experimental course arrangement, unified monitoring and management of laboratories, and generation and management of experimental environments. The core of practice teaching operation is course management service, where the teacher develops practical courses such as experimental environment configuration and experimental content design; multiple teachers can work together to complete the development of the curriculum practice. Students view the experimental content here, select the practical courses for learning, and submit experimental data such as procedures, documents, and lab reports; teachers complete the review of these materials. For each specific course experiment, students and teachers can leave a message. In this way, communication and exchange of experimental conditions are completed. The teaching assessment service uses data mining techniques to analyze and mine the various data recorded in the course of practice teaching. It can objectively evaluate the quality of teaching in different levels such as experimental class classes, teaching courses, and individual students. The laboratory management service completes the creation of various laboratory environments by laboratory management services so that students can complete the operation of the specific experimental process.
The specific experimental environment can also be regarded as a cloud service. The experimental environment is generated before class and terminated after the experimental course is over.

A variety of databases will be generated during the operation of the service, including: databases of laboratories and related laboratory equipment (generated from laboratory management services), course databases, and completed databases (produced by course management services). The user database is generated by the user management service. These databases reflect the basic state of practice teaching. Over time, this type of database will accumulate more data and use data mining techniques to perform data analysis and data mining on these data. On the implementation of the evaluation of the quality of practical teaching. Accumulated data from these databases and cloud platform log data are the basis for the evaluation of practical course teaching. The database is registered in the service discovery service to provide access and query services for other services.

5. Exploration of computer experimental teaching mode based on cloud computing

5.1. Relying on the online classroom to explore new experimental teaching mode

In the computer experiment teaching activities, the teachers continuously enrich and improve the teaching resources according to the long-term experimental teaching practice, collate and test the computer experiment teaching materials, and continuously supplement and improve the relevant theoretical knowledge, and aim at the undergraduate level computer teaching. Practical courses, based on cloud computing practice, compile relevant teaching materials, improve students' self-learning ability, enable students to independently complete experimental projects under the guidance of the tutorial, and simultaneously complete the online classroom construction of computer experiment courses and integrate various forms of computer experiments. Course materials, including audio, video, text, PPT, etc., enable the sharing of high-quality experimental teaching resources in the cloud platform. In recent years, with the rapid development of cloud computing technology, the cloud platform has been continuously updated at a relatively fast pace, and many new research results and technologies have to be acquired through network resources. Therefore, computer online experimental course teaching should keep close attention to the development of cloud computing technology. Keeping a close track of the mainstream cloud computing platforms and technologies and updating the technical data and knowledge points so that students’ knowledge will continue to broaden.

5.2. Cloud-based learning mode design

Targeted development of "quality engineering" and quality courses have improved the quality of computer experiment teaching in colleges and universities. In the new situation, quality and quantity have fulfilled new tasks. On the basis of fully considering the characteristics of cloud computing technology, it closely integrates with the teaching reform objectives of computer experiment courses. It explores and constructs a computer course experimental teaching reform model design based on cloud computing technology, which complements the traditional experimental teaching model.

Based on the cloud computing technology platform, we conducted a study on the collaborative learning model of computer experiment courses, as shown in Figure 2. In the implementation process, the experimental course teacher first determines the learning objectives and content and establishes an experimental collaboration group to allow students to register their account in the cloud platform environment interface, use the cloud computing technology platform to create a collaborative learning environment, and reasonably configure the experiment. Network cloud platform resources required for the course. The computer experiment course teaching teacher arranges the student to achieve the collaborative learning tool and the online software to realize the collaborative learning and communication between teachers and students through various communication tools. The cloud computing technology-based teaching collaborative learning model for computer experiment is relatively simple to practice. Students only need to log on the online collaborative learning account and they can join the cloud platform. Through the cloud service, the entire computer experiment course teaching practice can be realized.
6. Conclusion

Introduce the virtual project experiment teaching based on cloud computing in the teaching practice of computer experiment course, explore the teaching reform design model of computer experiment course on the basis of today's cloud computing technology platform, apply new technical means to inquiry in teaching practice, and study new the teaching reform approach is of great significance. In the existing computer experiments, virtual experiments were conducted on multiple courses to greatly increase the utilization of experimental equipment. Allowing students to use their spare time to conduct experiments on the cloud platform, which has played a catalytic role in the transformation of college students into applied talents. Taking the computer to implement the curriculum teaching practice reform design as an example, the virtual project experimental teaching reform design based on cloud computing technology platform is explored, which has an important reference role in the reform of college teaching practice.

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