Research on Colleges and Universities Assistant Teaching Application Design Based on Cloud Computing

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Abstract: Based on infrastructure and computing power provided by cloud computing service providers, more and more colleges and universities have developed information-based educational resources and implemented information-based educational applications in a virtualized environment. After accessing cloud computing services, universities do not need to spend a lot of money to purchase commercial software licenses, because cloud computing can provide a large number of commonly used application software. However, there are few cases about these educational information software resources applied to actual teaching and combined with specific courses, which makes the information software resources disconnected from the courses and reduces the teaching efficiency and effectiveness of the classroom. Based on aforementioned background, this study is aimed at the existing teaching mode in colleges and universities, to conduct research on the specific cloud computing application and practice in the teaching of colleges and universities. With rapid development of information technology, the education informatization will certainly transit from the computer-aided education to the education centered on calculation, data and service, of which possibility and technical support can be provided by the development of cloud computing. With the continuous development and popularization of cloud computing technology, its advantages of low cost, convenience and security will surely attract more colleges and universities to carry out daily education on cloud platform.

1. Introduction

In the network era, interaction and participation have been emphasized with the development of Internet. Nowdays, service has been highlighted, and education also conforms to its development trend. For the Computer Assisted Instruction (CAI) emerged in the 1990s, it has transited to the online learning supported by cloud computing [1]. Although we have been already familiar with the hybrid learning relying on the network, due to the limitations of objective network conditions, we could not give full play to the potential of learners' active learning, and technical problems are also one of the bottlenecks for teachers to build a quality learning environment.

In October 2007, Google and International Business Machines Corporation (IBM) began to promote cloud computing programs in the campuses of American universities, including Massachusetts Institute of Technology, Stanford University, Carnegie Mellon University, University of Maryland and University of California, Berkeley, etc [2]. They also provided corresponding software and hardware resources and technical support for these universities, hoping to save funds for distributed computing technology in academic research. On October 24, 2008, International Business Machines Corporation (IBM) and North Carolina State University jointly announced that they already have the ability to provide free services and calculations to students throughout the state [3]. In April 2009, Yahoo also announced the establishment of strategic relationships with three institutions of
higher learning, Cornell University, University of California at Berkeley and University of Massachusetts at Amherst, with a view to jointly strengthening the research on cloud computing technology. In addition, the three universities and Carnegie Mellon University will jointly use Yahoo's cloud computing group to conduct large-scale system software research, and develop new applications to analyze various data resources on the network, such as online news source and voting records [4].

Since the 1980s, computer-aided teaching has entered the field of education. In order to improve the teaching quality and optimize the teaching process, teachers in various schools use computer functions such as storage, calculation and presentation in classroom teaching to transfer teaching contents more effectively. After 2009, cloud computing technology expanded to the field of education. The application of cloud computing in education and teaching has brought a brand-new concept-cloud computing assisted teaching, which is a new interdisciplinary research field of computer science and education science and a new development of education technology [5]. At the same time, Cloud Computing Assisted Instruction (CCAI) studies the application rules of cloud computing services in education and teaching under the information environment, focusing on "soft technology", rather than the hardware technology of cloud computing, of which core is to design information teaching system based on cloud computing services.

With the advent of the first computer-aided teaching system developed by the Waston Laboratory of American International Business Machines Corporation (IBM) and the world's first multi-terminal computer-aided teaching system PLATO in 1958 [6], a new educational technology computer-aided teaching has played an important role in the information age, which has been widely used in information technology teaching and has had a profound impact on education and teaching reform.

The development of CAI reflects a trend of social development. The rapid development of computer science and technology also puts forward urgent tasks for educational work. First, in order to cultivate talents suitable for the development of science and technology, computer education must be popularized in schools of all levels and disciplines. Second, in order to improve the quality and level of education and teaching, computers must be taken as an important means to carry out computer-aided education and accelerate the informatization of educational means.

2. Architecture of Transparent Cloud Computing System
At present, most cloud computing infrastructures consist of reliable services delivered by data centers and virtualization technologies at different levels created on servers. Cloud computing industry is divided into three levels: cloud software, cloud platform and cloud equipment [7]. With the rapid development of network technology and software and hardware resources, the computing mode is also slowly transitioning from the mainframe mode to the micro-personal computer mode. However, it is still a difficult problem for users to obtain heterogeneous operating systems and applications, and it is also very difficult to obtain perfect services on lightweight devices [8]. In transparent computing, users do not need to know the specific location of the calculation, nor the specific technical details such as middleware, operating system and application. Instead, they can choose to obtain corresponding services according to their own needs and with the help of various networking devices [9].

Figure 1 shows three important components of the transparent computing system. Transparent clients are the operating devices of front-end users, mainly referring to various light weight devices such as PC, Notebook, PDA, Smartphone, etc. The Transparent network as the middle layer refers to the transmission facilities integrating different wired and wireless networks. Transparent servers, as the bottom layer, can be any possible service providing method, which can not only build transparent server clusters by means of traditional PC server clusters, but also use large servers, etc.
2.1. Bloom's Knowledge Dimension Classification of Cognitive Objectives
As shown in Figure 2, Bloom divided knowledge into four categories in the process of studying cognitive goals: factual knowledge, conceptual knowledge, procedural knowledge and reflective cognitive knowledge.

Factual knowledge: basic knowledge that students must understand when learning a certain course or solving a problem including terminology knowledge, specific details and element knowledge. Conceptual knowledge has the characteristics of organization, generality and summarization [10]. The emergence of such knowledge indicates that the knowledge elements in a discipline are intrinsically linked and have certain unity, which has abstract characteristics, including knowledge of categories and classifications, knowledge of principles and generalizations, knowledge of patterns and structures. Procedural knowledge is different from the result theory emphasized by factual knowledge and conceptual knowledge, which emphasizes a step-by-step process, including knowledge of technology and algorithms, methods and techniques, and knowledge of applying appropriate procedures. Reflective cognitive knowledge is also called metacognitive knowledge, which emphasizes the influence of psychological activities such as consciousness, reflection and adjustment on learning activities including strategic knowledge, conditional knowledge and self-knowledge.
2.2. The Connotation of Hybrid Learning under Cloud Computing Assisted Instruction

Mixed learning is the theory and practice that all learning elements are reasonably selected and combined to optimize the learning effect and the cost of learning items. Hybrid learning under cloud computing-assisted teaching is not simply a mixture with the classroom learning environment, but an organic integration of all elements related to teaching, including the supporting theory of cloud computing-assisted teaching, cloud platform learning environment, cloud teaching resources, learning methods and learning styles of learners under cloud environment, and teaching evaluation, etc [11]. Figure 3 presents the connotation of hybrid learning in cloud computing assisted instruction.

Fig.3 The connotation of hybrid learning in cloud computing assisted instruction

Mixed various teaching theories: such as humanism, constructivism, educational communication theory, etc. Mixed multi-cloud platform learning environment: comprehensive use of multi-cloud platform for education services to reduce the cost of teaching media and other hardware [12]. Mixed multiple learning methods: in mixed learning, learners mix various learning methods such as self-paced learning, collaborative learning based on cloud platform, and face-to-face teacher guidance [13]. Mixed multiple learning evaluations: diagnostic evaluation before the course, formative evaluation during the course, and summative evaluation after the course [14].

Mixed learning under CCAI attaches importance to the combination of teachers' leading role and students' main role, of which basic form is the organic combination of face-to-face teaching between teachers and students and students' learning with the help of cloud platform [15]. The essence of mixed learning is the study of information transmission channels, that is, the study of what kind of information transmission channels can promote learners' meaningful learning. Representative transmission channels built based on cloud computing technology mainly include virtual simulation laboratory, online courses, self-paced E-Learning, online collaborative platform, etc.

3. Design of Hybrid Learning Teaching Based on Cloud Computing Assisted Instruction

According to the definition, connotation and basic ideas of hybrid learning under cloud computing-assisted teaching, the teaching design of hybrid learning under cloud computing-assisted teaching is considered to be divided into four parts in this study, namely, analysis of teaching objectives, analysis of learners, learning contents and learning resources, design of learning activities and evaluation of activities, and final revision and improvement, which is shown in Figure 4.
3.1. Analysis of Learner Characteristics

In mixed learning, due to the change of roles: teachers are no longer the dominant teachers in teaching, and students have also changed from passive learners to active learners, becoming the most important part of the teaching process. All the teaching design processes should be designed and established with students as the center. Therefore, the analysis of learners' characteristics becomes the decisive factor for the smooth implementation of hybrid learning.

In general, the analysis of learners' characteristics is divided into three parts: the analysis of learners' general characteristics, the analysis of learners' initial abilities, and the analysis of learners' learning styles. However, students' own knowledge base, character, learning ability and learning style are relatively more complicated and diversified.
3.2. Analysis of Learning Contents and Objectives

Setting the learning units and learning objectives of the given courses is the first step in the design of mixed learning teaching. In this step, teachers are required to divide different learning units according to the contents of each chapter of the textbook and formulate the learning objectives of the corresponding units. Then students learn the courses in a planned and step-by-step manner according to the contents set by the teachers.

When the learning units are determined, teachers need to analyze, classify and summarize them according to the different information carried by the learning contents in each unit, and further divide them into different knowledge points. According to the "Bloom's Cognitive Target Knowledge Dimension Classification" mentioned above, each knowledge point is classified and the corresponding learning target is summarized, which is to enable students to be clear and focused on what they want to learn in the learning process. At the same time, dividing different knowledge points into different knowledge types is also helpful for students to learn differently: factual knowledge needs to be understood, conceptual knowledge needs to be memorized, procedural knowledge needs to be operated, and reflection on cognitive knowledge needs to design learning activities.

3.3. Design Learning Activities

Different learning contents carry different information. In order for students to improve learning efficiency and optimize learning effect in the learning process, teachers need to design learning activities for different learning contents. Based on the concept of "mixing" in the research process, the designed learning activities do not exist independently. All learning activities include traditional classroom learning and online learning. For example, classroom instruction in traditional classroom and information release in online learning are two independent learning activities. However, in this study, it is proposed that the two different activities should be organically integrated into a whole and play a complementary role to make it really helpful for students' learning.

3.4. Design Learning Support

Based on the above analysis, the learning support designed for learners in this topic is mainly information support. In this research, the information mainly comes from the teaching information and the network information. Among them, the teaching information mainly comes from the teachers' teaching of the course content in class. Whether it is theoretical teaching or experimental teaching, every knowledge point explained by the teachers and every operation demonstrated by the teachers can be regarded as the information that the teachers convey to the students. These contents are the main sources of information in the whole learning process. Network information is mainly aimed at various information supports established for the network learning part of hybrid learning. In this research, there are mainly the following three parts. Learning Dynamic Module in Network Learning Platform: the main function of this module is for teachers to release relevant learning information, learning tasks and learning notices through the network learning platform. Learning materials module in the online learning platform: the main function of this module is for teachers to publish learning materials related to courses through the online learning platform and provide download function. Network communication platform: This platform is created in the form of a forum through which teachers and students can release information and feedback or raise and solve problems.

3.5. Design Learning Evaluation

Paying attention to the results but ignoring the process is one of the major drawbacks in today's teaching. Higher education values not the students' scores, but the learning process so that students can know what they have learned and what they can do with what they have learned. Therefore, a variety of evaluation methods have been set up in the research process of this topic to conduct diversified assessment on students.
4. Conclusion
With the continuous updating of teaching concepts and the continuous improvement of teaching environment, hybrid learning has become the development trend of higher education and teaching, which organically combines traditional classroom learning with online learning and forms a brand-new learning mode. In this study, guided by the concept of cloud computing-assisted teaching, a teaching design model of hybrid learning aiming at the traditional classroom teaching mode in colleges and universities based on the theory of hybrid learning is constructed, to optimize the teaching process of teachers and students and promote the implementation of teaching activities in colleges and universities. This mixed learning mode has achieved good teaching results in the teaching process of the "teacher-led, student-centered" double-main teaching mode, which provides a good demonstration for the learning of other courses in educational technology and has certain application value in promoting the optimization of teaching process and the improvement of teaching quality. The construction of teaching websites based on cloud platform provides strong support for the implementation of collaborative learning, and cloud computing aided teaching platform plays a very good role in cultivating students' innovative thinking, improving team cooperation and problem-solving ability, and enhancing students' information literacy, which also provides a persuasive reference for the reform of educational informatization in colleges and universities.

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