Cloud-Assisted Curriculum Teaching Activity Design and Implementation

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Abstract. The development of “Internet +” technology has greatly promoted the transformation of the education field. This article takes the course “Cloud Data Centre Architecture and Security Management” as an example, attempts to employ the resources in the existing teaching resource library deployed on the cloud computing platform to improve the traditional teacher-centred teaching model by using advanced teaching methods such as flip classrooms. Which changed the learning status of teaching materials with textbooks or reference books as the main learning resources. Through a year of teaching practice, it is shown that this curriculum teaching design based on the teaching resource library can not only change the teachers' teaching concepts and teaching methods, but also fully mobilize the enthusiasm and initiative of students to achieve satisfactory teaching effect.

1. Introduction
In the last decades, cloud computing has been developed rapidly and applied in many fields such as scientific research, production, education, consumption, and entertainment etc. because of its benefits over traditional technologies, such as on-demand self-service, broad network access, resource pooling and rapid elasticity [1]. Cloud users can easily use resources offered by the cloud provider to run different applications which can be implemented on cloud provider infrastructure. Users can access cloud computing, storage or networking infrastructure from any computer with lower requirements on hardware and software reducing both cost and maintenance requirements [2, 3]. It offers lot of advantages for data and software sharing and makes the management of complex information technology systems simpler. Therefore, cloud computing attracts many attention from institutions or companies in advanced technology development, research and application [4].

Due to the limitations in the traditional-teaching methods, many higher education level college or universities are using cloud resources to assist teaching even though facing with security problems [5]. By means of utilizing resources driven by cloud computing technologies, college students’ learning attitude and academic performances were analysed by two groups with high school and vocational high school backgrounds, the results showed that no significant differences in the cognitive domain between these two groups of students, while college students with vocational high school background appeared to possess higher learning motivation in the online course studies [6]. In addition, the achievements of Computer Engineering Department students in Karabük University were compared according to criteria such as age, gender, type of high school education and whether the students studying online or regular education [7]. The results showed that formal education performed better than the online studies. This indicates that it is not a good choice in relying totally on the online learning.
2. Construction of Professional Online Resource

In recent years, China’s vocational education field has constructed many teaching resource libraries for various professional courses. The construction of professional resource libraries has provided a large number of online learning materials for distance teaching of related courses. The format of these teaching resources is diverse, and is dominated by materials that occupy large storage space, such as video and audio, requires massive storage space with easy to grow and expand. The requirements for access to resources are very high, not only to meet the internal access needs of the campus network, but also to meet the needs of online education on the Internet to resolve the concurrent access of multiple customers. These characteristics urgently need advanced data management methods and efficient organization methods to realize the storage and use of teaching resources. In order to solve the above problems, our school has introduced advanced cloud computing technology, combined with the school's teaching needs, developed a cloud computing online education platform to manage and use the rapidly increasing teaching resources.

The architecture diagram of teaching resource library based on cloud computing platform is shown in figure 1. The construction of professional resource database provides an open platform and a large number of online learning materials for the teaching of related courses. Relying on the national resource library construction project, our school has established an online education platform, and the number of high-quality teaching resources has reached more than 50,000. This article fully uses the high-quality resources in this online teaching platform to design the teaching activities of the course "Cloud Data Centre Architecture and Security Management". According to the teaching task, an online standard course was built by designing a series of teaching activities, which makes the “flip classroom” teaching model feasible and effective. Students can access the high-quality learning resources in the self-learning online courses through the Internet, and they no longer rely solely on the knowledge delivered by the instructor in class. The role of teachers in the classroom has also changed. Teachers’ more responsibility is to guide students to learn, apply and explore knowledge, and answer questions for students.

![Architecture diagram of teaching resource library based on cloud computing platform.](image)

**Figure 1.** Architecture diagram of teaching resource library based on cloud computing platform.

3. Teaching Activity Design

The construction of the existing resource library is realized to support the students’ ability to learn. At the same time, the construction of the resource library has good systemic, complete, and flexible
characteristics. Based on these resources, the design of the teaching activities of this course encourages students to make full use of the information resources to build a student network autonomous learning platform in the process of autonomous learning, so as to meet the needs of students to prepare before class and review after class with high-quality reference resources. Therefore, based on the resource information provided by the resource library, we constructed course tasks and extended knowledge reading and training after class. The teaching activities mainly include the following three aspects.

3.1. Self-Study Before Class
Pre-class self-learning refers to the learning process of students' online pre-preparation. Through pre-class self-learning, students can understand the learning goals and main content of this class, find the key points and difficulties for further learning in class. During the class, students can confirm their understanding, and the most important is that they can "solve their doubts". Therefore, pre-class self-learning has cultivated students' self-learning ability, boosted their enthusiasm for learning, and improved classroom efficiency to a very large extent.

The design of self-study before class requires teachers to complete it before teaching and deploy it on the online standard class platform. Teachers use online standard courses to effectively guide students to study autonomously before class. They need to follow the following rules: First of all, the learning materials pushed to students should be the focus and difficulty of content of this class. The pre-class guidance should focus more on guiding students to enhance their theoretical knowledge and understanding; Secondly, most of the guidance materials are presented to students in forms such as animation, micro-classes, teaching videos, etc., to enhance students' interest in self-study; and finally, carefully design each typical tutorial question, but the number of questions should not be complicated.

The following takes the class "Desktop cloud management system installation: installing Windows virtual machine" as an example to introduce the design of the tutorial, as shown in figure 2:

![Tutorial design diagram of "Desktop cloud management system installation: installing Windows virtual machine".](image)

The pre-class tuition is divided into four steps:

Step 1. An overview of the knowledge structure: In the course guidance of the online standard course, the teacher pushes the knowledge structure diagram of this chapter to the students, the purpose is to enable students to quickly browse the knowledge structure of this chapter, and clarify the content of this section in the knowledge structure position;

Step 2. Understand the learning objectives of this section: In the requirements of course guidance, the learning objectives of this section are proposed to enable students to learn the key points in a targeted manner;

Step 3. Study the online tutorial resources: select multimedia resources related to the learning objectives of this section, such as micro lessons, video recordings, animations, and documents, and
link them to the course guidance of this section to enable students to learn these resources remotely through the Internet, so as to conduct self-study before class;

Step 4. Check the learning effect: Use the exercise library in the "Teaching Resource Library" platform to select the exercises related to the students’ preview content for the students to self-test to detect the effect of their pre-class learning.

3.2. Task Inspiration during Class
Classroom teaching occupies a core position in teaching activities and requires the organization of high-quality learning activities. The "flip classroom" teaching design emphasizes the learner as the centre, giving students the opportunity to apply the content learned in specific environments, mainly including three links: problem creation, explanation demonstration and task exploration:

First is the problem creation. According to the preview content of this lecture and the learning goal of theoretical knowledge, a group of questions is proposed and discussed in groups. This group of questions is planned by the teacher in advance and should cover the main points of theoretical knowledge. After the discussion, a self-recommended member of the group can be used to present a topic for the whole class. Other students listened, questioned, supplemented and corrected. For students and groups who actively answer questions in the classroom, regardless of whether the ideas are correct or not, whether they really understand the essence of the problem, they must give full affirmation to the students’ serious thinking attitude, active answering questions, and the courage to try to solve the problem. For students who understand the problem in depth and have the right ideas, they can be invited to be the role of “teacher” to explain their views, and so as to cultivate their presentation skills. Students use tutor-style explanations to gain a sense of learning achievement and fun to explore. For those inaccuracies, teachers need to correct them in time after the students have finished explaining. This section can stimulate students’ learning motivation through the problem-driven teaching model.

Second is the explanation demonstration. After in-depth analysis of the key points and difficulties of the students’ discussion, the teacher explained and demonstrated the basic experiments, and pointed out the precautions during the practical operation. Distribute student task books in standard online courses, discuss task requirements with students, and propose solutions. In stimulating the tasks, we need to focus on cultivating students’ logical ability and optimizing work steps. For each classroom experiment, through discussion and explanation, a clear flow chart is formed in the students’ minds.

Last is the task exploration. According to the task book for this class issued by the online standard class, students will practice independently and complete the experimental tasks on the computer. For the difficulties encountered in practical exercises, students can raise their hands to ask teachers, or they can watch the micro lessons and video recordings published in online standard courses. Teachers should check and evaluate the progress and completion of tasks at any time, and record the results of the process assessment, so as to urge students to complete each task. For the difficulties and failures encountered by students, teachers need to guide them to troubleshoot in order to cultivate students' observation ability, thinking ability and troubleshooting ability. Provide timely feedback to students on the experimental process and practical report of each lesson, guide them to optimize, and pay attention to the exercise and training of students' written expression ability, and the final course report results can be formed at the end of the semester.

3.3. After-School Knowledge Extension
In the post-school knowledge extension part of online standard courses, teachers added extended reading and exercises. Through knowledge expansion, students are allowed to expand their knowledge, deepen their key points or knowledge chains, and enhance their enthusiasm for exploring professional skills. First, respect the individual differences of students. For different learning tasks, supplementing effective and feasible after-school expansion knowledge, especially in its depth, has certain difficulty, and at the same time does not make students feel helpless, both directly related to the solution of this task in this course. And second, design the feedback mechanism. The extended
knowledge exercises or thinking problems left in the previous course must be discussed before the new tasks are carried out in this class, so that students can find out the problems in their extended knowledge after class.

4. Suggestions for the Implementation of Teaching Activities
In the teaching process of the course, in order to stimulate students’ interest in learning and achieve good teaching results, we should pay attention to the following aspects:

1) Pay attention to the establishment of a harmonious teacher-student relationship and give students an appreciation education. In the teaching process, respect, care and encourage students, and their small progress in the learning process, especially the willpower to overcome difficulties should be commended, so that students experience the joy of self-directed learning during the learning process and form confidence in appreciation.

2) Enhance students’ autonomy in the learning process. Enhancing the autonomy of the learning process is a kind of trust incentive for students. In the process of students completing tasks, teachers act as good advisors, trust students, believe students have the ability to complete tasks, and encourage students to explore and solve problems.

3) Give full guidance. Effectively guide students in problem-solving methods and strategies to allow students to complete specific tasks through the transfer of existing knowledge and skills.

4) Help students build cooperative learning mechanisms. In the teaching process, through the establishment of a learning group to allow students to cooperate in learning, the group members each undertake different subtasks, so that students can experience the fun of group discussions and cultivate their sense of responsibility for teamwork.

5. Conclusion
In the teaching design and practice of this course, teachers rely on the course teaching cloud and teaching resource library platform to create an “online + offline” mixed teaching model. The traditional teaching model has been improved in three parts: before, during and after class. Which breaks the tradition of taking teachers as the centre and using paper materials such as teaching materials or reference books as learning materials. The online teaching platform provides students with rich functions such as enrollment, resource online learning, resource collection, homework submission, online self-test, communication and interaction, provide teachers with functions such as announcement, counseling, answering assignments, organizing discussions, publishing exams, etc. it provides strong support for effectively carrying out various teaching activities.

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