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Research Article

University Teaching Management and Education Reform Based on Multisource Data and Edge Architecture of IoT

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With the rapid development of wireless sensor and network technology, learners can learn anytime and anywhere through various intelligent terminals. For this reason, this paper is research on education and teaching reform in universities that use cloud computing and big data. Teaching practice has proved that the teaching reform based on popular technology not only combines theory with practice, can improve students' interest, and achieve good teaching effect but also is a beneficial exploration for students' comprehensive training. Aiming at the existing problems of distributed teaching system, this paper proposes to teach the theoretical knowledge points of distributed system under the framework of cloud computing and at the same time cooperate with related teaching reform of comprehensive design.

1. Introduction

Cloud computing has the characteristics of safety, reliability, scalability, and low cost. Moreover, cloud computing is built on the basis of the original technology, which reduces the cost and enhances the flexibility and speed of the service. Cloud computing has innovated concepts and applications based on the original method. However, from another point of view, cloud computing is completely new, because it develops some application software and the development and operation of infrastructure and improves the application quality of basic equipment.

For example, the study of [1] designed a mobile cloud computing workflow task dynamic scheduling model, using multiscale and multiscale feature analysis methods to aggregate and cluster the preference information of mobile cloud computing workflow tasks; this paper proposes a localized scheduling algorithm for mobile cloud computing based on Hadoop and provides an improvement plan for the hot data problems that may occur in practical application scenarios [2]; the study of [3] analyzes the research progress and security of elastic mobile cloud computing [4].

A learner-centered interactive teaching must be based on the cloud computing environment to ensure that interactive learning can be conducted at any time, in any way, with anyone, anywhere. Even if the learning environment is different, the form of the open course is the same. In recent years, my country's information technology has been developing continuously, and credits are gradually accepted in open courses. Open courses will be transformed from informal learning methods to formal learning methods, thereby expanding the scope of the audience [5, 6], to provide more learners with learning opportunities, so that more people can receive higher education, so as to improve their comprehensive quality. Since there are still some problems in open courses, in this research, it mainly designs the aspects of user service management, existing open courses, real-time interaction, and learning effects.

2. Problems in Teaching

2.1. Distributed Systems Are Highly Theoretical. When studying this course, students not only need a certain knowledge of hardware but also need the concept of system

architecture, which requires students to have a sufficient understanding of the previous pilot courses, such as computer network, operating system, object-oriented programming, and other courses. Based on these courses, students can better understand distributed systems, which is making it more difficult for students to learn distributed systems. At the same time, each chapter has a lot of fragmented knowledge points. Only distributed algorithms involve environmental consistency and parallelism, which increases the difficulty of students' learning. Students feel that a large number of concepts and theories in the course are abstract and difficult to understand, so they lack interest in the course, can only remember a few scattered knowledge points, and cannot understand the relationship between distributed system architecture and knowledge point modules from a higher level relationship between the studies of [7, 8].

2.2. Teaching Methods Are Not Flexible Enough. The traditional teaching mainly adopts the classroom teaching method, and the teachers teach the knowledge points in the classroom. The focus of this teaching method is that the teacher explains one knowledge point after another, while the students are relatively passive, just bury their heads in recording the knowledge points taught by the teacher, and think less. Due to more theoretical knowledge, teachers rarely use diverse teaching methods, and there is a lack of interaction between students and teachers in the classroom. Teachers cannot understand students' mastery of courses in the classroom, and there is less interaction between students and teachers after class. The quality of teaching is shown in the studies of [9, 10].

3. Cloud Computing Architecture

From the problems in teaching, it can be seen that the knowledge points of distributed system courses are complicated. How to guide students to master this course in limited classroom time and actually apply it to life is the goal of our teaching reform. The traditional teaching method is not well integrated with real life but only explains the knowledge points in the textbook, which leads to students' lack of interest in distributed systems, and their understanding of distributed systems only stays on abstract concepts. We believe that the teaching of distributed systems should be based on the popular technology (cloud computing) as an entry point, which can not only stick to the content of classroom teaching but also arouse students' interest in distributed systems.

3.1. The Relationship between Cloud Computing and Distributed Systems. As we all know, cloud computing belongs to distributed system, which is a combination of data sharing and service sharing computing mode, and the distributed system is the architecture of cloud computing in the era of big data. The architecture of cloud computing is shown in Figure 1 [11].

(1) A cloud computer cluster is formed by multiple computers. Because the cloud computing architecture is based on a distributed system, the degree of coupling and interaction between the computers in the cluster is higher than that of ordinary computers on the Internet, which makes the computing efficiency of cloud computing very high [12].

(2) Because the distributed system is the underlying system of cloud computing, based on the characteristics of the distributed system, cloud computing can provide powerful data storage and computing capabilities.

(3) Cloud computing can provide high reliability with the support of distributed systems. This comes from the basic idea of distributed systems (consistency, fault tolerance, and security), the failure of any node will not terminate the application service.

(4) Because of the excellent fault tolerance, strong fault recovery ability, and security considerations of distributed systems, cloud computing can provide services at a low cost and has a high cost performance.

(5) Distributed systems can provide frameworks and simple models to implement cloud computing applications. Developers do not need to consider issues such as fault tolerance, which is convenient for developers to quickly and effectively develop software.

4. Realization of Cloud Computing-Based Teaching Resource Platform Architecture

The teaching resource platform has three layers, the bottom layer is the mobile cloud computing platform layer, the middle layer is the teaching resource service layer, and the upper layer is the mobile application layer, as shown in Figure 2.

4.1. Cloud Computing Platform Layer. The mobile cloud computing platform layer is the foundation and core of the teaching resource platform. It builds a cloud environment through software technology and hardware resources and provides data services, computing services, storage services, and security services for the middle layer of the teaching resource layer. These services are implemented through virtualization technology Vmware Workstation, distributed storage Hadoop distributed file system, and parallel computing technology MapReduce programming framework. The platform adopts a distributed storage system, which can meet the needs of storing different types of teaching data. Fault-tolerant processing, data parallel processing, load balancing, etc., are all implemented by the MapReduce programming. The Hadoop distributed file system separates the ownership and control of data on the network. To share data between different devices, some important private data will be at risk. Therefore, the mobile cloud computing platform must first ensure data security. The solution of the

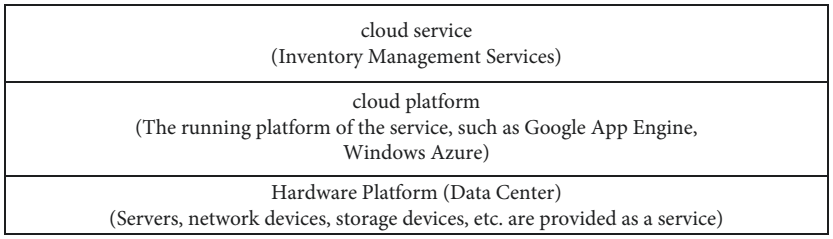

Figure 1: The three-tier structure of cloud computing.

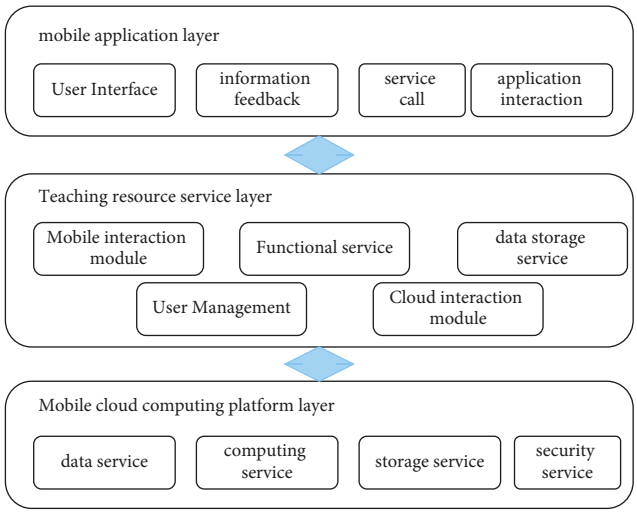

Figure 2: Teaching resource platform.

security service is to encrypt the data stored on the cloud server in advance. When accessing the data on the cloud server, decrypt it as needed [13, 14].

4.2. Teaching Resource Service Layer. As the middle layer, the teaching resource service layer is a bridge between users and the platform, providing users with services related to teaching resources. This layer provides an interactive interface for the mobile cloud computing platform layer through the cloud interaction module. This interface requires high adaptability and can be transplanted to different cloud computing platforms. The mobile interaction module in the teaching resource layer is used to provide interactive services for the mobile application layer and the teaching resource service layer, and customer requests and operations on the mobile application layer are processed and fed back by the mobile interaction module. The data in the teaching resource platform have the characteristics of rich types and a large amount of data, especially when the concurrency is large, the relational database cannot meet the needs of the platform. Therefore, the data storage adopts a distributed structure, and other transactions such as distribution and expansion are completed by the cloud [15, 16].

The design purpose of the teaching information management platform of cloud computing technology is to use cloud computing virtualization technology to establish a virtual resource pool for unified scheduling and management of teaching information. In this way, the software and hardware resources of the teaching information platform can be managed in a unified manner, the teaching information can be integrated efficiently, and the integrated application system can truly share the data of the teaching information resources. Combined with the advantages of cloud computing technology analyzed above and the characteristics of the school's educational information management platform construction business, this paper designs an educational information management platform based on cloud computing technology, as shown in Figure 3.

4.3. Mobile Application Layer. The mobile application layer is directly oriented to customers and can be said to be the window provided by the platform to users, including four modules: user interface, information feedback, service invocation, and application interaction. The mobile application layer generates data interaction between the application interaction module, wireless network technology, and the teaching resource service layer and does not perform actual calculation processing. It is mainly used for information communication with the teaching resource service layer. More consideration should be given to the design. User-friendly interface for providing services and presenting data. The main functions of the mobile application layer are as follows: first, to provide users with a friendly operation interface; second, to provide the required static files or resources for the application; third, to provide a communication interface for the mobile application layer and the teaching resource service layer; fourth, to customize the relevant information to be displayed to the user by calling the interface of the mobile terminal; fifth, to call other application services through the mobile platform interface [17].

4.4. Cloud Computing Design. The educational information management platform in this paper is implemented based on cloud computing technology. The Hadoop cloud framework is selected in this paper, and MapReduce and HFDS technologies are responsible for the efficient processing of massive data information. In the operation using the MapReduce programming model, new intermediate values can be generated without changing the original information data, so the Map operation has strong parallel computing capabilities. HDFS is a key cloud computing technology used in the design of this paper. As a distributed file system, it forms a typical master-slave structure, including the NameNode master node and multiple DataNode slave

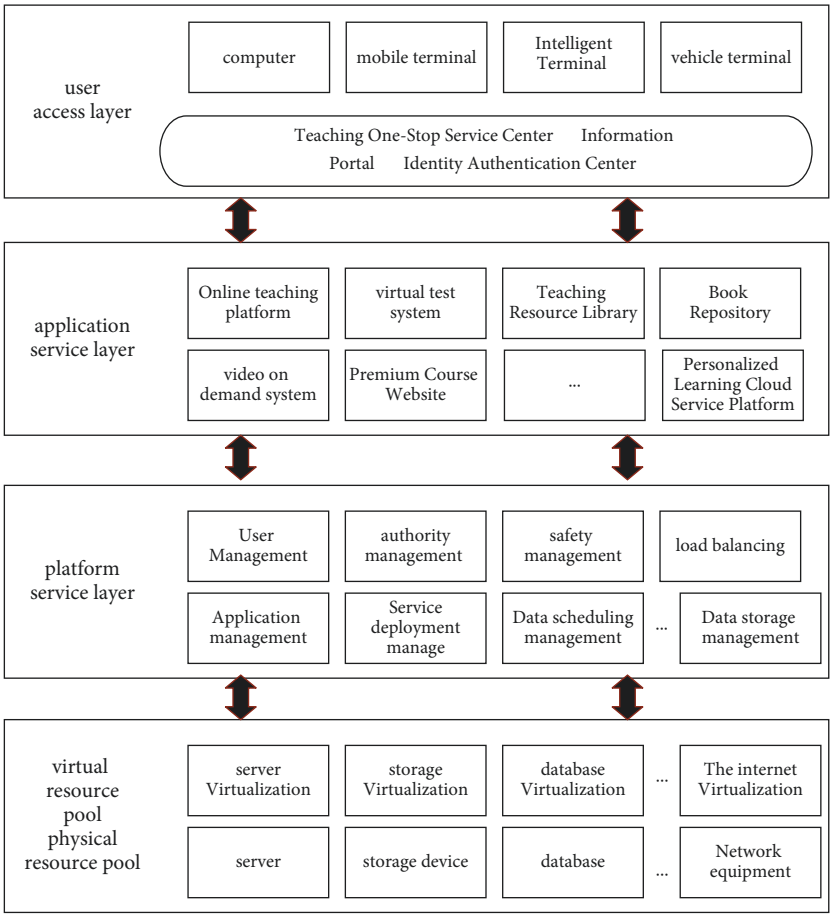

Figure 3: Educational information management platform.

nodes. In general, HDFS can name information files, and then cloud users can save relevant information to HDFS files in the name space or divide the information data into multiple content blocks and save them in different DataNode nodes [18, 19]. Figure 4 is an architecture diagram of HDFS, and Figure 5 is an architecture diagram of education information cloud computing based on HDFS technology.

The education information management platform is mainly for the collection, management, retrieval, and application of education information. The functional modules are designed as follows.

In this platform application, administrators can set system titles, columns, layouts, and specific pages, as well as custom management metadata and class library management.

In the design of this function, it is necessary to manage basic information such as user name, password, and department, divide the different application user roles of the platform, and design the corresponding user platform management authority level, including uploading, downloading, commenting, status display, and Information review.

The modular design is implemented in the platform of this paper, and cloud users can customize the display design of all levels of the platform. When designing teaching courses, you can refer to the subject classification method. First-level disciplines correspond to multiple second-level

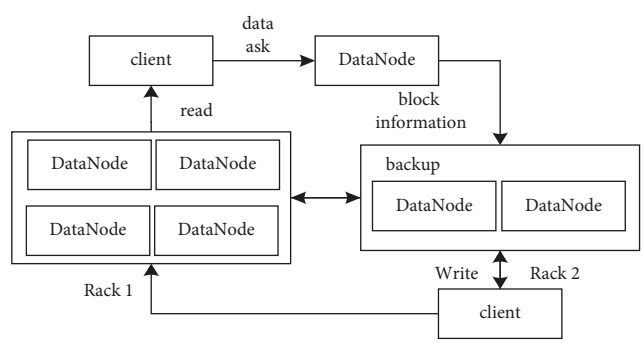

Figure 4: HDFS architecture diagram.

disciplines, and each second-level discipline can add corresponding course resources according to different professional courses of users [20].

Responsible for creating, modifying, and deleting categories, including videos, e-books, e-learning plans, high-quality courses, and other resources in the information category management, can upload, modify, delete, review, and publish related resources, as well as add and publish specific course information title, introduction, attachments, pictures, etc. and display them dynamically.

The education information management platform can not only realize the construction and management of

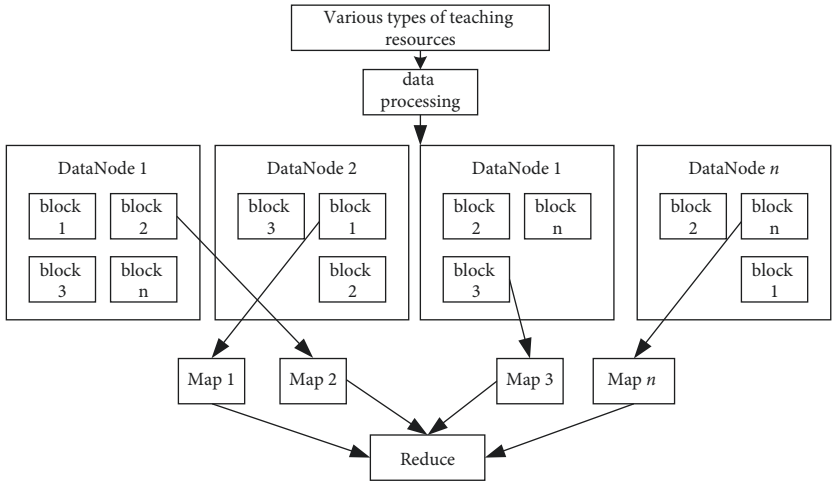

Figure 5: Educational information cloud computing architecture based on HDFS.

teaching resources for cloud users but also realize the connection of resources between platforms at different levels of schools, provinces, and countries, so as to satisfy users' resource sharing in platform applications and realize the sharing of teaching resources: public cloud and private cloud.

5. Database Design

The educational information management system platform in this paper is based on the B/S platform architecture to meet the operational needs of teachers, students, and platform administrators. The system is based on the Linux operation server, uses the Web server to establish the SQL Server database, and is designed in combination with the functional modules of the platform. The database relationship table to be created includes users, departments, teachers, courses, and teaching resources.

In the design of the educational information management platform, JDBC provides a set of Java APIs for database operations. All database classes and interfaces are implemented by the Java programming language to achieve the characteristics of cross-platform technology.

When designing the cloud computing education information management platform, it is necessary to comprehensively consider the roles of cloud users, the level of authority, and the operation and management of information resources. Three types of users are divided, including administrators, auditors, and users. The administrator is mainly responsible for the professional management of the educational information of the whole school and has the right to authorize the auditor of a certain department to manage and maintain the educational information resources as a whole; the auditor is responsible for the template management of educational information, the establishment of a professional resource database, and the approval of data resource information, including the functions of uploading, modifying, and deleting information; users can build an educational information management website and establish a personalized personal operation service center to extract data to meet cloud user applications. Figure 6 shows the business process of the educational information platform [21].

6. Case Studies

The user service management module includes managers, paid users, visitors, and registered users. Managers can view the progress of learning, use the learning community, etc. The user's identity to open the designated resources according to the type of the user. As shown in Figure 7, the optimization effect of teaching cloud resources by different methods [22].

The academic team evaluates the open courses according to specific regulations, processes the open courses according to the actual needs of the learners, and then publishes them on the real-time interactive platform, giving the corresponding retrieval function. Share and publish it on your personal real-time interactive platform. In addition, you can also select excellent open course resources from the public course resources and put them into your own real-time interactive platform to conduct more effective learning. For some open course resources, teacher evaluation or an evaluation system can be set up to improve the teaching quality of open courses and attract more learners' attention. As shown in Figure 8, the acceptance of teaching by different learners, teachers can use corresponding tools to record the teaching process in the process of teaching the course and make it into the courseware of the open course for learners to learn and use. Teachers can also add content where they need to be added, thereby improving learners' comprehension. In general, when producing a new open course, there is no need for the help of professionals and production companies, thus reducing the workload of the staff [23, 24].

During the learning process of open courses, many learners will choose the same courseware to study at the same time, resulting in a relatively high number of on-demand courses. As shown in Figure 9, different learners have different clouds. Calculate the learning tracking of teaching, and provide timely feedback on the teaching situation of

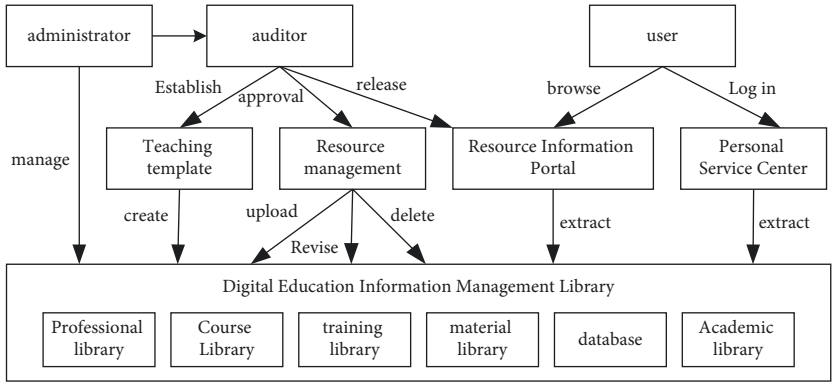

Figure 6: Business process of education information platform.

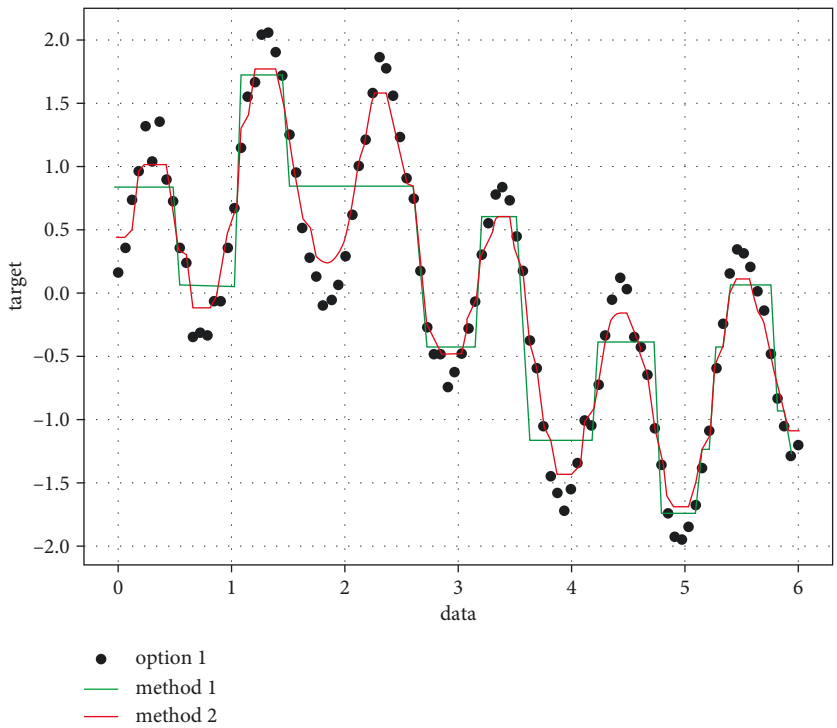

Figure 7: Cloud computing optimization with different methods.

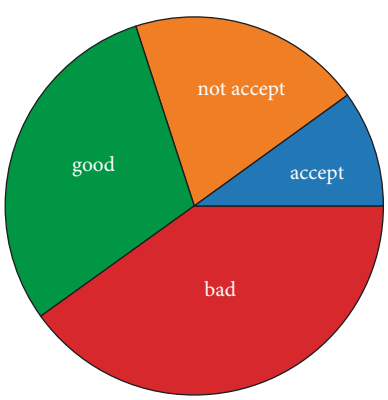

Figure 8: Acceptance of different learners.

teachers, so as to obtain a better teaching effect. In addition, the platform can also analyze the learners' listening status and attention level through corresponding technology, thereby improving the application of the open course real-time video interactive platform.

The application of network signal in the place where the learners are located, no matter whether accessing the open courses. The most important thing is that the version of mobile phones and computers is taken into account when making open courses so that various interfaces are produced to meet the needs of various versions, making it very convenient to enter the course for learning. In addition, if the learner wants to log out after logging in, he can keep the current state, and the next time he logs in, he can directly continue the learning in the last place, which saves many

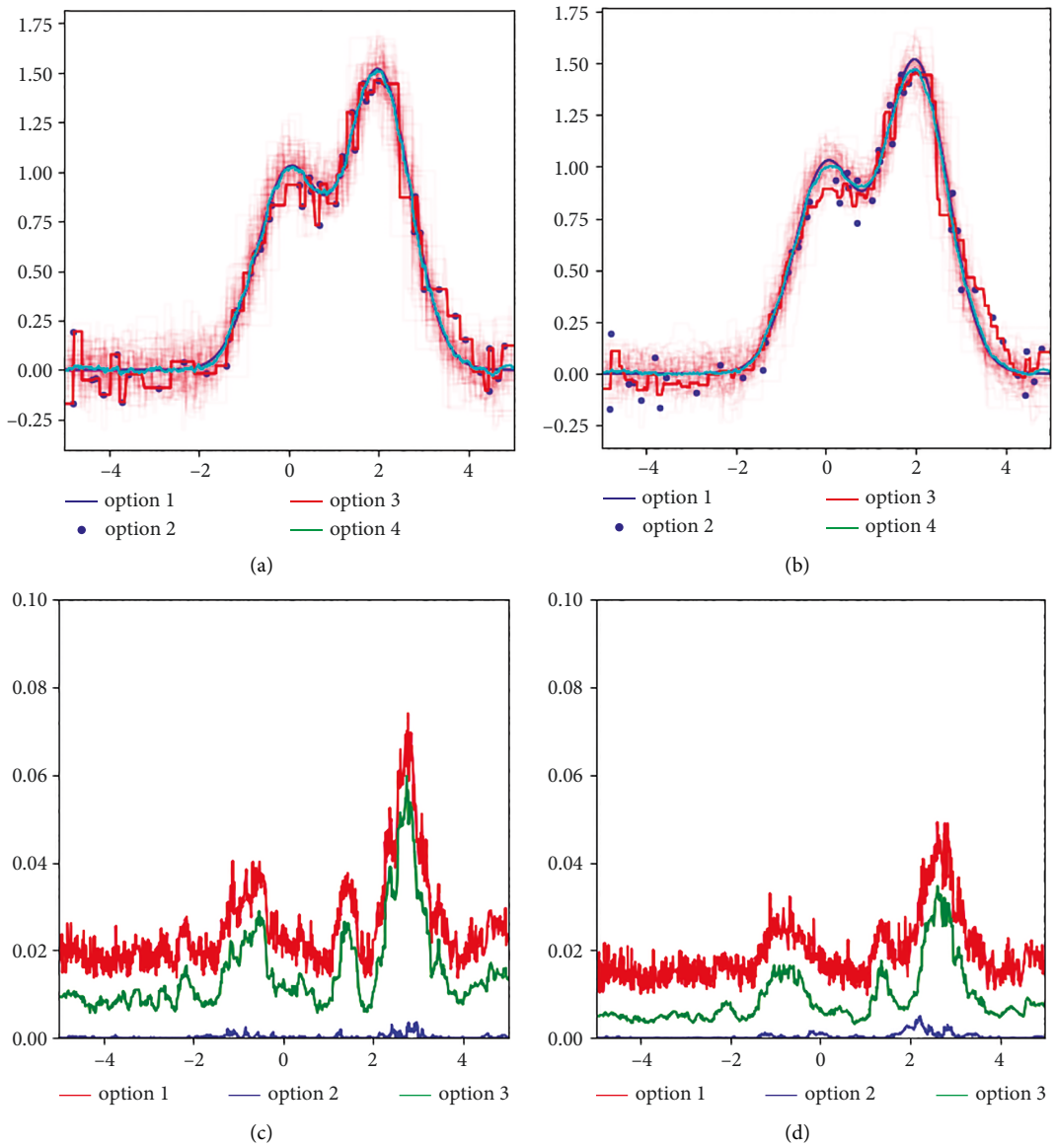

Figure 9: Learning tracking of different learners and different cloud computing teaching.

unnecessary steps, and the interface and the entrance are also designed in a very human way. In this very convenient situation, the enthusiasm and initiative of the learners to visit the open courses are improved, and the effective promotion of the open courses is realized.

7. Conclusion

The cloud computing environment checks whether the avatar is a logged-in registrant. During the learning process, the system will take the learner's avatar and log in. The avatars of the registrants are compared and accurate information is sent to the teacher. The learner's attention can be monitored in terms of how long the learner is away from the screen and the number of times other procedures are taken to cover the learning page. If the learner's concentration level is below the specified level, the system will automatically determine that the learner did not concentrate all the way as a basis for evaluating the learner's learning effect. In order to improve the model performance, we plan to optimize different parameters, design more advanced models, etc. and have expanded the application scenarios of this method.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest to report regarding the present study.

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