# Research on Online Education System for College English Majors Based on Cloud Computing

Meizhi Wu(✉)

School of Foreign Languages, Sichuan University Jinjiang College, Meishan 620010, China
wzm202303@163.com

**Abstract.** A new cloud computing based online education system for English major teaching in universities is proposed to address the issues of poor system usage and resource storage efficiency in online education systems. The system is based on cloud computing to construct the overall architecture of the system. The functions of each layer of the online education system are designed based on the overall structure. A low redundancy data storage algorithm based on data dependency is introduced to store system resource data. Combined with the CP-ABE encryption algorithm, the system is designed to share and improve the security performance of system resources, achieving research on online education systems for English majors in universities. The experimental results show that the system has a very satisfactory usage effect with a proportion of over 65.0%. The proportion of abnormal data stored in system resources is only 0.3%, and the probability of abnormal modification of resource data is less than 0.4% under all three conditions. This verifies that the system has higher system usage efficiency, resource storage efficiency, and resource data encryption effect. The CPU ratio of the system is studied to reduce the ratio and improve the operation effect of the system in the follow-up research work to further improve the performance of the system.

**Keywords:** Teaching English Majors in Universities · Online Education System · Cloud Computing · CP-ABE Encryption Algorithm

## 1 Introduction

The learning mode carried out under the information technology environment is constantly changing with the rapid development of computer technology and network technology. Every new technology can bring new learning methods and learning experience to the field of education. From computer-aided instruction to distance education, and then to computer network education are all the same [1, 2]. Cloud computing [3, 4] in this process, a concept proposed by Google for commercial use, it is another new computing mode after parallel computing, distributed computing and grid computing. The virtualization technology provided by cloud computing can solve the shortage of online learning resources and integrate the most abundant educational resources for


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online learning. Online teaching and learning under various "cloud education services" provided by cloud computing can greatly reduce the configuration requirements for mobile terminal devices. Therefore, with the development of cloud computing, online education can break through the bottleneck, usher in new development space, and form a new online education model - based on cloud computing online education model. This education model is mainly based on the education system of cloud computing. However, there are certain limitations in this education system at the present stage. For example, abnormal data in the resource data stored in the system accounts for a high proportion, leading to the unavailability of some resource data and the high probability of abnormal modification of resource data, which indicates that the encryption effect of resource data is not good and the system has security problems.

Relevant scholars have devoted themselves to in-depth research on this issue. Reference [5] studied a continuous water cycle ecological impact and remote English education system based on sequence matching. The system analyzed generation rules, designed an interface that can provide a free form, and had dynamic feedback function. Using the cognitive counseling creation tool developed by Carnegie Mellon University, an online tutoring system based on production rules was designed, Implement the design of the education system, but the system has poor performance in the actual use process. Reference [6] studied a constant water cycle ecological impact and remote English education system based on sequence matching. The system introduced JavaBean components and designed the system's software architecture. This paper analyzed the nonlinear model of water cycle ecology, combined it with English, and designed a remote English teaching system. The system shortened the development cycle and simplified system maintenance measures, but its resource storage effect was poor, Mainly due to the high proportion of abnormal data stored in system resources. Reference [7] studied a virtual reality action interactive teaching artificial intelligence education system. This study utilized VR technology to develop a human-machine interactive teaching process design for learning scenarios, introducing 3D modeling technology, model building, image and text panel production, video material production, and virtual guided 3D scene establishment. The principle is to use 3DMAX and Unity 3D engines to build 3D vision, construct 3D views for educational needs, and design high-quality images and video animations. Then, we introduced the use of VR glasses, smartphones, and Bluetooth wireless controllers to build a simple interactive teaching platform. The virtual reality action interaction effect of this system is good, but its resource data has a high probability of abnormal modification, which poses a threat to system security.

Aiming at the problems of the above methods, this paper studies a new online education system for college English major teaching based on cloud computing. Cloud computing is introduced into the system. The overall system architecture is built and the system functions are designed based on cloud computing technology. The system logic algorithm is designed to realize the functions of the online education system for college English major teaching according to the system architecture of cloud computing.

## 2 Online Education System Based on Cloud Computing Technology

### 2.1 Overall System Architecture Based on Cloud Computing Technology

The construction of online education system for college English major teaching based on cloud computing is to make up for the shortcomings of the current online learning mode, maximize the integration of rich learning resources, maximize the utilization of resources, and eliminate the information silo phenomenon as far as possible to improve the learning efficiency of learners. Therefore, the design of an online education model based on cloud computing is shown in Fig. 1.

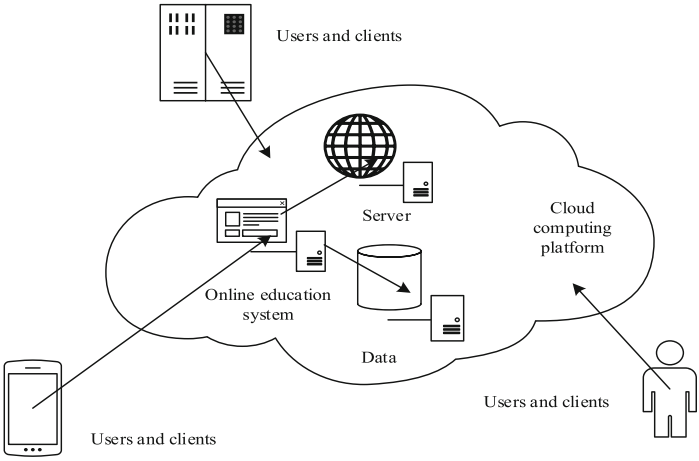



**Fig. 1.** Online Education Mode Based on Cloud Computing

According to Fig. 1, the realization of the online education department of English major teaching in colleges is based on the cloud platform of cloud computing [8]. In the online education mode based on cloud computing, education units no longer independently develop education systems, but enter the cloud service platform through interconnection. They can realize uninterrupted access at any time and place by using the cloud computing services provided by the cloud service platform, and share bandwidth and education resources with other users in the cloud platform. Cloud computing mainly provides infrastructure services, including storage, servers, and network devices. It can manage infrastructure in a unified manner and provide powerful computing power, data storage space, and network communication resources. End users through a unified user interface for online education in the cloud computing teaching system. At the same time, the online education resources of college English major teaching are stored in the cloud, and the cloud computing platform provider is responsible for the security of the resources. College education no longer needs to feel anxious about the inaccessible resources caused by the server failure. Based on this, with the functional needs of students and teachers as the core, the overall architecture of online education system for college English major teaching based on cloud computing technology is designed, as shown in Fig. 2.

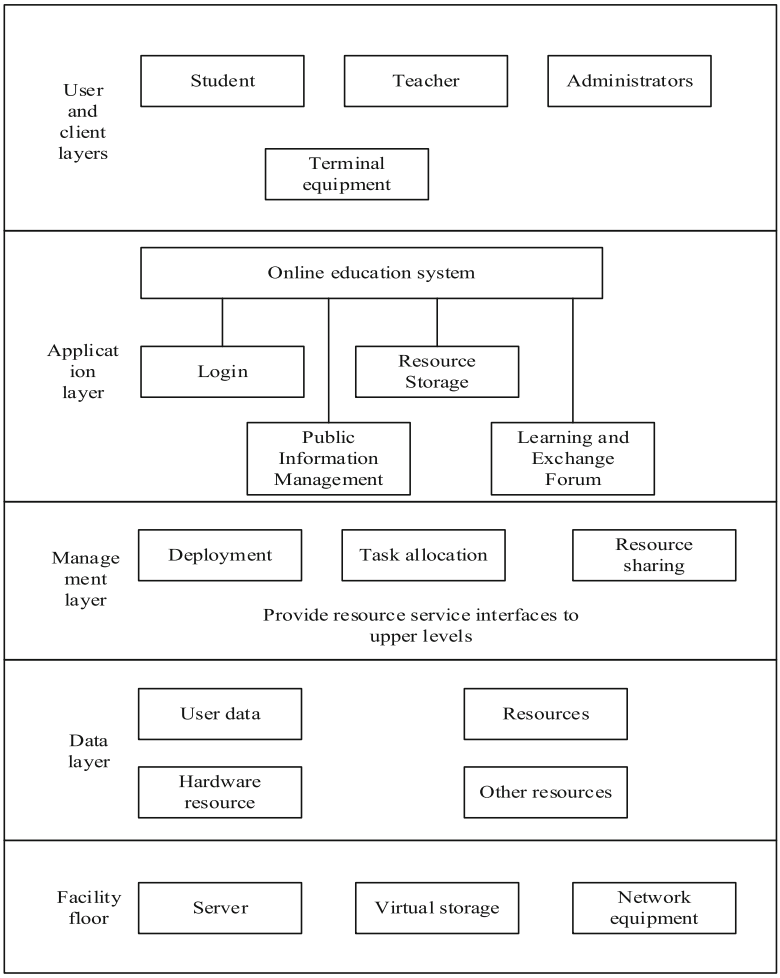



**Fig. 2.** Overall architecture of online education system for English major teaching in universities based on cloud computing technology

The overall architecture of the online education system for English major teaching in universities based on cloud computing technology is divided into five layers according to Fig. 2, namely user and client layers, application layers, management layers, data layers, and facility layers. The user and client layers are the consumers in the cloud computing system, while the application layer, management layer, data layer, and facility layer are the supporters and providers of cloud computing. The specific functions of each layer are as follows.

### 2.2 Functions of Each Layer of the Online Education System

According to the overall architecture of the online education system for college English major teaching based on cloud computing technology designed above, the functions of five layers are designed.

1) User and client layer

   Users of online learning platforms include students, teachers, and system administrators. Students can study online on the platform, including browsing courses, downloading learning materials, taking self-quizzes and discussing learning problems with teachers or classmates. Teachers use the platform to guide students in learning, assign homework and communicate online. The system administrator is responsible for the management of user information, course information, forums and other related work. As a medium for users to interact with the system, the client not only refers to personal computers, but also includes mobile devices such as smart phones. The system provides different interfaces and functions based on the device type owned by the user. The application of client is becoming more and more extensive with the development of communication network technology and wireless mobile communication equipment.

2) Application layer

   The application layer of the online education cloud platform aims to provide application software related to education and teaching, that is, education oriented applications. This layer includes an online education system as the backbone of the entire system, which does not directly carry and store data content. Instead, it enters the cloud service platform through the user login portal and calls the interface, using the relevant services provided by cloud computing. The online education system includes registration and login, public information modules, and interactive communication modules.

3) Management

   The management layer is the core and provides a running environment for the application layer's online learning system in the architecture of the online learning cloud platform, which is an educational oriented application platform. This layer represents the platform or service layer of cloud computing, using third-party application platforms launched by the system and deployed on a unified infrastructure. Users do not need to worry about the reliability, performance, and security of the platform, as its operation is monitored and maintained by service providers. The platform implements a load balancing mechanism internally in addition, which can automatically distribute a large number of request tasks to idle application servers for processing. This layer provides various services, data persistence storage mechanism and necessary management control functions for user applications, which are mainly realized by providing programming interfaces. The user, resource, and other data in the online education system are managed, shared, and interacted with by the components of this layer through interfaces.

4) Data layer

   It as the core of the architecture, the data layer is responsible for storing all types of data, both structured and unstructured. The core and foundation of online education system is the construction of educational resources. However, educational

resources cannot be fully utilized under the condition that each online education platform operates independently. Unified resource pool for users to share to solve this problem, data storage services in cloud computing consolidate resources into a common. The data storage service of cloud computing is provided by a cluster of one million servers. The storage space can be dynamically expanded as required without worrying about the capacity. The data layer stores two types of data: structured data and unstructured data.

5) Facility layer

It as the foundation layer of the entire architecture, the infrastructure layer corresponds to the infrastructure as a service in the cloud computing service layer, which determines the service scope and service capabilities of online education systems. The infrastructure layer provides users with hardware resources such as servers, storage space, and network devices, which are virtualized through virtualization technology, namely server virtualization, storage virtualization, and network virtualization. This method can generate multiple virtual machines on a physical server and achieve comprehensive isolation between multiple virtual machines, virtualizing storage resources into a "storage pool", consolidating many scattered storage resources, and improving overall utilization. Computer cluster technology virtualizes a unified cloud computing service platform through unified scheduling management. Its powerful computing power and massive storage space just meet the growing number of online learning users, the growing demand for educational resources and the purpose of hardware resource sharing. By using the infrastructure provided by cloud computing, educational institutions do not need to consider issues such as servers and storage space, and it can focus on the development and services of online learning platforms.

Wireless communication network is used to complete the communication in the online education system architecture based on cloud computing. The mobile learning system is used by learners to communicate through WIFI or 4G/5G network [9], which can be the private network of some specialized organizations or the 4G/5G service provided by network operators.

## 3 System Logic Algorithms Based on Cloud Computing Technology

After completing the architecture design of the online education system for English major teaching in universities based on cloud computing, the system logic algorithm of cloud computing technology is designed to achieve the system's functions based on the system of cloud computing technology. The low redundancy data storage algorithm based on data dependency and CP-ABE encryption algorithm [10] are introduced in this part. The online education system can store and share educational resources through the combination of algorithms and the complete system logic algorithm design, so that the system has application performance.

Firstly, the system designed in this article stores online education digital resource data for English major teaching in universities, making it easy for teachers, students, and management personnel to use teaching digital resources during the teaching process. A low redundancy data storage algorithm based on data dependency was introduced in the process of data storage design, and the structure of the algorithm is shown in Fig. 3.

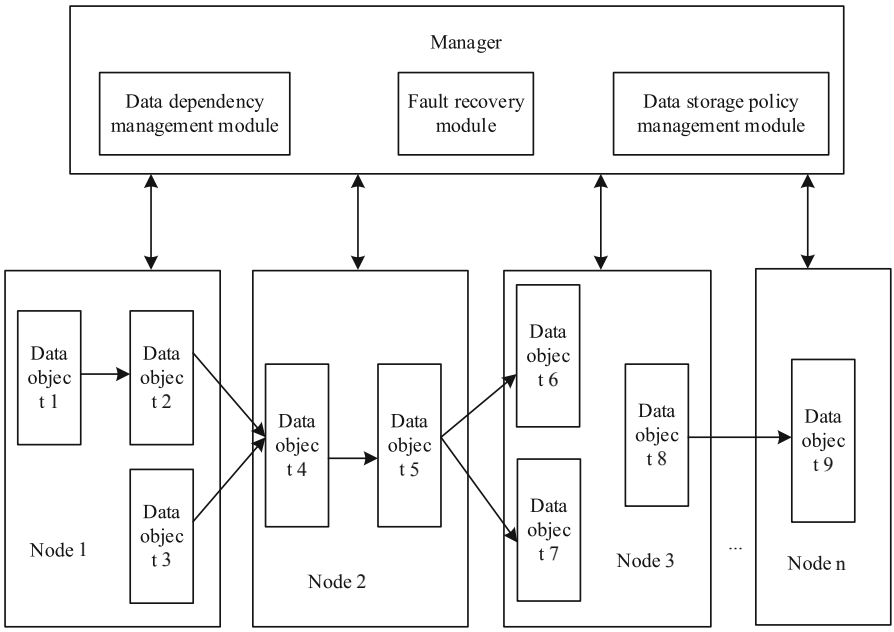



**Fig. 3.** Low redundancy data storage algorithm structure based on data dependency relationships

The low redundancy data storage algorithm based on data dependency mainly consists of three modules according to Fig. 3, which are data dependency management module, fault recovery module and data storage policy management module. Among them, the data dependency management module records the dependency relationship between resource data in the school education system. According to Fig. 3, $x_1, x_2, \cdots, x_n$ data object of educational digital resources is constructed in this module. The data object is set as A and the dependency relationship of the data object is designed.

$$x_k = \overline{x_i x_j}, k > j > i \tag{1}$$

where, $x_i, x_j$ represents the data object, belonging to $x_1, x_2, \cdots, x_n$ mentioned above, $\overline{x_i x_j}$ represents the directed edge, and $x_k$ represents the generated data. According to formula (1), only when the data object $x_i, x_j$ points to $x_k$ and $x_i, x_j$ is ready can $x_k$ be generated.

After determining the dependency relationship of digital resource data in the online education system for English major teaching in universities, abnormal data is recovered through a fault recovery module to avoid unavailability when teachers or students use resource data. Build the data generated through dependency relationships into a dataset, with the formula:

$$X = \{x_1, x_2, \cdots, x_i, x_j, x_k, \cdots, x_n\} \tag{2}$$

After determining the abnormality of digital resource data, the required data objects are found in the educational resource data set, and the resource data is re-generated by combining the generation operator. The formula is as follows:

$$x_k' = \alpha_k x_k, x_k \in X \tag{3}$$

where, $\alpha_k$ represents the generation operator. Reply to abnormal resource data through formula (3) to provide the system with usable data.

After the complete system resource data is recovered, the resource data storage policy is designed in the data storage policy management module, and the formula is:

$$x_k'' = \begin{cases} b_k(x_k, x_k'), 0 \leq b_k \leq 3 \\ 4, \text{Use the (10,14) erasure code store policy} \end{cases} \tag{4}$$

where, $b_k$ represents the number of copies of the data object.

Considering the resource data storage overhead of online education system for college English major teaching, the overall storage overhead of online education system is first determined in order to reduce the storage overhead and optimize the overall overhead of resource data storage, and the formula is as follows:

$$d(t) = \sum_{k=1}^{n} \{d_i(t) + (1 - \beta_i(x_k'')e_k d_k(x_k''))\} \tag{5}$$

where, $d_i(t)$ represents the storage cost of recovering faulty resource data, $\beta_i(x_k'')$ represents the availability coefficient of resource data, $e_k$ represents the storage cost factor of system resource data, and $d_k(x_k'')$ represents the storage cost of system resource data $x_k''$. The overall system storage cost for optimizing formula (5) is as follows:

$$F(t) = \min \sum_{k=1}^{n} d(x_k'', t) \tag{6}$$

Formula (4) and formula (6) are combined to obtain the final storage strategy. The formula is:

$$\begin{aligned} x_k'' &= \begin{cases} b_k(x_k, x_k'), 0 \leq b_k \leq 3 \\ 4, \text{Use the (10,14) erasure code store policy} \end{cases} \\ s.t\ F(t) &= \min \sum_{k=1}^{n} d(x_k'', t) \end{aligned} \tag{7}$$

where, the (10, 14) erasure code store policy is by storing redundant blocks together with the original data blocks, which can be recovered in case of data loss, and 4 means that there are 4 additional redundant blocks for fault tolerance, $d(x_k'', t)$ Indicates the storage cost of system resource data $x_k''$ at time $t$.

After completing the storage of digital resource data in the online education system for English major teaching in universities based on cloud computing, design a sharing algorithm for storing resource data, link the storage and sharing of system resource data, and achieve system functions. The system sharing considers the security of educational resource data and adopts CP-ABE encryption algorithm to achieve resource data sharing.

First, select a bilinear group $G$, the generator is $g$, the order of the group is a prime number $L$, and randomly select $\chi$, $\delta$, both of which belong to the addition group $G'$, and

then generate the public key and master key of the online education system for English majors in colleges and universities. The formula is:

$$\begin{aligned} M &= G, g, o, p, q \\ M' &= (\delta, g^{\chi}) \end{aligned} \tag{8}$$

Among them,

$$\begin{aligned} o &= g^{\delta} \\ p &= g^{\frac{1}{\delta}} \\ q &= (g, g)^{\chi} \end{aligned} \tag{9}$$

where, $M$ represents the public key of the education system, and $M'$ represents the master key of the education system.

After the public key and master key of the system are designed, the shared access control tree is designed, and the threshold of the node of the shared access control tree is set as $J_k$, then the access control is:

$$H = J(x_k''),\ J(x_k'') = J_k = 1 \tag{10}$$

Among them,

$$0 \leq J_k \leq n \tag{11}$$

where, $J(x_k'')$ represents the node polynomial of data $x_k''$ on the access control tree.

Connect formula (8) and formula (10) to generate ciphertext for online education system, with the formula:

$$M'' = (H, \widetilde{R}, R, R') \tag{12}$$

Among them,

$$\begin{aligned} \widetilde{R} &= Sq \\ R &= H(0) \\ R' &= H(att(x_k'')) \end{aligned} \tag{13}$$

where, $S$ represents the ciphertext of the education system.

To calculate the attribute private key of an online education system user, the formula is:

$$T = g^{\frac{\chi+\varepsilon}{\delta}} + g^{\varepsilon} H \tag{14}$$

where, $\varepsilon$ represents an element in the additive group $G'$.

After determining the user's attribute private key, recursively calculate the system resource data using the formula:

$$Derypt(M'', M, T, k) = e(g, g)^{\varepsilon H(0)} \tag{15}$$

where, $e(\cdot)$ represents a recursive function.

Through recursive calculation, the final ciphertext $S$ is obtained, and the formula is as follows:

$$S = \frac{\widetilde{R} \cdot Derypt(M'', M, T, k)}{e(R, M')} \tag{16}$$

Resource access under system resource data sharing can be achieved by using the ciphertext obtained above, achieving the purpose of system interaction. So far, the logical algorithm design of the online education system for English major teaching in universities based on cloud computing has been completed, and the system functions have been implemented.

## 4 Experimental Analysis

### 4.1 Experimental Scheme

The application performance of the system in actual online teaching is analyzed in order to verify the effectiveness of the cloud-based online teaching system for college English majors designed in this paper. Therefore, the comparative analysis experiment is designed. The specific scheme is as follows:

1. Before starting the experimental analysis, it is necessary to prepare the experimental environment to lay a foundation for verifying the method designed in this paper. The experimental preparation provides the online course information, system interface, and experimental equipment configuration.
2. Before analyzing the system performance, it is necessary to test the basic performance of the system designed in this paper to ensure the normal operation of the system and avoid affecting the experimental results due to the abnormal operation of the system.
3. After completing the system test, set the experimental parameters to ensure that the parameter settings are reasonable and scientific.
4. Set experimental conditions. In this step, considering that the number of concurrent online users may affect the system performance, set three experimental conditions about the number of concurrent online users. The experimental analysis was carried out under this condition.
5. Result analysis: After the preliminary preparation, the reference [6] method and the reference [7] method are used as comparison methods, compared with the method in this paper, and the effectiveness of system use, resource storage and resource data encryption are taken as evaluation indicators.

### 4.2 Experimental Environment

It is necessary to prepare for the experiment before the experiment starts. The object of the experiment is the online English major teaching course of a university. The system resource information for the course is shown in Table 1.

The online education system for college English majors designed according to the method in this paper is shown in Fig. 4.

The experimental configuration is shown in Table 2.

Prepare the experiment according to the above content.

**Table 1.** Online Course Information

| Serial Number | Name | Content |
|---|---|---|
| 1 | System course resource data volume | 50G |
| 2 | Resource data type | Electronic documents, videos, images, audio files |
| 3 | Number of course chapters | Chapter 12 |
| 4 | Course arrangement | Two classes per week in the afternoon |

### 4.3 Experimental System Testing

It is also necessary to ensure the normal operation of the designed online education system for college English major teaching based on cloud computing to avoid inaccurate experimental analysis results due to system problems before starting the experimental analysis. Therefore, targeted tests are conducted on the online education system, and the test results are shown in Table 3.

It can be seen that all functions of the system designed in this paper can be used independently and run normally according to the test results of the online education system in Table 3, and the system can run normally when multitasking is concurrent. Therefore, the system meets the basic application conditions, has the application performance and can be verified and analyzed.

### 4.4 Experimental Parameter Settings

Set experimental parameters to avoid different numerical values that may affect the experimental results. The specific settings of experimental parameters are shown in Table 4.

Set the experimental parameters according to the values in Table 4, complete the preliminary work of the experiment, and start the experimental analysis.

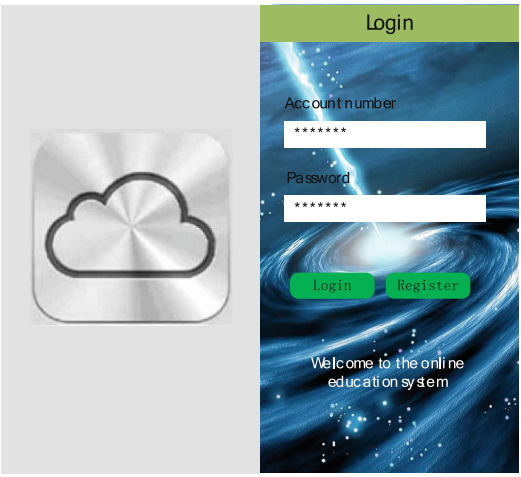
### 4.5 Experimental Conditions

Considering the different effects of the number of concurrent online users on the performance of the cloud-based online education system for college English major teaching, three experimental conditions were set and the experimental analysis was carried out under the three experimental conditions. The specific experimental conditions are shown as follows:

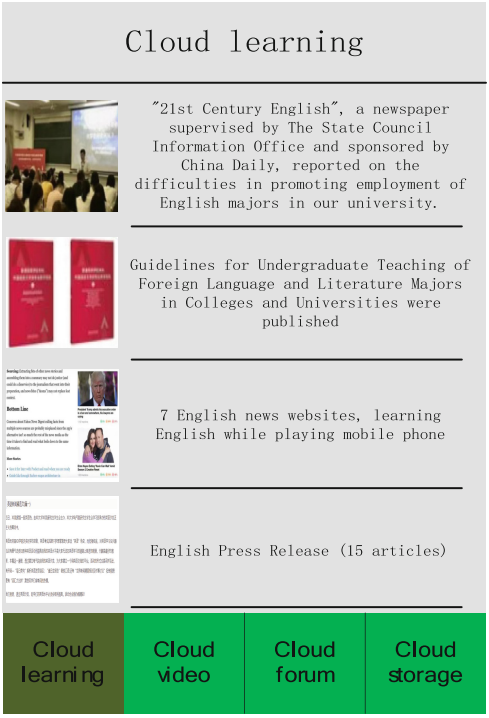
Condition 1: The number of concurrent online users of the online education system is 200;

Condition 2: The number of concurrent online users of the online education system is 400;

Condition 3: The number of concurrent online users of the online education system is 600.




(a) System login interface




(b) Internal interface of online education system

**Fig. 4.** System Interface

Based on the above three experimental conditions, the system in this paper, the reference [6] method and the reference [7] method are compared to analyze the effect of system use, resource storage and resource data encryption.

**Table 2.** Experimental Equipment Configuration

| Serial Number | Name | Content |
|---|---|---|
| 1 | Desktop computer | Model ThinkCentre neo P600 |
| 2 | CPU | I7-12,700, 2.1 GHz, twelve core |
| 3 | Graphics card | 6 GB |
| 4 | Motherboard | Chipset Intel B660, standalone graphics card |
| 5 | Operating system | 64 bit, Windows 10 |

**Table 3.** System Testing

| Function | Result |
|---|---|
| Register | Normal |
| Land | Normal |
| Cloud learning | Normal |
| Cloud Video | Normal |
| Cloud Forum | Normal |
| Cloud storage | Normal |
| Cloud sharing | Normal |
| Cloud access | Normal |
| Single-user access | Normal |
| 500 users accessing simultaneously | Normal |
| Simultaneous execution of different tasks | Normal |
| Performing the same task simultaneously | Normal |

**Table 4.** Experimental Parameters

| Serial Number | Parameter | Numerical value | Implication |
|---|---|---|---|
| 1 | $n$ | 1000 | Number of educational digital resource data objects |
| 2 | $k$ | $\leq$1000 | The $k$-TH of the generated data |
| 3 | $\alpha_k$ | (0,1.0) | Generating operator |
| 4 | $e_k$ | [0,0.874] | System resource data store cost factor |
| 5 | $L$ | 11 | The order of the group, which is a prime number |

## 4.6 Result Analysis

### 4.6.1 Analysis of System Usage Effectiveness

Firstly, analyze the effectiveness of the online education system for English major teaching in universities based on cloud computing, which includes resource data storage, resource data sharing, interaction, cloud learning, cloud video, cloud forum, and cloud access. Due to the differences in the functions of different literature systems and the lack of comparability, the analysis of this system ensures a certain degree of reliability in the experimental analysis by increasing the number of users participating in the use of the system. The number of users participating in the system usage is 500, and the experimental results of the system usage effect are shown in Fig. 5.

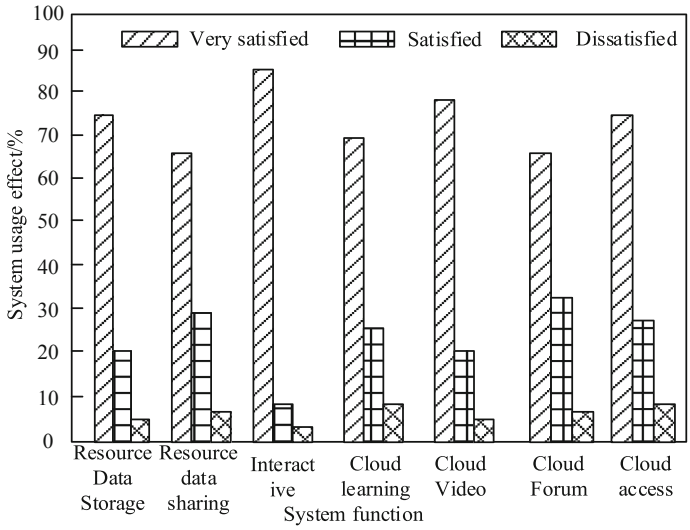



**Fig. 5.** System Usage Effect

The system usage effect in Fig. 5 is the percentage of very satisfied, satisfied, and dissatisfied users. An analysis of the system use effect data in Fig. 5 shows that the users of the cloud-based online education system for college English major teaching designed in this paper give a very satisfied proportion of over 65.0% for different functions of the system, and the users who are satisfied with the system use effect are less than 10.0% for the interactive function in addition to 3. While the functions of other systems are above 20.0%, and the proportion of interactive functions is low, because the users of this system are very satisfied with 86.2% of the interactive functions. By analyzing the dissatisfaction of system users, it can be seen that the proportion is only 8.3% at the highest level and 3.7% at the lowest level, indicating that most users after the system designed in this paper, The use effect of the homosensory system is good, which verifies that the use effect of the system in this paper has been recognized and has a certain feasibility and effectiveness.

### 4.6.2 Analysis of Resource Storage Effectiveness

The performance of the system in the storage of educational resource data is further analyzed on the basis of the above experiments. The effect of resource storage is reflected by the proportion of abnormal data in resource storage. The lower the proportion of abnormal data, the better the effect of resource storage is. Process of experimental analysis The system of this paper is compared with the method of literature [6] and the method of literature [7], and the experimental results are shown in Fig. 6.

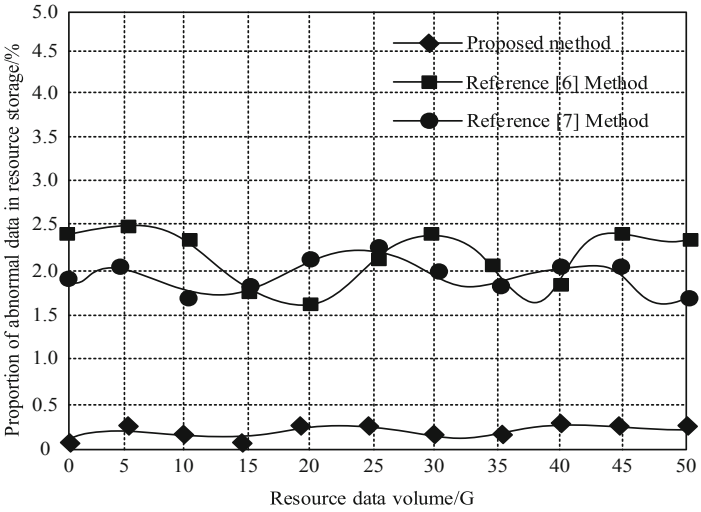



**Fig. 6.** Resource storage effects of different methods

Abnormal data accounts for less than 3.0% of storage resources in the three systems according to the effects of different storage methods in Fig. 6, meeting application requirements. However, among the three kinds of online education systems, the system designed in this paper has the lowest proportion of abnormal data in resource storage, and the highest value is only 0.3%. However, among the comparison systems, the abnormal data in literature [6] system and literature [7] system both account for about 2.0%, and the lowest proportion of abnormal data in the two systems is only 1.6% and 1.7%. In this paper, the proportion of abnormal data in resource storage is reduced by more than 1.3%. Therefore, it can be seen that the proportion of abnormal data in resource storage in this system is the lowest. The experimental results verify that the system in this paper has better resource storage effect.

### 4.6.3 Analysis of Resource Data Encryption Effect

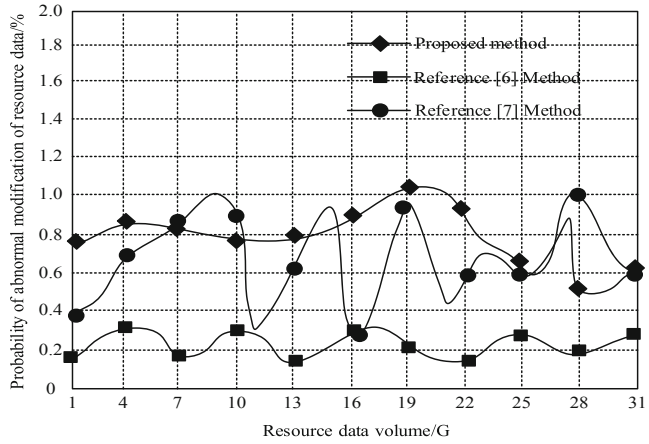
The probability of resource data being abnormally modified is used to reflect the effect of resource data encryption in order to further analyze the performance of the system and the effect of resource data encryption in this paper. The lower the probability of resource data being abnormally modified, the better the effect of system resource data encryption is. The expected target is that the probability of resource data being abnormally modified is less than 1.0%. The effect of resource data encryption of the three methods under three experimental conditions is analyzed, and the experimental results are shown in Fig. 7.

According to the data in Fig. 7, different systems have different effects of resource encryption under the three conditions, and with the increase in the number of concurrent online users, the probability of resource data being abnormally modified in the literature system has increased, while the probability of resource data being abnormally modified in the system in this paper has not increased, and the numerical curve has been lower than 0.4%. However, the probability of resource data being abnormally modified in the literature [6] system and the literature [7] system is above 0.7%, and the maximum probability of resource data being abnormally modified in the two systems is over 1.0%. Therefore, the resource encryption effect of the literature system can meet the application requirements when the number of concurrent online users is small. However, when there is a large number of online users at the same time, the literature system does not meet the requirements, while the paper system does.

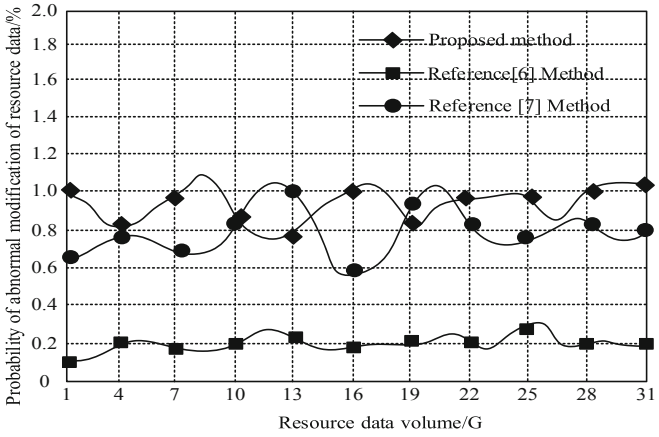
### 4.6.4 Effect Analysis of Resource Sharing

After analyzing the resource encryption effect of different systems, the resource sharing effect of the system designed in this paper is analyzed, and the resource sharing effect is reflected by the resource sharing rate. The higher the resource sharing rate, the better the resource sharing effect of the system is shown in Table 5.

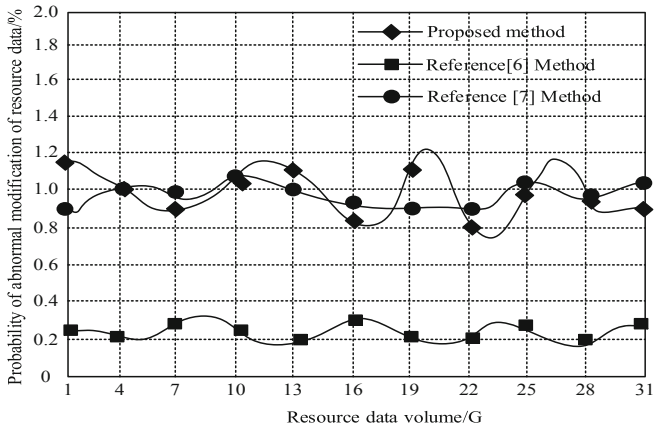
According to the data in Table 5, the resource sharing effect of the three methods is above 95.0%. However, detailed analysis shows that when the resource sharing data reaches 50G, the resource sharing effect of this method is the highest, reaching 99.6%, while the resource sharing rate of reference [6] method is only 97.6%. The resource sharing rate of reference [7] method is 95.1%, and the resource sharing rate of the proposed method is all above 99.0%. Therefore, the comparison shows that the resource sharing rate of the proposed method is increased by more than 2.0%, and the experimental results fully demonstrate that the proposed method effectively improves the resource sharing effect.




(a) Condition 1




(b) Condition 2




(c) Condition 3

**Fig. 7.** Resource encryption effects of different systems

**Table 5.** Resource Sharing Effect (%)

| Amount of resource data/G | Proposed method | Reference [6] method | Reference [7] method |
|---|---|---|---|
| 5 | 99.7 | 97.2 | 95.3 |
| 10 | 99.5 | 97.3 | 96.5 |
| 15 | 99.2 | 97.0 | 94.7 |
| 20 | 99.6 | 97.1 | 95.3 |
| 25 | 99.3 | 96.5 | 97.1 |
| 30 | 99.1 | 97.2 | 96.8 |
| 35 | 99.5 | 97.2 | 95.8 |
| 40 | 99.7 | 97.4 | 94.3 |
| 45 | 99.8 | 97.0 | 94.0 |
| 50 | 99.6 | 97.6 | 95.1 |

## 5 Conclusion

A new cloud computing based online education system for English major teaching in universities has been designed in order to improve the effectiveness of online education systems for English major teaching in universities and address issues such as poor storage of system resource data. The system introduces cloud computing. Based on cloud computing, the overall architecture of the system is designed, and the system functions are designed. Based on this, the low redundancy data storage algorithm based on data dependency and CP-ABE encryption algorithm are introduced. Through the combination of algorithms, the complete system logic algorithm design realizes the storage and sharing of educational resources in the online education system, so that the system has application performance. Finally, the performance of the designed system was verified through experiments. The experimental results showed that the system performed well, with a very satisfactory rate of over 65.0% and a satisfactory rate of over 20%. Additionally, the proportion of abnormal data stored in resources was reduced by over 1.3%, and the probability of abnormal modification of resource data was lower than 0.4%, which was 0.3% lower than other systems. Therefore, it can be concluded that the system has higher application performance. An in-depth study will be conducted on the CPU ratio of the online education system for English major teaching in colleges and universities in the follow-up work. The CPU ratio is an important indicator to measure the practical application effect. The lower the CPU ratio, the better the system performance will be.

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