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Multimedia Teaching System Based on Art Interaction Technology

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Abstract. With the development of the times, traditional classroom education has gradually failed to meet the needs of teaching. Now, with the application of computers in modern education, hybrid learning has developed rapidly in the field of education. How to promote the better development of hybrid learning has become a new research hot spot. Therefore, this paper aims at improving the MOOC platform, which is the largest application of hybrid learning. It integrates animation technology and multimedia technology, and designs a multimedia-teaching platform based on art interaction technology, which effectively improves the attraction of MOOC platform to learners. Firstly, this paper introduces multimedia technology, animation technology and interactive animation technology in detail, and applies them to MOOC platform. Secondly, according to the analysis of the research results of teaching platform requirements, the design principles and system framework of this paper are given. Finally, the information processing system of B/S architecture mode is built to make the improved platform have high response speed and data processing ability. In addition, this paper constructs a small-scale multimedia hybrid learning platform for testing, and finds that the multimedia teaching platform based on art interactive technology designed in this paper can well promote students' autonomous learning and improve the effect of students' learning.

Keywords: mixed learning, MOOC platform, multimedia teaching, art interaction.

1. Introduction

Since the beginning of the 21st century, the theoretical system of E-learning has been gradually established and improved, but the development of E-learning is not ideal. In 2001, the American Society for Training and Development reported that only 20% of corporate training was conducted in the form of E-learning, and E-learning was at low ebb. People began to reflect on this new way of learning, which led to the emergence of Blended Learning [1].

The main characteristics of MOOC curriculum are: large scale, openness, flexibility, easy to use, multi-source resources, participation autonomy, course audience, not limited by space and time, etc. Specifically, it is: (1) the scale of online learning is relatively large, and the number of people participating in curriculum learning is relatively large. (2) Openness: Regardless of the location, there is no threshold, as long as you want to

learn the interest of learning can participate in. (3) Flexibility: learning time is not single or gathered at a certain point, want to learn. We can use the fragmentary time to learn, and we don't need a fixed or specific time to learn. (4) Easy to use: the development of the teaching activities of "network course" can break through the traditional teaching requirements of time and space, connect the people who need to learn in various countries and regions of the world through the way of network connection, and learn the relevant courses they want to learn on the network. (5) Resource diversification: MOOC curriculum combines various forms of digital resources and various social network tools to form diversified and abundant curriculum resources and learning tools. (6) Participation autonomy: MOOC course not only has a higher choice rate, but also has a higher learning rate, which is inseparable from the need to learn a stronger sense of autonomy and a strong sense of honor, so as to complete the course learning content on time and learn the corresponding knowledge. (7) Course audiences: there is no restriction on the number of teaching staff, which can meet the needs of a large number of learners at the same time. The starting point of MOOC is people-oriented, which believes that everyone should have the right to learn. Every person with learning motivation and a person with learning ability in the world should acquire the survival skills they need in their life to improve their living environment, make their life better and make more contributions to their society [2-4].

Based on the advantages of MOOC platform, this paper introduces multimedia technology and animation interaction technology to improve the artistic quality of MOOC platform and strive to enhance the attraction of MOOC courses to learners. Multimedia, with the characteristics of text, picture, sound, image, and interaction, makes teaching intuitive and visual, greatly improves the transmission efficiency of knowledge and information, making teaching and learning is no longer a boring work, but a kind of enjoyment of art. Multimedia has interactive functions and hypermedia characteristics, making learning an autonomous behavior, truly reflecting the dominant position of students, while the leading role of teachers is to cut into the core of the teaching process [5]. The development and application of network technology, remote communication technology and virtual reality technology make multimedia teaching develop further. There will be rapid changes in modern educational technology. This topic will reveal the principles of multimedia teaching from the perspective of educational theory, study the practical functions of teaching system development from the perspective of teaching application, and provide a train of thought for the theoretical research and application research of multimedia teaching [6-8]. The development of art interaction technology has met the development needs of various fields. At the same time, the development of art interaction technology has broadened the new direction and field for the development of multimedia, which can enable students to learn more intelligently from multiple directions and angles. In the teaching process of many professional disciplines, vivid animation can make students feel high emotions in class, more attentive learning and thinking, and excellent works produced by animation can also shock students' hearts and make students feel the joy of creation and success. From the point of view of teaching effect, mature art design does not need teachers to teach too much. It can let students do their own work and brains, and let students interact and communicate with art. Let teachers teach knowledge into students' own exploration of knowledge, and let students actively explore knowledge in the true sense of realization [9-11].

In summary, on the basis of the advantages of MOOC platform, this paper introduces multimedia technology, animation technology and interactive technology, analyses the hierarchical structure and development process of the system, constructs information processing system using B/S architecture mode, and designs a multimedia teaching platform based on art interactive technology.

2. Related work

Hybrid learning mode is a new learning mode, which combines the traditional face-to-face learning mode and E-learning learning mode. It combines the advantages of traditional learning mode and E-learning learning mode. It not only avoids the neglect of students' autonomy in traditional teaching, but also alleviates the low utilization rate of E-leaning because it can't completely replace traditional teaching. Mixed learning involves many fields, including school education, enterprise training, teacher training, adult education and so on. There are also increasing number of academic conferences, project topics and papers on hybrid learning. The Horizon Report of the New Media Alliance (2016 Higher Education Edition) points out that among the six key trends that may affect the reform of higher education in 2016-2020, the widespread use of blended learning design will be increasingly concerned as a short-term trend (within one year). In China, some universities have incorporated the results of blended learning into the credit system, adding the credits obtained by blended learning to the credits obtained by traditional classes as the total credits of the course for learners. The vigorous development of blended learning mode provides a new direction for the teaching mode of open universities.

In 2008, the concept of MOOC (Massive Open Online Course) was formally proposed by Canadian scholars Dave Cormier and Bryan Alexander, that is, large-scale open online courses. In 2012, MOOC got a breakthrough development. Udacity, Coursera and edX, three major MOOC website platforms, were established and operated one after another. Millions of learners registered for online courses. MOOC swept the educational circles with a trend of giving up others and attracted wide attention from all walks of life. The New York Times called it "the first year of MOOC". With the entry of Harvard University, Stanford University, MIT and other world top universities, nearly 100 famous universities around the world have also invested in MOOC platform, and there are more than 500 online courses. In May 2013, the curriculum projects of six famous Asian universities, including Peking University, Tsinghua University, Hong Kong University and Hong Kong University of Science and Technology, were launched on edx platform. In July 2013, Shanghai Jiaotong University and Fudan University signed a contract with Coursera, one of the troikas. According to Coursera, nearly 130,000 Chinese learners registered on the Coursera platform in 2013, while in 2014, the number of registered learners increased fivefold to 650,000. In September 2016, the Ministry of Education issued Opinions on Promoting Credit Recognition and Conversion in Higher Education, pointing out that all kinds of college students can obtain credits not only by learning their own courses, but also by learning out-of-school courses and converting non-academic achievements. Encouraging students to take elective courses in universities or on the basis of Internet learning platform and

promoting credit recognition and conversion in higher education will adhere to learner-centered, university-centered, substantive equivalence and standardized and orderly, and the credit recognition and conversion system in higher education will be more perfect by 2020.

3. Key Technology Overview

3.1. Multimedia Technology

Multimedia network teaching breaks the limitation of region and time and space, realizes many functions such as bidirectional interaction, real-time multi-point communication, wide dissemination, fast data and information collection, and relies on network communication technology and multimedia technology. Therefore, in the multimedia network teaching, students can share learning resources, discuss and communicate problems together, and through a variety of media (such as audio, video, image, text, etc.) to enable students to strengthen memory and improve understanding, in order to avoid the original monotonous and mechanical learning, improve students' learning initiative. It can also enable students to exchange information with computers actively and frequently, and get timely feedback. It can be said that the interactive teaching of network multimedia has changed the process of students' understanding of things in the teaching process, changed the traditional teaching principles, changed the teaching content and the form of teaching materials.

Streaming media is simply a multimedia file (audio, video, animation or other multimedia files) transmitted over the network by streaming technology. Streaming technology is a network transmission technology that compresses the continuous video and audio information and places it on the server. Users can download it while watching, without downloading the entire compressed file to the local computer [12-14]. Media in streaming media can be audio, video, animation or other multimedia files.

Streaming transmission has two modes: sequential streaming transmission and real-time streaming transmission [15,16]. Generally speaking, real-time streaming transmission is used when video is transmitted in real time, or when streaming media servers or real-time protocols such as RTP and RTCP are used. RTP is a real-time transmission protocol developed by IETF [17,18]. If an HTTP server is used, the files are sent through a sequential stream. There are some differences between real-time streaming transmission and sequential streaming transmission. Special streaming media server and transmission protocol are used for real-time streaming transmission. Real-time streaming has the advantages of realizing live broadcast, broadcasting and multicast, random access to material, saving user's disk space and not wasting bandwidth. The disadvantage of real-time streaming is that dedicated streaming servers are needed, and lost packets will be lost permanently.

Real-time transport protocol (RTP) is a transmission protocol for multimedia data streams over the Internet. It is defined as one-to-one or one-to-many transmission. Its purpose is to provide time information and synchronize multimedia data streams. RTP

usually transmits data on the basis of UDP protocol. However, RTP does not provide any mechanism to guarantee the transmission quality, which is accomplished by RTP.

3.2. Animation Technology

Animation is a series of continuous playing pictures, these pictures are static, each adjacent two pictures have slightly different, when these slightly different static pictures continue to pass through the eyes, we feel that the scene in the picture is moving, so the essence of animation is movement, is the continuous movement of multiple pictures [19].

The basic principle of animation is "visual pause". Human vision has a temporary characteristic. It means that when the human eye sees a picture or an object, the image of the picture or thing will stay in the human vision for a short time and will not disappear for at least 0.25 seconds. Animation is to use this visual principle to produce a series of continuous changes in the picture, so that the previous picture in the human vision has not disappeared before playing the next picture, thus causing a continuous change in the visual effect. Animation can't be played too slowly. If a single picture stays in the human vision for more than 0.25 seconds, we can feel the incoherence of the picture. What we see is a static picture.

In the 1950s and 1960s, with the birth and promotion of computers, people began to use computers to produce animated films, thus stepping into the era of computer animation. It not only pushed the film and television technology to a climax, but also played an irreplaceable role in scientific research, health care, education and teaching.

Computer animation is generally divided into two categories: two-dimensional animation and three-dimensional animation. There is much software for making two-dimensional animation. Flash is a rising star, but also the current mainstream [20]. Flash is widely used because it generates vector graphics, has small files and fast propagation speed. Flash does not have the function of three-dimensional modeling, but it can import the three-dimensional animation created by other software into Flash to synthesize. Two-dimensional animation production software also includes Ulead GIF Animator, COOL 3D, Firework and so on. They have different functional characteristics, so the animation style is different, which can improve the artistry of courseware.

Because animation has the characteristics of image, continuity, and narrative, the animation design teaching platform will be able to play the advantage of animation to excel and vividly shape objects and storytelling. The visual beauty of animation narrative and intuitive beauty will be Close the psychological distance between the platform and the students, so that students have higher acceptance, faster acceptance and better learning results.

For courseware and other teaching materials, PPT and Flash can meet the requirements of teachers. But Flash tends to create animation, and can develop independent courseware integrating video, sound, image, text and animation. PPT tends to demonstrate graphics and text. Although Flash can express the same content, it is inferior to Flash in form. In the actual survey and analysis results, we can also see that Flash animation courseware can attract students' attention better than PPT demonstration courseware, and in the application of animation courseware in the classroom learning atmosphere is more active, the interaction between teachers and students is better. Based

on the simplicity of Flash operation, high compatibility and independence, and strong interaction ability, this paper chooses Flash as the development software of this artistic interaction-teaching platform.

3.3. Interactive Animation Technology

Interactive animation is the product of the combination of computer graphics and art. It is a new subject with the rapid development of computer hardware and graphics algorithms. It makes use of the knowledge of computer science, art and other related disciplines to create colorful and continuous virtual reality pictures on computers, providing people with a new world to fully display their imagination and artistic talent. Computer graphics is widely used in fine arts and business arts. Artists use a variety of computer methods, including dedicated hardware, commercial software packages, symbolic mathematics programs, CAD software packages, desktop publishing software and animation software to design the shape of objects and describe the movement of objects [21-23].

Interaction is the basic feature of interactive animation. Interaction is a term in computer technology that allows users to exchange information with computer systems. Interactive is to realize the interaction between human and computer through program. The way of human-computer interaction is actually an interactive process. When designing a program to achieve a certain function, it intends to set some links in the middle of the program that users can choose or decide according to their own needs. When running the program, all the operation methods of the computer are displayed on the monitor. As long as the user acts on the computer according to the prompts or suggestions presented on the monitor, the computer can automatically process the corresponding work according to the user's operation, so that the program can run according to the user's needs.

The application of interaction technology makes people's communication reach unprecedented breadth and depth. The types and quantities of information that digital media can carry are unparalleled by traditional media. The development of interactive technology makes people digitize their various behaviors. Digital information can be controlled by these digitized instructions. The application of interactive technology makes our interactive design more intuitive and convenient.Interactive animation will guide students step by step into the learning content of platform design, learning will become an autonomous behavior, let students feel the dominant position in learning, stimulate students' desire for exploration and curiosity, so that the original boring learning content becomes Lively and interesting.

4. Design of Multimedia Teaching \platform based on Art Interactive Technology

4.1. Platform Design Principles

In order to design the teaching platform more reasonably, this paper adopts the following principles to design the teaching platform:

1. With business as the core, business modules are reasonably divided. The teaching system platform is designed according to the characteristics of the education industry and from the perspective of educational and teaching needs to meet the needs of daily teaching management, teachers' teaching, teacher training and students' self-learning of the education management departments.

2. Define the interface clearly, improve the reusability of service, define the interface of service clearly, and distinguish the boundary between service interface and internal implementation. Service design should be reusable, defining abstract service interface, stabilizing abstract interface, changing its specific implementation class when business changes, so as not to affect the call between systems, realizing the user's requirements for complex work changing with demand, and adapting to business process changes.

3. Expansibility and compatibility: The system adopts standardized interface design, and business modules are independent of each other to meet the expansion needs of future business changes. The message communication system with standard XML format is compatible for data exchange.

4. Emphasis is placed on practicality and effectiveness: the system design emphasizes practicality, practicality and effectiveness, and meets the actual needs of teachers' digital and networked lesson preparation and teaching. The interface of the system is simple, the layout is reasonable, and the operation is simple.

5. Emphasis on interactivity and fun: The system design emphasizes the reasonable layout of the interface, has strong interactivity, is interesting and easy to operate, and improves the effectiveness of student platform learning.

6. Advancement and stability: Emphasis is laid on service-oriented design method and SOA architecture, J2EE system architecture, following the industry's open standard system, to ensure the portability and stability of the system.

7. Reliability of implementation: Using multiple clusters and high availability mechanisms, it has the ability of fault tolerance and disaster tolerance, and can meet the needs of applications in a variety of environments.

4.2. System Frame Structure

The whole system can be divided into software support part and hardware support part. The software part includes multimedia teaching program, animation resources, and the hardware part includes computer, display and so on. Based on the research and analysis of the requirements of the teaching system, this paper divides the platform into six subsystems: resource system, lesson preparation system, teaching system, test system,

interactive system and information system. Figure 2 shows the system framework of this paper. The system is built on the basis of hardware devices. The UI interface is used for teachers and students. The local or network teaching resources, including text information, image information and animation information, are used through other controls such as communication control and call control.

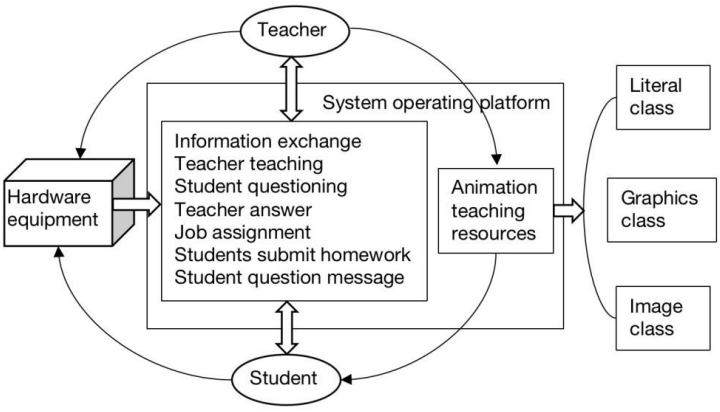

Fig. 1. System framework diagram

4.3. Teaching Platform Architecture Design

Nowadays, the most popular software architecture patterns are C/S structure and B/S structure [24, 25]. C/S (Client/Server) structure is client and server structure. This structure can make full use of the advantages of hardware environment at both ends, and assign tasks to Client and Server to realize reasonably, which reduce the communication overhead of the system. However, both Client and Server need specific software support. The software of this structure is not easy to transplant. Different versions of the system need to be developed for different operating systems. It is difficult to adapt to the simultaneous use of more than 100 local area network users. Moreover, it is expensive, inefficient and difficult to upgrade and maintain. B/S (Browser/Server) structure, browser and server structure, is a kind of structure that changes or improves C/S structure with the rise of Internet technology. There are many advantages in B/S structure system:

1. Client

In B/S structure, browser implements user interface, and very few things logic is implemented in Browser. Transaction logic is mainly implemented in Server, which can simplify the computer load of client. The operation and design of the network-teaching

platform should be considered for the client, to minimize the maintenance costs of the client and to reduce the requirements for the software and hardware equipment of the client.

2. Easy system maintenance and upgrade

Because server side mainly implements transaction logic, all clients are browsers. The software of B/S architecture only needs to manage the server. The client does not need any maintenance. The administrator can easily monitor the operation of the server and control the number of users accessing the server and using the server application. This can simplify the administrator's management of the system, reduce the workload of system maintenance, and ensure the reliable operation of the system. If it's different, it only needs to connect the server to the private network to achieve remote maintenance, upgrade and sharing.

3. Reducing development cost and improving system security

Based on the current technology, the local area network establishes the B/S structure of the network application, and through the Internet/Intranet mode database application, it is relatively easy to grasp and the cost is low. Since the B/S architecture software has no dependency on the server operating system, it can be installed on a free Linux server with high security. Because all operations are only for the server, it can effectively protect the data platform and manage access rights, and the server database is also safe. Combined with cross-platform language programming, B/S architecture management software is more convenient, fast and efficient.

4. Multi-selectivity of network hardware environment

B/S structure does not need special network hardware environment, such as telephone access, renting equipment, information management by itself; generally as long as there is an operating system and browser, because it is a one-time development, can achieve different personnel, from different locations, access and operate the common database in different ways (such as LAN, WAN, Internet/Intranet, etc.).

Therefore, the system development can adopt three-tier software architecture mode, namely, presentation layer, logic layer and storage layer, and B/S structure as the solution of the system. The system architecture is shown in Figure 2.

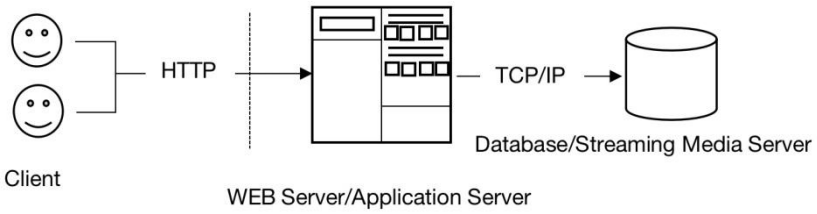

Fig. 2. System architecture

In the three-tier software architecture, the presentation layer is user interface, and the logic layer is divided into application layer and data interface layer. The storage layer is mainly used to store data, that is, physical database layer. The system is divided into three parts: database, application server and browser client. All users access the application server through the browser, and the application server and the database server interact to obtain the required data. User side adopts browser form, which can satisfy the usability requirement of zero client side.

5. Realization of Multimedia Teaching Platform based on Art Interactive Technology

5.1. Database Implementation

The basic functions of the teaching platform include students' question answering, transmission of teaching materials and notification of teaching information. Therefore, the key point of the platform construction is how to realize data information operation and processing and access of large object data files. Of course, connecting SQL Server database through MFC in VS is the most basic problem.

Accessing databases through data sources requires a driver engine. Common engines include ODBC, OLE DB and ADO [26,27]. This platform uses ADO (ActiveX Data Objects) control. ADO is an optimized set of dedicated objects, providing a complete solution for site database access. Users can use SQL instructions to add, modify and clear the data of the background server in the interactive interface. The ADO interface uses RecordSets objects. It not only supports multiple languages to access databases and output query results, but also links ODBC databases, such as SQL Server, Access, Oracle and so on [28, 29]. In MFC, statements are needed to refer to type libraries that support ADO components. Type libraries can be positioned as part of executable programs in their own affiliated resources, and initialization components are added to realize initialization components, and the components are closed at the end. In this way, ADO control can be used directly to complete the connection to the database, and SQL statements can be used for data processing. The basic processing methods mainly include query, addition, modification and deletion.

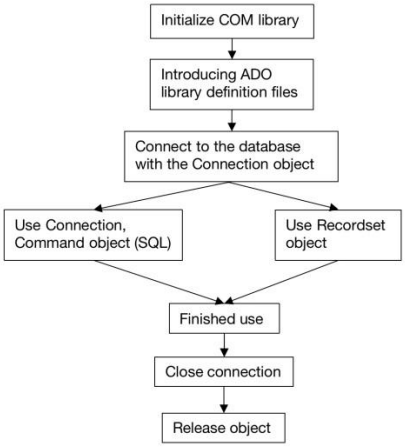

Fig. 3. System database development process

5.2. Interface Effect Diagram of Teaching Platform

Based on the advantages of MOOC platform, this paper improves and designs a multimedia-teaching platform based on art interactive technology. When the platform runs, it first enters the landing interface, as shown in Figure 4. As shown in the figure, users can login to the platform by entering their own username and password. The system will judge whether the landing user belongs to a teacher, a student or an administrator according to the database data, and then enter the corresponding interface.

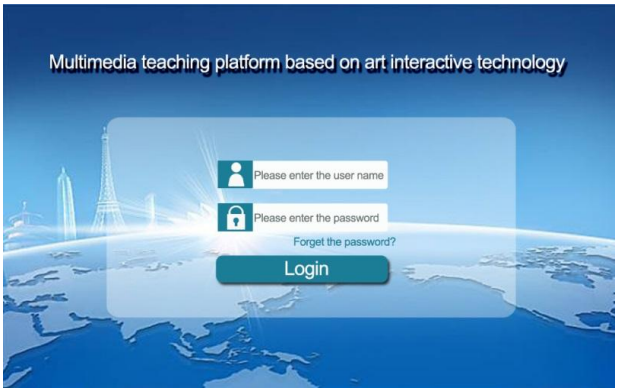

Fig. 4. User login interface

If students log in, they can enter the user interface, which is shown in Figure 5. As can be seen from the graph, the test system has two columns: the homework subsystem and the examination subsystem. Students can test in the system to verify what they have

learned. The test results will be retained. Teachers can inquire about the results so as to understand the students' learning situation. In the lower part of the interface, two interactive keys can be seen from the last question to the next question. Clicking can realize the function of jumping from the top to the bottom question.

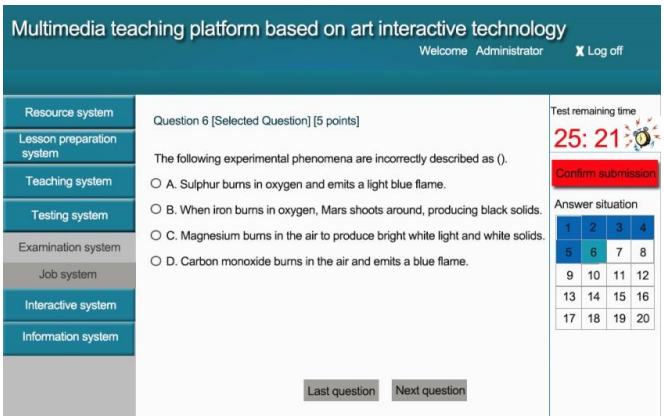

Fig. 5. Test system usage interface

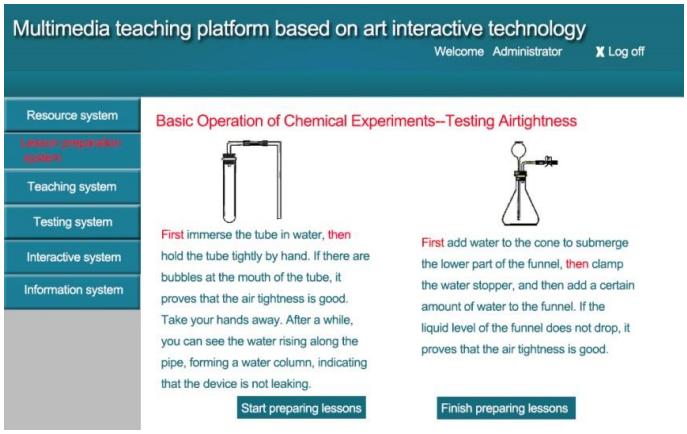

Fig. 6. Use interface of lesson preparation system

If the teacher logs on to the system, he can choose the lesson preparation system. The interface diagram of the lesson preparation system is shown in Figure 6. From the figure, we can see that after entering the interface, we can enter the course preparation process by clicking the interactive button to prepare lessons. Through animation technology, Flash software is used to design and process the material, so that it can be presented in different media forms such as text, image, picture-story book, video, audio and so on. Finally, Flash is used to organize and integrate all the contents, to make more

vivid/artistic and interactive teaching courseware with picture-text collocation and combination of dynamic and static cases; after the courseware is made, the interactive button for preparing lessons can be clicked and the courseware can be withdrawn. Courseware with vivid animation effect is undoubtedly more attractive for students to learn, and vivid animation, so that students can consciously think about the teaching content, improve the learning effect.

6. Test and Analysis of the Effect of Platform Implementation

Before the test, this paper conducts a questionnaire survey among 129 students to analyze the current situation of mixed learning using MOOC platform. The results of the survey are shown in Figure 7. From the figure, we can see that most of the students surveyed have the habit of using computer to study, and willing to use interactive media and other new media means， and only 3.5% of them do not use it. This data shows that today's learning is not confined to traditional classroom learning. Mixed learning using MOOC platform has become an important part of learning.

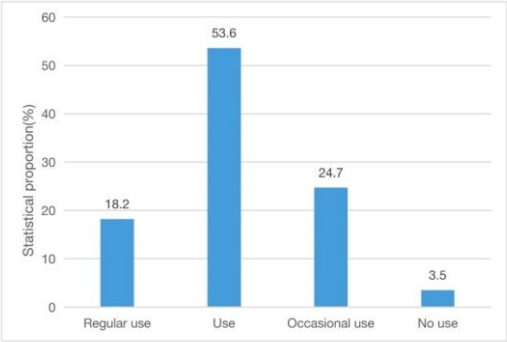

Fig. 7. Whether to learn using the MOOC platform

Secondly, 100 users of the small-scale teaching platform constructed in this paper have been surveyed. All 100 users have used MOOC platform to learn. This paper compares the learning effect, operation effect, interface design and transmission speed with MOOC platform, and the comparison results are shown in Figure 8. From Figure 8, we can see that compared with MOOC platform, users are more satisfied with the learning effect and operation effect of the teaching platform designed in this paper, and the satisfaction is more than 70%. Among them, the unsatisfactory aspects are interface design and transmission speed, which are 21.9% and 16.3% respectively. This shows that compared with MOOC platform, these two aspects need to be strengthened. Of course, this paper only builds a small-scale test platform. Compared with the mature MOOC platform, it is reasonable that interface design and transmission speed are insufficient. However, the introduction of interactive technology and animation technology in this paper can effectively increase the attraction of MOOC courses to learners.

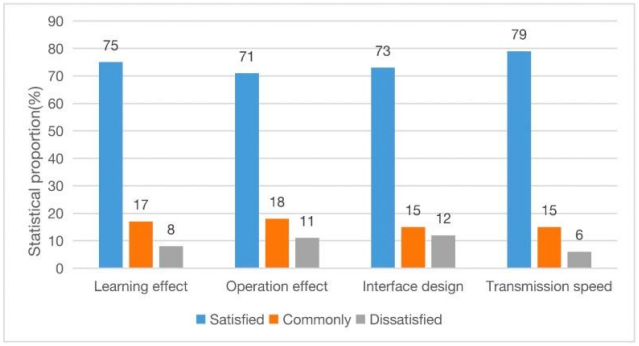

Fig. 8. User experience survey results

Finally, this paper uses the experimental class and non-experimental class to test the effect of use, in which the experimental class uses the teaching platform designed in this paper to guide learning. After a semester, the test scores are shown in Table 1. From Table 1, we can see that the results of the experimental class are better than those of the non-experimental class. This shows that the multimedia-teaching platform based on art interactive technology designed in this paper can promote students' learning and improve the effect of students' learning.

Table 1. Platform effect test data

Test class	Average score of test scores			
	Mathematics	English	Chemistry	Physics
Non experimental class	71.7	70.9	73.5	74.1
Experimental class	82.3	80.7	88.6	89.3

7. Conclusion

Nowadays, in the era when traditional classroom education can’t meet the needs of teaching, hybrid learning has gradually risen, and the MOOC platform, which is more representative of hybrid learning, has led the learning trend and become the latest research hot spot. Based on the advantages of MOOC platform, this paper studied the advantages of multimedia technology, animation technology and animation interaction technology in MOOC platform design, and designs a multimedia platform based on art interaction technology. The platform designed in this paper gives the system framework after analyzing the research results of the teaching platform requirements, and designs the teaching platform with B/S mode. In addition, the idea of database development and the interface effect diagram of the small-scale teaching platform constructed in this paper are given. Through the questionnaire survey and the test results of the

experimental class, we can see that MOOC platform has become the mainstream of online learning for students. Compared with the past, the MOOC platform designed in this paper uses art interaction technology. Improve the artistry, fun and operability of the platform, enhance its appeal to learners, and entertain and educate, so that students can actively learn, feel the joy of creation and success, and improve learning.

Data Availability. Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Conflict of Interest. The author states that this article has no conflict of interest.

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