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Research Article

College Vocal Music Teaching Design Based on Internet Platform

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Internet has penetrated into people's lives as the Internet education platform has faced many changes in the way vocal music is taught in the new situation. The teaching methods set up on the Internet have also undergone dramatic changes. A number of advanced music education concepts have emerged that require a careful review of the current state of music education in the world and in China. Current online learning environments are usually used only for formal or informal learning. The former overemphasizes the subjective role of the teacher and ignores the autonomy of the learner. Through a new modern network education method, this paper deeply analyzes the unique advantages and existing problems of a new voice education method based on the Internet and puts forward corresponding solutions. Its purpose is to encourage more ordinary vocal music teachers to better understand the new teaching methods, broaden their artistic horizons, consciously use modern teaching methods to support vocal music education in ordinary schools, and further expand the scope of music application. The experimental results show that for 4000 concurrent users, the response time of the system is less than 5 seconds, which can meet the time requirements of the system. For the service of querying some other data, the response time of the system is less than 9 seconds, so the response ability of the system to multiple users is impressive. Therefore, with the development of education, comprehensive network education platform is also the development direction of informatization in the future.

1. Introduction

The popularity of computer technology has reached an unprecedented rate, and people's lives are increasingly inseparable from it [1]. Digital technology has expanded the popularity of music education and is loved by the general public and music professionals [2]. "Internet+education" means that everything in education is combined with the Internet [3]. Teachers transmit knowledge through the Internet, students learn through the Internet and share various resources through the Internet, and real learning and online education complement each other [4]. Any change in the form of education is aimed at making education more convenient, efficient, and economical [5]. More and more people are learning vocal music through cloud education courses, online voice education is gaining unprecedented popularity, and more and more voice educators are urging a gradual change in traditional teaching methods [6]. Ethnic voice education is also evolving with the times to create online education that is different from the existing education [7].

To date, the Internet has penetrated into all areas of work and life [8]. With the excellent resources of the Internet, new teaching methods in the form of large online open courses, cell phone APPs, and WeChat have emerged, and related vocal teaching methods and theoretical studies have slowly developed [9]. Educational media are generally divided into traditional educational media such as blackboard, textbooks, drawings, and models. Modern educational media include slides, tape recorders, television, computers, and multimedia educational systems. All developments in educational media have had a great impact on education and education and even brought about a qualitative leap [10]. Music education has seized the opportunity to use technology to quickly adjust the teaching methods of relevant courses and introduce computer music production techniques and multimedia systems that have gradually matured with the development of computers to improve teaching methods and increase teaching efficiency must be designed [11]. The current situation of music education in most Chinese schools focuses on music appreciation and basic theory education [14]. Therefore, in

this paper, we propose a design of an Internet-based platform for teaching vocal music methods in universities. Various forms of vocal cloud education and education are attempted, and relevant data are obtained and analyzed to calculate the minimum cost and maximum audience range for investment in cloud education and education. The purpose of this paper is to explore the advantages and disadvantages of online college vocal music classes and to find solutions and future development strategies to better serve the majority of music and vocal enthusiasts in future online vocal music classes.

Teaching vocally is not as easy as some people may think, and the process of learning vocal music is out of sight and out of mind [12]. An important part of the vocal apparatus is found primarily in the human body, which drives the learning style and process [13]. Currently, music education is still in the most primitive method of learning, the one-to-many approach. The learning of vocal music was described in detail in ancient China, and the level and method of teaching vocal music remain at the original level [14]. With this in mind, traditional vocal education also suffers from a lack of visual and intuitive understanding of students' singing bodies, a lack of live performance opportunities, a lack of awareness of real voices, and a lack of objective impressions of performances. Therefore, vocal cloud education solves the problems of uneven distribution of teachers during traditional teaching, timely teacher-student interaction during the teaching process, and passive feedback from students after class.

The innovative points of this paper are as follows.

(1) The topic of this paper is relatively new, integrating the Internet education platform and analyzing and elaborating on the emerging new models of vocal music teaching and so on

(2) The paper discusses vocal music teaching in the new media environment, including its current situation, advantages and disadvantages, and coping strategies and development trends, in a more systematic and detailed manner

(3) From the perspective of online distance education, this paper takes the online teaching system as the research object, takes the development technology as the basis, and establishes a structure-based teaching system prototype

The research framework of this paper consists of five major parts, which are arranged as follows.

The first part of this paper introduces the research background and significance and then introduces the main work of this paper. The second part imports the work related to the design of an Internet-based platform for teaching vocal music in colleges and universities and the architecture of the Internet education platform. In the third part, the design of the hierarchical structure and the specific design method of the functional structure model are sorted out, so that the readers of this paper can have a more comprehensive understanding of the design method of the Internet-based college vocal music teaching system. The fourth part is the core of the thesis, which describes the test analysis of the Internet-based vocal music teaching system from two aspects: system function test and system performance test. The last part of the thesis is the summary of the whole work.

2. Related Work

2.1. Design of Vocal Music Teaching in Universities Based on Internet Platform. "Seeing the world at home" was once a distant dream, but now it has become a reality. The new media environment is becoming more and more mature, providing a good platform for new education. In the new media environment, it is in a university without walls. Vocal music education is also conducive to the reform and innovation of cloud education curriculum model. Multimedia education can be used in music appreciation, music theory, composition, and music production. After using multimedia-assisted training, all these courses have a good training effect.

Shi and Li compare school education with online education and suggest that traditional classroom education be improved and maintained as the ultimate goal of promoting human development and growth [15]. Singaravelu believes that the creation and development of online classroom is based on the Internet. This Internet breaks the restrictions of traditional time and space processes, so that learners stay at home and are no longer limited by region and time. You can also attend excellent lectures from famous universities at home and abroad [16]. Baker and Cohen propose a strategy for reforming the higher education model, starting from the role of "Internet+" in education, which provides a theoretical basis for the development of online music education [17]. Vakaliuk et al. used text and animation for emphasis and highlighting, providing learners with different styles of teaching and learning, and achieving diversified development of teaching resources [18]. According to the theme of John's online classroom, the emergence of online classroom means that the wall of the traditional campus will be broken, and the traditional function of sharing high-quality educational resources has become inevitable today. Online classroom education will become an important part of national culture and soft power output, and earth shaking changes will take place [19].

The application of vocal education system based on Internet platform is not only related to the development of Chinese music education, but also the development of Chinese music education model and the quality of Chinese talents affects the development of Chinese music. Music education will also make a leap in educational thought.

2.2. Architecture of Internet Education Platform. With the continuous development and deepening of Internet education platform, education has moved from closed to open. The progress of digital music production technology and the new teaching method of vocal music teaching by using computer multimedia system have become an important part of the development of basic music courses in this century. In the aspect of vocal music teachers, the rapid transformation of Internet education platform into the form

of "education+Internet" can make the vocal music teaching model develop continuously.

The online education platform system proposed by McCutcheon et al. is a representative online education platform that actively utilizes e-books and textbooks and has over 100 million registered users [20]. Firat et al. concluded that although online voice teaching has many advantages over traditional voice teaching methods, the online voice teaching method is not a substitute for traditional voice in terms of the specificity of vocal music. Vocal music is a teaching method, and only by combining the two can the strengths of each be fully exploited for the sustainable and healthy development of vocal music teaching [21]. The educational courseware designed by Fotiadou et al. is a web-based training courseware development and management system completely based on a web browser [22]. Not only can fully web-based courses be developed, but also existing courses can be published via the Internet. The educational system concept proposed by Weller et al. can provide tools that allow even nontechnical general teachers to easily create online courses with secure websites for courses, home pages, student management, and learning process tracking features [23]. The cloud education platform by Koodziejczak and Roszak can provide many learning tools such as resource modules, assignments, tests, glossaries, chat rooms, discussion boards, interactive assessments, polls, and blogs [24].

The rapid development of information technology such as multimedia technology has broadened the way people acquire knowledge, and learning has become more and more decentralized, nonlinear, networked, and socialized. Based on the openness and flexibility of online teaching, it can help students at all levels, and this online teaching model is rapidly popularized in many countries that need educational reform.

3. The Design Method of Vocal Music Teaching System in College Based on Internet Platform

3.1. Hierarchical Structure Design. The advent of the cloud era means that computing power has become an out-of-the-box service model [25]. The Internet provides a platform for students and teachers, and teachers transfer knowledge on a large scale through the Internet [26]. This teaching method helps the public to understand China's national vocal music culture in advance [27]. The role of music has been completely replaced by the Internet, forming a new education model based on music personalized service management constraints, generally a five-tier network model. The first layer is the information elements related to the case. The second layer is the membership function, and the formula is as follows:

$$u_{ij}(x_i) = \exp\left[\frac{(x_i - c_{ij})2}{\sigma_j^2}\right]. \quad (1)$$

Unlike the relative objectivity of cultural disciplines, music education focuses more on understanding the individuality of students during the educational process, in all aspects. The Internet-based platform for university vocal education system includes an infrastructure layer, an application interface layer, an application layer, and a user layer. The system structure is shown in Figure 1.

First is the infrastructure layer. It mainly provides infrastructure resources such as computing, data storage, and network communication to the upper layer. The development platform of this system is a backend database with B/S computing model, which is aimed at completing the system management of the online education platform. The main difference between B/S model and model lies in the platform model of the technical system. The server model is divided into two parts: data server and server. The third layer describes the number of fuzzy rules. The mathematical calculation of the output of rule j is as follows:

$$\Phi_j = \exp\left[-\frac{\sum_{i=1}^{r}(x_{ij} - c_{ij})^2}{\sigma_j^2}\right] = \exp\left[-\frac{\|X - C_j\|^2}{\sigma_j^2}\right]. \quad (2)$$

Second, the application interface layer directly provides developers with an Internet-based application development and execution environment, including the operating platform and the underlying cloud, which serves as a bridge between the application layer and the infrastructure layer. The two-tier model has many limitations; first of all, the system is not scalable, and the whole system becomes complex after the installation is completed [28]. If the application is to be installed on the client computer, the corresponding database must also be installed. The fourth layer, on the other hand, is the normalization layer, and the nodes of this layer should be consistent with the fuzzy rule nodes, and the output of its jth node N_j is as follows:

$$\psi_j = \frac{\Phi_j}{\sum_{k=1}^{N}\Phi_k}, j = 1, 2, \cdots, u. \quad (3)$$

The database supports multiple file formats to display results. These resources can be uploaded through the Internet or viewed directly by opening URL links. Of course, it can also be a file stored locally. Therefore, the three-tier architecture adds a server tier to the existing architecture, allowing the user interface and application logic to reside on different platforms.

Then, it comes with the application layer. Its function is to create and maintain the education platform system created by this system, manage user rights, analyze the transmitted data, and analyze the logic rules. It is the presentation of the combined model of online education platform and social media. If the user does not see the expected results on the first page, you can also easily return to the results on the next page by passing parameters. The user's query is completed by inputting the user's keywords or combining multiple conditions. The simple query is to realize the user's query by inputting some keywords, and the complex query is to complete the user's query by inputting two or more keywords. The fifth layer is the output layer, which outputs the evaluation of various music performance skills. Its output is as follows:

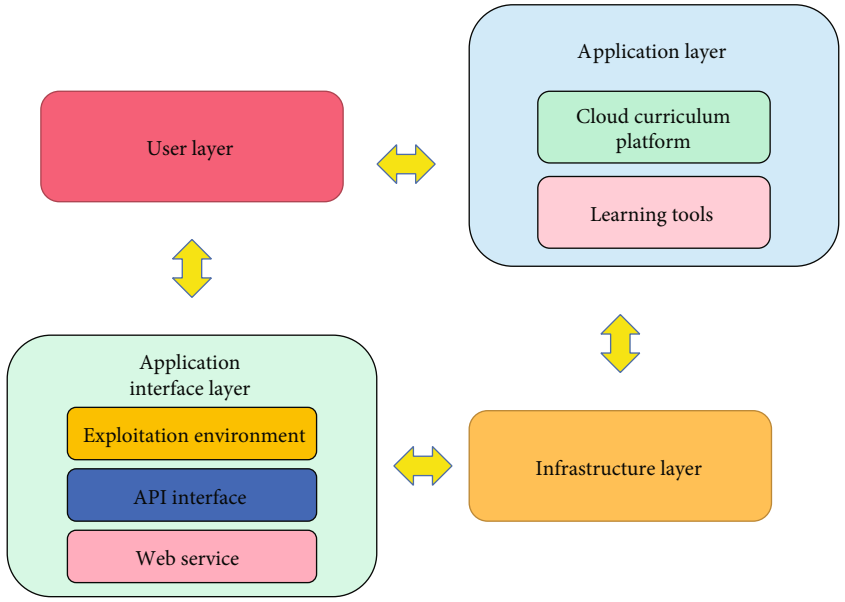

Figure 1: Hierarchical structure of cloud curriculum platform.

$$y(x) = \frac{\sum_{i=1}^{u} \left[(a_{i0} + a_{i1}x_{i1} + \cdots + a_{ir}x_{1r}) \exp\left(-\|x - c_i\|_2 / \sigma_i^2\right) \right]}{\sum_{i=1}^{u} \exp\left(-\|x - c_i\|_2 / \sigma_i^2\right)}. \tag{4}$$

w_k represents the connection mode of the kth rule, that is, the sum of the weight product of the output variable, as shown in the formula:

$$y(x) = \sum_{k=1}^{u} w_k \bullet \Psi_k. \tag{5}$$

Finally, the user layer is the top layer of the overall end-user-oriented architecture, where users can use end devices that connect to the Internet [29]. That is, the basic maintenance of user information user information includes user name, user number, and user address, and this basic information becomes the basis of the system. The details of the user can be viewed at any time throughout the system. Information maintenance includes add operation, modify and delete operations, and if a new user needs to be included in the cost, the user administrator is required to enter the user details. A technology runs in a web server-side scripting environment, i.e., it can exchange data with databases or other programs to enable the creation of new dynamic, interactive, high-performance applications. Such programs can extract javascript code from a page file and place it into a file for centralized management, making the code in the page file cleaner and more manageable.

3.2. Functional Model Design. From the perspective of "internet plus," the teaching methods of national vocal music are becoming more and more diversified. Nowadays, colleges and universities should cultivate high-quality and all-round talents. As a general performing arts discipline, the functional structure model design of online vocal music class system designed in this paper is mainly divided into learner management module, curriculum education module, and learning activity module. The online collaborative learning process of integrating social media based on cloud curriculum platform is shown in Figure 2.

The first is the learner management module. Learners can enter the cloud course platform in the state of registered or unregistered. Apache server accepts the request of the client, calls the dynamic web page of the request information according to the request, and processes various business logic. Key business logic includes accessing database and identifying user permissions. In addition, business logic does not depend on the ordinal nature of data input and is widely used in data set clustering. The smaller the entropy, the higher the purity of subset division:

$$I\left(s_1, s_2, \cdots s_{mj}\right) = \sum_{j=1}^{v} \frac{s_{1j} + \cdots + s_{mj}}{s}. \tag{6}$$

Different types of accounts have the same permissions. The user types include administrators, tutors, assistants without editing rights, students, and visitors. The learner management module is a logical structure of data, including the relationships between grids and hierarchies. The logical model is a key aspect of data warehouse implementation and is guiding and configurable for the project software. The data architecture of a software system accurately describes the system and pays attention to the use of logical processes to represent its functionality. The learner management module is also the platform for a multilingual environment that allows free organization of the application and has a large code base that can be shared across all .NET languages. Let S be a collection of s data samples, and assuming

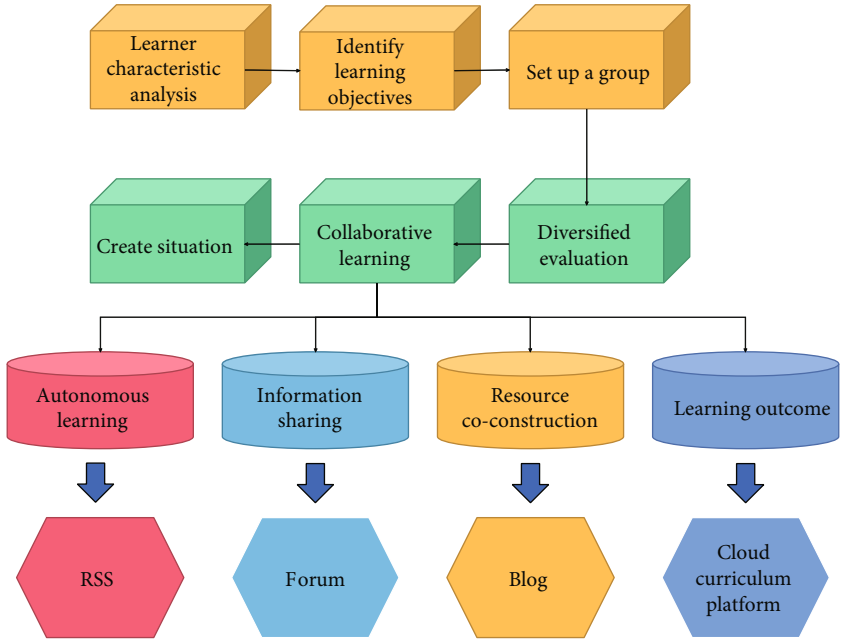

Figure 2: Design of teaching activities based on network collaborative learning.

that the class label attribute has a distinct value, the desired information required for a given codebase is as follows:

$$I(s_1, s_2, \cdots s_m) = -\sum_{i=1}^{m} \log^2 \frac{s_i}{s}. \tag{7}$$

Secondly, the curriculum teaching module, which is organized by teachers and focuses on systematic curriculum learning, provides a formal learning environment with organized strategies. This is the core and foundation of the information system. It mainly organizes a large amount of information in the system according to a certain model. Its main functions are as follows: storing deleted information, maintaining and searching data, etc., so that the required information can be obtained conveniently, timely, and accurately in the information system. The overall design of the teaching module is shown in Figure 3.

As an administrator or course instructor, you can set up and create all relevant contents for the course, such as planning the training resources and question bank of the course, assigning roles and creating classes or groups, assigning assignments, and scoring and evaluating assignments to relevant students. The course training module is aimed at determining the software and hardware configuration according to the amount of information, complexity, resources, database, and system life cycle of the software project. The MySQL open source database system is used, the operating system is Linux, and the application server uses the open source software Resin. Mutual information is a concept in information theory, and binary inverse information is used to measure the interdependence between two signals in a message. The binary reciprocal information is a function of the probability of two events, as follows:

$$\mathrm{MI}(XY) = lb \frac{P(X, Y)}{P(X)P(Y)}. \tag{8}$$

The last is the learning activity module. This module is mainly divided into reflective learning and collaborative learning, so that learners can choose to carry out learning activities in a personalized way. Most students are used to traditional classroom teaching, so they rely heavily on face-to-face counseling. The similarity of the two feature vectors is expressed as distance. The closer the distance, the higher the similarity. The similarity algorithm of the two feature vectors is as follows:

$$\Delta(x, y) = \sum_{i=1}^{n} \delta(x_i, y_i). \tag{9}$$

Navigation from page to page depends mainly on the language. The instructor can add or remove modules according to the nature of the course and the needs of the professor, and it is very easy to modify and expand, only by setting up a reasonable search to select the access path. For example, a general index is set up, and then, the index is set up hierarchically. The principle of indexing, whether centralized or distributed, is based on one attribute variable with the greatest information entropy at a time and then cyclically traversing the attribute branches, which is the expected compression of entropy, with the formula:

$$\mathrm{Gain}(A) = I(s_1, s_2, \cdots s_m) - E(A). \tag{10}$$

The learning activity module in operation is parsed and executed on the server side, so that developers do not have to worry about whether the browser can support ASP operation. At the same time, developers do not have to worry too

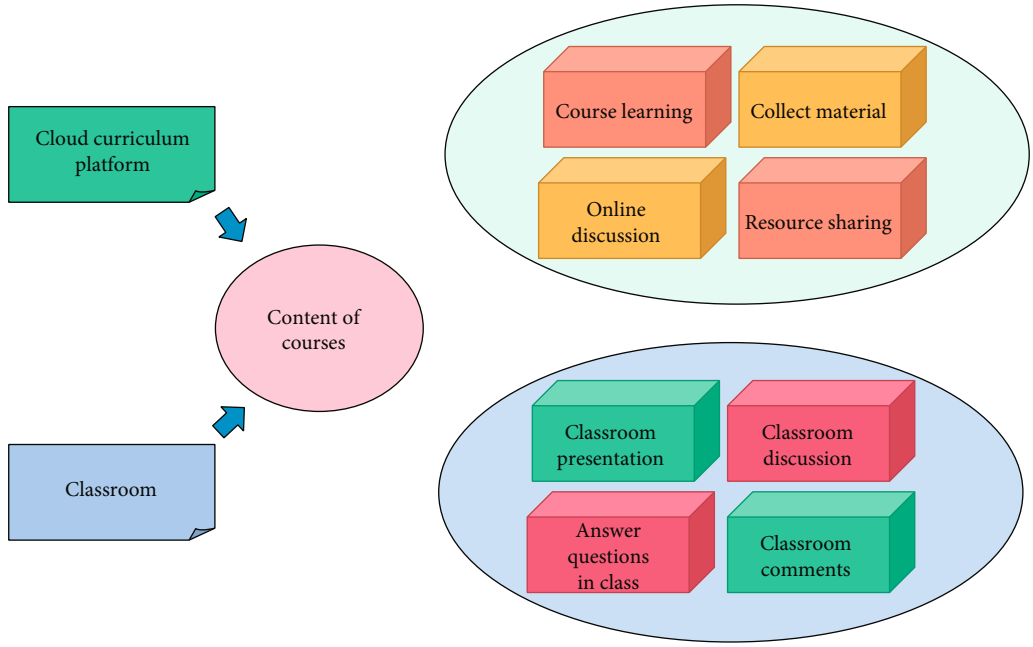

Figure 3: Course teaching module.

much about the program being stolen because it is executed on the server side.

4. Test and Analysis of Vocal Music Teaching System Based on Internet Platform

4.1. System Function Test Analysis. When users enter the Trustie Course website, the first thing they enter is the platform's homepage. The performance of this part is especially important because the platform's homepage displays a lot of content and contains links to queries from multiple tables. The test of the music assignment management module showed that the two roles of students and teachers could complete the tasks of music assignment management and music assignment query, and the operation of adding data was completely normal, and the operation of deleting data was correspondingly prompted to the user to ensure data security. The audio collection was completed by practicing the standard "A" vowel for 10 students, including professional voice teachers. The results of the recording using digital technology are shown in Figure 4.

Firstly, the response time of one user accessing the system and the response time of 20 users accessing the system are tested, respectively. There are generally two kinds of errors in system design and software debugging. First, syntax errors occur when writing statements. These errors are easy to find and repair according to the prompts. For example, the software directly gives an error. This is a location prompt that can be modified. Another type of error is a more difficult logical problem to fix. These types of errors are relatively hidden. They are usually small errors that will hinder the successful operation of other modules. The realization of multitouch technology requires the combination of software and hardware technology. This means that the equipment to be operated first must support multipoint simultaneous operation, and the motion software must handle multipoint operation. The system function test is used to realize the slice cache of the home page. The comparison data before and after the system test is shown in Figure 5.

If the system sets the path, you can set the path of the server path, set the necessary data table data such as role table, function table, and subfunction table, carry out the user who belongs to the senior administrator to set the role, and enter all functional modules of the whole system.

Second, the Solr-based full-text search system will be the improved system, and the search system built entirely on MySql queries, i.e., string matching function, will be called the pre-improvement system. The test results are shown in Figure 6.

Through the data statistics function, you can record and view each examination result of student users. The system can record students' examination results in the last 20 times and intuitively reflect students' examination status with a bar chart. Students can understand their own learning situation. In order to solve this problem, it is a process to simplify the complexity by using the segmented method to gradually verify the corresponding functional programs and conduct complete testing combined with the relevant functional modules.

Finally, add a new WEB form under the website, and then, use the designed master page Master Page .master, named sign .aspx, then lay out the entire page frame structure, and add the required server controls. If the application is designed for unicast, then the server forwarding bandwidth is the number of clients multiplied by 2 Mbps (e.g., 12 Mbps for 6 clients). In the early stages of uploading and downloading resources, the lack of front and backend differentiation leads to confusing programs and incorrectly linked pages. Therefore, frequency division multiplexing technology is used to create two relatively independent channels, upstream and downstream, to avoid mutual interference.

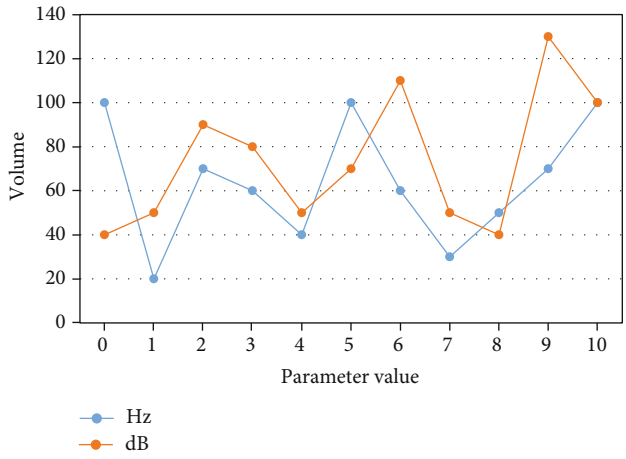

Figure 4: Vowel audio analysis chart.

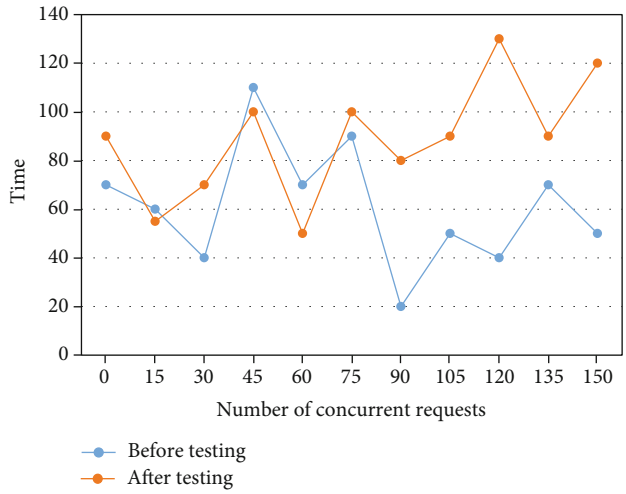

Figure 5: Comparison before and after system test.

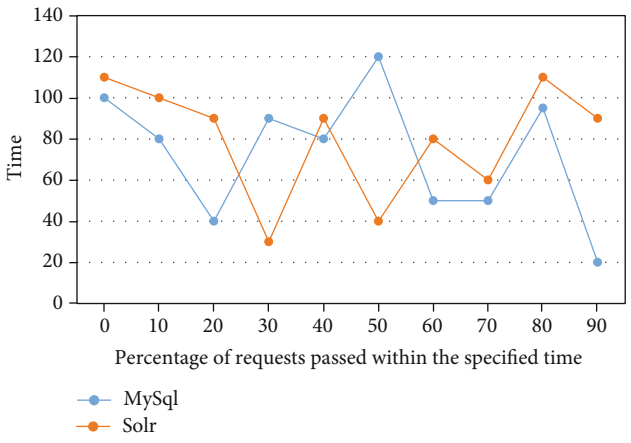

Figure 6: Comparison chart of concurrent query response time before and after system improvement.

Generally speaking, ADSL can provide a maximum uplink rate of 5 Mbps and a maximum downlink rate of 15 Mbps without affecting normal communication. The extent to which the system can respond appropriately under unexpected circumstances such as hardware failure, incorrect data input or operation errors. Since the system is oriented to the entire business system of each business segment, each department must share data through data service access, or at least no more concurrent access to users (applications) without access failure or return result timeout.

4.2. System Performance Test Analysis. The impact of new media technology on modern education, especially educational communication, cannot be underestimated. Online classroom has also been born. In the future, modern new media technology may improve the existing education model. Because the development environment of SAE is different from that of local, SAE also provides developers with a local test environment simulating SAE, so that developers can test their edited code locally. Therefore, the system performance test mainly includes two parts: stress test and recovery test. The function test of music job management module is shown in Table 1 below.

First, the stress test was performed by selecting several common application system features to simulate the number of virtual concurrent users and setting the number of virtual users according to the number of users in each department of the system and the number of applications. Under test conditions, simultaneously access to the service and the difference between about 1000 and 2000. Then, go to the Wordpress configuration page you want to configure and enter your site name, username, password, email address, etc., to complete the installation. The results of the test to verify that online classroom operations can be completed through the system by the student role are shown in Table 2 below.

The system is divided into customer level and application level. Therefore, when transmitting data, it can be realized through middleware, and the client does not need to be modified. Four factors must be carefully weighed: storage space usage, storage capacity, storage time, and management cost. Use the bidirectional encryption algorithm to encrypt the password, obtain the hit test parameters through the pointhittestparameters library function in the function library provided by WPF, and then pass these parameters to the hit test library function hittest of WPF. Hittest function can determine a range according to the contact point, then match according to this range, and return the result. The system performance test tests the methods of this paper, reference [17] and reference [20], and compares the three methods with the recovery test of online music education system. The comparison results are shown in Figure 7.

The second is the recovery test, which means that if there is a problem with the provided system, the system service can be restored to the original normal connection time. Generally, users will have abnormal system service when they access at the same time. Recovery of system services is done through the server side, in the case of a large number of simultaneous connections can be batch processing of requests. With the third-party plugin Buddypress, Wordpress can be turned into an educational environment with social functions such as Facebook. Here, the system will provide normal default values, and if it is difficult to adapt to software development during the development process, the

Table 1: Function test table of music operation management module.

Serial number	1	2	3
Test item	Information entry	Information modification	Messages deleted
Test method	Enter illegal data and test whether it can be saved	Modify the information and test whether it can be saved	Is there a prompt message before deleting the test?
Test result	Pass	Pass	Pass

Table 2: Online classroom module function test table.

Serial number	1	2	3
Test item	Learning log record	Music homework browsing	Online classroom questioning
Test method	Select courseware resources to play	Query keyword	Ask questions online
Test result	Pass	Pass	Pass

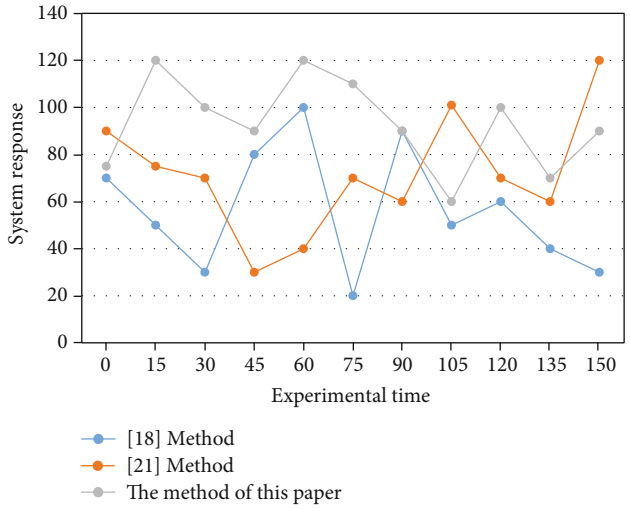

Figure 7: Comparison of recovery tests with different methods.

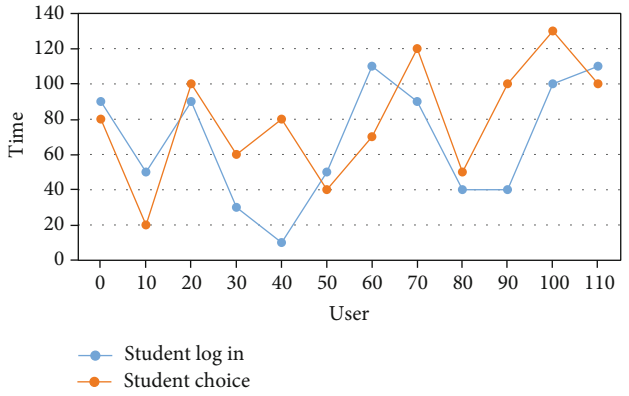

Figure 8: Response time change graph.

variable assignment needs to be adjusted and modified until it reaches and adapts to the developer's goal. The system response time is tested to be no more than 5 seconds for 4000 concurrent users, which can meet the time requirement of the system, and for the service of querying some complex data, the system response time cannot exceed 9 seconds. Thus, the responsiveness of the system for many groups is very impressive, which means that it can be used by several universities.

The modification action can be saved according to the newly entered data item, and there is a prompt to confirm the saving before the modification and saving. There is a clear deletion confirmation message prompt before deleting data records, and the selected records can be deleted after the deletion operation. Figure 8 accurately shows the average response time of the music education information system when different users visit it.

The function test shows that when the system user operates the new function, the system will verify the integrity of the newly added user content. If anything is missing, the corresponding prompt can be displayed and the entered data items can be saved normally. Then, enter the plug-in opening step. Before opening, you need to create the plug-in context ctsobj object and set the environment to open the plug-in. Finally, open the plug-in through the ctsobj object to complete the system performance test.

5. Conclusions

With the help of the Internet platform and information and communication technology, many new vocal pedagogies have emerged and related pedagogies and academic studies are heating up. The Internet education platform is to allow students to give full play to their independence and initiative and to choose online learning methods according to their interests. This learning method is ideal for modern students who like to go online and have access to computers and improve their learning efficiency. Digital technology is changing the traditional way of teaching vocal music in China for thousands of years (i.e., one-to-many oral instruction) and supporting the transformation of vocal music education into a modern, scientific approach to education. Traditional education methods should not be completely abandoned but should be combined with "Internet+" education methods to complement each other's strengths and weaknesses. The Internet-based university vocal education

system proposed in this paper uses a four-step structure to complete an interactive educational platform. At the same time, we analyzed the testing of the teaching system and explored the need for professors to integrate various social media to build online course platforms. By learning through these online education platforms, students can choose their own learning content according to their interests and learning abilities and can repeat the learning many times for content that is difficult to increase motivation and initiative. The best way to educate students is to combine traditional vocal music teaching methods with the Internet, which is a strong proof that this system can continuously inject fresh blood and cultivate innovative talents for the future development of ethnic vocal music.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

No competing interests exist concerning this study.

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