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Computer-based Music Solfeggio Teaching Resource Database System under Big Data

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Abstract: With the development of computer and multimedia technology, especially the development of digital music, it is urgent to change the traditional music education mode and education system. According to the national teaching content and teaching style, exploring the library of singing teaching materials and effectively promoting the development of high-quality music education has become the focus of current research. This paper designs the music solfeggio teaching resource database system under big data. This paper first introduces the design principles and business processes of the solfeggio teaching resource database system, and then studies the design methods of the solfeggio teaching resource database system, including the system objectives and composition, knowledge point settings, system framework, and system implementation. At last, it carries out experiments on the role of the solfeggio teaching resource database system. The experimental results show that before the use of the music solfeggio teaching resource database system, the efficiency of music solfeggio teaching is below 80%, and the satisfaction of music solfeggio teaching is below 90%. After the use of the music solfeggio teaching resource database system, the teaching efficiency and teaching satisfaction are greatly improved, indicating that the music solfeggio teaching resource database system is of great help to the music solfeggio teaching.

1. Introduction

Colleges and universities have a large number of important materials for solfeggio and ear training.

How to manage and use these resources scientifically is of great significance. In the process of educational reform in higher education institutions, the auxiliary learning system plays an irreplaceable and important role, and is crucial to the core functions of the system and the overall scientific design of the database. With the deepening of education reform, the new era of education reform has put forward new standards and requirements for the auxiliary learning system, which requires that the auxiliary learning system has powerful functions, simple structure, simple operation, and complete system function modules and data dictionaries.

At present, many scholars have studied the teaching of music solfeggio. Jingyi Zhang summarized the traditional music solfeggio teaching [1]. Veziryan E E studies the interactive methods in solfeggio teaching [2]. Parshina Larisa G used multimedia technology to study the development of music auditory perception of middle school students in solfeggio training courses [3]. Karimova M M M studied the teaching history and teaching methodology of solfeggio teaching [4]. Jing Zhang studied the reform of music teaching in colleges and universities [5]. However, the design of solfeggio teaching resource database system needs to be studied.

The teaching research based on big data is the focus of current research. Park Young-eun discovers the latest research trend of higher education teaching through text mining technology and predicts the main trend or new direction of big data teaching [6]. Daniel Ben Kei identified a wide range of key issues that researchers need to consider when using big data in education [7]. Yang Cuibi studies the application of big data technology in mixed teaching for college students [8]. Hicks Stephanie C discusses the general principles for developing data science courses [9]. Kim Brian demonstrated the use of cloud computing for data science teaching [10]. Although the research on big data teaching is relatively extensive, how to use big data to design the solfeggio teaching resource database system needs to be further studied.

In order to improve the teaching effect of music solfeggio teaching and effectively improve the students' music level, this paper designs and studies the computer-based music solfeggio teaching resource database system under big data [11]. This paper discusses the design method of computer-based music solfeggio teaching resource database system under big data, and studies the effectiveness of the system in music solfeggio teaching through experiments.

2. Design Principles of Solfeggio Teaching Resource Database System

2.1. Safety Principle

The learning resource management system used by universities needs to store, play and manage learning video resources to provide high-level security and good disaster prevention capability for data protection. At present, many universities have a history of many years or even hundreds of years, and have accumulated rich educational resources with rich types [12-13]. The storage environment is diverse. If resources are lost due to insecurity, it may have a significant impact on the history, culture, society, education and research of the university.

2.2. Economic Principle

Establish an economical and efficient management system to meet the needs of users with minimum investment, and avoid unnecessary waste through repeated system design. Many universities are actively investing in the development of educational resource management systems to meet the needs,

and libraries have also adopted network storage systems with good results [14].

2.3. Technical Principles

The audio-visual teaching resource management system in colleges and universities has advanced technology, which can effectively manage various forms and types of multimedia resources. The file can be read, written and shared quickly, with stable operation, long-term development ability, convenient maintenance, and technical support.

3. Business Process of Solfeggio Teaching Resource Database System Design

The system business process belongs to the logical model of the management information system. The system business process is an important factor in the design stage of the management information system. The business process design of the education system is also an important step to improve the management information system. The business process of the system is also a system process, which is an important basis for further development. The three external modules of the system, namely administrative management, teachers and students, are determined through relevant demand analysis [15]. Only by identifying the core functional modules of the system in advance can the basic data flow and detailed workflow of the system be obtained, as follows:

(1) The system user enters the appropriate user name and login password, and processes the credentials entered by the system user in the background.

(2) After processing, determine the user permissions according to the relevant conditions, and then initialize the menu and interface information according to the user permissions information, and wait for the user to perform other operations.

(3) The system analyzes user commands according to user operation commands without permission. Then, the query command is sent to the system database to obtain the relevant data information, and the data information is returned to the user interface displayed by the user to meet the actual needs of the user.

If the user has no logout task, the system will wait for the user to issue the logout command. If the user is an administrator, the user interface and menu are initialized. Initialization information includes: education resource management, course information management, including audio and video resource management, and user rights management. If you are a teacher, please initialize the user interface and menu. Initialization information mainly includes student performance evaluation, homework review, education resource management, including student response and audio-visual resource management. The system initializes the user interface and its menu. The initialization information mainly includes the latest information, audio and video on demand, online interaction, course review, online work, education resource survey and education resource downloads.

4. Design of Music Solfeggio Teaching Resource Database System Based on Big Data

4.1. System Objectives and Composition

The purpose of this system is to adapt to the education of music discipline and high-quality education in the field of music, as well as an open education system, so as to realize the functions of the song practice plan of public music courses, including music theoretical basis, listening test, learning

management, establishment of online examination, etc., independently manage resources, and provide learning windows for teachers and students. The system is divided into teacher, administrator and student modules. The teacher and administrator modules include the management of knowledge point database of video courses, problem database management, system user management, classroom management, learning achievement management, etc. Student module includes video course knowledge module, test knowledge point, online exam, score query and password change

4.2. Knowledge Point Setting

The knowledge of solfeggio is one of the key factors to be considered in the system. Generally speaking, the learning content in solfeggio training materials ranges from simple to complex, from simple to profound. The product line of solfeggio training materials has gradually introduced different learning systems from "one" to "two", from less to more. Students can use this exercise at different stages to consolidate and improve their mastery of theoretical knowledge and improve their perception of listening to music. According to the characteristics and principles of learning, this paper classifies the knowledge points of the main chapters of listening practice according to the difficulty to help students understand music. In the knowledge point installation program, many learning systems use the knowledge point installation method based on the chapter list, which has the advantage of being easy to use and learning at the same time with students who use learning materials. The disadvantage is that once learning materials change, knowledge points must be reset. During the learning process, the system selects the core knowledge points of the course according to the requirements of solfeggio practice content, and classifies them according to the requirements of the course, so that students can gradually master different knowledge points from shallow to deep, from light to difficult.

4.3. System Framework

Based on the analysis of the above system functional architecture, the system adopts a four-tiered service architecture, as shown in Figure 1.

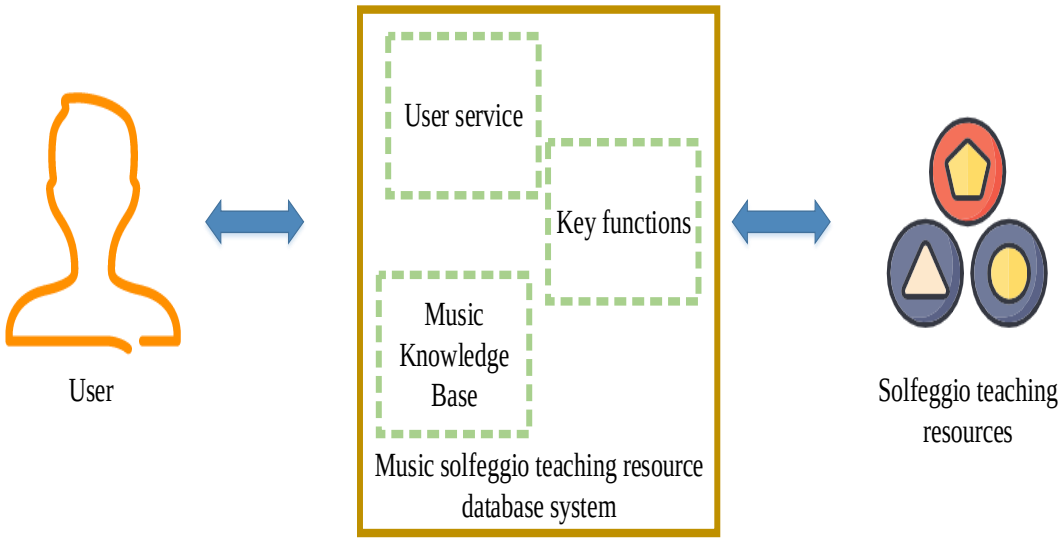


Figure 1. The system framework of music solfeggio teaching resource database

The first layer is a database to provide training resources for listening training. The second layer establishes corresponding training database, examination database and higher level personnel database. The third layer carries out resource database management, testing and measurement evaluation. The fourth layer constructs teacher and management subsystem and student system to realize multi-level user service through user interface. The learning resources of the five key knowledge points (such as syllable, interval, harmony, melody and rhythm) are concentrated to enable students, teachers and managers to classify and process different data objects. At the same time, the system is studying the standardization of listening materials, learning models, etc.

4.4. System Implementation

4.4.1. Resource Database Management

The system is a comprehensive learning support system, including vocal music teaching resource management, test database management, knowledge point training and testing, online examination, etc. The management of teaching materials in this system involves the management and establishment of test questions database, displaying knowledge points by melody and other chapters, and displaying contents by chapters and steps. Click the chapter icon in the menu to display the knowledge points of each chapter. The main function of learning resource management is to add, delete, modify and query knowledge points to practice songs.

4.4.2. Knowledge Point Learning

The form of resource catalogue in the system is combined with the main content of listening and listening training. The main content is based on the tone, volume, melody, rhythm and chord of the main chapters, and the content of each chapter is classified and marked according to the complexity of music creation and vocal music practice. Knowledge points are represented by text, images, notes, audio and other resources.

4.4.3. Test Paper Preparation

The function of test paper preparation is the basis for completing the singing test. A good test paper preparation ability determines the content of high-quality test. This reference system can help teachers determine the test name, chapter content, topic type and difficulty. In the process of writing the test paper, input the basic information of the test (including the time of answering questions) and store it in the database of the test form to form the test. After determining the test rules, the system will select any test question from the specified rules and store it in the test information table.

4.4.4. Student Examination

After students log in, the system will test according to their personal information, and display the test and record the test time according to the following steps: When students press the button to submit the test or set the test time, the system will save the students' answers in the database and automatically display the test. After completing the knowledge point learning in this chapter, students can enter the knowledge point test practice in this chapter. The head teacher organizes and manages the "knowledge point test" chapter. The test part contains different types of questions provided by the system in the test,

and the workflow is basically the same.

After the test, students can view the test results through the scoring system query module. When students complete the knowledge point test, they can view the test results and view the correct answers.

4.4.5. Examination Evaluation

When you click Test Complete or evaluate and measure the test at the end of the specified test time, the system will automatically complete the test and calculate the student's test results. This module also includes performance management and status query functions.

4.4.6. Build Knowledge Base

The main data structure of system knowledge is shown in Table 1.

Table 1. Main data structure of system knowledge

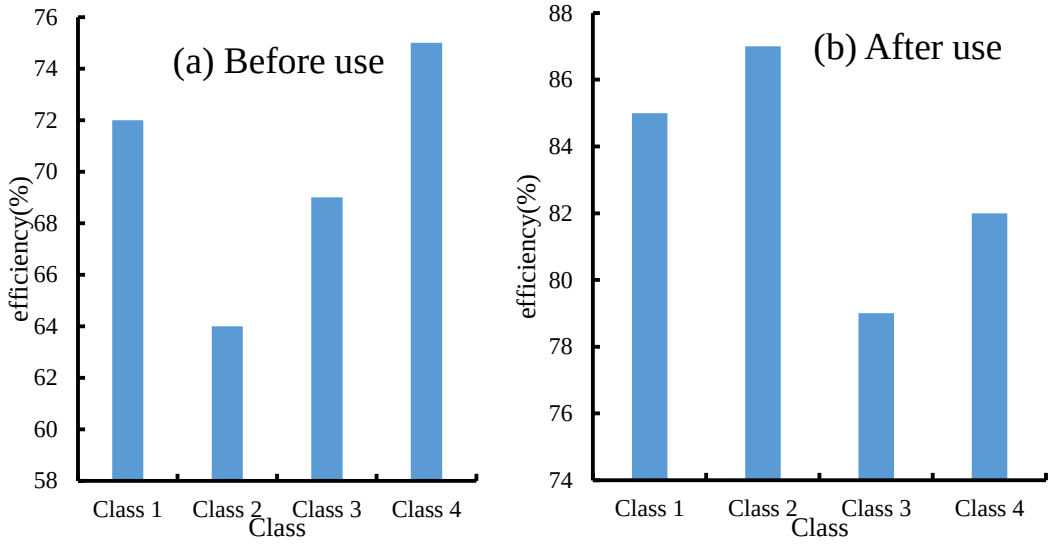
Category	Content
User information table	It is used to record the user information of this login system, including the system number, user identity, user name, user class, user name, password, and whether to take the exam
Student Information Form	Including student number, name, class, etc. The student ID is the key field and is the user name of the student user who logs in to the system
Teacher information table	Including user name, user password, teacher name, management class
Teaching resources information table	Used to store the knowledge point information in solfeggio and ear training teaching system

5. Design Experiment of Music Solfeggio Teaching Resource Database System

This paper applies the music solfeggio teaching resource database system to four classes in the music department of a school, and investigates the teaching efficiency and teaching satisfaction before and after use.

5.1. Teaching Efficiency of Music Solfeggio

The efficiency of music solfeggio teaching is shown in Figure 2.



(a) The efficiency of music solfeggio teaching before using the teaching resource database system

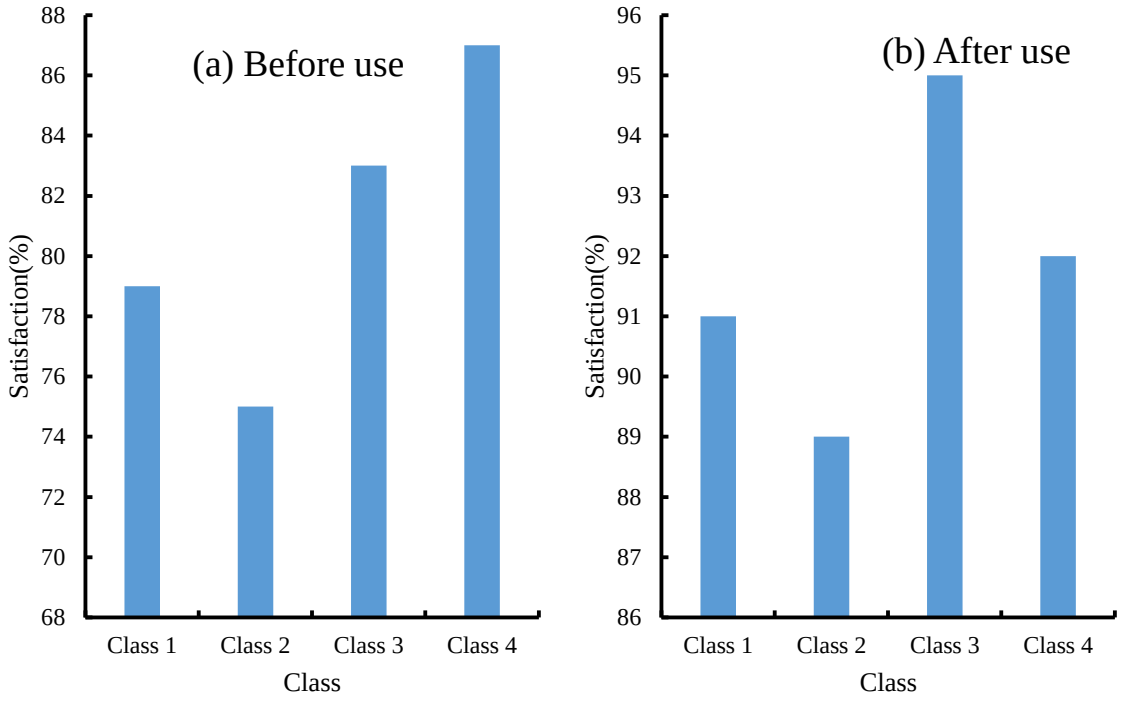
(b) The efficiency of music solfeggio teaching after using the teaching resource database system

Figure 2. Teaching efficiency of music solfeggio and ear training

Figure 2 (a) shows the efficiency of music solfeggio teaching before using the music solfeggio teaching resource database system, and Figure 2 (b) shows the efficiency of music solfeggio teaching after using the music solfeggio teaching resource database system. Before the use of the music solfeggio teaching resource database system, the efficiency of music solfeggio teaching in Class 1 was 72%, the efficiency of music solfeggio teaching in Class 2 was 64%, the efficiency of music solfeggio teaching in Class 3 was 69%, the efficiency of music solfeggio teaching in Class 4 was 75%, and the educational efficiency of the four classes was below 80%. After the use of the music solfeggio teaching resource database system, the efficiency of music solfeggio teaching in Class 1 is 85%, the efficiency of music solfeggio teaching in Class 2 is 87%, the efficiency of music solfeggio teaching in Class 3 is 79%, and the efficiency of music solfeggio teaching in Class 4 is 82%. The efficiency of music teaching in the four classes has greatly improved compared with that before use. It can be seen from the comparative data that the music solfeggio teaching resource database system can help improve the efficiency of music solfeggio teaching and make students' music ability have a greater improvement.

5.2. Satisfaction with Music Solfeggio Teaching

The satisfaction of music solfeggio teaching is shown in Figure 3.



(a) Satisfaction of music solfeggio teaching before using the teaching resource database system

(b) Satisfaction of music solfeggio teaching after using the teaching resource database system

Figure 3. Satisfaction with music solfeggio teaching

Figure 3 (a) shows the satisfaction of music solfeggio teaching before using the music solfeggio teaching resource database system, and Figure 3 (b) shows the satisfaction of music solfeggio teaching after using the music solfeggio teaching resource database system. Before using the music solfeggio teaching resource database system, class 1's satisfaction with music solfeggio teaching was 79%, class 2's satisfaction with music solfeggio teaching was 75%, class 3's satisfaction with music solfeggio teaching was 83%, and class 4's satisfaction with music solfeggio teaching was 87%. After the use of the music solfeggio teaching resource database system, the satisfaction of class 1 with music solfeggio teaching is 91%, class 2 with music solfeggio teaching is 89%, class 3 with music solfeggio teaching is 95%, and class 4 with music solfeggio teaching is 92%. Before using the music solfeggio teaching resource database system, the education satisfaction of the four classes was below 90%. After using the music solfeggio teaching resource database system, the music teaching satisfaction of the four classes was significantly improved, which shows that the music solfeggio teaching resource database system can improve the teaching effect of music teachers and improve the learning experience of students.

6. Conclusion

Under the background of big data, this paper studies the music solfeggio teaching resource database system. This paper first discusses the design principles of solfeggio teaching resource database system from three aspects of security, economy and technology, then analyzes the business process of solfeggio teaching resource database system, and finally designs the solfeggio teaching resource

database system. The system design part discusses the system objectives, system composition, knowledge point setting, and system framework, and discusses the system implementation from the aspects of resource database management, student knowledge point learning, test paper writing function, test paper evaluation, and knowledge base. The experimental results show that the music solfeggio teaching resource database system can effectively improve the efficiency and satisfaction of music solfeggio teaching.

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If any, should be placed before the references section without numbering.

Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

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

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