Application of Data Mining Technology in Music Curriculum Resources

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Abstract. As an indispensable medium between teaching theory and teaching practice, teaching mode can not only effectively guide teaching activities in theory but also help develop effective operating procedures and countermeasures for specific teaching practices. The music curriculum model based on data mining technology is a novel music teaching mode that focuses closely on the technology guideline of “Learning with technology” based on the educational cloud architecture with the collection of multimedia music curriculum resources and properly applies data mining technology to incorporate information technology (IT) means into the music teaching. In this paper, information means such as database and education cloud are effectively used to make an in-depth exploration of the music curriculum model based on cloud computing and data mining technology to provide higher quality information services to schools, teachers and students.

Keywords: Music curriculum model, Cloud computing, Data mining, Architecture

1. Introduction
“Teaching mode” refers to a relatively stable structure and program of teaching activities established under the guidance of certain teaching ideas or teaching theories. At the present stage, most of the music curriculum in China are taught by teachers—playing demonstration—student imitating teaching mode. This teaching mode is widely used and widely recognized. However, due to the changes in the structure of students' knowledge and skills, teaching content And the increasing number of teaching objects, the mode overemphasizes the shortcomings of hard quantitative training of playing skills. It can gradually mislead students into an incorrect professional ideological orientation, and the knowledge and skills learned cannot be effectively applied to practice, resulting With severe disconnection, the quality of students trained is generally not high enough to meet social needs\(^1\)\(^-\)\(^2\).

How to reasonably integrate Internet education resources to reduce additional education costs, how to maximize the educational data and apply them to teaching effectively are the issues to be solved by
educational scholars urgently [3]. The use of cloud computing technology can further optimize the allocation of educational resources and directly use the data resources stored in the cloud to minimize the pressure on end customers and promote the continuous growth of cloud storage data [4-5]. Data mining generally refers to a process of searching for information hidden in massive data by algorithms [6]. With the increasing application of data mining technology in the education industry, educators classify different research objects, build research models corresponding to each category, and collect a series of user data, and then use a variety of different types of Algorithms or graph models or classifiers of music curriculum resources. Finally, a music expert system based on big data is established. On this basis, a music curriculum model based on data mining technology is proposed in this paper.

2. Architecture of the data mining interactive system

2.1. Architecture of education cloud

The migration of cloud computing in the field of education is called “education cloud”, which can more effectively combine the data resources generated in the process of education informatization, provide excellent essential service support for education informatization, and build a more efficient, up-to-date, and intelligent educational resource platform can solve the problems of uneven distribution of educational resources, slow update, low sharing, and difficulty in collecting, integrating, and analyzing user data. The education cloud platform architecture mainly includes four major components, which are briefly introduced below in order:

1) Basic Resource Layer (IaaS). This layer contains two parts: the physical resource layer and the resource virtualization layer. It can provide essential services such as data storage and network communication for the upper layers. XEN running on Linux platform and VMware running on Windows Server platform are currently two models. The two most widely used virtual machine software;

2) Middleware Layer (PaaS). This layer is located in the middle layer of the cloud architecture, and above IaaS, it is aimed at developers of educational software, and provides development service interfaces and public APIs for educational software that needs to be developed. Developers can effectively access the underlying resources by effectively using public APIs. At the same time, they can configure the underlying resources in an all-round way through the management system and rely on the software to the cloud, which will greatly improve efficiency;

3) Educational Application Service Layer (SaaS). Provide a series of service applications closely related to teaching, this article mainly refers to the provision of services related to music teaching;

4) User Service Layer. For users who access Education Cloud, there are three services: mobile terminal-based data services, PC terminal-based data services, and classroom teaching real-time interactive environment services.

2.2. Architecture of the data mining interactive system

In the overall structure of the information management layer based on data mining, the user system includes two parts, the student and teacher systems. The primary function is to quickly and conveniently search learning materials through a search engine system based on the open-source
project Lucene. The primary function of the recommendation system is to obtain user-related information through a database and automatically recommend learning materials to users. Blogs and forums serve as the leading platform for music education informatization, and users can publish some valuable teaching information at any time through this platform.

After the overall architecture is designed, a more detailed infrastructure is established in this paper, as shown in Figure 1. In the basic architecture, the entire system interacts around the user interface, which is to carry out a series of teaching activities around the user, and the user plays a vital role in it. With the help of a real-time search engine, users can obtain comprehensive and up-to-date music teaching materials. Among them, it is essential to point out that the search engine index table is always dynamically updated and stored in memory, making it more convenient for users’ Quick access. The user information database collects user information and user actions on the user interface, effectively classify various types of information, and passes them to the user model and recommendation system, and then passes the music teaching materials that the user is interested into the user through this system. Finally, the goal of real-time interactive music teaching materials is achieved.

Figure1. Architecture of the Data Mining Interactive Information Management System

3. Teaching mode analysis of music curriculum based on cloud computing and data mining technology

3.1. Establishment of music resource library

Music curriculum resources not only have a huge amount but also have a very wide source channel. Therefore, how to effectively build a resource library that can be consistent with the actual teaching design and meet the actual needs of students is an early consideration for education cloud construction. Topic. If a relatively mature and complete data framework is not effectively constructed, it will bring a
lot of problems, which not only hinders the in-depth development of teaching curriculum but also loses the user base on which survival is based, which will lead to the accumulation of subsequent educational information. And collecting becomes more difficult. Therefore, building a relatively complete basic data structure of the teaching resource library can not only effectively meet the needs of teaching, but also provide strong theoretical support for subsequent classification model design.

3.2. Intelligent music teaching content

The information age makes it easier for students to enjoy a variety of electronic education resources, but the excessive information resources have brought many troubles to students who are in the initial stage of professional learning. “Li”, but it took too much time and energy. There are many different styles and characteristics of so many information resources on the Internet, which need to be reasonably classified. Under the premise of following the classification rules formulated by the music resource library, these learning resources can be labeled very accurately through machine learning and mining techniques. Based on this, the student model constructed by the Education Cloud can be effectively used for scientific analysis. To meet the needs of different students and recommend personalized resources to students at the first time, in particular, it is necessary to pay attention to the use of two technical means of learning intent perception and recommendation system, which is very important to guide students to learn in-depth and improve continuously.

Subsequently, based on the characteristics of the students' curriculum content, interest tags, etc., the student data was used to positively match the attribute vector with the music data stored on the cloud platform, and the electronic resources that met the requirements were filtered by adjusting the threshold. And then feedback the highly relevant music works to the students, determine whether these music works are of interest to the students according to the students' clicks, and then accurately feedback the results to the intelligent recommendation system. The sequence is optimized according to the needs of the students so that the interaction between the system and the students is finally achieved.

3.3. Interactive virtual teaching platform

Making full use of the educational resources stored in the education cloud can more easily build a music teaching curriculum learning website and provide cloud resources to each student through the teaching platform so that everyone can enjoy music resources together and build a shared music education resource database. The construction of the teaching platform has many advantages, which is not only conducive to the sharing of high-quality teaching resources but also can better support the further development of students and teachers. When teaching, the teacher can obtain the required teaching resources in real-time according to the needs, and can also adjust to a certain degree according to the needs of the students, which meets the individual needs of different students to the greatest extent, and truly teaches students according to their aptitude.

In addition, the content of resources on the education cloud is vibrant, and it is constantly added and accumulated. This is essentially the result of the joint efforts of resource providers and users. Both resource providers and users can upload some good resources at any time, and teachers can Upload a series of high-quality educational resources for students to learn, and students can also upload some good learning resources for everyone to learn. Through the platform of Education Cloud, teachers and
students are mobilized to jointly build educational resources and continuously update and improve the resource database.

3.4. Remote teaching and mobile device access
The distance education model is applied to music teaching, and the communication between students is realized through communication technology, which enriches the classroom content, makes the classroom teaching more vivid, greatly mobilizes the students’ enthusiasm for learning, and makes the original content boring. Simple music lessons are transformed into lively, interesting and informative comprehensive lessons. This teaching mode perfectly brings out the two advantages of multimedia interactivity and integration, which significantly improves the learning efficiency of students and improves the quality of classroom teaching, which is difficult to achieve with traditional single, centralized teaching methods.

The following evaluations are made for the teaching of music curriculum:
A multi-index evaluation system consisting of \( n \) evaluated objects \( u_1, u_2, \cdots, u_n \). \( m \) indicators \( x_1, x_2, \cdots, x_m \), \( x_j = x_j(i = 1, 2, \cdots, n; j = 1, 2, \cdots, m) \) is the observation data evaluation data matrix (decision matrix) of the evaluated object \( u_i \) and the index \( x_j \) can be expressed as shown in equation (1):

\[
A = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\
       x_{21} & x_{22} & \cdots & x_{2m} \\
       \vdots & \vdots & \ddots & \vdots \\
       x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix}
\]

(1)

The data in \( m, n \geq 3 \) and \( A \) are normalized data after preprocessing.
Can be transformed into equation (2):

\[
y_i = f(x_{i1}, x_{i2}, \cdots, x_{in}), i \in N
\]

(2)

Among them, \( f \) is a positive transformation function; \( y_i \) is the comprehensive evaluation value of the evaluated object \( u_i \). Sort \( u_1, u_2, \cdots, u_n \) according to the value of \( y_1, y_2, \cdots, y_n \) from large to small, and you can complete the comparison of the advantages and disadvantages of \( u_1, u_2, \cdots, u_n \).

If there are two evaluation objects \( u'_i, u''_i(i', i'' \in N, i' \neq i'') \), let \( u'_i, u''_i(i', i'' \in N, i' \neq i'') \) be a random variable that obeys a distribution on the interval \( \left[ \min(w_{ij}, w_{ij'}), \max(w_{ij}, w_{ij'}) \right] \), and call \( s(u'_i \succ u''_i) \) the superiority of \( u'_i \) to \( u''_i \), as shown in equation (3):

\[
s(u'_i \succ u''_i) = p\left(f(u'_i) > f(u''_i)\right) + 0.5p\left(f(u'_i) = f(u''_i)\right)
\]

(3)

In the equation, the aggregate function indicates the event probability as shown in equations (4) and (5):

\[
f(u'_i) = \sum_{j=1}^{m} \tilde{z}_j w_j(i', i'')
\]

(4)

\[
f(u''_i) = \sum_{j=1}^{m} \tilde{z}_j w_j(i', i'')
\]

(5)

In addition, special attention should be paid to the fact that education cloud architecture can effectively support mobile terminals. With the help of mobile terminal devices, teachers
and students can more easily and freely access educational resources, making teaching more flexible and conducive to the modernization of education.

4. Conclusions
In this paper, a music curriculum model based on cloud computing and data mining technology is proposed. The music education information platform architecture and data mining technology of educational cloud are effectively used to give full play to three major advantages, i.e., unity, openness, and flexibility, of the platform. It has successfully solved the problems of uneven distribution of music education resources, low sharing degree, simple and boring contents, and intelligent adjustment unavailable, etc., thereby providing higher quality information services to schools, teachers and students.

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