Application of Big Data Technology in the Study of “UGS” Collaborative Training Mechanism for Musicology Majors in Colleges and Universities in the Context of Professional Accreditation

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Abstract

The traditional education model gradually reveals the corresponding problems and deficiencies in the face of the update of the concept of education frontier and the change of talent cultivation mode. In this paper, we first sorted out the relevant features of the big data and data mining process, mined out the specific needs and realistic development dilemmas of musicology professional certification, and explored the appropriate mechanisms and strategies of UGS collaborative education and training. Using big data Hadoop technology as the infrastructure, a platform for music discipline services is designed to support interoperability and sharing of music education resources among universities, governments, and primary and secondary schools. Specifically, semantic similarity calculation is performed with music resource domain ontology to improve the intelligent retrieval ability, and the recommendation method of user dynamic preference is introduced to provide more accurate music teaching resources for platform users. The effect of cultivating musicology majors in colleges and universities is analyzed in terms of emotional attitudes, knowledge, and skills through the collaborative cultivation mechanism. The accuracy of the semantic similarity intelligent search method based on domain ontology is above 50%, and the mean value of students’ satisfaction with the intelligently recommended music learning resources is 4.3 points. 83.42% of the teaching carried out based on the subject service platform indicated that it met their learning needs, and the overall performance of the students who carried out the platform teaching was 16 points higher than that of the traditional classes. By using big data technology, the UGS collaborative cultivation mechanism can be utilized as a tool to enhance the quality of talent cultivation for musicology majors.

Keywords: Hadoop technology; Discipline service platform; Domain ontology; Semantic similarity; UGS collaborative cultivation; Musicology.

AMS 2010 codes: 68T05
1 Introduction

With the arrival of the big data era, big data technology has had a great impact in various fields, including the field of education [1]. Music education in colleges and universities, as an important art education activity, is also facing the challenges and opportunities of the big data era. How to use big data technology to optimize music education in colleges and universities to improve teaching quality and students’ learning effects has become an important issue [2]. The organic integration of artificial intelligence technology and music education enriches classroom teaching resources, expands the functions of intelligent musical instruments, and improves the technical means of music education [3-4]. It supports personalized learning, can observe music classroom learning, analyze the melody and beat of the music, effectively evaluate the teaching effect, inspire music teachers to use artificial intelligence technology to innovate music teaching, and play the leading role of teachers in classroom teaching [5-6].

The major of musicology is to cultivate practical specialists with music literacy, music professional knowledge, and skills which can be engaged in teaching, research, and management in a certain field, such as culture, education, and media, and have the ability to innovate [7-8]. It can be seen that the musicology major relies on music education and other disciplines to cultivate talents, with the characteristics of reorganizable, cross-cutting and comprehensive in the new liberal arts [9].

The curriculum of musicology majors in colleges and universities mainly includes the main courses of music skills, music theory, and music education [10]. However, in the process of traditional teaching, these professional-related courses lack effective integration, which affects the improvement of students’ professional ability and practical abilities [11]. The optimization of the teaching reform of musicology majors in colleges and universities can start from the construction of a regional service function and talent training mechanism, create diversified practice opportunities for students in the teaching process, form a perfect talent training mechanism, and exercise their professional ability through different practice experiences, as well as strengthen the sense of innovation [12-13].

Literature [14] illustrates that the rapid development of artificial intelligence conceptualization technology promotes the innovation of education concepts. The use of information technology in education better fosters the quality of classroom teaching. Literature [15] points out that the quality of online education is far inferior to the quality of classroom teaching, so digitalization is used in the education classroom to neutralize the characteristics of online education and classroom education, to stimulate students’ interest in learning, and to improve the quality of teaching. Literature [16] plays an important role in optimizing educational intelligence by enhancing the learning experience through novel assessment strategies and predictive teaching. Literature [17] uses big data in the teaching process can effectively connect teachers and students, improve classroom interaction, and promote teaching quality compared with traditional teaching. Literature [18] utilizes virtual reality technology to produce simulation teaching resources and build a virtual reading environment and virtual reading community so that readers can discuss, read, and evaluate in dynamic reading mode.

On the basis of sorting out the characteristics and processing flow of educational big data, the article analyzes the performance of the accreditation demand of musicology majors in colleges and universities as well as the realistic dilemmas in the process of development. It expresses the UGS collaborative cultivation mechanism and its collaborative development support strategy. Based on the Apache Hadoop technology of big data technology, a music discipline service platform is designed to better meet the sharing of various music teaching resources among universities, governments, and primary and secondary schools and to provide a new path for the innovation of talent cultivation mode of musicology majors in universities. In addition, in order to enhance the effectiveness of the platform for students’ music learning, the paper fully considers the domain ontology semantic information of
music resources, combined with semantic similarity to satisfy students’ intelligent retrieval of music resources. Based on the learning characteristics of users on the platform, practice weighting factors are also introduced to establish a dynamic preference model for intelligent recommendation of music learning resources. Finally, the intelligent retrieval and recommendation ability of the music discipline service platform is analyzed, and the cultivation puppy of the discipline service platform on the emotional attitude, values and knowledge skills of musicology students is verified through teaching experiments.

2  The fit between big data and the musicology program

The era of big data for data analysis to change education has come, and the analysis and calculation of data can help education policymakers and teachers get rid of ideological bias and make correct education and teaching decisions. Relying on big data technology to carry out the analysis of data related to the certification requirements of musicology majors in colleges and universities and combining the UGS collaborative education mechanism to innovate the talent cultivation mode of musicology majors, we aim to further enhance the high-quality development of music teacher training teachers.

2.1  Big data characteristics and processing flow

2.1.1  Specific characteristics of big data in education

Big data in education refers to data on students’ learning behaviors that originate from online learning platforms. Not just a large amount of data can be called big data; only after professional analysis, finding the inner connection of the data, grasping the potential logical relationship, and accordingly making the appropriate educational decision-making data can it be called education big data.

Diverse structures, low-value density, large scale, and high speed characterize big data. It’s crucial to efficiently handle diverse data structures in educational big data, which includes not only structured but also semi-structured and unstructured data. In addition, the correlation between unstructured data is not large, and it has random and unrestricted characteristics. If these data are united, it is easy to have an information error situation, which also indicates that the parameter density of big data is low. In the network era, all kinds of data are in constant change and loss; with the rapid development of various communication technologies and sensing technologies, the speed of data acquisition, dissemination, and exchange will continue to increase, and it is very important to process these constantly changing data in a timely manner.

2.1.2  Big Data Mining Processing Flow

Big data has the disadvantages of uncertain information value and uncertain distribution of high-value information. The resulting data types and application processing methods vary widely, but their processing processes are basically the same. The entire big data processing process, i.e., the data acquired by the data source, because of its different data structures, is processed and integrated with special methods to transform it into a unified standard data format to facilitate its processing in the future. Then, these data are processed and analyzed using appropriate data analysis methods, and the results of the analysis are presented to users using visualization and other technologies. Therefore, the processing flow of educational big data is shown in Figure 1, which can be basically divided into four stages: data perception and collection, data processing and integration, data analysis, and data interpretation.
Big data in college education mainly focuses on natural data and social data; natural data is primarily the data generated between machine-to-machine interactions, while social big data comes from all kinds of data generated by college teachers and students participating in social activities using the Internet as a carrier.

2) Data processing and integration

Data processing and integration is the process of appropriate processing, cleaning and denoising of collected data and further integration and storage. On the basis of data “denoising” and cleaning to find out valuable information, the complex structure of the data will be converted into a single or easy to deal with the structure of the data to lay the foundation for data analysis.

3) Data analysis

Data analysis is an effective way to improve the quality of university education by effectively using the data obtained after processing and integration to analyze problems and make accurate decisions.

4) Data interpretation
Data visualization technology mainly aims to convert abstract data into visible graphics or images with the help of graphical means and the visual thinking ability of the human brain so as to show the results of data analysis to users in an image clear and effective way.

2.2 Accreditation Needs of Musicology Programs

2.2.1 Specific requirements for professional certification

The national accreditation of teacher training programs ultimately examines whether the results of human resources training in colleges and universities have met the basic specifications stated in the training objectives. On the basis of this general requirement, if the musicology teacher training programs of colleges and universities want to pass the accreditation, they must pay attention to the degree of adaptation between the orientation of the musicology teacher training programs and the needs of society, the degree of support for music teachers and music teaching resources, the degree of effectiveness of the operation of the college’s quality assurance system, and the degree of satisfaction of the students and the employers, who are mainly in primary and middle schools, and so on. The requirements for the certification of the musicology program are shown in Figure 2. Based on the core competencies and qualities of “One Practice, Three Learning”, i.e., practicing teacher ethics, learning to teach, learning to educate, and learning to develop, the second level of qualification is broken down into eight index points and the third level of certification is broken down into eleven index points.

![Figure 2. Certification requirements for music science](image-url)
All aspects of the training activities of music faculties in colleges and universities are covered by the specific requirements and self-assessment contents of the National Teacher Education Accreditation Program horizontally. The entire training process from enrollment to graduation is covered by them vertically and their focus remains on student development for the next five years or even longer after graduation. The formulation of professional accreditation requirements sets the basic specifications for the future growth of teacher training students. It lays the foundation for a historic change in the development of teacher education in the future.

2.2.2 The Realistic Dilemma of Professional Accreditation

The musicology major is the main force responsible for teacher training in the music discipline of basic education and has produced generations of qualified music teachers for society. Currently, in the context of teacher training professional certification, taking the core concept of certification as a guide to improving the quality of music education personnel training is an important way to promote the comprehensive development of the musicology profession to adapt to the new era. The current musicology professional certification has certain realistic dilemmas, which are as follows:

1) Institutions are inconsistent in their degree of importance. Different colleges and universities have not shown a positive attitude towards musicology professional accreditation, and there is still a significant gap between the curriculum and practice, as well as the system and indicators for teacher training accreditation.

2) Differences in the concept of talent cultivation. Teacher training accreditation standards are the norms and requirements that must be observed and implemented by all relevant majors in all colleges and universities, regardless of whether they are the eight graduation requirements for second-level accreditation or the thirteen requirements for third-level certification, which are regardless of disciplines and specialties.

3) There is still a distance from the accreditation standards. Teacher training certification has unified and clear requirements for the indicators of each professional schooling. The certification system is more detailed and clearer than the basic requirements of the qualified assessment of undergraduate teaching work in some aspects. Most colleges and universities are unable to effectively meet the corresponding professional certification of the educational practice of inputs.

2.3 “UGS” synergistic training mechanism

2.3.1 Institutional framework for collaborative parenting

Under the background of teacher training accreditation, local governments have successively issued relevant real-time opinions on education development, relying on colleges and universities to guide primary and secondary schools in their teaching services, analyzing in depth the difficulties and problems existing in the process of practice, so as to continuously improve the teaching service system of primary and secondary schools, actively creating favorable conditions to promote long-term cooperation between the two sides, and facilitating the optimization of the cooperation mechanism between colleges and universities and primary and secondary schools. The “UGS” collaborative education mechanism is a trinity of collaborative education between colleges and universities, government, and primary and secondary schools, and its specific cooperation path is shown in Figure 3. Colleges and universities should actively dock with primary and secondary schools, understand the demand for teaching services in primary and secondary schools, improve the accuracy
of service supply, strive to reach mutually beneficial win-win cooperation, promote the mutual integration and interoperability of two-way resources, and optimize the effect of collaboration.

![Cooperative mechanisms](image)

**Figure 3.** UGS synergy training mechanism

The aim of training talent in musicology in colleges and universities is to develop high-quality and high-level music teachers. Relying on the UGS collaborative education mechanism can allow college students to go deep into the teaching practice of primary and secondary schools and fully enhance the level of teaching practice of music majors in colleges and universities. Students can receive more diverse teaching support in colleges and universities, and primary and secondary schools can also enhance their students’ music literacy through collaborative teaching practices.

### 2.3.2 Support strategies for synergistic development

The Government plays an important guiding role in teaching services for primary and secondary schools. It should consider the issue in terms of policy formulation and support from various aspects, levels, and perspectives. The government should fully play its role in scientific planning, design, and implementation, as well as resource funding for teaching services through policy leadership, organization, coordination, and platform building.

Primary and secondary schools at all levels and in all categories should, under the guidance of the government policy, take into account the conditions of the school, give full play to the advantages of the school in terms of ecology and humanities, make rational use of resources, fully mobilize the enthusiasm of all departments of the school as well as teachers and parents, and reasonably devise the program design of the teaching service. School administrators should carefully study the relevant programmatic documents and policies of the national, local, and other governments, adhere to the concept of student-centered development and nurturing, comprehensively and three-dimensionally improve the educational system of students’ teaching services, and diversify and comprehensively design the total program of services. Considering the problem from multiple angles, we adopt course series products and service modes such as the combination of common development and individuality development, the combination of inside and outside the classroom, and the combination of flexibility and continuity. At the same time, under the coordination of the university disciplinary service
platform, local universities should actively participate in the construction of primary and secondary school teaching service work, giving full play to the professional advantages of universities, talent advantages, and other resources to provide support conditions for primary and secondary school teaching service, while promoting the rapid growth of the preparatory teacher team.

3 Music discipline service platform based on big data

The rapid development of big data technology provides a new opportunity for the high-quality development of musicology majors in colleges and universities to carry out the construction of the music professional discipline service platform based on big data technology. The teaching resources of colleges and universities, the government and primary and secondary schools are shared to better help musicology professionals achieve professional certification and enhance the quality of talent cultivation for musicology majors in colleges and universities.

3.1 Music Discipline Service Platform Architecture

3.1.1 Apache Hadoop technology

Hadoop is a distributed massive data computing framework; it has good scalability and, through a simple configuration, can build a distributed cluster of hundreds of servers. Hadoop clusters completely at the software level to achieve the node running state monitoring, without the special support of the underlying hardware, can be strange node unfinished computational tasks assigned to other healthy nodes so that the user submits the program is not interrupted due to computer failure. Make certain that programs submitted by users are not interrupted by computer failure. With the power of cluster computing, programs running on the Hadoop framework can process huge amounts of data in a very short time.

Hadoop’s programming model is similar to Google MapReduce. A computational task submitted by a user is first initialized into a Job object. Then, the Job is decomposed into two computational phases: the Map phase and the Reduce phase. Before starting job scheduling, MapReduce divides the original input data into several slices. The node that performs the Map computation task reads a data slice as input in the form of <key-value> and writes the computation result in the form of <key-value> to disk after processing. The MapReduce framework categorizes the intermediate results of the output of all the Mappers according to the key values. It injects the data in the form of <key,(list of values)> into the Reduce phase. The MapReduce framework will categorize the intermediate results of all Mappers according to the key values and then inject the data in the form of <key,(list of values)> into the Reduce node, which will process each collection of values, and finally write the results of computation to disk.

3.1.2 Music Discipline Service Platform Construction

Based on big data technology, this paper fully investigates the professional certification needs of musicology professional training in colleges and universities. It carries out the architecture design of an intelligent music discipline service platform with the goal of docking user needs; its basic framework is shown in Figure 4. The basic framework is shown in Figure 4. It mainly includes data resource layer, technical support layer, information processing layer, intelligent service layer, user interaction layer, and the platform business processing flow structure with data collection module, demand analysis module, intelligent labeling module, behavior prediction module, service application module, and data exchange module.
The music discipline service platform should be oriented to the user demand level, take technology as a means, take intelligent discipline service content and product innovation as the purpose, take resource integration and convergence as the basis, take platform business synergistic processing ability improvement as the main line, take user intelligent service and value co-creating as the goal, and based on the synergistic theory of the understanding of the platform complex for the platform overall architecture design. The platform can realize the sharing of resources for collaborative education among universities, government, and primary and secondary schools, effectively enhance the talent cultivation capacity of musicology majors in universities, and promote the high-quality and innovative development of the accreditation of musicology majors in universities.

3.2 Intelligent Search and Recommendation of Resources

3.2.1 Intelligent retrieval based on domain ontology

Ontologies emphasize that concepts in the domain are the basic units of semantics, and each concept is expressed through relationships and attributes between concepts. In semantic information retrieval based on domain ontologies, domain knowledge is modeled using ontology to generate a shared domain ontology knowledge base. By utilizing the idea and method of semantic similarity, the limitations of keyword-based retrieval can be avoided, the retrieved relevant information can be further expanded, and the output can be sorted according to the degree of similarity so as to improve the accuracy and completeness of information retrieval.

In this paper, we synthesize the distance-based semantic similarity computation model and the attribute-based semantic similarity computation model to obtain the domain ontology-based semantic similarity computation model. Namely:

$$Sim(i, j) = \rho_1 Sim^1(i, j) + \rho_2 Sim^2(i, j)$$  (1)
Where $\rho_1$ and $\rho_2$ are the corresponding moderators, and $\rho_1 + \rho_2 = 1$. where $\text{Sim}^1(i, j)$ is the distance-based semantic similarity and $\text{Sim}^2(i, j)$ is the attribute-based semantic similarity.

The semantic similarity in domain ontologies is influenced by key factors, with distance-based factors being more important and attribute-based factors being more important. Similarly, for the same domain ontology, different experts assign different weights to both. These two moderators precisely take into account the various needs of varying domain ontologies and the different subjective decisions of other experts for the same ontology, which is more in line with the requirement of the subjectivity of semantic similarity.

### 3.2.2 Intelligent Recommendations for User Dynamic Preferences

In this paper, we first utilize the user dynamic attribute features to perform feature similarity calculations among users separately. Then, the comprehensive similarity expression of users is obtained by weighting the similarity of these two preference features. Finally, based on the user’s comprehensive similarity, the set of nearest neighbor users of the current user is obtained, and the Top-N teaching resource recommendation results are obtained using the user-resource score prediction formula.

In this paper, we refer to the idea of Ebbinghaus’ forgetting curve and introduce the time weight factor $L_{w,f,t}$ to dynamically adjust the change of user’s resource preference over time. Its specific calculation is expressed as:

$$L_{w,f,t} = \tau + (1-\tau) \times e^{-\tau (t_{\text{now}} - t_{u_j,t_k})} (1 \leq k \leq l)$$

(2)

Where $t_{\text{now}}$ denotes the time when the user $u_j$ currently uses the resource label $t_k$ and $t_{u_j,t_k}$ denotes the time when the user $u_j$ last used the resource label $t_k$. $\tau \in [0,1]$, which is meant to regulate the impact $L_{w,f,t}$ on the user’s resource preference.

Accordingly, in this paper, the user dynamic resource preference characteristics are jointly represented by the user’s operational behavioral characteristics $L_{w,bc,t}$ of the resource and the corresponding time weighting factor $L_{w,bc,t}$, which is calculated by the formula:

$$L_{w,bc,t} = L_{u,w,f} \cdot L_{w,bc,t} (1 \leq k \leq l)$$

(3)

Finally, the above expression is normalized to obtain the dynamic resource preference vector representation of the user $u$ as:

$$L_u = \{L_{w_1}, L_{w_2}, ..., L_{w_l}\}$$

(4)

From the user dynamic resource preference feature vector $L_u = \{L_{w_1}, L_{w_2}, ..., L_{w_l}\}$, the value of this feature vector is utilized instead of the user-resource score in the traditional collaborative filtering recommendation algorithm to compute the dynamic resource preference feature similarity between user $u_a$ and user $u_b$, which is calculated by the formula:
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\[
Sim(u_a, u_b)_{TS\_Preference} = \frac{\sum_{t=1}^{T} (L_{a,t} - \bar{L}_a) \times (L_{b,t} - \bar{L}_b)}{\sqrt{\sum_{t=1}^{T} (L_{a,t} - \bar{L}_a)^2} \times \sqrt{\sum_{t=1}^{T} (L_{b,t} - \bar{L}_b)^2}}
\]  
(5)

Where \( T_{ab} \) denotes the resource preference label shared by user \( u_a \) and user \( u_b \), \( L_{a,t} \) and \( L_{b,t} \) denote the dynamic resource preference feature vector values of users \( u_a \) and \( u_b \) for label \( t \), respectively, and \( \bar{L}_a \) and \( \bar{L}_b \) denote the average of the overall preferences of users \( u_a \) and \( u_b \) for the \( L \) labels in label set \( T = \{t_1, t_2, \ldots, t_j, \ldots, t_L\} \), respectively.

In addition, from the expression of user \( u \)'s teaching behavior preference matrix \( R(u)_{\text{preference}} \), this paper draws on the concept of matrix similarity. It defines the teaching behavior preference matrix similarity formula as shown in (6) to represent the similarity of teaching behavior preference features between user \( u_a \) and user \( u_b \). That is:

\[
\text{sim}(u_a, u_b)_{R\_Preference} = \frac{\langle R(u_a), R(u_b) \rangle}{\|R(u_a)\| \|R(u_b)\|}
\]  
(6)

Where, \( \langle R(u_a), R(u_b) \rangle \) denotes the inner product of user preference matrices \( R(u_a) \) and \( R(u_b) \), as shown in Equation (7). \( \|R(u_a)\| \) and \( \|R(u_b)\| \) denote the Frobenius paradigms of user preference matrices \( R(u_a) \) and \( R(u_b) \), respectively, as shown in Equation (8). i.e.:

\[
\langle R(u_a), R(u_b) \rangle = \text{tr}(R(u_b)^T R(u_a))
\]  
(7)

\[
\|R(u)\| = \sqrt{\text{tr}(R(u)^T R(u))}
\]  
(8)

Combining the two user feature similarity, using the weight factor \( \lambda \) to adjust the weight value of the feature, you can get the comprehensive similarity between users \( \text{sim}(u_a, u_b) \), the specific expression is:

\[
\text{sim}(u_a, u_b) = \lambda \times \text{sim}(u_a, u_b)_{TS\_Preference} + (1 - \lambda) \times \text{sim}(u_a, u_b)_{TB\_Preference}
\]  
(9)

Where the magnitude of \( \lambda \in [0,1] \), \( \lambda \) values is generally obtained by algorithmic effect validation.

The set of nearest neighbor users of the current user is obtained by the comprehensive user similarity \( U = \{u_1, u_2, \ldots, u_j\} \), in which the predicted rating of the target user for the unknown resource is calculated based on the historical resource implicit rating information of the nearest neighbor users. That is:
\[
\text{Prediction}(u_a, t_j) = \overline{\text{r}}_{u_a} + \sum_{u_a \neq u_b} \text{Sim}(u_a, u_b) \times (\text{r}_{u_b,t_j} - \overline{\text{r}}_{u_b}) \sum_{u_a \neq u_b} \text{Sim}(u_a, u_b)
\] (10)

Where \( \overline{\text{r}}_{u_a} \) and \( \overline{\text{r}}_{u_b} \) denote the average implicit ratings of the target user \( u_a \) and the nearest neighbor user \( u_b \) on the historical resources, respectively, and \( \text{r}_{u_b,t_j} \) denotes the implicit ratings of the nearest neighbor user \( u_b \) on the resource \( t_j \). Finally, the Top-N resource recommendation is performed based on the size-ranking results of the predicted values.

4 Application analysis of the music discipline service platform

Musicology professionals should be able to play, sing, dance, conduct, rehearse, and other skills in order to truly become “multi-faceted” in primary and secondary school music teaching and extracurricular activities and adapt to different environments and needs. This chapter is mainly focused on the music discipline service platform, which aims to optimize the quality of music major talent cultivation and provide support to meet the needs of music major talent cultivation in colleges and universities.

4.1 Validation of Intelligent Retrieval and Recommendation

4.1.1 Intelligent retrieval of learning resources

The traditional method of retrieving knowledge is based on keyword matching and only compares the degree of matching at the string level. In contrast, the semantic similarity intelligent retrieval based on domain ontology proposed in this paper realizes the retrieval on the semantic level of domain ontology after comprehensively analyzing the user’s retrieved music learning resources, which makes the final music resources more in line with the user’s learning needs. This experiment will utilize four methods for retrieval experiments, namely, the method of this paper, keyword matching retrieval, semantic similarity retrieval, and semantic information retrieval, and select the search rate and the search rate as the evaluation indexes and compare them based on the retrieval conditions of natural language. The comparison results of different retrieval methods are shown in Figure 5.

Under the natural language-based retrieval conditions, when using the semantic similarity intelligent retrieval method proposed in this paper, which considers the domain ontology of music learning resources and the speech information retrieval method for retrieval comparisons, the accuracy rate decreases with the increase of the full rate. However, both the full rate and the accuracy rate of the music resource retrieval method proposed in this paper are still maintained at more than 50%, and the retrieval performance is relatively good. In the traditional information retrieval method, with the increase of the check rate, the check rate decreases, the check rate of the three comparative retrieval methods is lower than 45%, and the check rate of the semantic information-based retrieval even decreases to about 15%, which is lower than the retrieval performance of the intelligent retrieval proposed in this paper. Therefore, on the basis of fully considering the ontology semantics of the music teaching resources domain, using different semantic similarities for music resources matching can provide diversified teaching contents for the cultivation of music majors in colleges and universities and also promote the sharing of music teaching resources between colleges and universities and primary and secondary schools.
4.1.2 Intelligent Recommendation of Music Resources

In the music discipline service platform, this paper introduces the intelligent recommendation method of music resources based on users’ dynamic preferences, which aims to recommend music education resources that better meet students’ learning needs on the basis of understanding students’ dynamic resource preferences. A total of 50 students were surveyed using the user dynamic preference questionnaire. The students’ learning data on the subject service platform were similarly calculated as a way to recommend resources for the students. The students were invited to score their satisfaction with the recommended music learning resources, which was mainly quantified using a five-level Likert scale. Figure 6 depicts the evaluation and satisfaction of the courses with the highest recommended similarity based on the questionnaire results.

The proposed user dynamic preference model in this study suggests more obvious satisfaction. Among the 30 students who participated in the experiment, 13 students were very satisfied with the most relevant music teaching resources recommendations results, and the overall satisfaction mean value of the students was 4.3 points. However, 3 students were lowly satisfied with the most relevant music learning resource recommendations, which may be due to the fact that the elements in the user preference model are not categorized in detail. The musicology major courses are more complicated, thus making it difficult to classify the recommendations of music learning resources. In addition, the 30 students’ satisfaction with the recommendation of music teaching resources reached 83.51%. On the whole, the music resource recommendation effect achieved by the model in this paper is satisfactory after fully considering the students’ dynamic preferences in the music discipline service platform.
4.2 Cultivation effect of disciplinary service platform

Based on the music discipline service platform, we carry out the online and offline combination of talent cultivation modes for the training of musicology majors in colleges and universities. Sixty students in the second year of the School of Music of X Normal University were selected as the research object. They were randomly divided into traditional teaching classes and platform teaching classes. There was no significant difference in the mastery of music knowledge and skills between the two courses before the start of teaching. The discipline service platform is utilized to enhance the quality and optimization mechanism of talent training for musicology majors in order to meet the requirements of musicology professional certification.

4.2.1 Affective Attitude and Value Development

To fully understand how students’ affective attitudes and values change when teaching on the subject service platform, questionnaires were collected for students in the platform teaching classes. The survey mainly includes I like music class more than before (A), enhancement of enthusiasm for music learning through online learning (B), platform music teaching can intuitively feel and understand music (C), subject service platform teaching can satisfy the learning needs (D), active music aesthetic communication (E), better cultivation of teaching and nurturing attitude (F), and sufficiently enhanced expectations for music teaching (G). The questionnaire was quantified using a five-level Likert scale, and the data obtained from the questionnaire were collected and organized to get the results of the students’ affective attitudes and values cultivation, as shown in Figure 7.

For the seven questions designed in the questionnaire, 83.42% of the students think that under the platform teaching mode, they enjoy music lessons more than before, and the vast majority of the students have been stimulated and cultivated their interest in music learning in the implementation of the platform music teaching. Only 1.39% of the students said that the platform teaching mode is very incompatible with their learning needs. Using the online self-study stage can fully mobilize the initiative and enthusiasm of students for music learning. The online and offline music teaching modes based on the music discipline service platform can effectively guide students into the world of music and cultivate their appreciation for music. In addition, 88.05% and 91.76% of the students think that it is better to develop their attitude toward teaching and educating people for the competence demand of musicology certification, which fully enhances the students’ expectation of music teaching. Through the effective connection between colleges and universities and primary and secondary schools, more teaching practice opportunities are provided for students to help them understand
music-related knowledge in teaching practice, which better meets the needs of musicology professional certification.

Overall, the implementation of the online and offline teaching mode based on the music discipline service platform has achieved good results in the cultivation of emotional attitudes and values, indicating that the platform music classroom is conducive to the formation and development of the student’s sense of musical autonomy, helping to fully mobilize the individual’s subjective initiative to actively participate in learning activities so that they can obtain a positive inner experience. It fully improves students’ professional cognitive abilities, identifies the basic characteristics of teaching and education in teaching practice, and supports the realization of professional certification for musicology talents.

![Figure 7. Emotional attitude and values culture](image)

### 4.2.2 Understanding and deepening of knowledge and skills

In order to understand the impact of different learning modes on the theoretical knowledge understanding of musicology majors, students in traditional teaching classes and platform teaching classes were tested for their knowledge at the end of the teaching experiment, and statistical analysis was carried out on the student’s test scores according to uniform standards. Figure 8 shows the distribution of the number of students’ scores across different learning styles.

From the overall average scores of the tests taken by both classes, the average score of the class implementing platform teaching is 16 points higher than that of the traditional teaching class. The use of big data technology in online and offline teaching for musicology students has been shown to have a positive impact on their understanding of music conceptual knowledge. Secondly, in terms of the distribution of the number of students in each score band, the number of students in the high score band in the classes where the platform teaching is implemented is significantly higher than that in the high score band in the classes where the traditional teaching is implemented, i.e., the number of students in the score bands of “81-90” and “91-100” are 7 and 3 higher, respectively. The number of students in the high-scoring group is significantly higher than the number of students in the high-scoring group of traditional teaching classes. The subject service learning platform can be utilized in music teaching to mobilize the enthusiasm of most students and improve the effect and quality of learning. The subject service platform based on big data technology can fully release the impact of UGS collaborative training and educating mechanisms and enhance the correlation of resources between colleges, universities, and primary and secondary schools. Musicology students can benefit
from a better understanding of the responsibilities and obligations of music teachers in teaching practice, better absorbing relevant music knowledge, and laying a solid foundation for obtaining musicology professional certification.

**Figure 8.** Student scores in different ways of learning

### 5 Conclusion

In this paper, we have established a music discipline service platform by combining the UGS collaborative education mechanism with big data Hadoop technology to address the needs for musicology professional certification. The platform is designed with intelligent search and recommendation methods to provide students with diversified teaching resources, and it also connects music teaching resources of colleges and universities, the government, and primary and secondary schools through external interfaces. The validation analysis was carried out to examine the talent cultivation effect of the music discipline service platform. In the music discipline, the search accuracy rate of the semantic similarity intelligent retrieval method based on the domain ontology is maintained at more than 50%. When music teaching resources were recommended based on the full consideration of students’ dynamic preferences, the mean value of students’ overall satisfaction was 4.3 points, and the recommendation satisfaction rate reached 83.51%. Conducting online and offline music teaching with the subject service platform, there are 83.42% of students think that the teaching method is innovative and can well stimulate their interest in music learning. In addition, the students’ comprehensive music achievement score of the platform teaching class is 16 points higher than that of the traditional teaching class, and the number of students with 80 points or more is 10 students higher. Based on big data technology and combined with the UGS collaborative education mechanism can fully meet students’ needs for teaching resources and teaching practice, effectively enhance students’ emotional identity and values, and provide a guarantee to meet the certification of musicology majors.

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References


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