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The integration and development of ethnic cultural inheritance and reform of music education in universities

Wen Lin[1] and Chen Chen[1,*]
[1] Academy of Music, Guangzhou College of Technology and Business, Guangzhou, Guangdong, 510000, China
Corresponding authors: (e-mail: tengfeng0914@163.com).

Abstract In recent years, music has been developing rapidly in China and has become one of the hot items of current school teaching, and more and more schools have carried out college music education. However, there are still many problems that need to be solved in college music education, among which the problem of unreasonable teaching methods is particularly prominent. In this study, we use federal reinforcement learning technology to explore in depth the theory and method of the situational classroom teaching model and implement it into music education in China's general colleges. Through empirical testing, we further analyze the optimization effect and empirical variability of the model to provide reference for the implementation and promotion of the situational classroom teaching model in China's general college music education. The experimental results proved that the optimized federal average algorithm achieved better results than the traditional teaching method, using the situational classroom teaching method in college music education, which could improve the quality of set completion and significantly improve the teaching quality, and the accuracy of the optimized model of federal learning increased by 8%.

Index Terms Federated reinforcement learning techniques, situated classroom teaching, college music, federal average algorithm optimization

I. Introduction

music is a popular art form among adolescents, and in recent years, as art education and college entrance examination fever continue to rise, more and more adolescents are learning music in the hope that they can use it to trim and shape their bodies, enhance their physique and master an art [1]. It has become a fashion to take music lessons, which is loved by more and more teenagers. It can be expected that in the future, with the deepening of school teaching reform and the gradual popularization of lifelong thinking, music has a good prospect and a broad space for development in schools [2]. The unreasonable teaching method is an important factor that restricts the development of music education in colleges.

music is a comprehensive and artistic project, which requires systematic and scientific learning and training to master its complex technical movements and to show good movement expression with the perfect cooperation of music partners [3]. The quality of music education in colleges is influenced and restricted by many factors, and teaching methods are considered to be the core element of teaching [4]. The teaching process ignores, or even neglects, whether the teaching methods are rich and diversified, whether they can effectively attract students' learning motivation, etc., so that the cognitive education is disconnected from the emotional education, which is very likely to lead to students' boredom and easy fatigue in movement, reducing students' willingness and interest in learning music, and even losing their enthusiasm for music [5]. Therefore, how to adopt effective teaching methods to enhance students' enthusiasm and enthusiasm for learning music is a long-standing concern in the teaching of music in colleges at all levels and in all types of schools.

music education algorithm can train a high-quality model using relatively small communication rounds, which is the classical federal reinforcement learning technique, and many later federal reinforcement learning algorithms have further developed on this basis and formed many excellent branching algorithms [6], [7]. music has a long history of development, but limited by factors such as insufficient teaching resources, its time as a college course optional program is not long, in recent years, with the significant improvement of teacher quality and the gradual enrichment of teaching resources, it is widely carried out in colleges at a rapid rate, and is liked by college students. As a college course, music has many attributes such as fitness, entertainment and competition, but it is also because of its multiple attributes that there are some problems, for example, the individual differences among students are relatively large, if we adopt "duck-filling" teaching without regard to these differences, the teaching results will often be counterproductive. Students may be less interested in learning because they have difficulty meeting the teacher's requirements or the course is not difficult enough.

In response to this problem, many scholars in the field of music have also proposed some teaching concepts and methods, such as "differentiated teaching" and "tiered teaching", but because teachers still occupy a dominant position in these teaching methods, they have not found a way to properly deal with students' However, because teachers are still dominant in these teaching methods, they have not found a way to deal with students' differences, and students are still passive in teaching [8]. On the contrary, the situational classroom teaching mode is based on "learning to teach", and the whole teaching process starts from students' independent learning, independent questioning, independent cooperation, and independent competition, ensuring that students have full freedom in every aspect, completely bringing out students' creativity and individuality, optimizing the learning process of music, and significantly improving students' learning efficiency.

At present, many teachers have tried to integrate the situational classroom teaching method into music project teaching, but the situational classroom teaching method is still a relatively new teaching method in college music education, and the application rate is relatively free, this study mainly tries to integrate the situational classroom teaching method into college music education and carry out corresponding experimental research, through which more music teachers understand what situational classroom teaching is and know how to carry out Through the study, more music teachers understand what situational classroom teaching is and how to carry out it, and then improve the teaching quality through the innovation of teaching methods [9]. From the theoretical point of view, the lack of systematic experience in teaching practice due to the lag of theoretical research on the situational classroom teaching method in college music education is an important constraint to the development of situational classroom teaching in music.

This paper uses the basic theories of situational classroom teaching such as constructivist learning theory, cognitivist learning theory, emotion-driven principle, and role-transformation principle to build a relatively complete and reasonable framework system of music situational classroom teaching, and combine it with experiments to verify the advantages of music situational classroom teaching, enrich the theoretical research of music situational classroom teaching method [10]. From the practical point of view, the frequency of the situational classroom teaching method in music project teaching is still relatively low, and the practical research on situational classroom teaching is rarely seen in college music education [11]. This study integrates a variety of theories to conduct an in-depth study on the specific use and development of the situational classroom teaching method in college music education, and combines teaching experiments to analyze the impact of the situational classroom teaching method on learning interest and teaching effectiveness, and to demonstrate the effect of the situational classroom teaching method on improving the quality of college music education, in order to guide music situational classroom teaching, improve the effectiveness of college music education, and provide practical value for the overall improvement of music students'.

In summary, the application of the situational classroom teaching mode to college music education can respect the individual differences of students and give full play to their learning autonomy, which has positive significance for music curriculum reform and teaching mode innovation [12]. However, as an emerging teaching mode, the specific effect of its application in college music classroom still needs to be studied.

II. Federal averaging algorithm optimization

In the process of creating music education model, federal model training and model average are more critical, and its Euler angle corresponds to the quaternion of equation (1).

$$q = q\theta_1, q\theta_2, q\theta_3 = \left[\cos\frac{\theta_3}{2}, \left(0,0,\sin\frac{\theta_3}{2}\right)\right]\left[\cos\frac{\theta_2}{2}, \left(0,\sin\frac{\theta_2}{2},0\right)\right]\left[\cos\frac{\theta_1}{2}, \left(\sin\frac{\theta_1}{2},0,0\right)\right] \tag{1}$$

Its corresponding rotation matrix can be calculated as Equation (2).

$$M = \begin{bmatrix} M_{00} & M_{01} & M_{02} \\ M_{10} & M_{11} & M_{12} \\ M_{20} & M_{21} & M_{22} \end{bmatrix} = \begin{bmatrix} 1-2y^2-2z^2 & 2xy-2zw & 2xz+zwy \\ 2xy+2wz & 1-2x^2-2z^2 & 2yz-2wx \\ 2zx-2wy & 2yz+2wx & 1-2x^2-2y^2 \end{bmatrix} \tag{2}$$

Find the quaternion $\therefore q = \left[\cos\frac{\theta}{\rho}, n\sin\frac{\theta}{\rho}\right] = [w,(x,y,z)]$, where Formula (3):

$$x = 1/2\sqrt{M_{00} - M_{11} - M_{22} + 1}, \quad y = \left(M_{01} + M_{10}\right)/4x \tag{3}$$

$$z = \left(M_{02} + M_{20}\right)/4x, \quad w = \left(M_{21} + M_{12}\right)/4x \tag{4}$$

The formula for calculating the similarity between motion fragment Q and motion fragment P is Equation (4).

$$\psi(Q,P) = \frac{1}{2}\sum_{i=1}^{k}\left(\left(\sigma_i / \sum_{i=1}^{n}\sigma_i + \lambda_i / \sum_{i=1}^{n}\lambda_i\right)\left|\mu_i \cdot \nu_i\right|\right), \tag{5}$$

The functions used in the target drawing number of the federal averaging algorithm algorithm are defined in Eqs. (5)-(8).

$$C_j\left(e_j\right) = c_j e_j, \quad S_{ij}\left(h_{ij}\right) = s_{ij}h_{ij} \tag{6}$$

$$I_i\left(h_i\right) = \begin{cases} 0, & \sum_j h_{ij} = 1 \\ -\infty, & \text{otherwise} \end{cases}; \tag{7}$$

$$E_j\left(h_j, e_j\right) = \begin{cases} 0, & e_j = h_{jj} = \max_i h_{ij} \\ -\infty, & \text{otherwise} \end{cases} \tag{8}$$

The eye-comb function for federal average clustering is Equation (9).

$$\sum_{i,j} S_{ij}\left(h_{ij}\right) + \sum_j\left(C_j\left(e_j\right) + E_j\left(h_j, e_j\right)\right) + \sum_i I_i\left(h_i\right). \tag{9}$$

Similar to the federal average algorithm, the two constraint functions I and E cause each point to be assigned a unique representative point, and a data point must choose itself as a representative point if it is pushed by another data point. The objective function of HAP clustering is Eq. (10).

$$\sum_{i,j,l} S_{i,j}^l\left(h_{l,j}^{'}\right) + \sum_{\mathrm{j},l} C_j^l\left(e_j^l\right) + \sum_i I_i^1\left(h_{l,l}^1\right) + \sum_{i,l>1} I_i^l\left(h_{l,j}^l, e_i^{l-1}\right) + \sum_{\mathrm{j},l} E_j^l\left(h_{i,j}^l, e_j^l\right) \tag{10}$$

Given two sets of by points, as in Eq. (11).

$$A = \left\{\left(A_1, w\left(A_1\right)\right), \left(A_2, w\left(A_2\right)\right), \cdots\left(A_m, w\left(A_m\right)\right)\right\} \tag{11}$$

$$B = \left\{\left(B_1, w\left(B_1\right)\right), \left(B_2, w\left(B_2\right)\right), \cdots\left(B_m, w\left(B_m\right)\right)\right\}, \quad A_i, B_j \in R^2 \tag{12}$$

III. Methods

III. A. 3.1 Data set selection

This study mainly analyzes the music situational classroom teaching mode of control group A and B, and discusses the implementation value of situational classroom teaching mode to improve the quality of music education in colleges. As the research on context-aware technology and situational awareness technology continues to deepen, the framework of its corresponding context-aware system is also quickly mentioned, and the interrelationship between them is shown in Figure 1.

The object of this study is the students majoring in music. It combines classroom scenes with model building to promote the improvement of students' music level.

Different recommendation algorithms have their own applications, and each recommendation algorithm has its own advantages and disadvantages. The pros and cons of different recommendation algorithms are shown in Table 1.

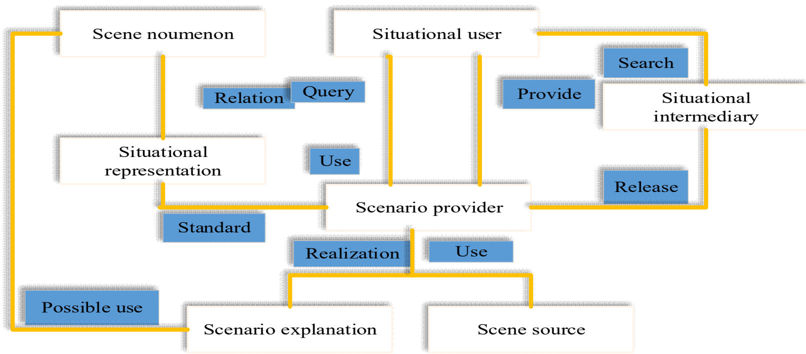

Figure 1: Context awareness system framework

Table 1: Comparison of different recommended algorithms

Recommended algorithm	Advantage	Shortcoming
Content based recommendation algorithm	The recommendation results are intuitive and easy to understand without sparsity	The cold start problem of new users is difficult to handle due to its complex attributes; Need enough data to construct classifier
Recommendation algorithm based on collaborative filtering	Can handle complex unstructured object recommendation with high degree of personalization and automation	New user problems; The quality depends on the poor recommended quality at the beginning of the historical dataset system
Recommendation algorithm based on association rules	New points of interest can be found; No cold start problem	Rule extraction is difficult and time-consuming; Product name synonymy; Low degree of personalization

Since different recommendation methods have different advantages and disadvantages, they can be used in practice to complement each other to make recommendations, which is also called combination recommendation. There are two types of combinatorial recommendation, one is to combine the results obtained from different recommendation algorithms, and the other is to directly combine different recommendation algorithms.

Therefore, when using a combinatorial recommendation algorithm, it is necessary to choose the appropriate type of combinatorial recommendation algorithm according to the specific environment. Dedicated ontology reasoners can support fewer ontology description languages, and common dedicated ontology reasoners include Pellet, Pellet, FaCT++, and Jena, among which the respective characteristics of these reasoners are shown in Table 2.

Table 2: Characteristics of each inference engine

Inference engine	Jena	Jess	Pellet	Racer	FaCT++
Development language	Java	Lisp, Java	Java	Lisp	Lisp,C++
Supported formats	RDF,XML	OWL ,SWRL	OWL ,RDF,RDFS	OWL,RACER,SWRL	Kb
Query language	SPARQL	RDQL	RDQL	OWL-QL,nRDQL	Nothing
Sample code	Have	Have	Have	Nothing	Nothing
Implementation algorithm	Rete	Rete	Tableaux	Tableaux	Tableaux
Database	Have	Nothing	Nothing	Have	Nothing
API	DIG	DIG, Lisp	DIG	DIG, Lisp	DIG
Editor	$\Pr ote'ge'$	$\Pr ote'ge'$	$\Pr ote'ge'$,Oi1Ed	$\Pr ote'ge'$,Oi1Ed	$\Pr ote'ge'$,Oi1Ed
Open source or not	Yes	Yes	Yes	Commercial	Yes
Developer	HP Labs	Sandia Labs	University of Maryland	Franzens, Germany	University of Manchester

Among them, Jena reasoner is the most widely used ontology reasoner, whose structure mainly includes: resource description framework interface, ontology analysis module, resource description framework model, reasoning subsystem, ontology subsystem, and ontology query language. The inference subsystem and ontology subsystem are the core of the Jena reasoning machine. Classroom location scenarios are descriptions of the locations of teachers, students, and classroom administrators. Classroom location scenario information can be divided into two major categories based on the characteristics of student activities: on-campus and off-campus. The specific classroom location scenario information is shown in Figure 2.

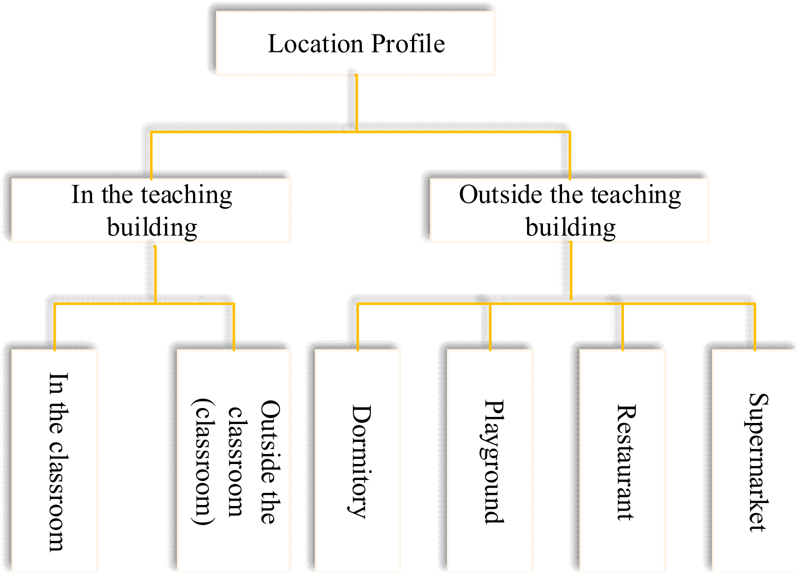

Figure 2: Classification of location scenario information

The scenario classroom is fundamentally different from traditional physical education in terms of teaching philosophy, method and system framework, which is an innovative teaching mode rather than an improvement under the traditional teaching mode. The key to the application of scenario classroom in college music is to bring into play the students' ability of independent learning. The time for learning and absorbing new music movements and techniques is placed before class, while in class the problems found in pre-class learning are mainly solved, thus achieving the purpose of improving learning efficiency.

III. B. 3.2 Federated learning model training and optimization

The main purpose of generating multiple classifiers is to improve the accuracy of the computation and reduce overfitting. The process of its algorithm is elicited below, As shown in Figure 3.

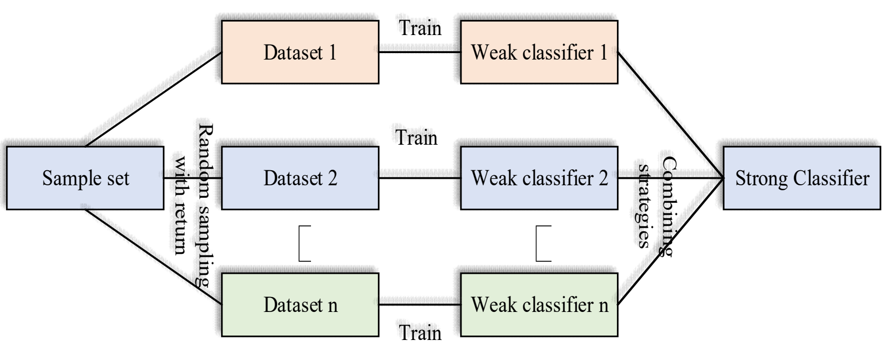

Figure 3: Optimization flow chart of federal average algorithm

Figure 4 shows the model training process based on federation reinforcement learning.

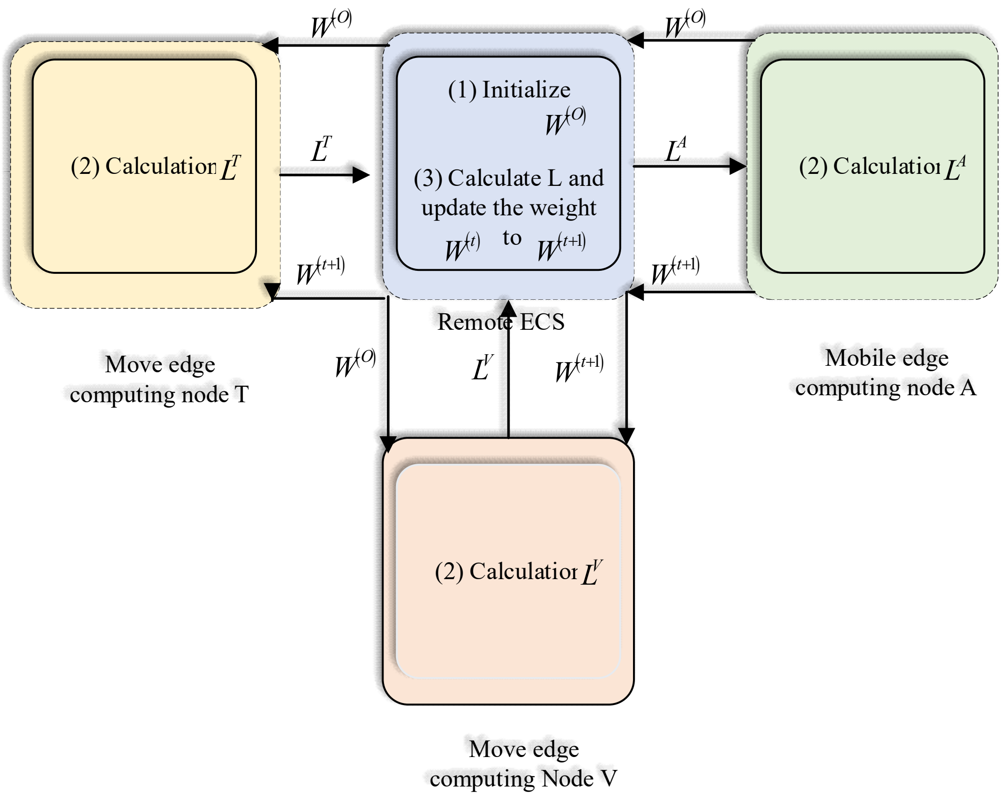

Figure 4: Model optimization based on federated reinforcement learning

However, in this model, it should be noted that the number of neurons in different connection layers is related to the number of data sets, and the problem of weight imbalance should be paid attention to. Therefore, we can perform normalization operation according to Formula (13) - Formula (14).

$$\mathrm{att}_k^l = \mathrm{softmax}\left(\left\| \mathrm{w}' - w_k^l \right\|_p\right) = \frac{e^{\left\| w' - w_k' \right\|_p}}{\sum_{k=1}^{n} e^{\left\| w' - w_k' \right\|_p}} \tag{13}$$

$$w^L = \left(\mathrm{w}_a^L + \ldots + \mathrm{w}_b^L\right) / \mathrm{K} \tag{14}$$

This subsection describes the database management system, the database and the various tables created in the database that need to be used in the process of implementing the system, such as Table 3, Table 4 and Table 5.

Table 3: Table of teachers in college music education scene class

Field Name	Data type	length	Is it empty	Field Description
Id	Int	11	No	Primary key, teacher serial number
Name	Varchar	10	Yes	Teacher Name
Username	Varchar	20	Yes	Teacher user name
Password	Varchar	20	Yes	Teacher password
Qx	Int	11	Yes	Teacher authority
Remark	Varchar	255	Yes	Remarks

Table 4: Student Table of Scene Classroom in College music education

Field Name	Data type	length	Is it empty	Field Description
Id	Int	11	No	Primary key, student serial number
Cid	Int	11	No	Class No
Sno	Varchar	20	No	Student ID
Password	Varchar	20	No	Password
Name	Varchar	10	Yes	Student Name
Sex	Varchar	10	Yes	Student gender
Phone	Varchar	20	Yes	Student contact information
Remark	Varchar	255	Yes	Remarks

Table 5: Curriculum Schedule of Scenarios Classroom for music education in colleges

Field Name	Data type	length	Is it empty	Field Description
Id	Int	11	No	Primary key, course serial number
Teacherid	Int	11	No	Teacher serial number
Classid	Int	11	No	Class No
Name	Varchar	20	No	Course name
AttendNum	Int	11	Yes	Attenmusic
TaskNum	Int	11	Yes	Number of people submitting work
Remark	Varchar	255	Yes	Remarks

IV. Regression analysis test

For the indoor information of music education training and scenario drills, we optimized the VIRE algorithm in this model to update it. Figure 5 and Figure 6 show the comparison of the improved model positioning error.

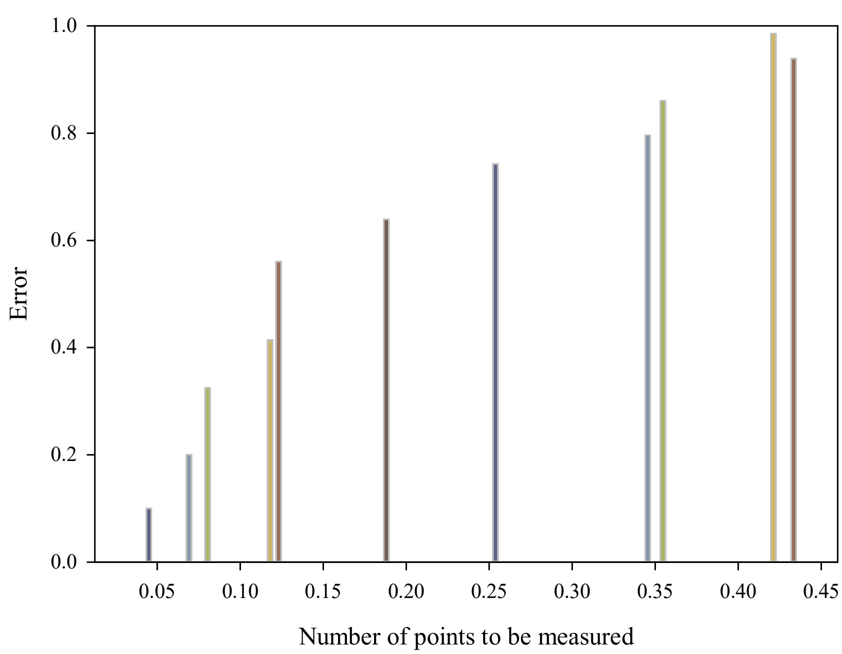

Figure 5: Positioning error of different algorithms

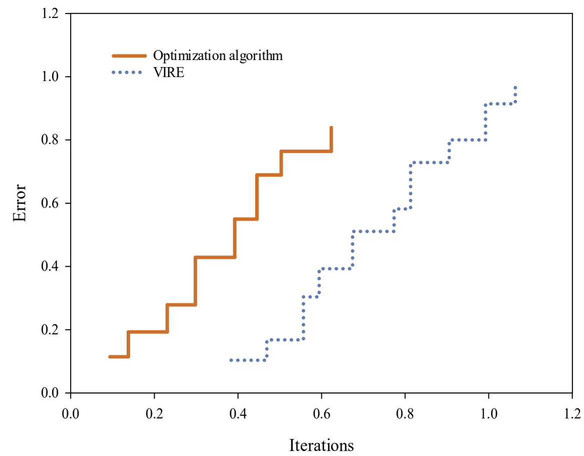

Figure 6: Error CDF Curve after Fitting by Different Algorithms

Interest in learning is an important factor that influences students' participation in music learning. According to the research needs this study conducted learning interest measurement during the whole experiment to understand the change of students' learning interest between the situational classroom teaching and the traditional teaching method. The changes in students' learning interests in the two classes are shown in Table 6.

Table 6: Results of music learning interest test for students in experimental class and controlclass

	Basic test	4 weeks	8 weeks	12 weeks	16 weeks	F	P
Experimental class	2.41 ± 0.25	3.35 ± 0.25	3.76 ± 0.53	3.91 ± 0.47	4.40 ± 0.31	1.665	<0.01
Control class	2.40 ± 0.28	3.50 ± 0.21	3.43 ± 0.27	3.59 ± 0.38	3.75 ± 0.26	1.213	>0.05
F	0.378	1.237	0.351	1.368	1.772		
P	>0.05	>0.05	<0.01	<0.01	<0.01		

As can be clearly seen in Figure 7, with the advancement of the teaching experiment at different stages of the experiment class students' interest in music learning increased significantly more than that of the control class students.

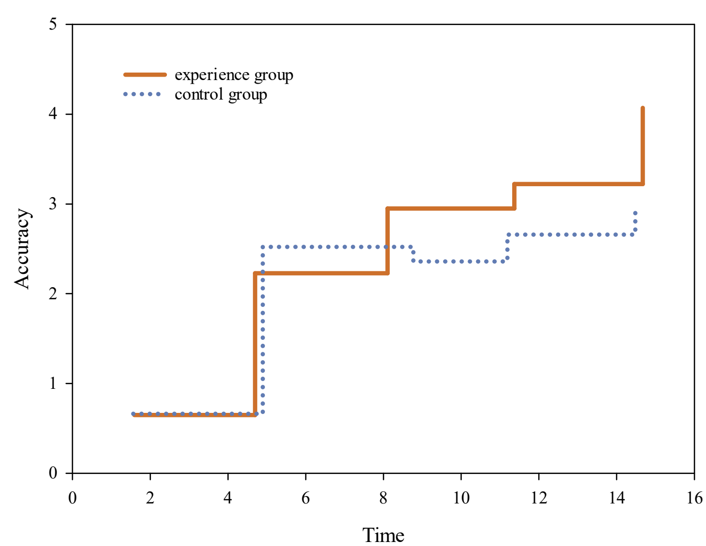

Figure 7: Average score of music learning interest of experimental class and control class

The experimental results clearly show that there is a significant difference between the scores of the two control groups AB, and the scores of the classes simulated by the music scene classroom model are relatively high, which shows two problems. First, the simulation of the scene classroom is quite effective for students' learning quality, and second, the actual fitting degree of the model is relatively high. music movements are complex and varied, with high technical specifications, requiring students to go through systematic learning and training in order to master good techniques. Traditional music is teacher-oriented, after the teacher explains and demonstrates the movements, students are required to imitate and practice and strengthen training, thus forming technical movement stereotypes, neglecting the cultivation of students' interest in learning, resulting in some students' low interest in learning and insufficient enthusiasm, which is the most direct reason for the ineffectiveness of traditional teaching methods. Scenario classroom teaching method to create the scenario is mostly the actual life of students in the life of the scene, this living scenario can make students more simple to understand the main points and difficulties of music technology, and through the self-created situation to master, consolidate the knowledge learned, help improve the level of basic technical movements.

V. Conclusion

The use of "situational classroom teaching method" in college music education can greatly improve the quality of complete sets of movements and significantly improve the quality of teaching. This paper addresses the following two problems of Federated Reinforcement Learning: the average aggregation method of the existing Federated Reinforcement Learning framework is too coarse for uniform averaging of clients and ignores the value of personalized content of clients; the traditional training model of Federated Reinforcement Learning has a low ability to handle category incremental data, and the training cost is high for retraining all the old and new data in the face of new tasks and data. Finally, experiments are conducted to verify the effectiveness of the algorithms in this paper. The experimental results demonstrate that the accuracy of the federated optimization model is improved by 8%.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that they have no conflicts of interest regarding this work.

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