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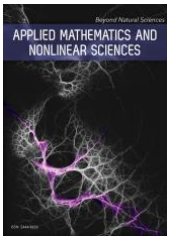

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Optimization of local ethnic music teaching transmission path based on logistic regression model

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Abstract

To be able to better develop local folk music and traditional culture, this paper proposes the optimization of local folk music teaching and transmission paths. Analyze the musical styles taught in colleges and universities, learn that ethnic music with a strong national culture is not asked for, build a more comprehensive and three-dimensional system of musical knowledge, master the cultural connotations of ethnic music, strengthen the understanding of their own group culture, and lay the foundation for survival and development in a multicultural society. According to single or multiple continuous or discrete analysis of folk music teaching transmission paths, the state variables of the path optimization process are set to ensure that the growth rate coefficient of the teaching transmission path is positive and the growth rate of teaching is positive. Combining the amount of teaching demand for local ethnic music, the inflection point of the path curve is substituted into the transmission path to obtain the path state variable values. Using the fruit fly optimization algorithm to strengthen the Logistic model, the individual flight distance and direction of fruit flies are preset, and the distance value between the fruit fly position and the origin is calculated to locate toward the target position with visual advantage, and finally the music teaching transmission path optimization is realized. The analysis results show that the logistic model combined with the FOA algorithm has a significantly higher test rate both for subsamples and full samples, and the value of 0.45 is closer to the true value of 0.46, which has a strong applicability and a good path optimization effect.

Keywords: Local folk music; Music teaching heritage; Logistic regression model; Path optimization; State variables
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1 Introduction

At the present stage, universities have increased the development of music education in order to improve students' music literacy, cultivate their ability to appreciate and feel music, and thus promote the improvement of students' comprehensive literacy [1]. At the same time, in the process of music teaching in colleges and universities, enhancing the teaching and promotion of national traditional music culture [2-3] is also a way to further guide students to appreciate the charm of Chinese traditional music culture, so as to promote the development and improvement of national traditional music culture. Therefore, enhancing music teaching in colleges and universities and deepening music teaching reform [4] can not only effectively improve the teaching level of colleges and universities, but also deliver more highly educated and comprehensive talents to society and provide a strong boost to the construction of socialist civilization. Music teaching in colleges and universities promotes the spread of folk music and also passes down traditional music culture, and this process not only maintains and develops folk music, but also plays an important role in innovating its music culture at the same time [5]. It is both the basis for the spread of folk music culture and the inheritor of folk music.

The traditional culture of folk music originates from historical development and the precipitation of musical cultures of various ethnic groups [6], which is not only the development of musical ideas by previous generations, but also the epitome of historical culture. In contrast, music teaching in colleges and universities is the teaching of traditional folk music to students through efficient teaching methods, not only the education of musical melodies and styles, but also the dissemination of folk music culture. Then, in the process of the dissemination of folk music culture, universities play an important role in preserving orthodox folk music with their more professional teaching ability [7]. At the same time, modern music is also used to continuously enrich the presentation of folk music, and also to combine and intermingle different musical styles [8-9], which then also plays an important role in the development of folk music culture.

By carrying out ethnic music culture in the music teaching work of colleges and universities, we can further improve and optimize the development of ethnic music culture, which is more and more conducive to the progress and development of ethnic traditional music culture. In recent years, most colleges and universities have recognized the importance of promoting and inheriting ethnic traditional culture [10], and have included ethnic music culture in their college music teaching work, which promotes students' understanding of ethnic traditional music culture on the one hand, and enhances the comprehensiveness and systematization of ethnic music culture teaching on the other [11-12]. In other words, through the development of music teaching work in colleges and universities, it not only effectively enhances the diversity of music teaching and cultivates the national emotions of students. At the same time, it also effectively improves and develops the national music culture, and lays a solid foundation for the further dissemination and development of the national music culture.

Music culture is by nature a comprehensive and integrated culture, and is often influenced by several factors in its development, such as Western music, national customs, historical background, etc. The same is true for ethnic traditional music culture, where rich and strong ethnic cultural characteristics are the most crucial core of ethnic traditional music culture [13]. It is not enough to rely on teaching and propaganda alone to develop and promote traditional ethnic music culture in essence, but must be combined with the background of the times, political, economic and cultural influences, and only by enhancing the integration and complementarity between cultures can traditional ethnic music culture be revitalized. Therefore, introducing traditional ethnic music culture into the music teaching work of colleges and universities can, on the one hand, create a platform for the exchange and integration of ethnic music and various other types of music, make traditional ethnic music culture

more contemporary and comprehensive, meet the needs of the times and social development, and thus produce a stronger vitality. On the other hand, through the teaching work of colleges and universities, it can provide a new way of spreading the traditional ethnic music culture, and can let more people contact and understand the profound connotation and artistic charm of the traditional ethnic music culture. Therefore, it is said that the development of education in colleges and universities is extremely important for the dissemination and development of traditional national music culture [14]. In a way, the two are a mutually reinforcing relationship. Music teaching in colleges and universities can provide a broad platform for the improvement, development and innovation of traditional ethnic music culture, and promote the better and faster development of traditional ethnic music culture; at the same time, the teaching and promotion of traditional ethnic music culture can also effectively enrich students' learning content, cultivate students' national emotions and the diversity of music learning, so as to achieve the comprehensive development of students' music literacy. In the process of carrying out music teaching in colleges and universities in the future, college educators must recognize the importance of spreading and promoting traditional national music culture, and improve the level and efficiency of music teaching. The promotion and development of folk music culture is put into practice in the actual teaching work, not just a meaningless slogan [15].

Based on this, numerous scholars have extensively studied various aspects of music. The literature [16] disseminates and continues education through compulsory education, national curriculum, national assessment and hidden curriculum. The cultural dominance of Western art music has become a norm and an institution in educational systems, national curricula, and national assessment that is inherently ideological and policy-making. The idea of multicultural education in a democracy is opposed to the hegemony of domination. The goal of multiculturalism is to change the dominance and achieve policies, attitudes, curriculum, assessment, language of instruction, teaching and learning strategies. The literature [17] examines the impact and contribution of music teachers who have been in the profession for more than 30 years introducing an expert in a new area of expertise and attempting to make an impact on music teachers in Australian secondary schools. A larger quality study collected information, including a national questionnaire and interviews. The analysis of the interview data is not yet completely finished in the large-scale survey. The study uses a Likert-type questionnaire with open-ended questions to explore its impact on music teachers' work practices. The literature [18] explores the issues and challenges facing music teachers in the UK today. And more detailed information about their perceptions of potential opportunities and limitations of music education. This was achieved by analyzing new data from online questions and telephone interviews with music teachers from all regions of the UK. Key themes explored related to funding, equal opportunity and access to music education, hidden personal costs, confidence in decision making, leadership and accountability. The literature [19] aimed to reveal the influence of factors such as gender, age, their current years of study at university and musical experience on their self-efficacy in music skills and music teaching. The study involved 395 preschool and classroom teachers from the Department of Basic Education in the School of Education. Data were collected through the use of a self-efficacy scale developed for music competency and music instruction. The results of the study showed that although the participants did not show gender differences in their self-efficacy in music ability and music teaching, they did show meaningful differences based on their grade level in college. However, the aforementioned literature studies only Western music or popular music, and treats local folk music with little analysis, and cannot look at folk music and its heritage from a general musical perspective.

In this paper, in order to be able to explore an effective path more suitable for its development and further improve the recognition rate of the model, the model is constructed according to the principal component analysis. The logistic model is then enhanced using a fruit fly optimization algorithm.

Logistic regression models were used to analyze the factors influencing the performance of local ethnic music teaching assessment. First, we used stepwise regression analysis to gradually eliminate some insignificant variables and find out the main influencing factors of the local ethnic music teaching assessment performance in this school, and then we fitted and predicted the remaining variables. The experimental results show that the method has strong applicability and can actively inherit and try to innovate local folk music.

2 The transmission of folk music culture in music teaching

In view of the current multiculturalism, music teaching certainly needs to absorb the essence from western countries and continuously deepen the underlying of music culture, but if we want to cultivate more excellent music talents, we still need to base on national music culture education [20]. In the face of globalization, the display of musical culture characteristics and its rising status in the international arena require that music teaching should be infiltrated with ethnic music culture in order to cultivate more professional music talents [21]. The school is the main place for the transmission and development of folk music culture, and the transmission of folk music culture in music teaching is more effective and convenient than other forms. In the teaching, students can build a more comprehensive and three-dimensional system of music knowledge, grasp the connotation of folk music culture, and form a sense of folk culture. Schools are usually rich in teaching resources with outstanding specialization characteristics, both in terms of quality resources and strength, which are key to the transmission of ethnic music culture [22].

The addition of ethnic music content to school music instruction is an important part of achieving individual development and cognition, which is conducive to students' enhanced understanding of their own group culture and contributes to the overall development of their personality. With the increasing speed of market economy development, strengthening the teaching of ethnic music culture is conducive to students' absorption of multiple cultures, constantly improving their cross-cultural adaptation ability, and laying the foundation for their survival and development in a multicultural society. Since the reform and opening up, although music teaching has made certain achievements in ethnic music, the teaching mode, methods, and contents that have been popular for a long time are transplants of western music teaching, with very little ethnic music content, and ethnic music has almost no foothold. The problems of lack of awareness of curriculum resources, lack of deep theoretical research, lack of maturity in curriculum development, and lack of perfect functions of ethnic music teaching are more prominent. In the context of multicultural music teaching and the concept of "Chinese culture as mother tongue music education", the healthy development of music and music teaching in a multicultural context should become something that music educators must look at and think about. At this stage, the shortage of music education teachers and the lack of ethnic folk music cultural literacy among non-music majors have had a negative impact on the transmission of ethnic music culture and the cultivation of students' consciousness of transmitting ethnic folk music culture.

3 Logistic regression model

Logistic regression models are multivariate analysis methods that analyze and predict discrete dependent variables based on single or multiple continuous or discrete independent variables. logistic functions were originally applied to population estimation and prediction, and have been developed for use in a variety of fields of study. When a species moves into a new ecosystem, its population will change. Assuming that the starting population of the species is less than the maximum capacity of the environment, the population will grow [23]. Since the species has natural enemies in this ecosystem

and relatively insufficient resources such as food and space, i.e., it survives in a non-ideal environment, its growth function Logistic image has an S-shape.

The basic form of the logistic model is:

$$X_{t+1} = aX_t\left(1 - X_t\right) \tag{1}$$

Since the 1990s, logistic models have been heavily applied to research in the social sciences.

The development of folk music teaching transmission is subject to the constraints of the music's own abilities and the teaching environment [24], and limit values exist for the growth of various state variables in the transmission path. Thus, the optimization process of a pathway exhibits a law of change that is relatively consistent with that of natural species: at the early and late stages of the optimization of the pathway of local folk music teaching transmission, the pathway develops at a low rate and at a high rate in the intermediate stages, and the overall process takes the form of an S-shaped curve.

Let the state variable of the path optimization process be $X = X(t)$. Assume that the growth rate of the teaching heritage is proportional to its state variable in the optimization process, and the state variable X will gradually approach the growth limit value with time t in the optimization process [25], while the growth rate of the optimized path grows from the initial slow to fast, and with the approach of the growth limit and the growth rate will weaken, and gradually level off and stable.

The optimal path for the teaching and transmission of local ethnic music can be described by a mathematical model.

$$\frac{dX}{dt} = aX\left(N - X\right) \tag{2}$$

In equation (2), a represents the speed elasticity coefficient of the educational transmission path, and its size depends on the conditions of teaching itself, which is related to factors such as the factor input structure of teaching; N is the limit value of growth, and since local ethnic music teaching is closely related to the demand for school education, N can also be regarded as the limit value of the demand for school education. Teaching heritage cannot exceed the capacity space indicated by N. It can be seen that equation (2) represents the growth rate of the transmission path at any point in time, and therefore, this equation can also be called the growth rate model of the local music teaching transmission path.

The optimization model of local music teaching transmission path shows that the growth rate conforms to the characteristics of a logistic curve. Equation (2) is nonlinear, i.e., the optimization process of pedagogical transmission is nonlinear. Where X is the dynamic principal component, which increases with time t. $(N - X)$ is the decelerating principal component, whose value decreases with time t. X and $(N - X)$ denote the feedback mechanisms of the state variables on the optimization of the transmission path, respectively [26]. In equation (2), if $a \leq 0$, or $N \leq 0$, indicates a shrinking demand for instruction, or a negative demand for instruction, which means that the classroom does not exist. Therefore, assuming $a > 0, N > 0$, and if $a > 0$, then $\frac{dX}{dt} > 0$, that is, the growth rate of teaching is positive as long as the growth rate coefficient of the teaching transmission path is positive, i.e., the teaching demand for local folk music will maintain a continuous growth.

Solving equation (2) yields.

$$X = \frac{N}{1 + c\exp(-aNT)} \tag{3}$$

In equation (3), $c = e^{-k}, k$ is the integration constant, which is determined by the initial conditions of the heritage path optimization. Eq. (3) is the state evolution equation of the pedagogical demand of local folk music, which describes the trajectory of the dynamic change of pedagogical demand in the process of transmission path optimization [27], and its shape is also an S-shaped curve, the same as the basic form of the Logistic equation.

Assuming that the initial state of the teaching demand of local ethnic music is $X(0) = b, 0 < b < N$, then:

$$X = \frac{N}{1 + \left(\frac{N}{b} - 1\right)e^{-aNt}} \tag{4}$$

The logistic model of transmission path optimization can be used not only to describe the evolutionary trend of teaching needs [28], but also to determine the stage of development of teaching needs for local folk music, thus revealing the transmission optimization path.

Taking the second order derivative of equation (2) yields:

$$\frac{d^2X}{dt^2} = a^2X\left(N - X\right)\left(N - 2X\right) \tag{5}$$

According to the mathematical meaning of the derivative, equation (5) represents the acceleration of the demand for teaching local ethnic music at a certain point in time, i.e. the amount of change in the growth rate of the demand for teaching local ethnic music. Setting the value of the second-order derivative to zero, it is possible to obtain the inflection point of equation (2), which is the inflection point of the heritage optimization path curve [29].

That is, $\frac{d^2X}{dt^2} = 0, a > 0$. The solution is:

$$\begin{cases} X_1 = 0 \\ X_2 = N \\ X_3 = \dfrac{N}{2} \end{cases} \tag{6}$$

The above equation shows that when the state variable $X = 0$, it indicates that the teaching demand of local ethnic music does not exist, and when $X = N$, then the teaching demand of local ethnic music has reached the limit of teaching demand. Combined with the actual amount of teaching demand of local ethnic music, we set $0 < X < N$, then there is only one unique solution for the derivation of equation (5), namely $X^* = \frac{N}{2}$, and this point is the inflection point of the path optimization curve.

Substituting this solution into the path optimization equation (2) yields: $t^* = \frac{ln\, c}{aN}$. At this point, the growth rate of the demand for local ethnic music instruction is:

$$\left.\frac{dX}{dt}\right|_{t=t^*} = \frac{aN^2}{4} \tag{7}$$

A further three derivations of equation (2).

$$\frac{d^3X}{dt^3} = a^3X\left(N-X\right)\left[N-\left(3+\sqrt{3}X\right)\right]\left[N-\left(3-\sqrt{3}X\right)\right] \tag{8}$$

Solving this derivative equation such that $\frac{d^3X}{dt^3} = 0$, and from the analysis above, $0 < X < N$, it follows that:

$$X_1 = \frac{N}{3+\sqrt{3}}, X_2 = \frac{N}{3-\sqrt{3}} \tag{9}$$

Substituting these two solutions into the inherited path optimization equation (2), we obtain:

$$t_1 = \frac{\ln c - \ln\left(2+\sqrt{3}\right)}{aN}, t_2 = \frac{\ln c - \ln\left(2+\sqrt{3}\right)}{aN} \tag{10}$$

At this time, the growth rate of the demand for teaching local ethnic music is:

$$\left.\frac{dX}{dt}\right|_{t=t1} = \left.\frac{dX}{dt}\right|_{t=t2} = \frac{aN^2}{6} \tag{11}$$

Therefore, the growth rate curve of the teaching demand of local ethnic music has two symmetrical inflection points $\left(t_1, \frac{aN^2}{6}\right)$、$\left(t_2, \frac{aN^2}{6}\right)$. The states of the transmission path optimization equations corresponding to these two points are:

$$X_1 = \frac{N}{3+\sqrt{3}}, X_2 = \frac{N}{3-\sqrt{3}} \tag{12}$$

The state and velocity curves for the optimization of the pedagogical transmission path of local folk music are shown in Figure 1.

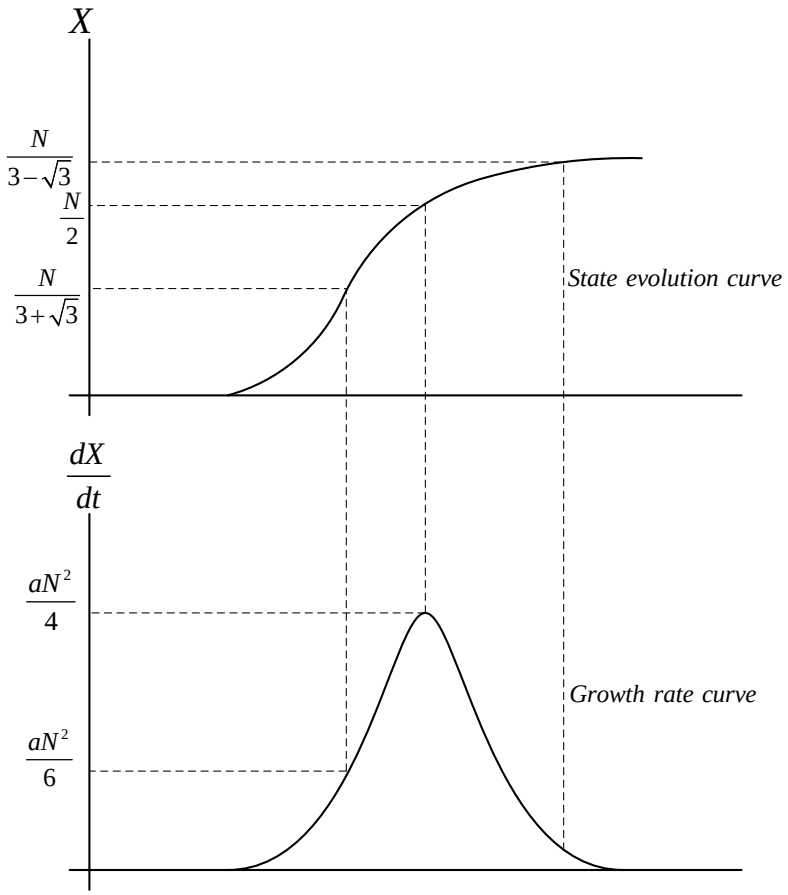


Figure 1. State curve and velocity curve of the optimization of teaching transmission path of local ethnic music

The growth of any teaching demand has a limit of growth, and as time goes by, the development of teaching demand will approach its limit state, and when the development of teaching gradually approaches the limit state, the speed of the development of teaching demand will gradually slow down and slow down, i.e., when $t \to +\infty$, $X \to N$, $\frac{dX}{dt} \to 0$ we can find that the value of the state variable of inheritance path optimization - the amount of teaching demand X shows an S-shaped growth change curve with the change of time t, in which there exists an upper boundary asymptote $X = N\left(t \to +\infty\right)$, which is always smaller than N and infinitely close to infinity.

4 Drosophila optimization algorithm

Logistic model, there is still room for improvement. In order to be able to further improve the recognition rate of the logistic model, the logistic model was constructed according to the principal component analysis method, and then the logistic model was enhanced by using the fruit fly optimization algorithm, which has strong applicability.

The fruit fly optimization algorithm (FOA) is a new method for finding the global optimal solution based on the foraging behavior of fruit flies. The advantages of FOA (easy to understand algorithm, easy to implement program code, fast operation speed, few adjustment parameters, and algorithmic properties that do not depend heavily on parameter values) have made it possible to combine various models and algorithms to be widely used in many fields such as computers and mathematics.

Drosophila is able to find food easily due to its inherent sensitive sensory perception system. The fruit fly first uses its olfactory organs to precisely locate the various sources of odor in the air, then uses its keen vision to find the location of food and its companions and flies in that direction. The following steps are necessary to understand the foraging characteristics of fruit flies, as shown in Figure 2 (Fruit fly foraging path diagram).

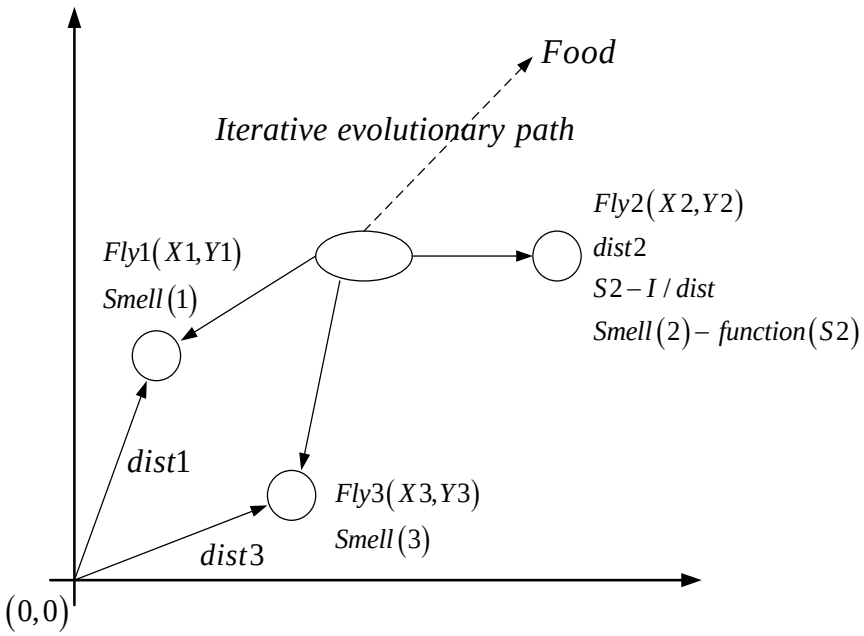


Figure 2. Foraging path of drosophila

1) Randomly generate the initial coordinate position $(\boldsymbol{InitX_{\_axis}, InitY_{\_axis}})$ of the Drosophila population, the population size ($\boldsymbol{sizepop}$) and the maximum number of iterations ($\mathbf{max}\ \boldsymbol{gen}$).

2) The flight distance and direction of individual Drosophila are preset. $(\boldsymbol{X_{\_axis}, Y_{\_axis}})$ is the coordinate position of the previous Drosophila, $\boldsymbol{RandomValue}$ is a random function of the search direction and length of the Drosophila, $(\boldsymbol{X_i, Y_i})$ is the new coordinate position of the individual Drosophila after flying in a certain search direction and length above the previous coordinate position, and $\boldsymbol{i}$ denotes the number of individual Drosophila in the group.

$$\begin{cases} X_i = X_{\_axis} + Random\,Value \\ Y_i = Y_{\_axis} + Random\,Value \end{cases} \tag{13}$$

3) Since it is impossible to know the location of the food, but it can be determined that the further away from the origin, the closer to the food, and vice versa, the distance value between the location of the fruit fly and the origin (Disti) can be calculated first, and the reciprocal of this value is used as the taste concentration determination value ($\boldsymbol{S_i}$).

$$Dist_i = \sqrt{X_i^2 + Y_i^2}, S_i = \frac{1}{Dist_i} \tag{14}$$

4) Set the taste concentration function ($\boldsymbol{Function}$) according to the problem to be solved, and substitute the taste concentration determination value ($\boldsymbol{S_i}$) to find the taste concentration ($\boldsymbol{Smell_i}$).

$$Smell_i = Function(S_i) \tag{15}$$

5) Find the individual with the best flavor concentration ($\boldsymbol{Smell_i}$) in the Drosophila population (as an extreme value), where the best concentration and the coordinates at this point are denoted as $\boldsymbol{bestSmell}$ and $\boldsymbol{bestIndex}$, respectively.

$$[bestSmellbestIndex] = \max(Smell) \tag{16}$$

6) The coordinate value $(\boldsymbol{X_{\_axis}}, \boldsymbol{Y_{\_axis}})$ of the optimal flavor concentration is retained, and the Drosophila population uses its visual advantage to fly toward this location.

$$Smellbest = bestSmell, \begin{cases} X_{\_axis} = X(bestIndex) \\ Y_{\_axis} = Y(bestIndex) \end{cases} \tag{17}$$

7) Enter the iteration and judge whether the flavor concentration is better than the last iteration flavor concentration, if yes, execute step (6), otherwise execute (2)-(5) until the run stops. To sum up, the best local ethnic music teaching transmission path is realized to better develop the excellent ethnic culture.

5 Path optimization results analysis

In this paper, we used a logistic regression model to analyze the factors influencing the performance of local ethnic music teaching assessment in a school. First, we used stepwise regression analysis to gradually eliminate some insignificant variables and find out the main influencing factors of local ethnic music teaching assessment performance in this school, then we used logistic regression model to fit and predict the remaining variables, and analyzed the fitting and prediction results.

In order to avoid the variability of teaching methods in different courses during the evaluation process, 480 students of a university in the class of 2018 were selected as the subjects of this study. The information of the course "Musicology" was collected in 2019-2020. The information collected included students' ratings of the teacher's teaching attitude (x1), teaching content (x2), teaching style (x3), and teaching effectiveness (x4), as well as textual evaluation information on these four aspects, students' regular grades (x5), and final exam results (x6).

The local ethnic music teaching evaluation grades were divided into five grades, which were below 60, 60-69, 70-79, 80-89, and 90-100. In addition, the textual information of students' evaluation of teachers was quantified as 0 and 1 variables, and if the text of students' evaluation contained the corresponding key words in Table 1, it was recorded as 1. Otherwise, it was recorded as 0. The obtained results are shown in Table 1.

Table 1. Students' textuality evaluation keyword score criteria

Independent variable	Key words	Score	
		Include	Not include
Teaching attitude(x_1)	Excellent, Responsible, Like, Patient, Serious, Good, Great, Rigorous,Responsible, Considerate, Down-to-earth, Appreciate, Cheer	1	0
Teaching content(x_2)	Excellent, Clear, Powerful, Substantial, Novel, Knowledgeable, Extensive, Broadened, Extracurricular, Insightful, Comprehensive, Strong, Detailed, Expert	1	0
Teaching methods(x_3)	Excellent, Lively, Interested, Method, Attentive, Interesting, Humorous, Flexible, Encouragement, Motivation, Interaction, Personality, Thought	1	0
Teaching effect(x_4)	Harvest, Ability, Excellence, Mastery, Cultivation	1	0

Table 2. Descriptive statistical information of the variables

Variable	Mean	Standard deviation	Minimum	Maximum value	Kurtosis	Skewness
Teaching Grading Scale(y)	4.74	0.60	1	5	12.01	-3.07
Teaching attitude(x_1)	0.70	0.44	0	1	-1.10	-0.94
Teaching content(x_2)	0.20	0.40	0	1	0.31	1.51
Teaching methods(x_3)	0.22	0.41	0	1	-0.32	1.28
Teaching effect(x_4)	0.04	0.20	0	1	17.05	4.35
Usual grades(x_5)	88.91	8.42	50	100	4.53	-1.77
Final grade(x_6)	76.58	12.22	0	97	3.38	-1.18

As can be seen from Table 2, the mean value of the teaching evaluation scale was 4.74. It can be inferred that, overall, students held a satisfactory attitude toward the overall music teaching evaluation. Its skewness coefficient is -3.07, and this distribution is left skewed and deviates to a large extent, reflecting that individual students hold a more extreme negative evaluation of the subject. In terms of kurtosis and skewness, the distributions of the other three textual evaluations were smoother and more symmetrical, except for the kurtosis and skewness of teaching effectiveness, which were larger. It is speculated that this may be due to individual differences in students, resulting in large differences in different students' receptiveness to different types of music, and therefore large differences in different students' evaluations of classroom teaching effectiveness. In contrast, students can directly feel and experience the teacher's teaching attitude, teaching content and teaching style during the teaching process, and the evaluation is relatively objective, so the difference in evaluation is relatively small. Secondly, the mean, maximum, minimum, kurtosis and skewness of students' regular grades were 88.91, 50, 100, 4.53 and -1.77 respectively, while the mean, maximum, minimum, kurtosis and skewness of final grades were 76.58, 0, 99, 3.38 and -1.18 respectively. The kurtosis and skewness of the final grades are smaller and closer to the positive too distribution, which indicates that the final grades are closer to the natural norm, while the students' usual grades are more influenced by the subjective factors of the teaching process.

We divided local ethnic music teaching assessment scores into five levels and set them as dependent variables with values of y = 1, 2, 3, 4, and 5. Therefore, this paper uses a logistic regression model to model and analyze the actual situation to identify the key factors affecting local ethnic music teaching assessment scores.

In order to test the accuracy of the model, 119 samples are taken as the test set to test the model fitting effect, and the remaining 360 samples are used as the training set for fitting the model. A logistic

regression model was built for the training set and combined with the polr function using the MASS package of the statistical software R language. To optimize the model, the independent variables were screened using the backward stepwise regression method, and the insignificant variables were gradually eliminated, and the regression analysis was done again using the logistic model for the remaining variables, whose regression results and test results are shown in Table 3.

Table 3. Model regression results

Variable	Coefficient	Standard deviation	Prediction accuracy
Teaching attitude(x_1)	1.30	0.28	0.97
Teaching content(x_2)	-0.92	0.30	0.43
Teaching methods(x_3)	0.81	0.36	0.56
Teaching effect(x_4)	-0.90	0.30	0.72

By using the R software predict function, the predictions were obtained and the predicted and true values were compared and analyzed, and the results are shown in Table 4.

Table 4. Analysis of the fitting effect of the predicted values

Predicted value (rank)	True value (level)				
	1	2	3	4	5
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	1
5	0	1	5	15	97

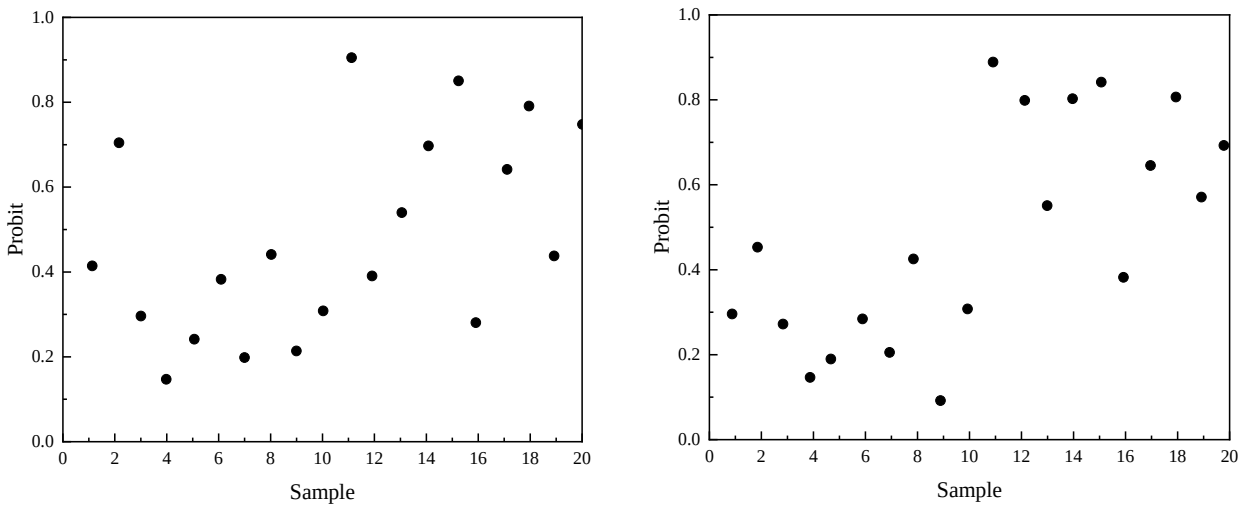
As can be seen from Table 4, there is no corresponding predicted value for the true value of 1, while the predicted values for the true values of 2, 3, and 4 are all 5, and the numbers are 1, 5, and 15, respectively. there is only 1 test value for the true value of 5 corresponding to the test value of 4, and 97 corresponding to the test value of 5. Therefore, the overall accuracy of the model is 97/119=0.8151. Because the predicted value of the true value of 4 is 5, and the predicted value of the true value of 5 is 4, which is close to correct, the correct rate is approximately equal to (1+15+97)/119=0.95. Its prediction is better, thus indicating that the chosen regression model is more reasonable. Thus, we can conclude that the main factors that can reflect the performance of local ethnic music teaching assessment in this school are the teaching attitude and teaching style of teachers in the teaching process.

We parameterized teaching attitudes among the main factors at the same time, and to prove the validity of the model, 20 test samples were selected from the above data using Logistic and FOA-Logistic, respectively. The specific data are shown in Table 5.

Table 5. Predicted values of parameters of teaching attitudes

	Actual value	Logistic	FOA—Logistic		Actual value	Logistic	FOA—Logistic
1	0.32	0.42	0.30	11	0.90	0.90	0.90
2	0.46	0.70	0.45	12	0.42	0.38	0.80
3	0.28	0.30	0.28	13	0.56	0.55	0.56
4	0.13	0.14	0.15	14	0.76	0.72	0.80
5	0.22	0.25	0.2	15	0.83	0.86	0.84
6	0.31	0.40	0.29	16	0.37	0.30	0.39
7	0.20	0.20	0.21	17	0.66	0.67	0.65
8	0.44	0.45	0.44	18	0.80	0.82	0.80
9	0.12	0.22	0.09	19	0.53	0.46	0.58
10	0.30	0.30	0.30	20	0.72	0.75	0.70

Figure 3(a)(b) shows the test results of Logistic model and FOA-Logistic model, respectively. The x-axis in both figures indicates the number of samples and the y-axis represents the predicted value of the samples.



(a) Logistic model test results **(b)** Results of the FOA-Logistic model test

Figure 3. Logistic model and FOA-Logistic model test results

Figure 3(a)(b) shows that after the prediction of the logistic model and the test result of the FOA-Logistic model, the biggest difference in the prediction result is in the second group of test data. It can be seen that the test rate of the FOA-optimized logistic model is significantly higher for both subsamples and full samples, indicating that the logistic model combined with the FOA algorithm is highly applicable.

6 Conclusion

The inheritance of ethnic music culture should be combined with ethnic music teaching, seeking the era, form, subject matter, musical language and music teaching should focus on improving the ethnic music culture of teachers and students, and the inheritance of ethnic music culture in the form of music teaching can further carry forward the traditional excellent culture. This paper used a logistic

regression model to uncover the factors that had a significant effect on the performance of local ethnic music teaching assessment, and found that teaching attitude and teaching style had a significant effect on the model. Teachers have a direct influence on the teaching outcomes, and only by improving their ethnic music literacy and their ability to appreciate and comprehend ethnic music culture can they guide their students in the teaching process, Explain the feelings behind folk music works, develop students' ability to appreciate folk music works, cultivate correct national aesthetic concepts, and gain new knowledge of emotions, ideas, and personalities in order to experience the beauty of folk music culture at a deep level. And by investigating the performance of local ethnic music teaching assessment in a school, after logistic model prediction and FOA-Logistic model test results. Taking the second set of test data as an example, the logistic model predicted at 0.70 and the FOA-Logistic model tested at 0.45, it can be seen that the logistic model optimized by FOA has significantly improved the test prediction rate for both samples.

References

[1] Van der Linden, B. (2015). Non-Western national music and empire in global history: interactions, uniformities, and comparisons. Journal of Global History, 10(3), 431-456.
[2] Spector, B. (2015). "I Hear America Singing": Folk Music and National Identity. Journal of American History.
[3] Short, H., Thomas, D. (2016). "Big Up West London Crew": one man's journey within a UK National Health Service rap/music therapy group. Nordic Journal of Music Therapy, 25(sup1), 67-68.
[4] Bate, E. (2020). Justifying music in the national curriculum: The habit concept and the question of social justice and academic rigour. Breast Cancer Online, 37(1), 3-15.
[5] Pulido Londoño, H. A. (2018). Radiouvintes e "música nacional" em meados do século XX: o programa de rádio Antología Musical de Colombia. Historia Crítica, (67), 67-88.
[6] Vandenberg, F., Berghman, M., Eijck, K. V. (2020). 'Wear Clogs and just Act Normal': Defining Collectivity in Dutch Domestic Music Concerts. Cultural Sociology, 15(2).
[7] Ng, H. H. (2018). Enabling Popular Music Teaching in the Secondary Classroom – Singapore Teachers' Perspectives. British Journal of Music Education, 35(3), 1-19.
[8] Biasutti, M., Hennessy, S., de Vugt-Jansen, E. (2015). Confidence development in non-music specialist trainee primary teachers after an intensive programme. British Journal of Music Education, 32(2), 143-161.
[9] Jorritsma, M. (2022). Towards an eco-literate tertiary music education: Notes from a South African context. International Journal of Music Education, 40(1), 14-25.
[10] Hanke, M. (2022). Living the spiral curriculum: using the Swanwick/Tillman sequence of musical development to support music in primary schools in the 1980s. British Journal of Music Education, 39(1), 115-119.
[11] Beach, E. F., Gilliver, M. (2019). Time to listen: most regular patrons of music venues prefer lower volumes. Frontiers in Psychology, 10, 607.
[12] White, J. (2016). Controlling the Flow: How Urban Music Videos Allow Creative Scope and Permit Social Restriction. Young, 25(4).
[13] Cronenberg, S. (2018). Teaching general music to young adolescents: Findings from a survey of music teacher perspectives. International Journal of Music Education, 37(4), 025576141879472.
[14] Wesolowski, B. C. (2015). A facet-factorial approach towards the development and validation of a jazz rhythm section performance rating scale. International Journal of Music Education, 0255761415590524.
[15] Bolduc, J., Guay, K., Jalbert, S., et al. (2021). Book review: Cslovjecsek, M. & Zulauf, M. (Eds.).Integrated music education. Challenges for teaching and teacher training. Psychology of Music, 49(5), 1424-1426.
[16] Villiers, A. (2021). (Re)organizing the music curriculum as multicultural music education. International Journal of Music Education, 39(4), 383-393.
[17] Robinson, J. (2020). Australian super veteran secondary school music teachers: Motivated and valuable. International Journal of Music Education, 38(2), 025576142090287.

[18] Savage, J. (2021). Teaching music in England today. International Journal of Music Education, 39(4), 464-476.
[19] Burak, S. (2019). Self-efficacy of pre-school and primary school pre-service teachers in musical ability and music teaching. International Journal of Music Education, 37(3), 025576141983308.
[20] Winkler, C. (2018). The Organization of Medical Education in Psychiatry and Neurology at the Dutch Universities, with Special Reference to the Neuro-Psychiatric Clinic at Utrecht University: An address delivered to the Medico-Psychological Association of Great Britain and Ire. british journal of psychiatry, 70(289), 179-198.
[21] Gibson, S. J. (2021). Shifting from offline to online collaborative music-making, teaching and learning: perceptions of Ethno artistic mentors. Music Education Research, 23(2), 1-16.
[22] Simones, L. L. (2019). A framework for studying teachers' hand gestures in instrumental and vocal music contexts. Musicae Scientiae, 23(2), 231-249.
[23] Corcoran, S. (2021). Teaching creative music in El Sistema and after-school music contexts. International Journal of Music Education, 1, 025576142199082.
[24] Hornillos, R. C., Roa, J. (2015). The music, a tool in teaching Spanish as a foreign language through the application of new technologies. Porta Linguarum, 23, 139-151.
[25] Taylor, D. M., Raadt, J. S. (2021). Stereotypically gay- and straight-sounding auditory cues change adolescent music students' perceptions of men's teaching effectiveness. Psychology of Music, 2, 030573562110033.
[26] White, R. (2020). Authentic learning in senior secondary music pedagogy: an examination of teaching practice in high-achieving school music programmes. British Journal of Music Education, 38(2), 1-13.
[27] Regier, B. J. (2021). Preservice music teachers' self-efficacy and concerns before and during student teaching. International Journal of Music Education, 39(3), 340-352.
[28] Ying, J. (2016). Methodical Support Of Future Music Teachers' Aesthetic Development In The Process Of Teaching Piano. Science & Education, 30(1), 51-56.
[29] Lebaka, M. (2019). Modes of Teaching and Learning of Indigenous Music Using Methods and Techniques Predicated on Traditional Music Education Practice: The Case of Bapedi Music Tradition. European Journal of Education, 2.