Research on the Pathways for Innovative Cultural Development of University Music Courses Based on Music Education Concepts

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Abstract

In order to improve the music education in colleges and universities for cultivating students' comprehensive quality and enriching students' cultural literacy. In this paper, firstly, we optimize the music teaching mode, based on the theory of multiple intelligences and centered on the characteristics of students' intelligence structure, we innovate the teaching mode of music courses in colleges and universities, and emphasize the authenticity and context of the teaching environment. Secondly, the ant colony algorithm is used to find the optimal solution of music course classroom-time. In the solution process, hard constraints and soft constraints are considered to set up a class schedule that teachers and students are satisfied at the same time. Next, the optimal results of music course scheduling without and with conflicts are calculated. The traditional teaching model was set as a control class, and the final validation found that the experimental class scored the highest 90.2 ± 9.4 for music knowledge mastery and was statistically significant. In terms of music composition and music understanding, the experimental class fully agreed with 43% and 48%, higher than 41.0% and 40% of the control class, and the innovative music teaching content was above the students' psychological acceptability, with an average cultural satisfaction score of 4.2487 and an average cultural recommendation score of 4.5347. Therefore, colleges and universities should base their curriculum on the concept of music education, constantly explore and innovate, improve the rationality of curriculum arrangement, and promote the dissemination and development of music culture.

Keywords: *Multiple Intelligence Theory, College Music Curriculum, Ant Colony Algorithm, Music Creation, Cultural Satisfaction.*

INTRODUCTION

Nowadays, some colleges and universities in the development of music education professional curriculum teaching, the teaching is usually vocal theory knowledge and performance skills, the re-composition of vocal works and other aspects of the content [1]. Although this kind of teaching can achieve certain results and help improve the musical literacy of college students, there are also many problems, which make teachers easy to ignore other important teaching content in the music curriculum system [2]. For example, the basic theory of vocal performance Chinese and foreign art song appreciation and so on, these contents have an important role in improving the level of music practice of college students [3]. However, many colleges and universities in the actual teaching of vocal courses, is strictly in accordance with the requirements of the syllabus, based on the content of the textbook, and did not build a perfect professional curriculum system of music education [4-5]. At the same time, with the continuous change of the modern educational environment, some colleges and universities existing teaching methods and syllabi have been unable to meet the needs of the modern society of talent training, thus resulting in the difficulty of the course teaching to achieve the desired results, and gradually lost the practicality of teaching and effectiveness, and can not ensure that the cultivation of musical talent and modern social needs match.

This paper firstly elaborates the connotation of the multiple intelligences theory and the new thinking of education, analyzes the disciplinary characteristics and teaching content of music in colleges and universities, finds the entry point of the multiple intelligences theory to guide the innovation of music curriculum in colleges and universities, and puts forward the principles and strategies of the teaching design of the music curriculum based on the multiple intelligences theory. Then from the perspective of multiple intelligences theory, the music teaching modules stipulated in the curriculum standard are outlined, and based on the Kemp model, a teaching model centered on the characteristics of students' intelligence structure is constructed. Then based on this

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model,in order to improve the scheduling efficiency of colleges and universities, this paper proposes to apply the ant colony algorithm to the scheduling time arrangement. Finally, considering the scheduling characteristics of music courses in colleges and universities, the course class, teacher, classroom, and class time are set as the basic elements to avoid the schedule cannot be in conflict between the five factors. Setting hard constraints and soft constraints, the optimal result of course optimization is finally sought to complete the innovation of college music courses and enhance the participation and recognition of music culture.

Related Words

In order to solve the problem of matching musical talents with the needs of the society, Salvador, K et al. used a constructivist approach to interview music education grounded theory. Through several analyses, a learning process consisting of character development, materials, emotional intensity, and curricular structure was constructed to provide guidance for music teachers' educational philosophy [6]. Bennett, C et al. in an effort to promote diversity in music teaching practice defined disruptive normative learning as an issue in teacher development based on a thematic synthesis approach to discover internal and external factors that influence differences in teaching and learning processes in order to stimulate innovative thinking about music learning [7]. In response to the problem of inequity between education and society, Richerme, L. K hypothesized that in music education, music production develops students' skills and that students from families with high incomes are more advantaged. In the study, it was shown that music education and social equity is a value relationship [8]. Walzer, D in an effort to innovate a model of music teaching that is overly reliant on bureaucratic technology, proposed a creative practice approach based on acoustic thinking to provide educators with new ideas [9]. Cai, H et al. defined four dimensions of music teaching in the context of deep learning, analyzed students' motivation through questionnaires, and proposed innovative teaching methods for music majors by focusing on students' mental health [10]. Xiao, H pointed out in their study that music education is one of the ways to cultivate students' literacy, and a curriculum innovation model based on digital multimedia VR technology was proposed to better cultivate music talents in colleges and universities. The findings showed that the application of VR technology in the music classroom played a positive role in efficient music courses [11]. Qu, X et al. investigated the current status of higher education and vocational education to integrate innovation and entrepreneurship with music education in order to develop professionals in line with international education [12]. Tai, Y analyzed the degree of innovation in music scenes in settings of moderate economic legitimacy and higher cultural legitimacy by collecting information on 5,000 music sessions in order to understand the link between the degree of legitimacy and musical innovation in different cultural contexts [13]. Carbone, L et al. created a data set of users and lyrics to discuss the relationship between popular music and culture in contexts with varying degrees of culture [14].

The above research focuses on analyzing the current music education theory and curriculum innovation mode, and at this stage, there are fewer studies on the innovative cultural construction path of college music courses. In this paper, we refer to the relevant studies and put forward the innovative cultural construction path of college music courses to help continuously improve the teaching effect of college music courses.

Application of Multiple Intelligences Education Theory to Curriculum Innovation in Colleges and Universities

Implications of Multiple Intelligences Theory for Teaching and Learning

According to the theory of multiple intelligences, while developing students' intelligences in all areas, schools must be mindful of the fact that each student will only excel in one or two areas of intelligence in particular, and that students should not be penalized for this when they fail to catch up with progress in other areas [15-16]. One of these intelligences is musical intelligence, which refers to a person's ability to acutely perceive pitch, melody, rhythm, timbre, and so on. Each student differs in all intelligences, and a student who may not be good or proficient in a particular area may think that his or her deficiencies in this area are innate and cannot be solved, and often feel frustrated and chagrined. Every student has the ability to develop all eight of his or her intelligences to an appropriate level if given the proper encouragement, nurturing and guidance. If we can reposition our educational goals in our regular teaching, change our students' outlook, change our teachers' outlook, treat every student well, teach at the right time, teach according to the material, develop in an all-round

way, improve our quality, and practice courageously, we will be able to improve the cultural literacy of our students.

Innovative Construction of Music Curriculum in Colleges and Universities

Basic Teaching Model

Instructional design is the basis for teaching and learning, and the purpose of instructional design is to promote effective teaching and learning so that students can utilize their potential to explore new knowledge and get optimal development. To construct an instructional design model based on the concept of multiple intelligences education, it is first necessary to clarify the form in which the theory of multiple intelligences is applied to teaching. Only taking intelligence as the goal of teaching is an insufficient understanding of the multiple intelligences theory, and intelligence should be more of a method or tool for students' cognition. This paper argues that the form of integration of multiple intelligences theory and curriculum should be to help students to recognize multiple intelligences, to understand the characteristics of their own intelligence structure is the basis on which to guide students to develop multiple intelligences, and finally, teachers should be adept at the use of multiple intelligences in teaching to promote the teaching of music.

Music curriculum innovation advocated by the teaching to respect the intelligent characteristics of students, the student-centered education concept is compatible with constructivism, which believes that learning is the process of constructing understanding and generating meaning on the basis of the learner's original knowledge and experience in some kind of socio-cultural interactions, emphasizing the initiative of the learner. Therefore, this paper tries to construct an instructional design model under the guidance of the concept of Multiple Intelligences music education, drawing on the Kemp model.

Figure 1 shows the Kemp model, a teaching system should include four basic elements: teaching objectives, learner characteristics, teaching resources and teaching evaluation. No instructional design process can be separated from these four basic elements, and these four basic elements and their relationships constitute the overall framework of the instructional design model and lead to it.
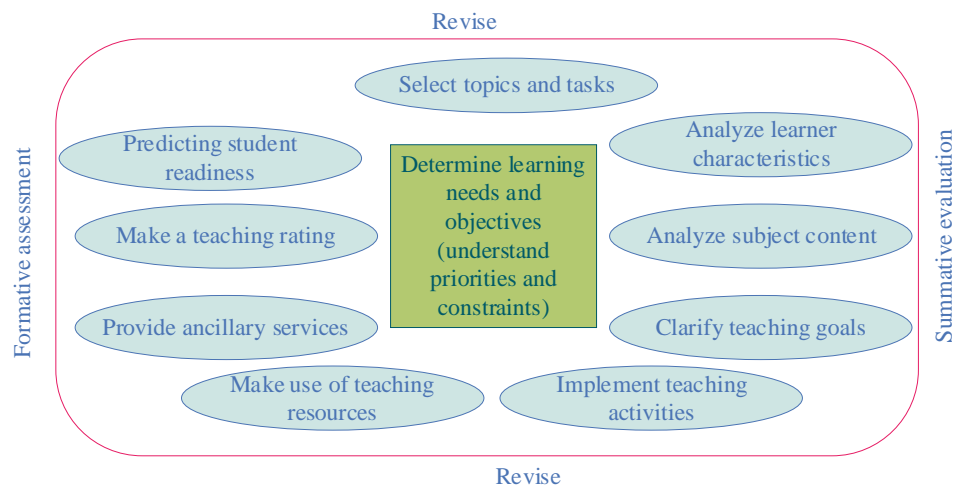

Figure 1 Kempe model

The main features of Kemp's model are as follows:

Kemp does not point out the specific steps of instructional design, but lists 10 elements of instructional design, which indicates that the model is non-linear and the design process is flexible.The 10 elements are not connected by using lines and arrows, which indicates that, in some cases, the design can be continued from any one of the elements as a starting point according to the actual situation, or it is possible to design without considering or designing all of the elements.

The 10 design elements are evaluated and modified throughout the system indicating that these two tasks are carried out throughout the instructional design and are the basic spirit that needs to be implemented in every part of the model.

Learning Needs and Learning Purpose are located at the center of the model, emphasizing that the instructional design process should always be centered on these two elements.

Innovations in Teaching Models

In this paper, according to the Kemp model, based on the concept of multiple intelligences education on music education in fact, from the perspective of multiple intelligences theory on the innovation of music curriculum in colleges and universities [17]. Try to build a teaching design model centered on the characteristics of students' intelligence structure, intelligent teaching goals, personalized learning content, enriched teaching process, diversified teaching strategies, contextualized teaching evaluation and open teaching environment, and the innovation model of music curriculum is shown in Figure 2.

The main features of the music curriculum instructional design to be shown in this model are:

The learner is at the center of the model, and the instructional design of multiple intelligences is student-centered, especially focusing on students' multiple intelligences structural characteristics, and the design of other elements should be centered on the students' characteristics so that each student can get better development.

The model lists five design elements: learner intelligence structure characteristics, teaching objectives, teaching content, teaching process, and teaching strategies. All five elements are represented by eight-pointed stars, representing that all these elements can be analyzed from different directions of multiple intelligences. For example, the selection of teaching content to meet the needs of students' personalized development, can be designed in a variety of ways to present, there is no effective teaching process and teaching strategies for all students, can be designed according to the different forms of expression of different intelligences.

The five design elements are represented by an eight-pointed star and are organized around each other like gears. The combination of instructional design elements does not have to be confined to one form, and the elements in the instructional design should be rotated like gears so that students' learning can realize the migration between different intelligences.

The model draws on the model structure of Kemp's model, evaluation and modification throughout this instructional design, and emphasizes that the evaluation of teaching based on the theory of multiple intelligences should focus on the combination of formative and summative evaluation, and focus on the contextual nature of the evaluation, focusing on the student's ability to solve practical problems.

The outermost rectangle of the model indicates the teaching environment, and the dotted line indicates that the teaching environment is open. The teaching environment includes rich software resources and hardware resources, and the music classroom in colleges and universities should emphasize the authenticity and contextual nature of the teaching environment.

Adjustment elements in the environment means that certain elements should be adjusted at any time according to the actual situation while teaching is in progress, utilizing the viewpoint of generating lesson plans in the teaching process in the relational theory, reflecting the teaching viewpoint of flexibility and vitality.
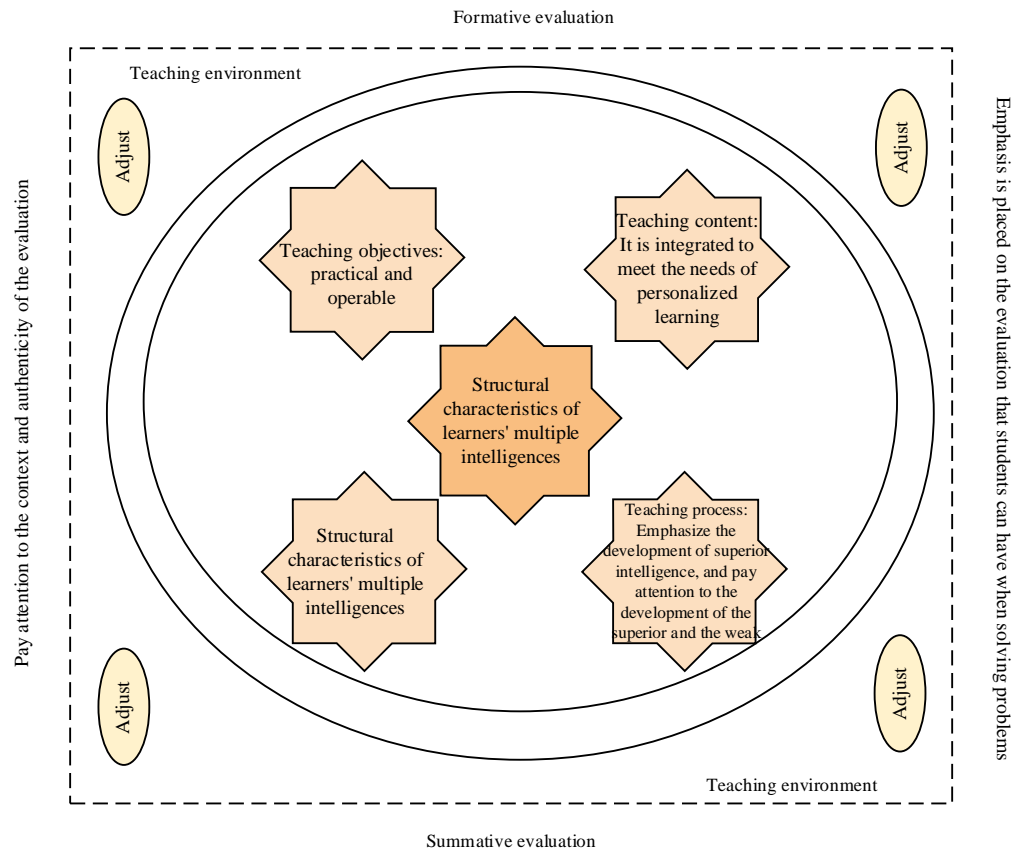
Figure 2 Music curriculum innovation model

Music Curriculum Culture Construction Based on Ant Colony Algorithm

The music learning ability of college students is different, classroom music education is the main channel to implement quality education, scientific and reasonable setting of music courses is the premise of music education innovation. In addition to building the theoretical model of multiple intelligences education, reasonable curriculum setting, class schedule optimization, has an important role in cultural construction [18-19]. In order to create and optimize the effect of music curriculum innovation in colleges and universities, colleges and universities should build a suitable music curriculum arrangement for students, adopt a targeted form of education, effectively improve the students' music and cultural literacy, so as to lay the basic conditions for the cultivation of high-quality specialists.

Application of Ant Colony Algorithm in Class Scheduling

Classroom-Time Optimal Solution

Due to teacher resource constraints, many college and university music programs use two or more classes in a combined classroom, requiring the use of a combined classroom or step classroom, which has a high demand and creates a number of related problems. In addition, teachers in many colleges and universities have 18 to 20 classes per week. The scheduling problem mainly involves factors such as courses, classes, teachers, classrooms, and class times, and the essence of scheduling is that there can be no conflict between the above five factors in the course schedule. To describe the problem aspect, the class problem C is denoted as:

$$C = \{C_1, C_2, C_3, \cdots, C_n\} \tag{1}$$

The course collection is denoted using S and the collection is:

$$S = \{S_1, S_2, S_3, \cdots, S_m\} \tag{2}$$

Teacher problems can be described as:

$$T = \{T_1, T_2, T_3, \cdots, T_x\} \tag{3}$$

The classroom collection is represented as:

$$R = \{R_1, R_2, R_3, \cdots, T_t\} \tag{4}$$

The time period is described as P and the formula is as follows:

$$P = \{P_1, P_2, P_3, \cdots, P_i\} \tag{5}$$

Combining Eq. (1)-Eq. (5), the optimal set of time periods and classrooms is:

$$N = P * R = \{(r_1, p_1), (r_2, p_2), \cdots, (r_n, p_n)\} \tag{6}$$

where the classroom-time pairs are elements in set N. The music course scheduling problem seeks an optimal solution for each class, i.e., a suitable classroom-time pair.

Constraints

Under the background of multiple intelligence education theory, hard constraints are the limitations that must be complied with in the process of scheduling music courses in colleges and universities. If the hard constraints cannot be satisfied, the optimal solution cannot be obtained, which in turn leads to the inability to implement the music culture building program. According to the scheduling characteristics of colleges and universities, assuming that a teacher cannot teach in two classrooms at the same time as R_1, a class cannot teach in two classrooms at the same time, and a classroom cannot be arranged for two courses at the same time R_3, there are:

$$R_1 : \sum_{p=1}^{P} \sum_{n=1}^{N} \sum_{m=1}^{M} x l_p c_m r_n s_k t_d \leq 1$$

$$R_2 : \sum_{p=1}^{P} \sum_{n=1}^{N} \sum_{m=1}^{M} x l_p c_m r_n s_k t_d \leq 1 \tag{7}$$

$$R_3 : \sum_{p=1}^{P} \sum_{n=1}^{N} \sum_{m=1}^{M} x l_p c_m r_n s_k t_d \leq 1$$

Where: $\left. \begin{array}{c} k \\ m \\ n \end{array} \right\} = 1, 2, \cdots, K; d = 1, 2, \cdots, D; x l_p c_m r_n s_k t_d = \begin{cases} 1 \\ 0 \end{cases}$, 1 is a condition that is satisfied, and 0 indicates that the condition is not satisfied.

Soft constraints are those constraints that do not affect the implementation of the music teaching program whether they are met or not, but affect the experience of teachers and students. In order to increase teacher and student satisfaction with music teaching, the laws of human biology should be fully considered while scheduling lessons. In the process of scheduling, the more the soft constraints are satisfied, the smoother the implementation of the teaching program and the more the schedule will satisfy the teachers and students. The soft constraints are as follows:

Try to arrange the more difficult courses or courses with higher requirements for music culture in sections such

as the 1st and 2nd classes in the morning, where students' thinking is relatively more active.

Try to schedule music training and music knowledge in the 3rd and 4th periods in the morning and the 5th and 6th periods in the afternoon, with due consideration to the fact that it is not appropriate to enter an overly specialized course immediately after music practice due to physical exhaustion.

Course Optimization Solution

Under the no-conflict premise, the evaluation function of the optimality of a single candidate schedule node corresponding to schedule TT_s is defined as:

$$opt\left(c_i / TT_s\right) = \gamma_1 a + \gamma_2 b + \gamma_3 c + \cdots \tag{8}$$

In the formula, a, b, c quantity value is taken as 1 or 0, which corresponds to the main consideration factor of candidate schedule under the premise of satisfying the boundary conditions. For example, some special requirements on the scheduling time, the uniformity of the distribution of important courses, etc., $\left(c_i / TT_s\right)$ the corresponding quantitative value of 1 when the factor is satisfied, otherwise 0. γ is a coefficient used to adjust the relative importance of the difference between the factors.

Next, all available candidate schedules $\{TT_v\}$ are examined for class c_{j+1} that are relatively conflict-free with $\left(c_i / TT_s\right)$. Scheduling in the form of candidate schedules ensures that for each class it is impossible for the same class to take two courses at the same time. Conflict in this context means no conflict for the instructor, i.e., the same instructor cannot schedule two classes in the same time slice, and combined classes need to be pre-specified.

Select TT_v by pseudo-randomized proportionality rule and ant transfer rule is:

$$TT_v = \arg \max_{u \in allowed, k} \left\{\tau^\alpha\left(TT_s, TT_u\right) \times \eta^\beta\left(TT_s, TT_u\right)\right\} \tag{9}$$

If $x \le x_0$, the choice is made according to a priori knowledge, and if the result is 0 then the choice is made according to probability.

The probabilistic search equation is as follows:

$$P_{TT_s, TT_u^k}(t) = \begin{cases} \dfrac{\tau_{TT_s \ TT_u^k}^\alpha(t) \times \eta_{TT_s, TT_u^k}^\beta(t)}{\displaystyle\sum_{y \in allowed, k} {}_{TT_s, TT_u^k}(t) \eta_{TT_s, TT_u^k}^\beta(t)} \\ u \in allowed, k \end{cases} \tag{10}$$

If the result in Eq. (10) is 0, the new lesson time is recalculated. In the formula, TT_s, TT_u is the shorthand of the first and last two nodes $c_j\left(TT_s\right), c_{j+1}\left(TT_u\right)$ on the current path of ant k respectively, pheromone concentration $\tau(t)$ is taken as the average of the optimization degree of the nodes at both ends of the path corresponding to the candidate class schedule TT_s, TT_u respectively, and visibility $\eta(t)$ is taken as the inverse of the optimization degree of TT_u to get the result of the optimal music course scheduling to achieve the construction of the course innovation culture.

Validation Of Innovative Cultural Paths in Music Curriculum

Information and Methods

The research object of this paper is to select the newly enrolled students of a certain university, the control group and the experimental group are 20 randomly selected classes, and the number of students in each group is 1000. In the experimental group, there are 450 male students and 550 female students. In the control group, there were 500 male students and 500 female students, and the duration of the study was two semesters.

In the control group, conventional teaching methods were used in the college music class, in which the music teacher explained the music knowledge to the students in the form of a traditional board book, and at the same time played or played the relevant music scores for the students to learn. In the experimental group, the music teacher used the Multiple Intelligences Education Model (MIEM) and the Ant Colony Algorithm (ACO) to organize the music lessons. The music teachers combined music teaching concepts to create an experiential music teaching environment for students to learn more about music culture on the basis of hands-on experience of music knowledge.

Evaluation of the Effectiveness of Curriculum Innovation

Degree of Musical Knowledge

In this paper, the degree of musical knowledge mastery was assessed in three aspects: Chinese and foreign musical works, the degree of mastery of basic knowledge, and the understanding of vocal skills, and was evaluated by means of a test paper examination and a field test. The data in this paper were statistically and analytically analyzed by SPSS17.0 using t-test, and if the results are compared with $P<0.05$, the difference is significant and statistically significant. Table 1 shows the results of the comparison of the knowledge mastery of the two groups of students, the experimental group classes in the three aspects of knowledge mastery are significantly better than the control group of students, the difference is significant when comparing, the mastery of basic knowledge in the experimental group scored the highest 90.2 ± 9.4, and $P < 0.05$, statistically significant. Music teachers highly integrated music knowledge with the concept of multiple intelligences education during lesson preparation to create a rich and interesting experience space for students.

Table 1 Results of Knowledge Mastery of Two Groups of Students

Group	Number of classes	Student number	Chinese and foreign musical works	Basic knowledge	Vocal technique
Control group	20	1000	69.5±7.1	67.4±6.5	68.1±6.6
Test group	20	1000	86.2±9.1	90.2±9.4	97.2±9.4
P	/	/	<0.05	<0.05	<0.05

## Development of Multiple Intelligences

Adopting the theory of multiple intelligences in music teaching in colleges and universities is a more efficient form of organization of teaching, which can establish students' sense of subject participation, promote the coordinated development of students' individuality and commonality, improve students' cultural competence, and contribute to the mastery of music skills in various aspects. Figure 3 shows the results of students' musical intelligence development, which statistically shows the students' improved attitudes in music composition, understanding and performance. Figure 3(a) shows the results of competence enhancement in the control group, where 6% and 5% of the students in the control class disagreed with the enhancement in understanding and playing. Figure 3(b) shows the results of the experimental group's ability improvement. Students in the experimental class thought that they were improved in music composition and music understanding, and the percentages of the experimental class choosing to agree completely in the two components were 43% and 48% respectively, which were significantly higher than those of the control class, 41.0% and 40%, and the percentages of the experimental class choosing to agree were 47.0% and 50% respectively, which were also higher than those of the control class, 40% and 39%. This shows that the teaching mode is effective in improving students' language expression and verifies the feasibility of the concept of multiple intelligences education.
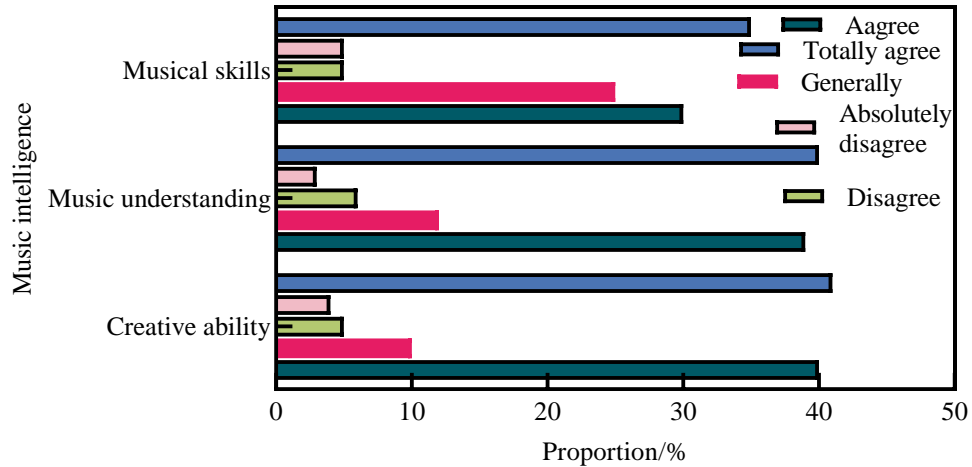
(A) Ability Improvement Results of The Control Group
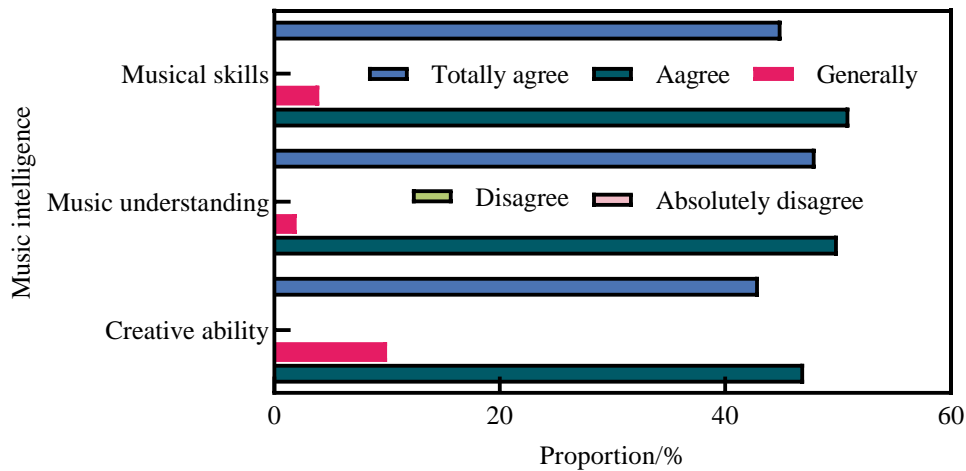
(B) Experimental Group Ability Improvement Results

Figure 3 shows the results of students' musical intelligence development

Music is a kind of infectious emotional language, which has the functions of stimulating emotion, active thinking, causing creativity, enhancing memory, and pleasing the emotions. The music course is of great significance to stimulate students' interest, emotion and attitude in learning aerobics class, to activate and cultivate students' thinking ability and creative spirit, and to realize the teaching objectives of the new curriculum. Figure 4 shows the results of the comparison of the sense of music rhythm, it can be clearly seen that the students in the experimental class think that their sense of music rhythm has been improved, and the number of people who chose to completely agree with the number of 51%, which is significantly higher than that of the control class of 47%, which shows that the teaching mode is effective in cultivating the students' sense of music.
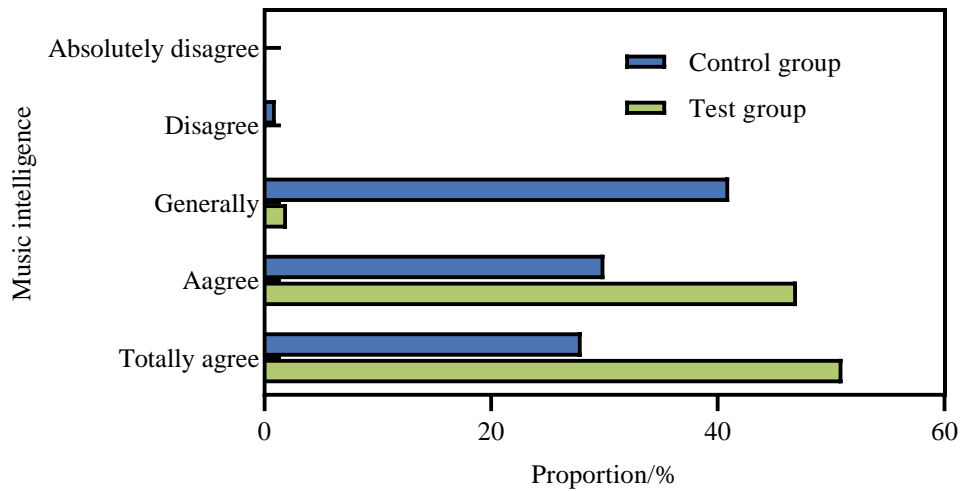
Figure 4 Music rhythm comparison

The results of the comparison of the accuracy of instrumental performance are shown in Fig. 5, the closer to 1 indicates the higher the accuracy and the better the coordination of the performance. In bowed string music, brass music, woodwind music, plucked music, keyboard music and percussion music, the accuracy of the experimental class is above 0.9, and in the case of keyboard music accuracy, for example, the experimental class of 0.96 is better than the control class of 0.78, which shows that the teaching effect of the Multiple Intelligences Theory is better than that of conventional teaching.
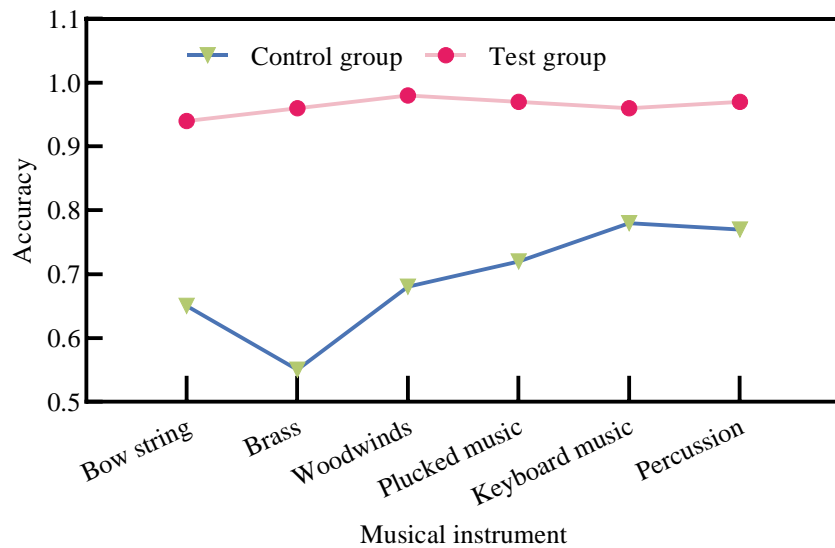

Figure 5 Accuracy of musical instrument playing

Evaluation of the Effectiveness of Cultural Construction

Cultural Participation

To further validate the impact of curriculum innovation on music culture, the main focus is on the correlation analysis of the nine indicator elements. By planning the curriculum through the ant colony algorithm, the mean scores were obtained by using the base data, and the indicator scores were obtained by multiplying the first two items, and Table 2 shows the results of the scores of the participation elements in the control and experimental classes. In terms of cultural infectiousness and cultural uniqueness, the mean scores of the control group are

3.6910 and 3.389 respectively, but still lower than those of the experimental group, which are 4.7875 and 4.7246. The mean score of cultural satisfaction of the experimental class is 4.2487, which is a high score, indicating that the innovative music teaching content is above the students' psychological acceptability level. The mean score of cultural recommendation of the experimental class is 4.5347, and the mean score of cultural cognition is 4.5215, both of which are higher, indicating that the willingness to recommend music courses and the willingness to publish course experience are higher under the theory of multiple intelligences, and colleges and universities should keep the status quo of course optimization of the ACO algorithm, and make timely adjustments to the content of music education based on the changes of students' needs.

Table 2 Scores of Cultural Participation Elements

Participation elements	Control group			Test group		
	Weights	Mean score	Indicator score	Weights	Mean score	Indicator score
Cultural awareness	0.0167	3.2060	0.0535	0.1534	4.5215	0.1212
Innovative ways	0.0134	3.8372	0.0514	0.1499	4.1682	0.1345
Infectiousness	0.0177	3.6910	0.0653	0.1232	4.7875	0.1320
Sensitivity	0.0208	3 9834	0.0829	0.1108	4.6654	0.1455
Unique	0.0344	3.3189	0.1142	0.1542	4.7246	0.1685
Diversity	0.0327	3.8173	0.1248	0.2327	4.6652	0.1794
Compatibility	0.0437	4.0930	0.1789	0.1748	4.5686	0.2342
Satisfaction	0.0355	3.7243	0.1322	0.0355	4.2487	0.3524
Recommendation	0.0739	3.7043	0.2737	0.0739	4.5347	0.3020

Cultural Identity

The Music Cultural Identity Scale was used as a testing tool to accumulate the scores of the two groups of students in the survey scale of the overall level of music identity, out of 120.Table 3 shows the statistics of cultural identity.From the statistical analysis, the results show that the control class has the highest mean value of difference identity, 2.91.And the mean value of cultural self-confidence is the lowest, 1.45.The three intermediate items in the order of cultural pleasure, cultural Concentration and Cultural Participation. In addition, the standard deviation values of cultural pleasure and difference identity in the experimental class are high, reaching 9.26 and 9.38 respectively, showing that there are large differences within both. It can be seen that music courses in colleges and universities not only need to construct the teaching mode of multiple intelligence theory, but also rationally arrange the course time and educational content. This means that a good music culture teaching environment should be present throughout the teaching process, therefore, traditional cultural knowledge can be taught in the music classroom moderately, incorporating traditional cultural elements and enriching the content of music education. At the same time, it enhances the self-confidence of college students in traditional music and cultural exchanges, and promotes the enhancement of cultural identity.

Table 3 Statistical Results of Cultural Identity

Identity factor	Control group		Test group	
	Average value	Standard deviation	Average value	Standard deviation
Cultural engagement	1.86	7.12	4.56	9.15
Differential identity	2.91	2.35	5.68	9.05
Cultural self-confidence	1.45	5.69	5.74	9.38
Cultural pleasure	2.78	8.92	4.85	9.26
Cultural focus	1.96	4.56	6.88	9.04

Scheduling Settings

The number of students in music courses in colleges and universities is large or small, and the classroom capacity is large or small, the manual pre-scheduling of classes is compared with the ACO algorithm proposed in this paper, and Table 4 shows the comparison of the scheduling work of the two algorithms. The total number of music courses in two semesters is 36, the ant colony algorithm has 0 conflicting courses in class, classroom and class time, and the highest rate of conflicting courses is 2.78%. This compares to a maximum of 22.22% for manual pre-scheduling and a maximum of 8 conflicting courses for the instructor. Practice has proved that for colleges and universities, the ant colony scheduling algorithm can realize the simplification of scheduling work and the improvement of the correct rate, the algorithm reduces the error rate of teachers'

scheduling to a large extent, and also relatively reduces the workload of the teaching management personnel. In the construction of innovative cultural paths in music courses, the virtuous cycle of teaching work is promoted.

Table 4 Comparison of Class Scheduling Between Two Algorithms

Conflict factors	Conflict Courses/Sections		Conflict ratio/%	
	Ant Colony Algorithm	Manually scheduled classes	Ant Colony Algorithm	Manually scheduled classes
Courses	1	3	2.78%	8.33%
Classes	0	6	0.00%	16.67%
Teachers	0	8	0.00%	22.22%
Classroom	1	6	2.78%	16.67%
Class time	0	5	0.00%	13.89%

DISCUSSION

In the future, the in-depth study on the path of innovation and culture construction of college music curriculum is yet to be explored in depth in the following aspects:

The mathematical and physical calculation methods used in the study should not be limited to those adopted in this paper, but should try to use more mathematical and physical calculation methods in order to establish a more precise model of curriculum innovation.

Whether or not a scientific, rational, and demonstratively popularized music curriculum innovation culture construction can be established is of great practical significance in promoting the dissemination of traditional music culture. Therefore, whether this study has wide applicability still needs to be further verified.

CONCLUSION

Based on the concept of multiple intelligences education, this paper takes Kemp's model as the basis to innovate the music curriculum model in colleges and universities, and designs a teaching model with intelligent teaching objectives, personalized learning content, enriched teaching process, diversified teaching strategies, contextualized teaching evaluation, and open teaching environment. At the same time, combining with the ant colony algorithm, considering a variety of constraints, to find the optimal solution of the classroom-timetable arrangement. The conventional teaching method in the teaching process of music class in colleges and universities is the photo group class, and the application of the constructed innovative model of multiple intelligences education and the use of ant colony algorithm for course arrangement is the experimental class. Comparing the degree of music knowledge mastery, it was found that the experimental group had the highest score of 90.2±9.4 in basic knowledge mastery, and P<0.05. In the comparison of music rhythmic sense, 51% of the students in the experimental class chose to completely agree that music rhythmic sense was improved, higher than the 47% in the control class, which verified that the constructed teaching model was effective in cultivating the students' sense of music. Comparison of instrumental performance accuracy found that the keyboard music accuracy of the experimental class was 0.96 better than that of the control class of 0.78. In addition, the standard deviation of the experimental class on the identification of cultural differences in music was higher at 9.38, and the rate of the conflict course of the ant colony algorithm was the highest at 2.78%. It deepens the integration of multiple intelligence theory and music curriculum innovation in colleges and universities, and provides help to improve the effect of cultural construction.

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