



Strategies for Integrating Traditional Music and Modern Technology in Higher Music Education

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SUMMARY: *With the development of computer technology nowadays, how to incorporate the modern technology into music teaching has become an important topic to discuss. In this paper, I will explore the teaching methods using the modern technology for music teaching, and propose a music performance evaluation system using simulated annealing algorithm to evaluate the music performance of vocal music player. The music performance evaluation method designed in this paper is able to precisely determine the performance level of music players and help students to receive feedback. After using the modern technology and the performance assessment model for music teaching, the experimental students' concentration level showed significant differences from the control students at the 1% level in all sections, and the overall concentration level of the experimental students increased by 15.19%. The experimental students whose concentration and relaxation scores were above 60 were 37.78% and 22.22% higher than the control students, indicating that the application of modern technology and the model in this paper can effectively improve students' concentration in traditional music learning and promote students' efficient music learning.*

KEYWORDS: *simulated annealing algorithm; music performance assessment; modern technology; music education*

1 Introduction

As the impact of contemporary technology on education grows, it not only modifies conventional teaching techniques but also offers a fresh approach to bridging cultural divides and promoting multicultural values, giving education new life [1, 2]. In music education, this trend is likewise evident, as modern technology has injected fresh momentum into its development.

The variety of educational content in the effective use of technology in college and university music education not only maximizes students' sensory engagement but also provides them with a variety of interaction options, allowing them to fully assimilate various types of information [3-5]. At the same time, the distinctive educational theory built on modern technology can also respond to students' psychological patterns and meet the varying needs of different learners [6]. From a psychological point of view, in the knowledge acquired by students, the memory from the auditory and visual respectively is 15% and 25%, but if the two memory organs can be effectively stimulated and used at the same time, the effect is not simply 15% plus 25%, but can be directly increased to 65% [7, 8]. It can be seen that the effective application of modern technology in college teaching has created a broad platform

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with higher efficiency, larger capacity, and better effect for college music education, which is not only conducive to the stimulation of students' enthusiasm for learning, but also promotes the development of students' comprehensive abilities such as learning efficiency, personality, and aesthetics, so as to enhance students' artistic literacy in a subtle way, and ultimately inject new elements into the reform of college music teaching classrooms [9-12].

However, in traditional music courses, cultural heritage such as ancient music scores and traditional instrument playing techniques are at risk of being lost, and the education mode of oral transmission is difficult to meet the learning needs of current students, so there is an urgent need to integrate with technology to create new possibilities for traditional music [13, 14]. Currently, less than 50% of conventional music education classes use technology, and increasing the integration of traditional music education with contemporary technology in colleges and universities will significantly boost music education's vitality. On the one hand, it makes it easier to combine knowledge of music with contemporary technology; on the other, it enhances students' ability to be creative and adaptive when studying music [15-18]. Therefore, exploring new pathways for combining traditional music with modern technology has become a key issue in the advancement of music education.

In order to establish a traditional music performance appraisal model for use as an aid to subjective assessment of students' musical performance abilities, this paper examines the use of modern intelligence technology in traditional music education. Specifically, ARM processors and simulated annealing algorithms are used. The effectiveness and accuracy of the model for music performance assessment is tested through the assessment analysis of three different levels of performers. Then students from two colleges and universities were selected for teaching empirical experiments, using the controlled experimental method, students were divided into a control group and an experimental group to carry out music teaching, and the concentration and relaxation of students were collected through the brainwave detecting instrument as the evaluation index of students' classroom status. We compared the concentration and relaxation of students in the two groups and analyzed the distribution of students with different concentration scores to investigate the effect of modern technology and performance evaluation model on the improvement of students' music learning status.

2 Traditional music teaching strategies based on modern technology

The efficacy of developing talent has decreased as a result of conventional musical education's educational philosophy and practices not being able to adapt to the demands of contemporary education. In order to guarantee the high caliber of instruction and the effectiveness of talent training, the integration of contemporary technologies into conventional music theory instruction becomes crucial.

2.1 Software teaching method

The development of computer network technology, for teachers to innovate teaching methods to provide a convenient, computer music software, for example, computer music software with practical, flexible, comprehensive and other characteristics, teachers can use the test, listening, singing and other functions, to create a three-dimensional mode of teaching for students, not only to improve the students' ability to master knowledge, but also to cultivate their imagination and creativity, has a very important role. For example, when teachers explain the basics of music, they can use the software to teach, which is conducive to

enriching the teaching content and improving students' interest in learning.

In addition, some intelligent piano accompaniment APP, using AI technology, intelligently recognizes the user's playing action, analyzes the strength, speed, rhythm and other parameters of their playing, and intelligently gives real-time feedback and guidance through a large amount of stored playing data to help players improve their skills. Some intelligent music skills assessment systems can use intelligent voice recognition and audio processing technology to automatically evaluate students' vocalization and skills if they practice alone with the AI automatic accompaniment. These systems can then provide students with appropriate feedback and suggestions for improvement, as well as automatically adjust the accompaniment's speed and difficulty level to help users gradually improve their skills. In order to help the user improve, the system will automatically adjust the accompaniment's tempo and level of difficulty based on the user's performance. This not only reduces the workload of the teacher and improves the efficiency of the assessment, but also helps the student to better understand his/her own strengths and weaknesses, so that he/she can make targeted improvements.

2.2 “Micro-teaching” methodology

Teachers can use photography, video and other technologies to make micro-video of the teaching process when teaching traditional music. And can use network technology to collect some pictures, video, audio and other educational resources, will be combined with the teaching video, can effectively enrich the form of expression of the teaching video, from various aspects of the music theory knowledge for students. This teaching mode is shorter and more focused, which can effectively strengthen students' understanding and guarantee the teaching effect.

2.3 Optimizing teaching resources

The development of network technology provides technical guarantee for teachers to enrich teaching content and optimize teaching resources. Teachers can create educational websites in schools and design teaching boards, resource boards, forum boards and other kinds of contents in the websites to meet the diversified needs of students. It is implied by the teaching board that instructors are required to build a network unit for each lesson topic and post instructional resources pertaining to music theory on the website. Additionally, by presenting the teaching materials from many perspectives, the integration of network resources and instructional resources facilitates learners' comprehension and assimilation of the topic. In essence, the resource board is a database that stores various kinds of information and allows students to perform research based on their own needs.

2.4 Optimizing classroom structure

With the deepening of classroom teaching reform, teachers are required to optimize the teaching structure according to the actual teaching situation. The practicality of multimedia technology is relatively strong, teachers can use this technology to create a situation for teaching, which is conducive to students in the learning of emotional experience, improve students' enthusiasm for learning. For example, when teaching music composition, students need to have a certain comprehensive ability to ensure the effect of composition. Teachers can collect some music repertoire through the network, but also collect video, pictures, text and other resources related to the repertoire, which is conducive to creating a teaching situation for students.

3 SA-based assessment method for traditional music performance

Modern technology can be combined with intelligent technology for music performance and assessment of traditional music teaching. In this chapter, a traditional music assisted teaching system is given, using simulated annealing algorithm to design a traditional music performance evaluation model, which can give the overall evaluation of the playing results of the evaluated person, and help the learners to improve their music performance level.

3.1 Basic Design Concept

Create a keyboard that has exactly the same characteristics as a typical keyboard. A standard ARM CPU, a USB interface circuit, and a keyboard scanning circuit will all be located inside the keyboard. The duty of obtaining, processing, and encoding the keyboard's key information falls to the ARM processor. The USB Interface Circuit is then used by the ARM processor to transmit the key information from the keyboard to the computer. Voice synthesis is performed through the MIDI component of the computer system. With this system, it will be possible to record, process and transmit the keys information of the keyboard played by the students. This way the computer will simulate the sound of the playing and make a recording and at last play back evaluation will be done with this playing result. The working principle of this system is described in Fig.1.

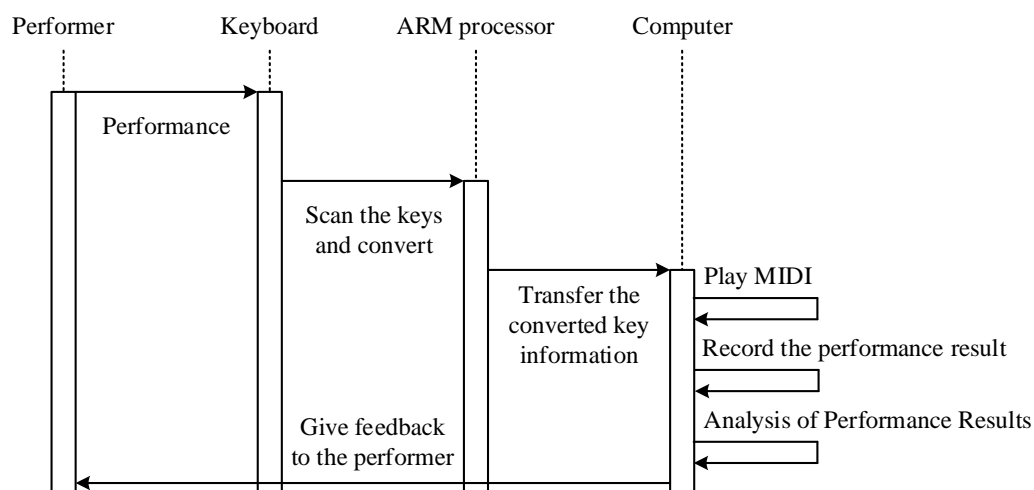


Figure 1: Basic principle of system

3.2 Traditional Music Performance Assessment Module

3.2.1 Simulated Annealing Algorithm

A stochastic optimization technique called the Simulated Annealing Algorithm (SA) was created by mimicking the actual annealing process. Using a method akin to actual annealing, the simulated annealing technique combines the benefits of random walk and hill-climbing algorithms. The ideal solution is also discovered by gradually cooling the annealing at a predetermined high temperature until the physical base state is attained. In order to find an approximation optimum solution in polynomial time, this method adheres to the Metropolis criteria, in which cooling-schedule parameters control the search process. The method's fundamental idea is that, given a fixed starting temperature, there is still a chance that locally

optimal solutions will ultimately converge to the global optimum as the temperature progressively drops.

The simulated annealing algorithm is mainly the following six steps:

Step 1: Set the current optimal solution such that $T = T_0$, which denotes the initial temperature at which annealing is started, randomly generates the initial solution x_0 and solves for the value of the objective function $E(x_0)$.

Step 2: Generate the difference between the new solution and the current solution, and perturb the current solution x_i to get the new solution x_j , which in turn solves for the value of the objective function $E(x_j)$, which can be obtained as $\Delta E = E(x_j) - E(x_i)$.

Step 3: Determine whether the new solution is accepted or not, if $\Delta E < 0$, then the new solution x_j can be accepted. If $\Delta E > 0$, then the new solution x_j is accepted with probability $\frac{e(E(x_j) - E(x_i))}{T_i}$, and T_i denotes the temperature at this moment.

Step 4: When the new solution is accepted, the new solution x_j is treated as the current solution.

Step 5: Loop through the previous four steps and repeat the perturbation and acceptance process k times in the case of temperature T_i , which in turn leads to the next step.

Step 6: Find the global optimal solution, by determining whether T has reached the termination temperature T_f , if it has, then terminate this round of the algorithm. Instead, go to the initial step and continue to find the global optimal solution.

Basic parameters required for the simulated annealing algorithm:

(1) Initial value of the control temperature parameter T_0

In general, the initial value of the control temperature parameter T_0 needs to be set large enough, but in practice, it often varies from problem to problem, and different initial temperatures are set depending on the problem. Statistically: the higher the initial temperature, the higher the probability of obtaining a globally optimal solution, but the longer the time required.

The initial temperature obeys the Metropolis criterion, i.e., when a particle changes from one state to another at a certain temperature, the new state is accepted unconditionally if it has a lower internal energy. Conversely, it is accepted by probability. The acceptance probabilities are shown below:

$$p = \begin{cases} 1, & E(x_{t+1}) < E(x_t) \\ \exp\left(-\frac{E(x_{t+1}) - E(x_t)}{KT}\right) = \exp\left(-\frac{\Delta E}{KT}\right), & E(x_{t+1}) \geq E(x_t) \end{cases} \quad (1)$$

(2) The number of iterations L_k for any temperature T

The algorithm keeps repeating the loop in the flowchart over a range of Markov chain lengths, with similarities to the process of reaching thermal equilibrium, at a certain temperature, for a solid substance. If the iterations are repeated at a certain temperature, the corresponding Markov chain will reach a smooth distribution probability. The selection of the Markov chain is also closely related to the descent of the temperature control parameter T_k . A slow decline avoids an excessive number of iterations. Assuming that the decay function of the control parameter has been selected, in order to allow each value to be taken to achieve a

quasi-equilibrium state. According to the previous experience, $L_k = 100N$ is generally taken, where N is the size of the problem.

(3) Control parameter T final value T_F

In general, the end of a loop can be determined by some conditions, such as the number of loops, the end temperature, and the fact that the solution of the loop process does not change in successive loops. The final temperature is usually set to zero, but this will take a lot of time. As the temperature approaches zero, the state around it is essentially the same. So, just find an acceptable minimum temperature.

(4) Controlling the decay function of temperature T

Different annealing methods obtained by the temperature reduction rate is not the same, the exponential cooling is the most common annealing method, the method of temperature change there is a law, directly related to the parameters. Its decay function can be expressed by the following equation:

$$t_{k+1} = \alpha t_k (k = 0, 1, 2, \dots, n) \quad (2)$$

where: α - a constant close to 1.

(5) State reception probability

The state acceptance probability is represented by the following equation, which is used to compare the value of this probability to a random integer from the interval $[0, 1]$ in order to determine whether or not the candidate state will be accepted:

$$\min[1, \exp(-\Delta C / t)] \quad (3)$$

3.2.2 Algorithms for evaluating musical performances

In addition to evaluating the player's performance in a scientific and comprehensive manner, it is also necessary to evaluate each keystroke the player makes, considering not only whether the keystrokes are appropriate but also their duration and quantity, in order to quantitatively assess the performance of the player's work. The performance results of music masters may be used as the foundation for comparison in this type of assessment. To make the process simpler, the issue of chord judgments will not be taken into consideration at this time.

In order to use the features of the simulated annealing approach, notably its capacity to find the global optimum and converge quickly, the standard composition is divided into key groups according to the score. An evaluation function is then introduced for each key group:

$$f = \left[\sum \left(|x-1| \cdot \left| \frac{T_{sal} - T'_{sal}}{T_{sal}} \right| \right) + \sum \left| \frac{T'_{sal}}{avg(T_{skl})} \right| \right] / N \quad (4)$$

where $x \in \{0,1\}$ and $x=1$ means keystrokes are correct, 0 means keystrokes are incorrect or fewer keystrokes, T_{real} is the length of the actual keystrokes, T_{skl} is the length of the standard keystrokes, T'_{real} is the length of the multiple keystrokes, $avg(T_{skl})$ is the duration of the average standard keystroke, and N is the number of keys. Then there is the following SA evaluation function for the whole playing result (and all the actual keystrokes):

$$F = \min \sum f \quad (5)$$

The constraints that should be satisfied when applying the simulated annealing algorithm to generate new solutions are as follows:

$$\left\{ \begin{array}{l} \alpha_1 = \frac{\sum T_{std}}{\sum T_{std}} \in o(1, \delta) \\ \alpha_2 = \frac{\sum T_{std} \text{Internal standard number of keys}}{\sum T_{std} \text{Actual number of keys in}} \in o(1, \delta) \end{array} \right. \quad (6)$$

3.2.3 Music Performance Error Determination

For the convenience of judgment and description, the following concepts are introduced:

Primary key: ratio to standard keystroke duration $\rho = \frac{T_{real}}{T_{stl}} \in o(1, \delta)$, where δ is some normal quantity < 1 .

Sub-key: the ratio $\rho < 1 - \delta$ to the standard key press duration.

Wrong key: i.e., a key that was pressed incorrectly.

Without loss of generality, assume that the $i-1$ keys before the i th actual key have been judged, and now start with the i th key to determine whether the actual key is the primary key.

When $\rho \geq 1 - \delta$, regardless of whether the key type is correct, we consider the key to be the wrong key and give it no further consideration.

When $\rho \in o(1, \delta)$, the key is the primary key. The master key will move on to the next round, pending further evaluation.

When $\theta < 1 - \delta$:

$$\left\{ \begin{array}{l} \alpha > 1 + \delta \quad \text{Situation 1} \\ \alpha \in o(1, \delta) \left\{ \begin{array}{l} \beta = \sum \frac{T_{real}}{T_{skl}} > 1 \quad \text{Situation 2} \\ \beta = \sum \frac{T_{real}}{T_{skl}} < 1 \quad \text{Situation 3} \end{array} \right. \\ \alpha < 1 - \delta \left\{ \begin{array}{l} \beta = \sum \frac{T_{real}}{T_{skl}} > 1 \quad \text{Situation 4} \\ \beta = \sum \frac{T_{real}}{T_{skl}} < 1 \quad \text{Situation 5} \end{array} \right. \end{array} \right. \quad (7)$$

where $\alpha = \frac{T_{real}(i+1)}{T_{real}(i)}$. Case 1 is where the i th key is the primary key. Case 2 is that the $i+1$

key is the primary key, and the final judgment will be given based on the specific keystrokes. Case 3 is that the i] and $i+1$ keys are secondary keys and the $i+2$ key is the primary key. Case 4 is where the $i+1$ and $i+2$ th keys are secondary keys and the $i+3$ th key is the

primary key. Case 5 the first to $i+3$ key is a secondary key and there is no primary key corresponding to this standard key.

3.2.4 Algorithms for determining keystroke conditions

Let $T_{real}(start)$ be the start moment of the i th actual keystroke, $T_{skl}(end)$ be the end moment of the i th standard keystroke, and δ be some normal amount. The following judgment condition is introduced:

$$T_{real}(start) - T_{skl}(end) > -\delta \quad (8)$$

Then the algorithm can be simply described as.

- 1) Perform the following for each set of keystrokes.
- 2) $i = 1, \dots, L$, L is the number of keys in the group, then for the i th key there:
 - (a) Determine whether Eq. (8) is satisfied.
 - (b) If satisfied, go to (d).
 - (c) If not, it indicates that the assessed individual failed to play the key.
 - (d) Determine the main key using the previously mentioned technique, provided that equation (6) is fulfilled.
 - (e) The key is successfully pushed if the primary key is located and compared to the standard key. The key is incorrect if it is not the same.
 - (f) If not, all of the keys under examination are secondary keys, and all of these secondary keys are multi-press keys.
- 3) Output the result and jump out.

As was previously mentioned, an impartial and scientific evaluation of the game's outcomes is carried out using the simulated annealing process. In addition to providing an evaluation of the appraisee F^* , performance, the simulated annealing algorithm helps determine whether each keystroke is correct or incorrect, when each keystroke occurs, how long each keystroke takes, and whether there are too many or too few keystrokes based on the optimal solution it constructs. This is crucial in assisting the appraisee in concentrating their efforts on honing their traditional music-playing abilities.

3.3 System application analysis

After the implementation of the system, its application effectiveness was tested through experiments. In the case of the two music pieces, three participants were chosen to play, and among them, one was a piano teacher, student 1 was an eighth-grade piano player, while student 2 was a seventh-grade piano player. Each participant was asked to play ten times in total, and their respective scores after completing their playing are illustrated in Fig. 2. The average scores of the piano teacher, student 1, and student 2 were 0.93, 0.85, and 0.74, respectively. Whether the assessment is based on a single score from one performance or the average score across several performances, the scores in the system ranked from highest to lowest are those of the teacher, student 1, and student 2, respectively. Compared with the real piano performance level of the three performers, this score ranking can objectively reflect the performance level of the performers. Therefore, the system is effective for evaluating music performance levels and enhancing students' independent learning ability.

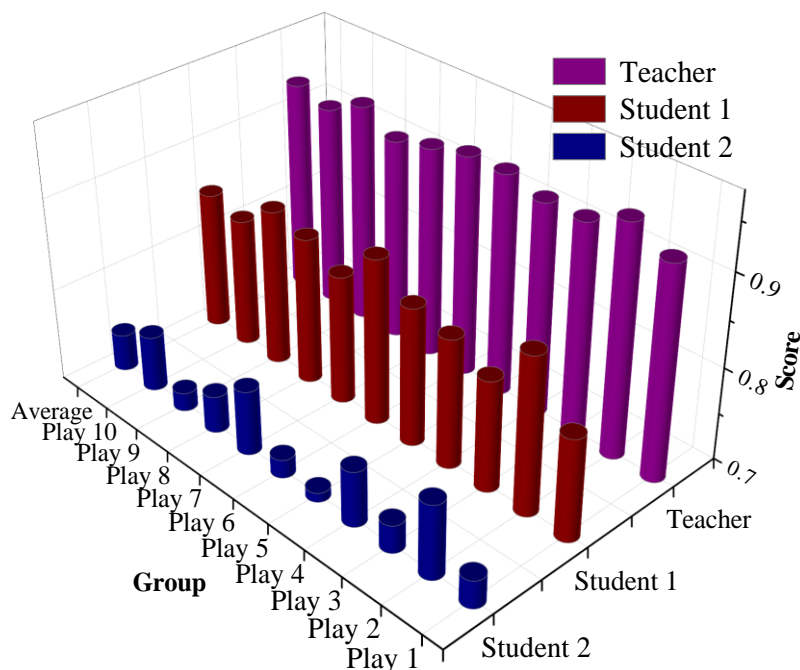


Figure 2: The score of the three players

4 Pedagogical empirical experiments in the application of modern technologies

In the previous section, the design of the modern technology application strategy was carried out, and the traditional music performance assessment method based on the SA algorithm was analyzed, and now it is necessary to use the modern technology teaching strategy and the traditional music performance assessment model in specific teaching practice.

4.1 Empirical experimental design

4.1.1 Experimental Objects

The subjects were drawn from two colleges A and B. 45 students were drawn from each of the two colleges in the first year of study, totaling 90 students, with a male to female ratio of 1:1.

Stratified random sampling method was used in this experiment. Students' final grades in the subject of music were divided into four strata: excellent, good, pass and fail, with each stratum accounting for 30%-35% of the total number of students, according to the requirements of the regulations (the ratio of the failing stratum to the total number of students tended to be infinitely close to 0%, since very few teachers graded their students as failing). The ratio of excellent, good and qualified students to the total number of students tends to be 1:1:1. Taking the students' first semester music final grades as the stratification mark, 15 students were randomly selected from each of the A and B secondary schools for each stratum, and the students were randomly divided into 3 groups, and then the 3 groups of students were randomly assigned to the control group and the experimental group.

4.1.2 Experimental methods

The experiment was conducted using the controlled experiment approach, with two groups: the experimental group (Group 2) and the control group (Group 1). The main difference

between the two groups was that the conditions were the same except that the “experimental group” was given the intervention of the modern technology and the traditional music assessment system. The experimental class consisted of preparation T0, traditional music culture learning T1, knowledge and skills learning T2, and composing practice T3.

Whether or not the modern technology and traditional music assessment system intervened was used as the independent variable, and the students' concentration and relaxation levels captured by the brainwave detector were used as the dependent variables. A Microsoft Surface laptop computer was connected to two BrainCube Bluetooth Brainwave Detectors to monitor students' brainwaves dynamically. Using the Mind XP software that comes with the instrument to eliminate background interference, the dynamic change curves of “concentration” and “relaxation” of the subjects were obtained, and the values of the parameters ranged from 0 to 100.

4.2 Experimental results

4.2.1 Analysis of differences in learning status

In the process of teacher-student interaction, it is difficult to accurately control the time of each group in each teaching session due to the individual differences of students. Therefore, it is necessary to first analyze the overall process of the experiment (T0-T3) to check whether there are differences in the student status of the two experimental groups, and then analyze the subsections (T0-T1, T1-T2, T2-T3).

The K-S test was used to test the normality of “concentration” and “relaxation” of the two groups in the overall experimental process (T0-T3), and the results of the normality test of the two groups are shown in Table 1. The data of the four groups are not significant ($p > 0.05$), which means that the data of the four groups are all normal. That is to say, all four groups of data have the quality of normality, and there is a high similarity of normal characteristics between the extracted samples and the whole, which has a good sample representation and can be compared with the differences.

Table 1: The normality test of two groups

Time interval	Group	Number	Mean	SD	Kolmogorov-Smirnov	
					Statistic D	P
T0~T3	Group 1-concentration	45	48.25	8.42	0.053	0.379
	Group 2-concentration	45	55.58	9.46	0.055	0.235
	Group 1-relaxation	45	60.18	6.25	0.124	0.098
	Group 2-relaxation	45	62.26	9.08	0.095	0.305
T0~T1	Group 1-concentration	45	52.63	5.04	0.105	0.473
	Group 2-concentration	45	61.41	7.52	0.079	0.091
T1~T2	Group 1-concentration	45	48.64	6.94	0.077	0.377
	Group 2-concentration	45	53.82	9.65	0.091	0.093
T2~T3	Group 1-concentration	45	48.33	8.32	0.107	0.297
	Group 2-concentration	45	53.57	7.48	0.064	0.299

The study next employed the independent samples t-test to ascertain the differences; Table 2 displays the findings of the independent samples t-test for the two groups. The scores of the students in Group 2 on “concentration” differed from the scores of the students in Group 1 at the 0.01 level of significance, and the t-test of $t=5.063 > 0.7$, $p(\text{Sig two-tailed}) < 0.01$, compared with that of the students in Group 1, the scores of Group 2 on “concentration” increased very

significantly ($p < 0.01$). Compared with Group 1, the “concentration” of Group 2 is highly significant ($p < 0.01$), and the specific comparison of the differences shows that the mean value of concentration in Group 2 (55.58) is significantly higher than the mean value of concentration in Group 1 (48.25), which confirms that the use of modern technology and the traditional music performance assessment model can improve the concentration of the students during music learning. The t-test of “relaxation” of the two groups $t = 2.456 > 0.7$, $P(\text{Sig two-tailed}) > 0.05$, there is no difference, which indicates that the two groups of students have similar relaxation state in the whole process of traditional music learning.

As a result of no difference in relaxation between the two groups of students, it is reasonable to carry out the analysis of both sections with respect to the concentration of the two groups of students. However, apart from the fact that the concentration of group 1 was less than 0.05 at the period of T2 to T3, at all other periods, both groups met the normal distribution with respect to their concentrations at $p > 0.05$. Therefore, the concentration scores of group 1 in T2 to T3 were counted again, and the P-P plot and histogram of “concentration” of group 1 are shown in Figures 3 and 4, and it can be considered that the score data of group 1 is approximately normally distributed, and it can be compared with the difference. After the independent samples t-test, in all time intervals, the “concentration” scores of the two groups of students are different at the 0.01 significance level.

Table 2: Independent sample t-test of two groups

Time interval	Analysis term	Group	Number	Mean	SD	t	P
T0~T3	Concentration grade	Group 1	45	48.25	8.42	5.063	0.003**
		Group 2	45	55.58	9.46		
		Total	90	51.92	8.65		
	Relaxation grade	Group 1	45	60.18	6.25	2.456	0.063
		Group 2	45	62.26	9.08		
		Total	90	61.22	7.28		
T0~T1	Concentration grade	Group 1	45	52.63	5.04	4.224	0.005**
		Group 2	45	61.41	7.52		
		Total	90	57.02	6.47		
T1~T2	Concentration grade	Group 1	45	48.64	6.94	4.452	0.002**
		Group 2	45	53.82	9.65		
		Total	90	51.23	7.58		
T2~T3	Concentration grade	Group 1	45	48.33	8.32	2.785	0.025*
		Group 2	45	53.57	7.48		
		Total	90	50.95	7.83		

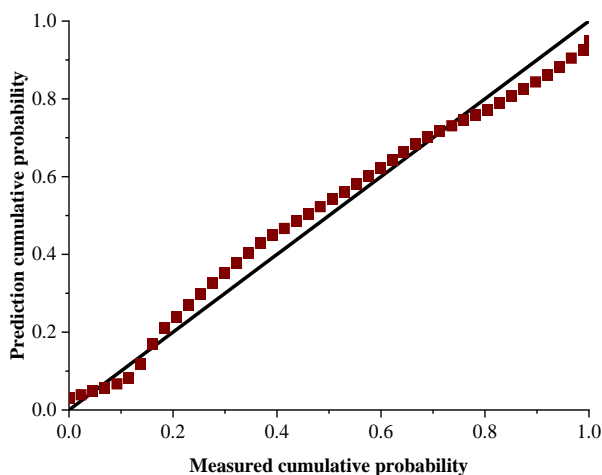


Figure 3: P-P graph of "concentration" of the group 1 in T2~T3

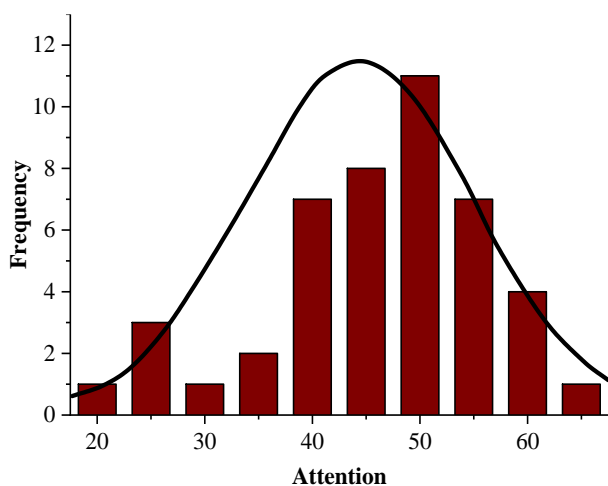


Figure 4: Histogram of "concentration" of the group 1 in T2~T3

4.2.2 “Focus” achievement level analysis

The students' scores were organized according to the stratification requirements of Mind XP, and the differences in “concentration” between the two groups were further analyzed, and the number of students in different stratification levels is shown in Fig. 5. In the time interval from T0 to T3, first of all, 97.78% of the students in the two groups' concentration scores were more than 40 points, which meets the requirements for effective learning, indicating that the design of traditional music teaching content is effective. It shows that the design of traditional music teaching content is effective. Among them, 40% of the students in group 2 had a high concentration score of 60 or above (above average learning effect), while only 2.22% in group 1, which confirms that the application of modern technology and the performance assessment model can greatly improve the concentration of students in the traditional music classroom.

Secondly, 100% of the students in both groups reached a “relaxation” score of 40 or above, which confirms that music learning can be enjoyable for students with or without the use of modern technology. In Group 2, 77.78% of the students achieved a relaxation score of 60 or above, compared to 55.56% in Group 1, which indicates that the use of modern technology and the performance assessment model can increase the relaxation level of students in the classroom to a small extent, but there is no significant difference.

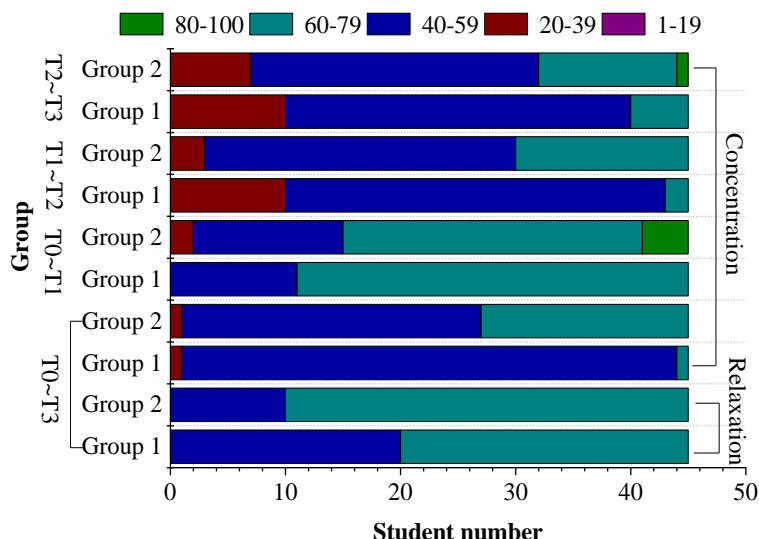


Figure 5: The number of students at different score levels

5 Conclusion

This paper discusses the integration strategy of traditional music and modern technology, and proposes an assessment method for traditional music performance in combination with simulated annealing algorithm. Then the modern technology application strategy and assessment model are used in music teaching to carry out teaching empirical analysis. The main results of the study are as follows:

(1) Software teaching and “microclass” teaching can be used to enhance the intuitiveness of teaching content, integrate modern technology into traditional music based on the optimization of teaching resources and classroom structure, stimulate students' interest in learning, enhance students' ability to learn independently, and guarantee the effectiveness of traditional music teaching.

(2) After actual testing, the traditional music performance evaluation model based on simulated annealing algorithm achieves the expected design goals, and the average evaluation scores of the three players are 0.93, 0.85 and 0.74, which are in line with their real performance level, indicating that the proposed music performance evaluation model can reflect the real level of the players, which is conducive to the development of traditional music teaching.

(3) The experimental group's concentration level is much greater than the control group's, with an increase of 15.19%, indicating a significant difference in the total degree of concentration between the two groups. Additionally, the experimental group continuously outperformed the control group in terms of focus throughout every lecture. This illustrates how modern technology and the performance assessment system may improve students' level of concentration during music courses. Additionally, the results show that while 77.78% and 55.56% of students in the experimental group and control group, respectively, have a degree of relaxation of more than 60 points, 40% of students in the experimental group and 2.22% of students in the control group have a degree of concentration of more than 60 points.

Practice has proved that the introduction of modern educational technology means into the traditional music classroom can improve the enthusiasm and initiative of students' learning, so that students have the desire to know and the spirit of exploration of music, and optimize the teaching process and effect.

About the Author

Xiaolei Xu was born in Luoyang, Henan, China, in 1989. She obtained her master's degree from Luoyang Normal University in China. She currently employed at the School of Educational Science and Music, Luoyang institute of Science and Technology. Her main research direction is musicology and music education.

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