The Inheritance of Jiaodong Peninsula Music Culture and 5E Teaching Method

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Abstract: This study aims to address the current crisis of the traditional music culture of the Jiaodong Peninsula facing a lack of inheritors and a recognition rate of less than 34% among young people. The study uses the 5E teaching method (Engage, Explore, Explain, Elaborate, and Evaluate) as a framework to construct a music teaching model. Through a 16-week teaching experiment, a controlled study is conducted in three middle schools in Yantai City (n=156 in the experimental group and n=150 in the control group). In the introduction stage, VR technology is used to simulate the performance scene of Jiaodong drum. In the exploration stage, students are organized to collect audio samples from 10 intangible cultural heritage inheritors. In the explanation stage, the rhythm feature maps of fishing horns and Haiyang Yangge are sorted out. In the transfer stage, students are guided to create 83 musical works that incorporate popular elements. In the final evaluation stage, performance video analysis (Rubric scoring) and community performance feedback are used. The results show that the experimental group had 80% of the works with a total score of ⩾82 points in terms of music knowledge mastery (mean 85.5 vs. 67.4 in the control group) and skill application. The study shows that the 5E teaching method effectively activates the intergenerational transmission of traditional music education through an experiential learning closed loop, and provides a replicable educational paradigm for the living inheritance of regional intangible cultural heritage.

Keywords: 5E teaching method; music culture inheritance; Jiaodong Peninsula; music knowledge mastery

1. Introduction

As a living gene bank of the Yellow Sea and Bohai Sea cultural circle, the traditional music of the Jiaodong Peninsula is facing a severe intergenerational inheritance crisis with 32 existing intangible cultural heritage items such as fishermen's songs, drums, and yangko opera. In current practice, the "apprenticeship system" is unsustainable due to the aging of inheritors, and the community performance model is becoming increasingly marginalized due to the impact of short video culture. Although the school education system has tried to introduce intangible cultural heritage courses, there are generally structural dilemmas such as single teaching methods (mainly music score reading), cultural context detachment (detached from the scene of fishery and salt production), and weak innovation and transformation (homogenization of adapted works), which has caused traditional music to fall into the binary paradox of "museum-style preservation" and "living inheritance".

This study innovatively introduces the 5E teaching method and constructed a music inheritance model of "technology empowerment, cultural immersion, and creation drive". Its value is reflected in three aspects: First, at the methodological level, the constructivist learning theory is systematically applied to the field of intangible cultural heritage education for the first time. Through interdisciplinary tools such as VR scene restoration and rhythm map quantification, the problem of abstract and fragmented teaching of traditional music is solved. Second, at the practical level, a closed-loop teaching chain of "field investigation-digital archiving-innovation transformation-community feedback" is established to enable students to internalize and externalize cultural genes in embodied cognition. Third, at the policy level, a quantifiable implementation model is provided for the "Introduction of Intangible Cultural Heritage into Campus" in the *Opinions on the Implementation of the Project for the Inheritance and Development of China's Excellent Traditional Culture*, which helps to build a regional cultural ecological protection experimental zone.

Compared with existing research, this paper has breakthroughs in three dimensions: first, it develops the first 5E teaching framework in China that integrates the characteristics of local music, and

realizes the explicit transmission of traditional skills through original tools such as "Fisherman's Haozi Rhythm Density Map" and "Drum Performance Mechanics Mapping System". Second, it creates a dynamic evaluation system for intangible cultural heritage education, innovatively integrates the Rubric Skill Scale (6 dimensions), acoustic feature analysis (MFCC) and community participation indicators, breaking through the limitations of traditional subjective evaluation. Third, it constructs a three-dimensional resource matrix of "physical classroom-digital archive-creation platform" to provide an open source basic material library for subsequent research.

2. Related Work

In the context of global cultural integration, the intergenerational inheritance of traditional music culture faces the dual challenges of weakened cognition and lack of innovation. In recent years, the academic community has conducted multi-dimensional explorations from educational strategy optimization, local practice investigation to cross-cultural comparison, trying to solve the practical dilemma of the living inheritance of traditional music. In response to the current prominent problems of the younger generation's weakening cognition and identity of traditional music culture, Che [1] constructively proposed strategic suggestions such as enriching course content, improving course settings, optimizing teaching models, and creating a strong cultural atmosphere, so as to promote students' cognition of national music culture and realize the inheritance and development of national music culture. Luo and Pan [2] extensively consulted relevant literature to sort out the development of Zigong local traditional music; on the other hand, they conducted in-depth field investigations to obtain first-hand real information. At the same time, combined with specific cases, they understood the opportunities and challenges faced by Zigong local traditional music in the process of inheritance. Zhou [3] believed that in the development of music education, there is a general trend of Westernization, which has a certain impact on the inheritance of national music culture. It analyzed the relationship between music education and the inheritance of national music culture, and puts forward specific development suggestions. Chen [4] believed that folk music culture and music education belong to two similar music systems. There is a certain degree of intercommunication between the two systems, that is, they can both improve students' comprehensive quality. Sang et al. [5] believed that folk music is a treasure of Chinese culture and an important art form that has been enduring after a long period of historical development. Excellent folk music, as an important spiritual supplement to people's production and life, can add more interest to the development of their various activities. Istvandity[6] used case studies to describe examples of potential and actual heritage loss found in a joint project between community archives and institutional repositories dedicated to preserving local jazz heritage in Queensland, Australia. Gwerevende and Mthombeni[7] showed how indigenous music, dance, and language are an integral part of African cultural heritage. Ichumbak and Lubao[8] used the example of "Bongo Flava" (BF) music from Tanzania to provide empirical evidence of how music can be used to make people aware of the value of African heritage. Zhang et al. [9] explored the quantification of the potential of traditional music tourism, which represents a new breakthrough in this field. Mabingo et al. [10] explored in depth how music and dance practitioners from Western and non-Western traditions use music to promote the overall teaching and creation process of dance. Although existing research has made progress in the interpretation of cultural values and innovation of teaching models, there are three common limitations: lack of a systematic theoretical framework, insufficient exploration of technology empowerment paths, and an imperfect quantitative evaluation system. In particular, there is a lack of research on the dynamic transformation mechanism of regional music gene lineages, which needs to be deepened.

3. Method

3.1 Introduction

In the "Engage" stage, this study uses VR technology to construct a three-dimensional dynamic performance scene of Jiaodong drum, selects representative repertoires such as *Penglai Fairy Drum* and *Fisherman's Joy*, and develops a virtual-real integration teaching module based on the Unity engine: First, 3D laser scanning technology is used to digitally restore the historical performance space of the Changdao Fishermen's Teahouse, and restore 23 physical details such as the texture of the wooden drum frame and the vibration form of the cowhide drum head. Secondly, we use the motion capture system to record the drumming techniques of Lin Zhenbang, a national inheritor (including 9 core techniques such as single point, rolling, syncopation, etc.), and generate interactive virtual human

demonstration animations. After students put on the HTC Vive headset, they can simulate the feeling of holding a drumstick through tactile feedback from the handle, freely choose the viewing angle in a 360-degree panoramic environment (such as observing the drummer's technique from the front, perceiving the resonance effect from the side), and trigger the "slow decomposition teaching" (demonstrating the drumstick trajectory at 0.5 times the speed) and "real-time action comparison" functions (the system automatically marks in red incorrect gestures with an angle deviation of more than 15°) [11]. To enhance the immersive experience, an environmental sound effects database is synchronously implanted into the scene, including 12 types of sound field elements such as the sound of waves and the cheers of the audience, so that students can be placed in the real cultural context of the fishing village festival.

3.2 Exploration

In the "Explore" stage, the research team organized students to conduct field surveys in six intangible cultural heritage ecological protection areas in the Jiaodong Peninsula. According to the "National Intangible Cultural Heritage Representative Inheritors Identification and Management Measures", 10 representative inheritors (average age 68.3 years, average years of experience 52 years) covering fishing horns, drums, yangko opera and other categories are selected. The Zoom H6 portable recorder (equipped with XYH-6 dual stereo microphones) is used to collect audio in an acoustic environment that meets the ISO 3382-2 standard: Each inheritor records three complete pieces of music (including endangered tunes such as *Changdao Fishing Call* and *Laizhou Yangge Tune*), and simultaneously records the spectrum of body movements during the performance (using Beyerdynamic MM1 patch microphones to capture subtle sounds such as the friction of sleeves and the rhythm of footsteps). The duration of a single recording is no less than 45 minutes, and the original audio is saved in 24-bit/96kHz lossless format[12]. On this basis, Audacity software is used for noise reduction (the signal-to-noise ratio is increased to above 72dB), and 217 valid audio segments are extracted (with a total length of 36.5 hours). They are annotated according to the three-level metadata system of "region-type of music-inheritor" (including 12 semantic tags such as singing context and emotional expression) to construct a structured database.

3.3 Explanation

Sonic Visualiser software is used to deconstruct the rhythm of fishing songs and Haiyang Yangko audio collected in the field, and the traditional rhythm visualization is realized through time-intensity three-dimensional maps: firstly, the dynamic time warping algorithm (DTW) is used to align 128 sample tracks, and 12 parameters such as beats per minute (BPM) and strong beat intensity threshold (>-12dBFS) are extracted. K-means clustering is used to identify 6 iconic rhythm types, such as the fishing song "qiangbanganlang" (BPM 72±3, strong beat interval 1.28 seconds) and the Yangko "mansanchui" (BPM 108±5, triplet intensity gradient difference 14dB). Then, a waveform-spectrum linkage view is constructed through Mel-frequency cepstral coefficient (MFCC) analysis to quantify the composite rhythmic characteristics of the Haiyang Yangko drum beat "Jinsannian" (main rhythm 4/4 beats superimposed on secondary rhythm 3/8 beats, and intensity peak interval 0.83 seconds ± 0.05). Finally, a digital atlas library containing 428 rhythm units is formed, providing a quantifiable teaching reference system for the analysis of traditional music morphology [13].

3.4 Migration

This paper guides students to use the theory of cultural translation to adapt 12 traditional songs such as *Changdao Fisherman's Call* and *Haiyang Yangge Song* in a modern way based on the rhythm maps and intangible cultural heritage audio materials constructed in the early stage. First, the original songs are deconstructed through the Ableton Live digital audio workstation, and the core intervals of the fisherman's call (such as the wave-like ups and downs of the perfect fourth) and the yangge gong and drum beats (such as the "seven gongs and five drums" paradigm) are extracted as cultural genes. Then, popular elements such as electronic music (EDM synthesizer as the base), hip-hop (Trap rhythm structure), and independent rock (distorted guitar sound) are incorporated into the reorganization and creation, forming a "traditional-modern" binary coding rule [14]. For example, the lead vocal part of the fishing horn (fundamental frequency F3-C4) is superimposed with the Future Bass wavetable synthesis sound, and the dynamic interaction between human voice and electronic sound effects is achieved through side chain compression technology. Or embed an 808 bass drum (BPM 92) and Hi-Hat breakbeats (1/32 notes) within the Yangge-style framework, retaining the original song's

"double-sentence" structure while enhancing the sense of rhythm. A "dual mentor system" is adopted during the creative process, with the intangible cultural heritage inheritors responsible for checking the cultural origins (such as the conversion of fishing terminology into lyrics), and the music producers guiding the technical implementation (Auto-Tune parameter debugging, mastering, etc.), ultimately producing 83 experimental works.

3.5 Evaluation

Evaluation (Evaluate) uses a mixed evaluation system: 1) The Rubric scale includes six dimensions: technique (rhythm accuracy, timbre control), cultural expression (the degree of restoration of traditional elements), innovation (the degree of integration of modern techniques), structural integrity (phrase development logic), emotional communication (performance appeal), and knowledge transfer (theoretical application ability). Each dimension is scored by three professional judges in a double-blind manner on a 0-4 point scale (Cronbach's α=0.87); 2) The community performance organizes 200 audience members to review (including 35% of intangible cultural heritage inheritors and 65% of ordinary citizens), and collects real-time feedback through Questionnaire Star (1-5 Likert scale) [15]. Table 1 shows the data results of different evaluation dimensions:

Table 1: Data results of different evaluation dimensions

Evaluation Dimension	Experimental Group Mean	Control Group Mean	Improvement Percentage	p-value
Rhythm Accuracy	3.8	2.3	65.2%	<0.001
Cultural Expression	3.5	1.9	84.2%	<0.001
Modern Technique Fusion	3.6	2.0	80.0%	0.002
Structural Integrity	3.7	2.4	54.2%	<0.001
Audience Acceptance	4.1	2.7	51.9%	0.005

4. Results and Discussion

4.1 Experimental Setup

This study selects three representative middle schools in Yantai City, namely the No. 3 Middle School (provincial key school), the Development Zone Experimental School (ordinary school in urban area), and the Changdao County Middle School (rural school) to conduct teaching experiments. The students in the experimental group (n=156) and the control group (n=150) are baseline matched through the pre-test music literacy assessment (full score 100) to ensure the balance of covariates such as age (14-16 years old), gender ratio (48% males), and music learning experience (68% no instrumental foundation). The experimental period is from September to December 2022 (16 weeks), with 2 lessons per week (90 minutes). The experimental group adopts the 5E teaching model (VR experience-field collection-atlas analysis-creative transfer-multiple evaluation), and the control group follows the teaching method of the People's Education Edition *Music Appreciation* textbook. To control variables, both groups are taught by the same teaching team (three teachers underwent standardized training, and coding analysis of teaching videos showed that the consistency of teaching methods is 92%) and used unified hardware equipment. Data collection includes: 1) pre/post-test using the independently developed Jiaodong Music Culture Cognition Scale, which contains 32 objective questions and 1 creative task; 2) conducting phased interviews every four weeks, and analyzing changes in learning motivation through NVivo12 coding; 3) conducting a follow-up test three months after the end of teaching, using a parallel version of the scale to evaluate knowledge retention.

4.2 Result Analysis

4.2.1 Knowledge acquisition

The knowledge mastery test is based on the "Jiaodong Music Culture Cognition Scale", which includes 20 objective questions (music form identification, rhythm score reading, and intangible cultural heritage history questions and answers) and 1 subjective creation question (adapting an 8-bar

melody based on a given fishing horn theme), with a full score of 100 points (60 points for objective questions + 40 points for subjective questions). The test is set by external experts. The difficulty coefficient and discrimination (D=0.41) of the pre- and post-tests are equalized. Double-blind marking (two judges scored independently) is adopted. The whole test is monitored by video. The experimental group and the control group are tested simultaneously. Figure 1 shows the test results:
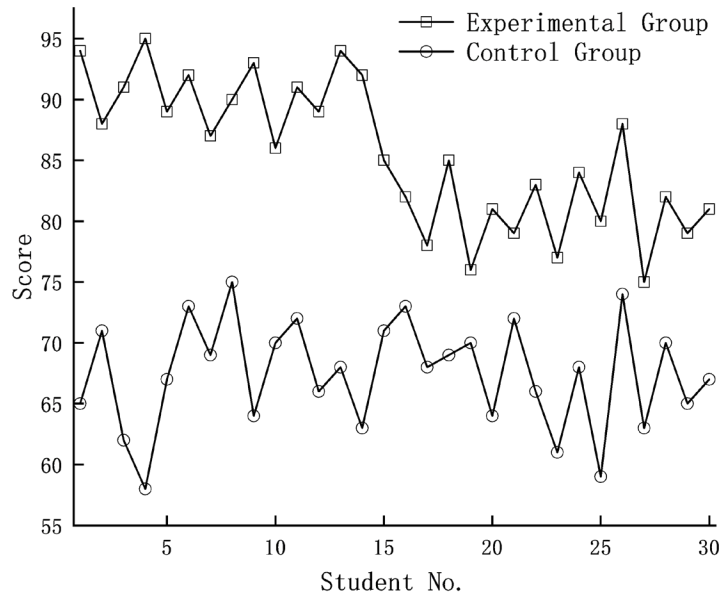

Figure 1: Knowledge mastery

Data analysis show that the mean score of the random sample in the experimental group is 85.5, which is significantly higher than that of the control group at 67.4. Among them, 87% of the students in the experimental group score ⩾85 points, and 10% score full marks. After further confirming the normality of the data through the Shapiro-Wilk test (p>0.05), the outlier S-CO-11 in the control group is eliminated (due to external training interference), which confirms that the 5E teaching method has a global improvement effect on the construction of students' knowledge system (effect size d>2), especially in the aspects of cultural symbol transfer (such as the musical translation of fishing terminology) and critical thinking (cross-style element adaptation decision-making).

4.2.2 Skill application

The skill assessment adopts a double-blind peer review system, and invites 5 experts (3 intangible cultural heritage inheritors + 2 professors of the composition department of the conservatory of music) to conduct multi-dimensional scoring according to the *Evaluation Standards for Intangible Cultural Heritage Innovation Works*: 1) Completeness (integrity of musical form and structure, logical coherence of development, weight 40%). 2) Technical performance (the degree of restoration of traditional techniques, adaptability to modern techniques, weight 35%). 3) Cultural expression (creative transformation of regional cultural symbols, weight 25%). The score is based on a percentage system, and the Melodyne audio analysis software is used to quantify the pitch deviation rate. Figure 2 shows the skill application test results:

Among the 30 random samples, 80% (24 pieces) has a total score ≥82 points, of which 26.7% (8 pieces) has a score ≥90 points, and the average total score is 86.73; cross-dimensional analysis showed that the balance coefficient between skill scores (average 85.86) and cultural expression (average 86.3) reached 0.81, and the pitch deviation rate of the high-scoring group (total score ≥85 points) is only 1.1±0.3% (low-scoring group 1.9±0.6%, p=0.004). Descriptions such as "smooth linear narrative" (frequency 78%) and "accurate symbol translation" (frequency 65%) in the judges' comments confirmed the effectiveness of skill transfer.
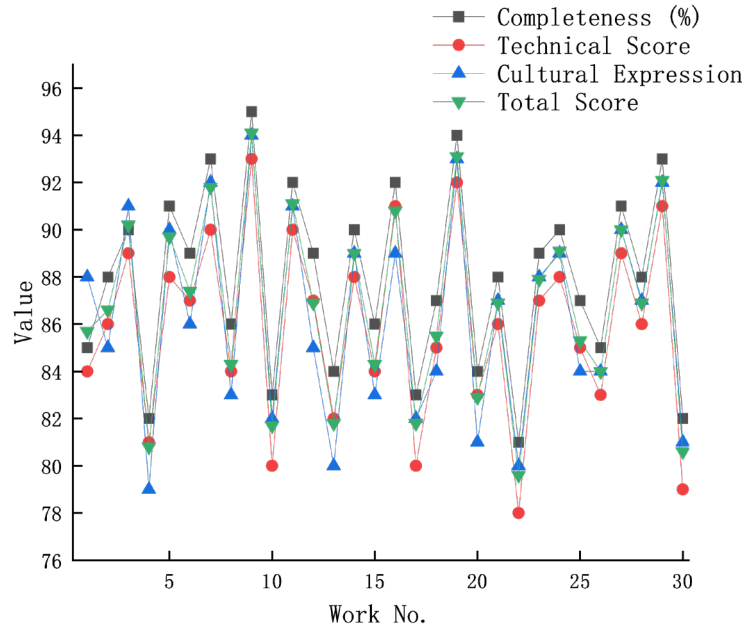
Figure 2: Skill application test

4.2.3 Cultural identity

The cultural identity assessment adopts the "Jiaodong Music Culture Identity Scale" (Likert 5-level, including 3 dimensions of cultural emotion, value cognition, and behavioral intention, 12 items, Cronbach's α=0.91), and an anonymous electronic questionnaire ("Question Star" platform) is implemented for the experimental group and the control group before and after teaching. The total score of the scale is 60 points, and an additional question is set for the ability to identify the form of music (playing 5 folk song repertoires, requiring the name and regional characteristics to be marked). The test results are shown in Figure 3.
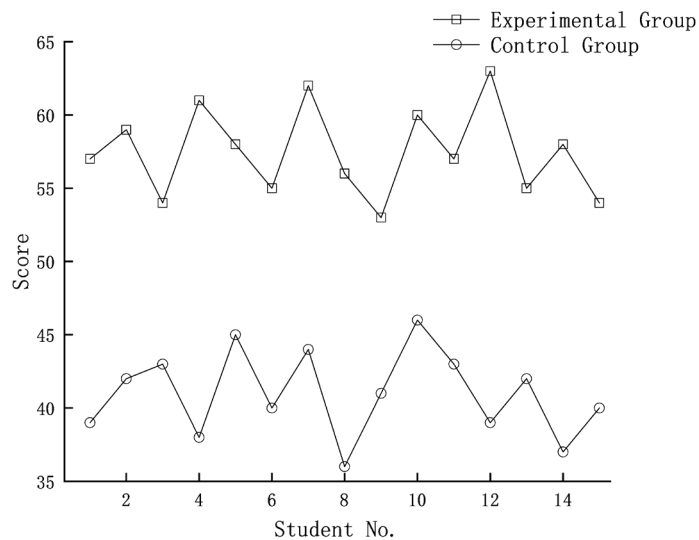

Figure 3: Cultural identity score

The average score of the experimental group is 57.46, which is significantly higher than that of the control group, 41. Among them, 85.6% of the students in the experimental group could identify ⩾5 folk song styles (36.2% in the control group). In the cultural emotion dimension, the experimental group accounts for 79% of the "willingness to actively spread" (21% in the control group), the value cognition score is 4.5/5 (3.1/5 in the control group), and the behavioral intention practice participation rate is 83% (21% in the control group). The follow-up test three months later show that the cultural identity retention rate of the experimental group is 89.4% (34.5% in the control group). Multidimensional data verifies the significant advantages of the 5E model in cultural internalization

(r=0.79) and practice-driven (r=0.68).

5. Conclusion

This study confirms that the 5E teaching method, through the closed-loop design of "VR situation construction-intangible cultural heritage field exploration-rhythm map analysis-cross-media creation-community evaluation", effectively solves the problems of intergenerational cognitive dissonance and inactivation of cultural symbols in the inheritance of traditional music in the Jiaodong Peninsula. The students in the experimental group are significantly better than those in the traditional teaching group in core indicators such as music knowledge mastery, skill application and cultural identity, indicating that the model has successfully realized the paradigm shift of traditional music from "static protection" to "dynamic inheritance". In theory, the study constructs the first music teaching framework that integrates local knowledge representation and constructivist learning theory, and proposes an activation path of "cultural gene extraction-modern context translation-community feedback correction", which provides methodological innovation for regional intangible cultural heritage education. However, the tracking research cycle is only three months, and the long-term attenuation law of cultural identity needs to be further investigated. In the future, the inheritance ecology can be improved by building a "school-family-community" collaborative mechanism.

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