Proceedings of CONF-SPML 2026 Symposium: The 2nd Neural Computing and Applications Workshop 2025
DOI: 10.54254/2755-2721/2026.TJ31188

# *Enhancing Youth Engagement with Chinese Ancient Instruments Through Interactive Digital Tools and Pop Music Fusion*

**Yijun Chen**

*Tandon School of Engineering, New York University, New York, USA*
*yc7427@nyu.edu*

***Abstract.*** This research addresses how an interactive digital tool might emotionally connect the youth with their culture, concentrating on one of the oldest and richest traditions of China - ancient music. The application enables the user to be the instrumentalist of the virtual world through playing the guqin, bianzhong and some popular songs as well, all this while getting step-by-step instructions, a scoring feature, a playback feature, and cultural insights presented in the form of trivia tied to high scores. The purpose of the app is to use the emotional and cultural aspects to bring the past into the young people's present time and thus get them more involved. It was the systematic measures of cultural and musical engagement together with emotional reactions to learning and music that I used for the research whose participants were thirty-six young adults aged 18 to 25 and who completed a 14-day study, where the influence of the traditional cultural activities was compared with this interactive gamified method. The data imply that the app users practice the culture more deeply than other users, so interactive digital instruments can become a powerful tool to revive cultural heritage and, at the same time, make it more fun and educational. The research outcome can shape not only the future of cultural preservation but also that of education.

***Keywords:*** Emotional Engagement, Interactive Music Apps, Chinese Music Tradition, Modern Pop Integration, Cultural Heritage Engagement

## 1. Introduction

The world which is highly dependent on technology and is moving at a very fast speed has thrived through globalization and digital advances by reshaping cultures. Digital communication is an integral part of the modern lifestyle, thus young people are not the only ones to experience the worldwide spread of cultures at an unimaginable rate. Such a trend has widened the generational gap in terms of the connection between young people and traditional culture leading to a less understanding of and less emotional engagement with cultural heritage objects like ancient musical instruments among the younger generation [1]. It applies mostly to young people aged 18 to 25 as they are the ones most deeply involved in digital entertainment and media. Habits of interactive

DOI: 10.54254/2755-2721/2026.TJ31188

content consumption lock them in, so that they won't be interested anymore in looking at traditional culture presented in a museum or watching videos - they will neither be touched nor intrigued.

Traditional ways of teaching and learning the cultural heritage of the past have become insufficient. Lectures and museum exhibits are less interactive forms of participation which young people nowadays strongly expect. By persistent traditional formats, heritage seems to drift away from them; therefore, cultural retention lowers, and emotional investment in ancient traditions remains scarce.

In view of these problems, the demand for platforms that connect the two - young people's interests and cultural heritage's preservation - is substantially increasing [2]. The aim of this research is to find out how digital interactive means which combine modern-day pop music with ancient Chinese musical instruments can create greater involvement of young people in the Chinese music tradition. The primary research question of this paper is: How does combining pop music and interactive digital tools help to build a stronger emotional link between traditional Chinese music and young people [3]?

The creation of this app was based on the idea of merging aspects of education and gamification, hence younger users had to be digitally savvy in order to profit from it. It provides users with ready-made lessons, live scoring, playback features, and culturally thought-provoking insights that can be revealed as they make progress. Thus, the app's purpose is to facilitate or even intensify the formation of emotional bonds. By having an app with the mentioned features at hand, we were able to carry out a controlled experiment in which we could assess the app's influence on emotional engagement and cultural affinity. Our hypothesis was that the app would evoke nostalgia, increase engagement and cultural identity of the participants. In the end, this endeavor has the potential of turning the table in cultural education, thus making it possible to create a different, more relevant to the global digital generation, preservation of heritage [4].

## 2. Related work

Understanding theoretical concepts and technologies is a must before judging how a digital interactive tool can emotionally engage users with ancient Chinese music. This part of the paper examines two main things: First, it considers the emotional and engagement measurement scales which have been used in parallel studies and which have been utilized here for the evaluation of user interaction with the app. Second, it looks at the present-day digital heritage products in China, which are the examples of how digitally the cultural engagement is developed. The two areas combined highlight the shortcomings of the current tools and practices which this research seeks to overcome.

### 2.1. Theoretical foundations: emotional and engagement measurement scales

#### 2.1.1. Geneva Emotional Music Scale (GEMS)

The Geneva Emotional Music Scale (GEMS) represents one of the main instruments to emotionally evaluate music-induced one of the nine emotional dimensions of the model: wonder, transcendence, tenderness, nostalgia, peacefulness, and power, joyful activation, tension, and sadness. One is able to grasp highly complex and even mixed emotional experiences in music with the help of this tool, although the origin of the scale comes from the Western context, and thus, some limitations regarding traditional Chinese music may be observed [5].

DOI: 10.54254/2755-2721/2026.TJ31188

#### 2.1.2. Geneva Music-Induced Affect Checklist (GEMIAC)

The Geneva Music-Induced Affect Checklist (GEMIAC) is a short form of GEMS that allows measurement of emotions much faster - it has 45 terms which correspond to the GEMS categories. It is a favorite instrument in the digital and interactive realms; however, GEMIAC might be lacking the necessary depth to reveal subtle emotional nuances and similarly to GEMS, it has been established on the basis of Western cultural norms, therefore it might need some adjustment for Chinese traditional music contexts [6].

#### 2.1.3. Emotions while Learning an Instrument Scale (ELIS)

The Emotions while Learning an Instrument Scale (ELIS) identifies positive as well as negative emotions accompanying music training. The scale has been originally devised for children, yet one can make it suitable for older age groups (e.g., young adults). It is quite informative for emotional engagement in learning, and at the same time, it requires cultural adaptation when one wants to use it for measuring emotions related to Chinese music and virtual learning scenarios [7].

#### 2.1.4. Music USE (MUSE) questionnaire

The Music USE (MUSE) Questionnaire is mainly concentrated on the behavioral and contextual facets of music use. The questionnaire helps to understand how people use music in their day-to-day lives. Though the MUSE efficiently brings out music consumption patterns, it gives little emphasis to the emotional part and, hence, may fall short in capturing emotional arousal in an immersive and interactive setting related to either traditional Chinese instruments or pop music fusion [8].

### 2.2. Chinese documentary interactive cultural heritage products

#### 2.2.1. Cube Museum and CoVisit VR Museum

The Cube Museum and CoVisit VR Museum initiatives are prime examples of digital heritage projects in China. Cube Museum implements augmented reality (AR) to enable users to interact with the 3D models of museum artifacts, whereas CoVisit provides a multi-user VR experience that lets participants examine exhibits together. Both platforms are excellent in providing remote, engaging learning experiences; however, they revolve around visual and artifact-based heritage and hence, do not consider musical interaction and emotional feedback, thus, are not the best for research on musical engagement [9].

#### 2.2.2. Shanhai app

The Shanhai app delivers digital versions of Chinese cultural artifacts such as 3D models and multilingual content, and it enhances user engagement through creative expression. Nevertheless, the app is predominantly geared towards visual and textual content, with minimal musical interaction. There is no support in the app for engagement with traditional Chinese instruments or the fusion of modern music, nor does it offer the necessary tools for emotional response assessment, thus, it is limited in terms of research that focuses on emotional connections to music [10].

DOI: 10.54254/2755-2721/2026.TJ31188

## 3. Design

The redesign of this interactive platform is a perfect fit for people in their late teens and early twenties, 25 years old max, a group of people who can be termed as digital natives, are constantly bombarded with fast-paced media, and have the psychological inclination to use popular culture as a means of identity expression. Among these youngsters, music is not only oral entertainment but also the users' favorite medium to explore their personal side, make new friends, and build cultural identity. Today's popular music - e.g., songs of the world-famous artists like Billie Eilish, Queen, or even Chinese pop acts – appeals to the listeners emotionally and makes the songs socially relevant. The app is trying to close the generational and cultural gap by mixing these songs with traditional Chinese instruments such as the guqin, bianzhong, and traditional drums [11,12]. Using this method, the app essentially becomes a "cultural hybrid" where youth can embrace Chinese tradition more by mingling with pop culture they are already familiar with so that it serves as a bridge and thereby increases the level of engagement with, and introduces them to, the ancient instruments.

As shown in Figure 1, the platform, in terms of appearance, implements a highly contrasted, lively cartoonish kind of look which would be very much in tune with the users' habit of getting their daily dose of entertainment from highly energetic digital environments such as mobile gaming, music apps, and short-video platforms. The visual design is very much focused on capturing user attention and turning the interaction into a very easy and understandable one leaving out the hard part of the cognition which is normally there when cultural learning of the traditional kind is involved. The whole idea of music selection is portrayed in the form of a game and users have the liberty of testing various sounds and music genres which also goes with the agency and inwardness of creative exploration.


Figure 1. A screenshot of the app interface


Figure 2. A screenshot of various screens of the app prototype

DOI: 10.54254/2755-2721/2026.TJ31188

As shown in Figure 2, the content of the program is divided into short, step-by-step, and clearly explained guides on how to do each of the fundamental things like using fingers, rhythm, and playing gestures. These guides change dynamically depending on the skill level of the user, thus everybody will have their own personalized learning curve which will never be too steep (hence, causing frustration) and which at the same time will encourage flow- a psychological state that goes hand-in-hand with both enjoyment and deep learning. The point system is there to evaluate the rhythm and accuracy on the spot, to give a response without delay, and to give access to such rewards as 'cultural trivia', i.e. brief, interesting pieces of historical or musical knowledge. The implementation of this reinforcement method through game-playing activities serves the function of motivation maintenance and, moreover, skill-acquirement being linked with cultural insight, which is a technique to increase intrinsic interest and long-term memory, is put into effect.

Moreover, users may avail themselves of a playback feature which allows them to hear their own recordings. This leads to self-awareness, subsequent improvement through the repetition cycle, and emotional investment of an otherwise unmotivated learner in the process of acquiring knowledge. Most importantly, it changes the role of the user from a passive absorber of cultural heritage into an active worker in musical educational psychology, suggesting this results in higher personal relevance and greater emotional connection.

While waiting for their turn to play, learners can read small pieces of knowledge modules about the history and culture of the instruments they are holding. These parts are deliberately very short and deeply embedded into the flow of the experience, thus the brain won't get overloaded with new information but cultural literacy will be gradually built. Rather than seeing culture as something extra that has to be learned in addition to playing music, the system goes far in treating it as the natural and inevitable outcome of musical progression, therefore, it not only strengthens the concept that culture is not something "behind the curtain" or separate from today's life but it is a living experience which can be played as well.

The sum of all these design decisions is a user-centered approach model which takes into account not only the psychological but also the cultural habits of the modern youth. Bringing together emotional immediacy found in pop songs, the user involvement employing the methods of gamified learning and the profundity of traditional Chinese music culture, the platform becomes one that does not expose youth to culture passively anymore but rather turns this exposure into an active, affective, and personalized journey—thus it is re-positioning ancient heritage as something that is still emotionally relevant and creatively accessible to younger generations.

## 4. Methods

The study employed a randomized, mixed-method, longitudinal design with three conditions. The design was aimed to depict the emotional, behavioral, and cultural changes as reflected in the GEMS, GEMIAC, ELIS, and MUSE scores. Thirty-six young adults (18–25 years old) were students of local universities and had no background of formal musical training. They were randomly assigned to three groups with an equal number of participants to evaluate the emotional and cultural impact of various musical interactions.

1. Group A (Traditional Only): Inhaled the sounds of the Chinese instruments (guqin, bianzhong) through the lens of classical traditional suites only.

2. Group B (Pop Only): Covered modern popular songs (e.g., tracks by Billie Eilish or local Mandopop artists) on traditional instruments, without the modules of cultural context.

3. Group C (Fusion Mode): Were allowed to access the full app version which featured the linking of traditional instruments, modern songs, gamified interaction, and embedded cultural trivia.

DOI: 10.54254/2755-2721/2026.TJ31188

In addition to the 14-day study, two major phases were identified:

During the 1st week, the Guided Phase (Days 1–7), the participants took part in daily 30-minute app sessions in their assigned conditions. They were mainly involved in tutorials and interactive tasks during this phase.

The Free Exploration Phase (Days 8–14) followed the participants' experiments of app features in an unrestricted manner. This design of the study also corresponded to MUSE's focus on the use of music in a natural environment and the implementation of behaviors for emotional self-regulation.

### 4.1. Data collection and instruments

There were three measurement points for the study—before the study (Day 0), in the middle of the study (Day 7), and after the study (Day 14) in order to have the time-based changes visible. The instruments used were:

1. GEMS (Geneva Emotional Music Scale): It was the main emphasis at each time point to track music-induced excitement, nostalgia, and transcendence.
2. GEMIAC (end of each session): Provided very short emotional snapshots of the session for the analysis of real-time emotional trends.
3. ELIS: As the emotional side of the learning instrument, it could identify the phenomenon of the co-existence of positive (e.g., enjoyment, progress) and negative (e.g., frustration) emotions.
4. MUSE: It was a record of the frequency of musical engagement, location, or context (e.g., relaxation, identity expression) as well as emotion regulation, which could be done both before and after the entire intervention.
5. The Cultural Attachment Scale: We created a measure in the form of a fifteen-item scale that monitors the changes of perceived cultural connectedness and identity over time.

### 4.2. Behavioral and physiological metrics

Apart from the self-report measures, the app also recorded the following behavioral data:

1. The duration of each session
2. The number of tutorials done
3. The amount of cultural trivia revealed
4. The times replay was initiated (as an indicator of self-reflection and interest)

Participants, if allowed, could share HRV (heart rate variability) data through a wearable device during three guided sessions (Day1, Day7, and Day14) to pinpoint the real-time physiological markers of excitement and stress.

### 4.3. Ethical considerations

Information about the aims, procedures, and the participants' rights of the study was given to all the participants. Consent to participate was voluntary and informed, and the participants were provided with the information about their right to withdraw at any time. The HRV and behavioral data were gathered anonymously, and all the data were kept in a secure manner.

DOI: 10.54254/2755-2721/2026.TJ31188

## 5. Analysis and results

### 5.1. Overview

Data gathered from 36 participants divided into three experimental groups (Traditional Only, Pop Only, Fusion Mode) over a 14-day period were analyzed by mixed ANOVA, repeated-measures t-tests, and correlation analysis. These analysis methods were in line with the research goal of measuring emotional engagement, musical participation, and cultural attachment. The analyses were mainly concerned with the comparison of results over time (pre/mid/post) as well as the differences between groups in order to find out how the kind of musical interaction influences the emotional and cultural connection of the young users.

### 5.2. Emotional response (GEMS & GEMIAC)

Table 1. GEMS (pre–mid–post comparison)

| Group | Nostalgia (Pre–Post Mean Δ) | Excitement (Pre–Post Mean Δ) | p-value |
|---|---|---|---|
| A – Traditional Only | +0.4 (SD = 0.6) | +0.5 (SD = 0.8) | $p < 0.05$ |
| B – Pop Only | +0.6 (SD = 0.5) | +0.8 (SD = 0.7) | $p < 0.01$ |
| C – Fusion Mode | +1.2 (SD = 0.4) | +1.5 (SD = 0.6) | $p < 0.001$ |

As shown in Tables 1 and 2, fusion experiences significantly elevated both emotionally reflective (nostalgia) and stimulating (excitement) dimensions, confirming the hypothesis that combining traditional elements with modern music enhances engagement.

Table 2. GEMIAC (daily emotional snapshots)

| Emotion (avg score 1–5) | Traditional | Pop Only | Fusion |
|---|---|---|---|
| Joyful Activation | 3.1 | 3.8 | 4.3 |
| Wonder | 2.9 | 3.6 | 4.4 |
| Nostalgia | 3.2 | 3.3 | 4.1 |
| Tension | 1.9 | 2.0 | 2.1 |

### 5.3. Musical learning emotions (ELIS)

Table 3. ELIS

| Group | PELI Score Change (Positive Emotion) | NELI Score Change (Negative Emotion) | Interpretation |
|---|---|---|---|
| A | +0.6 (SD = 0.5) | –0.2 (SD = 0.4) | Mild learning joy |
| B | +0.8 (SD = 0.6) | –0.3 (SD = 0.3) | Moderate learning engagement |
| C | +1.4 (SD = 0.4) | –0.6 (SD = 0.2) | Strongest motivation, least frustration |

Table 3 shows statistical significance: ANOVA $F(2, 33) = 7.21$, $p < 0.01$ (positive emotions); $F(2, 33) = 6.17$, $p < 0.01$ (negative emotions)

DOI: 10.54254/2755-2721/2026.TJ31188

Table 4. Behavioral engagement metrics

| Metric | Traditional | Pop Only | Fusion |
|---|---|---|---|
| Avg Session Time (minutes) | 24.1 | 27.6 | 33.4 |
| Completion Rate (%) | 82.5% | 87.1% | 95.3% |
| “Fun Facts” Unlock Rate (%) | 45.2% | 62.3% | 89.7% |
| Replay Attempts (avg/day) | 0.8 | 1.2 | 2.3 |

Table 5. Cultural attachment results

| Item Example | Traditional | Pop Only | Fusion |
|---|---|---|---|
| I feel connected to these instruments. | 3.4 | 3.7 | 4.5 |
| I’d like to learn more about the culture. | 3.9 | 4.2 | 4.8 |
| This music reflects part of my identity. | 3.1 | 3.5 | 4.6 |
| Overall Cultural Attachment Score | 3.5 (SD=0.6) | 3.8 (SD=0.5) | 4.6 (SD=0.4) |

Shown by Tables 4 and 5, ANOVA $F(2, 33) = 8.94$, $p < 0.001$

Table 6. Physiological results (HRV – optional subset, n = 18)

| Day | Traditional ($ms^2$) | Pop ($ms^2$) | Fusion ($ms^2$) |
|---|---|---|---|
| Day 1 | 45.2 | 49.7 | 54.1 |
| Day 7 | 52.1 | 56.3 | 66.7 |
| Day 14 | 53.0 | 55.2 | 69.4 |

Table 7. Summary of key findings

| Dimension | Best Performing Group |
|---|---|
| Emotional Engagement | Fusion Mode |
| Learning Enjoyment (ELIS) | Fusion Mode |
| App Usage Time | Fusion Mode |
| Cultural Identification | Fusion Mode |
| Curiosity/Replay | Fusion Mode |
| Physiological Arousal | Fusion Mode |

These outcomes, as shown in Table 7, give firm numerical backing to the conjecture that the hybridization of traditional Chinese instruments with contemporary pop music by means of an interactive gamified design would exponentially drive the user's emotional connection (through GEMS, ELIS, HRV), behavioral participation (through usage metrics, MUSE), and cultural attachment and identity (custom scale), as opposed to conservative-only or pop-only digital formats. The results herewith emphasize the efficacy of fusion strategies as a means to engage the youth in digital cultural heritage tools.

DOI: 10.54254/2755-2721/2026.TJ31188

## 6. Answering research question

The main aim of the research was to find out whether a combination of pop music and traditional Chinese instruments presented on a digital platform would be able to connect emotionally young users to traditional music culture. The results, in fact, do not bring about unequivocal solutions, but they indicate the first signs that such a manner of work might correspond to the cultural and psychological needs of the youth of today.

One of the characteristics attributed to young adults of 18-25 years of age is that they are "digital natives". The term implies that they are power users of content, fast-moving, visually appealing, and extremely interactive. Customization, immediacy, and emotional relevance are the main features through which they interact with media. Pop music is, by and large, the main contributor to the formation of the youth' identities and the regulation of their everyday moods thanks to its great accessibility and strong emotional connotations. The role of the interaction is to serve the combination of pop music as a bridge—traditional cultural elements are intertwined with the emotional and stylistic aspects that are familiar to the users.

Correspondingly, it might not be merely the interactivity of the content but also the design which featured real-time feedback, gamified scoring, and reward-based cultural learning that could have led to more participation as the latter was in line with the media consumption and psychological expectations of the targeted age group. Participants were able to gain experience with control, agency, and progress that are, in all likelihood, the main motivators for them, digital-native users.

On the other hand, the variation in responses also indicates that the allure of pop culture should not be restated as a universal way and that cultural engagement is contingent upon different social and personal factors. As it stands, the pilot study only opens up the question of cultural knowledge retention in the long run and a real shift in cultural aspects which will need to be addressed in subsequent research.

## 7. Conclusion

The current study was aimed at finding out whether the fusion of pop music with traditional Chinese instruments in an interactive digital environment could be a means to increase young people's cultural and emotional engagement. The evidence for some effect of the method is very real, but it should be regarded only as provisional, not definitive.

Their media consumption is a psychological puzzle of the youth-centered kind, and the attractiveness of the method to young people lies in the fact that it fits this puzzle perfectly. The youth of today are, by and large, the ones who would prefer culture if it were delivered in the form of a personal, emotionally resonant, and digitally immersive experience. As a matter of fact, they expect their content to provide self-expression, offer immediate feedback, and give a sense of reward or progression—these are the elements that can all be found in the interactive platform.

Rather than simply blending traditional instruments with pop music, the latter is a psychological connector: a familiar emotional language through which users can reframe and reinterpret traditional instruments. Therefore, the merger might help the users to decrease the distance between them and the source of the heritage content and so get them more curious and emotionally responsive instead of going in the formal way or passive consumption.

Moreover, the article concedes that the study has some limitations. The extent to which the participants were engaged may have been because it was a new experience for them, and the level of cultural knowledge gained within a short period of time is also uncertain. While the instruments

DOI: 10.54254/2755-2721/2026.TJ31188

used were quite effective, they were not designed to detect long-term identity changes or complex levels of cultural literacy.

In brief, it would be wrong to claim that this method is a sure way of cultural reconnection at this point in time. The report, however, indicates that the design strategy influenced by youth and pop culture could revolutionize the way traditional culture is presented as part of a contemporary digital framework. Such an effect invites further study of interactive systems, not only adjusting them to the psychological but also to the aesthetic needs of modern youth, and, instead of being the substitutes for tradition, being the flexible agents for its reinterpretation.

## References

[1] Wan, W. (2022). Digital technologies in music education: The case of Chinese students. Musica Hodie, 22.
[2] Khan, I., Melro, A., Amaro, A.C., Oliveira, L. (2022). Role of Gamification in Cultural Heritage Dissemination: A Systematic Review. In: Yang, XS., Sherratt, S., Dey, N., Joshi, A. (eds) Proceedings of Sixth International Congress on Information and Communication Technology. Lecture Notes in Networks and Systems, vol 235. Springer, Singapore. https: //doi.org/10.1007/978-981-16-2377-6_37
[3] Juslin, P. N., & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code?. Psychological bulletin, 129(5), 770.
[4] Wu, W., Tham, J. & Khatibi, A. (2024). Exploration of Digital Inheritance Ideas of Chinese Traditional Music Culture in the Information Age. Applied Mathematics and Nonlinear Sciences, 9(1), 2024. https: //doi.org/10.2478/amns-2024-2233
[5] Zentner, M., Grandjean, D., & Scherer, K. R. (2008). Emotions evoked by the sound of music: characterization, classification, and measurement. Emotion (Washington, D.C.), 8(4), 494–521. https: //doi.org/10.1037/1528-3542.8.4.494
[6] Coutinho, E., & Scherer, K. R. (2017). Introducing the GEneva Music-Induced Affect Checklist (GEMIAC) a brief instrument for the rapid assessment of musically induced emotions. Music Perception: An Interdisciplinary Journal, 34(4), 371-386.
[7] Roden, I., Friedrich, E. K., Etzler, S., Frankenberg, E., Kreutz, G., & Bongard, S. (2021). Development and preliminary validation of the Emotions while Learning an Instrument Scale (ELIS). PloS one, 16(8), e0255019. https: //doi.org/10.1371/journal.pone.0255019
[8] Chin, T., & Rickard, N.S. (2012). The Music USE (MUSE) Questionnaire: An Instrument to Measure Engagement in Music. Music Perception, 29, 429-446.
[9] Xu, N., Li, Y., Wei, X., Xie, L., Yu, L., & Liang, H. N. (Accepted/In press). CubeMuseum AR: A Tangible Augmented Reality Interface for Cultural Heritage Learning and Museum Gifting. International Journal of Human-Computer Interaction, 40(6), 1409-1437. https: //doi.org/10.1080/10447318.2023.2171350
[10] Global Times. (2024). Cultural heritage app exhibits world museums. Global Times. https: //www.globaltimes.cn/page/202408/1318310.shtml
[11] UNESCO. (2003). Guqin and its music. UNESCO Intangible Cultural Heritage. https: //ich.unesco.org/en/RL/guqin-and-its-music-00061
[12] Wong, I. (2009). The Heritage of Kunqu: Preserving Music and Theater Traditions in China. Intangible Heritage Embodied. https: //doi.org/10.1007/978-1-4419-0072-2_2