A Delphi Study on Teacher Trainees' Competencies to Promote Cultural Sustainability of Chinese Traditional Musical Instrument Education

Zhang Jiaxin[1], Priyadarshini Muthukrishnan[2*], Teoh Sian Hoon[3], Gao Xiaobao[4], Liu Chengxuan[5]

[1] [2] INTI International University
Persiaran Perdana BBN Putra Nilai, 71800 Nilai, Negeri Sembilan, Malaysia
I23024479@student.newinti.edu.my
priya.krishnan@newinti.edu.my
[3]Faculty of Education, Universiti Teknologi MARA,
UiTM Puncak Alam Campus, 42300 Puncak Alam, Selangor, Malaysia
teohsian@uitm.edu.my
[4]JingMing Reading Center, Linyi City, Shandong Province
tron775498@gmail.com
[5]Qingdao Film Academy, Qingdao, Shandong Province
1801283397@qq.com
*Corresponding Author

Abstract: This study aimed to use the Delphi method to identify the core competencies required of teacher trainees to effectively promote the educational and cultural sustainability of traditional Chinese musical instruments. This study systematically collected and condensed the views of five experts on this topic through three rounds of expert surveys and eventually reached a consensus. Currently, traditional Chinese musical instrument education faces a lack of professional teachers, a lack of systematic teaching methods, and a lack of enthusiasm among teachers and students, making effective teacher training crucial. However, previous research on the education and training of traditional Chinese musical instruments for trainees is insufficient and there are no clear guidelines on the competencies needed for trainee teachers to meet future educational needs. This study identified 18 core competencies and classified the competencies needed by teacher trainees in traditional Chinese musical instrument education into three dimensions: musical knowledge, teaching skills, and cultural attitude based on a competency-based model. The results of this study will provide clear guidelines for teacher training programs to improve the quality of education and ensure the preservation and promotion of traditional Chinese music culture in contemporary society, thus contributing to the achievement of SDG 4: Quality Education.

Keywords: Delphi Study, Teacher Trainees' Competencies, Chinese Traditional Musical Instrument Education, Cultural Sustainability

1.   Introduction

Traditional Chinese musical instruments (Fig. 1) refer to those that originated in China before the Qing dynasty and have been preserved and played up to the present day. These instruments, integral to Chinese culture, have historically played significant roles in palaces, religious ceremonies, and folk celebrations. However, modernization and globalization have posed significant challenges to traditional

Chinese music. Modern music, popular culture, and new forms of entertainment have overshadowed traditional instruments, leading to a decline in their presence in daily life and a decrease in public interest (Jia, 2021). While China once boasted over 70 types of traditional instruments, many have disappeared or are in disuse.

Fig. 1 Traditional Chinese Musical Instruments

In recent years, there has been a positive trend toward reviving traditional Chinese music. Prestigious music institutions in China are increasingly focusing on the education of traditional Chinese musical instruments, and the interest of young people in traditional culture is growing. Furthermore, the international influence of Chinese traditional music has expanded through various promotions and performances. Despite this resurgence, traditional Chinese musical instrument education faces numerous challenges, such as a lack of teaching resources, insufficient qualified teachers, and the absence of systematic teaching methods (Wang, 2019).

One primary issue is the shortage of professional teachers of traditional musical instruments in China, which makes it difficult to meet the increasing demand for instruction. This shortage results in lower quality education for students, negatively affecting their learning outcomes and interest in Chinese traditional culture. Additionally, current teaching methods for traditional instruments lack systematization and standardization, leading to an incomplete teaching system. Consequently, students struggle to acquire comprehensive knowledge and skills, limiting their pursuit of traditional instrument culture. Furthermore, both teachers and students generally lack enthusiasm for teaching and learning traditional musical instruments. The difficulties in learning traditional instruments, limited career opportunities, and the pervasive influence of modern music and popular culture further diminish the effectiveness and impact of traditional Chinese musical instrument education.

Education in traditional Chinese musical instruments is essential to preserve and promote cultural heritage. The above problems can be improved by enhancing the competence of teachers because teachers are at the core of this education, and their competencies directly impact teaching effectiveness and students' learning experiences. Given the current state and challenges of traditional Chinese musical instrument education, there is a growing demand for teachers who can effectively teach these instruments. To ensure high-quality music education and promote cultural sustainability, the competencies required of teachers are becoming increasingly stringent.

Since 2008, more than 20,000 new music teachers have been trained annually through public and private music education programs in China. These trainees are future educators and cultural knowledge transmitters that directly influence the overall quality of the teaching workforce. Therefore, developing the competencies of these trainees is crucial for their future teaching roles (Nordin et al., 2024). However, there is currently a lack of research on the training of teacher trainees for traditional Chinese musical instrument education, and there are no clear guidelines on the competencies required for these trainees, making it difficult to meet future educational needs.

This research aims to identify the core competencies necessary for teacher trainees to effectively contribute to the cultural sustainability of traditional Chinese music instrument education and to achieve consensus among an expert panel on these competencies. By identifying and reaching a consensus on these competencies, the findings will provide clear guidelines for teacher training programs, improve the quality of education, and ensure the preservation and promotion of traditional Chinese music culture in contemporary society, ultimately promoting cultural sustainability. The current research is focused on the following research questions.

1. What are the core competencies that teacher trainees need to effectively contribute to the cultural sustainability of traditional Chinese music instrument education?

2. What are the expert panel's consensus levels on those competencies?

2.   Literature Review

Traditional Chinese musical instruments are the essence of Chinese music and a vital part of Chinese culture. Deeply rooted in China's cultural fabric, these unique musical works not only showcase distinct musical charm, but also reflect the profound connotations of traditional Chinese culture (Xie, 2024). Prominent examples such as guzheng, erhu, pipa, and dizi have rich cultural significance and a long history that dates back thousands of years. These instruments have evolved and diversified across historical periods and social contexts, developing unique musical styles and playing techniques.

Gultom et al. (2020) highlight in their research that learning traditional instruments is viewed as an effective way to enhance personal cultivation and develop moral character. It demands not only technical proficiency, but also inner cultivation and emotional resonance, contributing to the formation of a well-rounded personality and noble character.

Modernization and globalization have had a dual impact on traditional Chinese music. On the one hand, modern culture and western music have overshadowed traditional Chinese music, especially among the younger generation, leading to a decrease in its audience and practitioners. Many young people consider traditional Chinese music to be outdated, and some even experience emotional fatigue toward it (Xie, 2024). Most research focuses on Western music, particularly popular and classical music, neglecting traditional Chinese music as a complex art form (Ma & Chen, 2024).

However, globalization has provided opportunities for exchange and revival, bringing more attention and recognition to traditional Chinese music on international platforms. In recent decades, as more Chinese composers and musicians study and perform abroad, Chinese musical culture has not only gone global, but also interacted with other cultures in various ways (Wong, 2020).

Furthermore, young musicians are using modern technology and new media platforms to blend traditional music with modern elements, attracting a broader and younger audience. Research shows that new media, by breaking the constraints of time and space, have enhanced the influence of traditional Chinese music and brought new opportunities for its dissemination (Xie, 2024).

In recent years, the inheritance and development of China's outstanding traditional culture have received significant attention and support from the central government. Chinese conservatories and higher arts institutions generally have departments or majors dedicated to ethnic music, specifically focused on teaching and research of traditional Chinese musical instruments. Beyond the formal education system, various folk music training classes and studios have gradually been established, offering flexible and diverse learning channels for learners of all ages, meeting the demand for traditional music education from all sectors of society (Zhang, 2023). This has undoubtedly promoted the popularity of traditional music in schools.

Some teachers use social media platforms to promote traditional culture and Chinese traditional musical instrument courses, attracting more young audiences and enthusiasts. A study on the inheritance and promotion of Chinese traditional music culture in college piano education showed that 88% of respondents emphasized the importance of traditional Chinese music in education (Lu, 2022), indicating that traditional Chinese music education plays an increasingly important role in people's minds.

However, compared to Western music education, the popularity of traditional instrument education is still insufficient. Many schools lack professional teachers and teaching resources, making it difficult for students to systematically learn and master traditional musical instruments. At the same

time, in a rapidly changing social environment, the younger generation can show a diminished interest in traditional culture, leading to a cultural disconnect to some extent (Zhang & Choatchamrat, 2023). To improve this situation, higher demands are placed on the cultural sustainability and professional competence of teachers.

Previous research shows that teachers with high-level teaching skills significantly improve student learning outcomes and interest (Zhang, 2023). Their professional knowledge and skills influence the students' enthusiasm for traditional culture. Teachers in traditional Chinese musical instrument education must inspire students' interest and cultural identity. Effective teacher training improves education quality and maintains traditional instrument teaching (Du & Leung, 2021). Skilled teachers design effective plans, teach complex techniques, and promote an understanding of the aesthetic characteristics of traditional Chinese music. They use diverse approaches to cultivate musical literacy and cultural identity and foster sustainability through creative activities. Competent teachers ensure the authentic transmission of musical styles and facilitate global cultural exchange. Improving teacher training and professional competence is the key to quality education, cultural preservation, and innovation in the education of traditional Chinese musical instruments.

Cultural sustainability in traditional Chinese musical instrument education involves preserving and utilizing cultural resources, including tangible heritage such as instruments and scores, and intangible heritage such as values and customs. Promoting cultural sustainability maintains cultural diversity, passes on traditional music, and ensures future generations appreciate this heritage, traditional Chinese music is crucial for modern music development, carrying historical memory, and reflecting national identity. Incorporating traditional music into education promotes cultural inheritance and innovation. Ma & Chen (2024) argue that the vitality and adaptability of traditional music culture are essential for its sustainable development.

Achieving cultural sustainability requires teachers to understand the cultural context of traditional Chinese music and effectively transfer this knowledge. Teachers should encourage creative expressions of traditional music while maintaining its authenticity. Digital technology, such as online platforms and courses, can expand the audience and facilitate the sharing of traditional music across cultures. Teachers must also adapt to the cultural needs of students, promoting cultural identity and pride and encouraging them to be active in cultural heritage and innovation. In summary, cultural sustainability in traditional Chinese music involves educational concepts, teaching practices, and cultural policies, which require collaboration between educators, scholars, and society to support the sustainable development of traditional music culture.
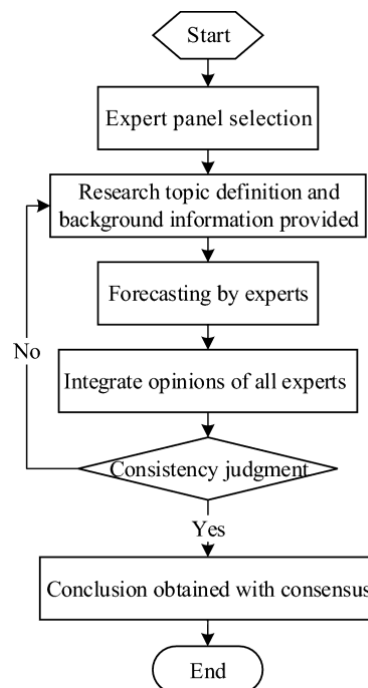

Fig. 2 Delphi Method

The Delphi method is a systematic, interactive way of gathering expert opinions, commonly used in forecasting and decision-making research; its basic principle involves achieving expert consensus through multiple rounds of anonymous surveys (Barrios, 2021).).). As shown in Fig.2, researchers first select a group of experts with extensive experience and professional knowledge in the process. They then collect the opinions of these experts through questionnaires, providing feedback after each round until a consensus is reached.

The Competency Based Education (CBE) model emphasizes students' mastery of specific competencies, including knowledge, skills, and attitudes, providing a theoretical foundation for this study. Research using the CBE model spans multiple educational fields. Foster and Jones (2020) found a significant improvement in students' competency levels through a self-assessment based on CBE. Wang & Luo (2021) applied CBE to e-Commerce course reform, highlighting its versatility.

These studies validate CBE's potential to improve educational quality and adaptability by promoting competency development, innovative teaching methods, curriculum reform, and practical skill enhancement. This study aims to apply the CBE model to teacher training for traditional Chinese musical instrument education, proving its applicability and effectiveness. This will provide practical guidance and theoretical support to cultivate educators in traditional Chinese music.

Currently, research on educational methods for Chinese traditional musical instruments and prospective teacher training is insufficient, with a lack of guidelines for the necessary teaching competencies. This study enriches the theoretical application of the CBE model in traditional Chinese music education and provides practical references for teacher training and curriculum design. By systematically exploring teacher trainee competencies, we can enhance the quality of traditional Chinese musical instrument education and promote the inheritance and development of Chinese traditional music.
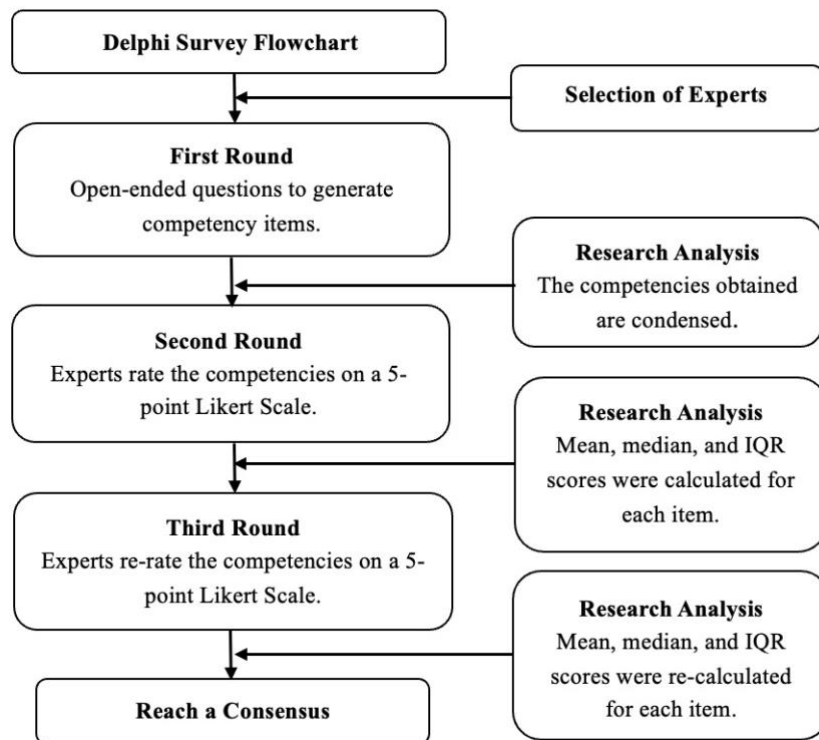
3.   Methodology

3.1   Research Design

Fig. 3. Delphi Study Research Flowchart

This study used the Delphi method, with data collected through the online platform WeChat and Questionnaire Star. As illustrated in Figure 3, the first round involved open-ended questions where experts were invited to share their views. The subsequent two rounds used a 5-point Likert scale (1 = not important to 5 = very important) to reach a consensus on quantitative ratings. This study maintained anonymity to prevent peer pressure, ensuring independent and innovative opinions from experts.

3.2 Unit of Analysis

The unit of analysis in this study is the trainee teacher, defined as individuals who are trained to become certified music teachers. These trainees are pivotal for the future development and enhancement of traditional Chinese music education. Identifying the competencies they should possess is essential to promote cultural sustainability in traditional Chinese musical instrument education, thus improving the effectiveness and relevance of teacher training courses.

3.3 Sampling Design

This study selected five accomplished professors in the field of Chinese music to form the expert panel. The professors come from diverse regions and institutions, specializing in different traditional Chinese musical instruments, which can ensure the diversity and representativeness of the panel. The purposive sampling method was used, and the selected professors met the following criteria:

i) They must have notable academic achievements in Chinese music education, including significant published research papers or books in the field.

ii) They should have extensive experience in traditional Chinese musical instrument education and a deep understanding of related courses and teaching methods.

iii) They must be highly regarded and influential in the music education community and recognized by their peers as experts in the field.

These criteria ensured a wide range of perspectives and opinions, improving the professionalism and reliability of the study results.

3.4 Questionnaire Design and Data Analysis

This research involves a three-round questionnaire design and three-round data analysis, with each questionnaire available in both Mandarin and English. The first round consists of qualitative research, while the subsequent two rounds involve quantitative research.

3.4.1 Round 1

The first-round questionnaire comprised two sections: demographic information and open-ended questions. The demographic section included age, gender, organization, educational background, and academic title, ensuring the diversity and representativeness of the expert panel. The open-ended questions invited experts to list six core competencies needed for teacher trainees to promote cultural sustainability in the education of traditional Chinese musical instruments. All experts were encouraged to freely express their professional experiences and views, providing detailed and comprehensive responses. After collecting the first-round questionnaires, the qualitative data collected were coded and categorized based on the Competency-Based Education (CBE) model.

3.4.2 Round 2

The second-round questionnaire condensed the responses from the first round, asking respondents to rate the competencies using a 5-point Likert scale (1 = not important to 5 = very important). This quantitative scoring method facilitated a systematic assessment of the importance of each competency and provided the underlying data for subsequent analysis. The mean, median, and Interquartile Range (IQR) were calculated using SPSS, with the following criteria (Tables 2, and 3) for consensus assessment:

Table 2. Level of Consensus

IQR	Level of Consensus	Description
IQR ≤ 1	Strong consensus	There is a high degree of concentration of respondents' opinions.
1 < IQR ≤ 2	Moderate Consensus	There was some concentration of respondents' opinions, but there was some disagreement.
IQR > 2	Weak and No Consensus	The opinions of the respondents were scattered and lacked consensus.

Table 3. Level of Importance

Median	Level of Importance	Description
M≥4	High Importance	The importance of this competency was considered high by the respondents.
M<4	Low Importance	The importance of this competency was not perceived as high by the respondents.

3.4.3   Round 3

The third-round questionnaire followed the same format and questions as the second-round questionnaire and also included the mean and median of the second-round ratings. The design was intended to invite experts to reassess the importance of each competency based on feedback from previous rounds. The inclusion of statistics from round 2 allowed experts to review the consensus of panel members and contributed to a more informed and reflective assessment, resulting in a stronger consensus on the competencies to be assessed.

In terms of data analysis, round 3 used the same approach to determine the level of consensus as Round 2, which can further enhance the reliability and credibility of the findings. Based on the feedback from the first two rounds, the experts re-evaluated the importance of the competencies to further narrow down the divergence and reach a final consensus. A three-round study is more feasible in terms of time and resources; two rounds may not be sufficient to reach a full consensus, while more rounds may lead to a waste of time and resources.

4.   Data Analysis: Experts' Consensus

4.1   Round 1

The following Table 4 is the information and description of the five interviewees:

Table 4. Demographic Information of Respondents

Demographic Information	Description
Age	42-53
Gender	Female*4, Male*1
Organization	Different regions, different universities: Taishan University*1, Sichuan Conservatory of Music*1, Central Conservatory of Music*1, Nanjing University of the Arts*1, Shenyang Conservatory of Music*1
Education background	Masters*4, PhD*1
Major	Different Traditional Chinese Musical Instruments: Pipa*1, Guqin*1, Guzheng*1, Flute*1, Erhu*1
Academic Title	Expert*5

Based on the responses of the five professors, the identified competencies were systematically analyzed, merged, omitted, and summarized, ultimately resulting in 18 competency items. These competencies can be categorized according to the Competency Based Education (CBE) model, which consists of three core dimensions: musical knowledge (as shown in Table 5), teaching skills (as shown in Table 6), and cultural attitudes (as shown in Table 7).).

Table 5. Dimension: Musical Knowledge

Competency	Mastering and Showcasing Musical Intricacies	Upholding Professional Standards in Music Performance	Appreciation of Aesthetic Values of Traditional Chinese Music	Practical and Stage Performance Competency	Professional Competency in Music Theory	Acoustic Recognition Skills
Description	Teacher trainees are expected to have excellent playing skills, be able to play traditional Chinese musical instruments accurately and fluently, and be able to demonstrate the musical appeal of the instrument with confidence in a variety of situations.	Teacher trainees are expected to master standardized performance and teaching methods, demonstrate a high level of instrumental skills, and accurately grasp and interpret the unique charm of traditional Chinese music.	Teacher trainees should have the ability to appreciate traditional Chinese music in terms of rhythm, fingering, and emotion and be able to critically analyze it.	Teacher trainees should have practical experience playing and performing on stage to be able to provide practical guidance to students in actual performance activities.	Teacher trainees are expected to have a solid basic knowledge of music theory and can deeply understand and utilize the close integration of harmony, mode, and instrumental music.	Teacher trainees should have excellent sight-singing and listening skills and be able to accurately recognize and understand melodic, rhythmic, and other elements of music.

Table 6. Dimension 2: Teaching Skills

Competency	Pedagogical Skills	Teaching Design and Implementation Skills	Collaborative Skills	Emotional Expression Competency	Creativity and Innovation	Competency to Integrate Interdisciplinary Approach
Description	Trainee teachers should have a solid ability to teach a musical instrument and be able to	Teacher trainees can utilize teaching strategies and methods flexibly in instructional	Teacher trainees are expected to have collaborative skills, to be able to lead folk	Teacher trainees should be able to convey emotions and stories through	Teacher trainees must innovate based on tradition, create new works and	Teacher trainees should be able to cross the boundaries of art forms and cultural domains to

guide students to progressively master the basics and skills of playing a traditional Chinese musical instrument.	design and implementation to ensure that the teaching content matches the characteristics of students and promotes their holistic development and learning effectiveness.	instrumental groups and to coordinate the cooperation of different instruments, to enhance the overall performance of the group, and to develop a spirit of cooperation and teamwork among students.	music, guiding students to become emotionally invested in their performances, to appreciate the depth of the music, and to achieve a higher level of artistic excellence.	performance styles that incorporate modern musical elements, stimulate students' creativity, and expand the playing space and audience for traditional instruments.	enrich and deepen students' learning and experience of traditional Chinese music by integrating knowledge and skills from different disciplines.

Table 7. Dimension 3: Cultural Attitudes

Competency	Research Skills and Knowledge Dissemination	Lifelong Learning Approach	Cultural Promotion and Exchange Competency	Cultural Adapt Competency	Cultural Sensitivity, Identity, and Responsibility	Global Perspective, and Cultural Ambassadorship
Description	Teacher trainees should be able to conduct independent academic research, master scientific research methods and thesis writing skills, and be able to effectively disseminate the results of their research for the advancement and development of the academic field and educational practices.	Teacher trainees are expected to have a positive attitude toward learning and self-reflection and to be able to adapt to the ever-changing field of music through continuous learning and exploration, maintaining a continuous improvement in professionalism and teaching standards.	Teacher trainees should utilize modern technology to effectively promote the culture of traditional Chinese music and musical instruments, facilitate cultural exchanges and dissemination, and increase public knowledge and appreciation of traditional Chinese musical culture.	Teacher trainees should flexibly combine traditional and modern musical elements in their teaching practice so that traditional music can approach contemporary aesthetics while maintaining its traditional essence.	Teacher trainees should realize the importance of cultural inheritance and, through their actions and influence, promote the recognition and protection of traditional music and culture in society and facilitate its wide dissemination and influence in society.	Teacher trainees can promote and showcase traditional musical instruments worldwide, acting as cultural ambassadors and promoting the global dissemination and awareness of traditional Chinese music culture.

4.2   Round 2

Based on the responses from the expert panel in the first round, the 18 identified competencies were integrated into a questionnaire, which includes three dimensions. Dimension 1, Musical knowledge, includes questions 1-6. Dimension 2, Teaching skills, includes questions 7-12. Dimension 3, Cultural Attitudes, includes questions 13-18. Table 8 presents the scores for this round of the survey, including the median, mean, and interquartile range for each question.

Table 8. The Scores in Round 2

Items	Mean	Median	Percentiles			IQR
			25	50	75	
Q1	4.80	5.00	4.50	5.00	5.00	0.50
Q2	4.80	5.00	4.50	5.00	5.00	0.50
Q3	4.60	5.00	4.00	5.00	5.00	1.00
Q4	4.60	5.00	4.00	5.00	5.00	1.00
Q5	4.40	4.00	4.00	4.00	5.00	1.00
Q6	4.40	4.00	4.00	4.00	5.00	1.00
Q7	4.80	5.00	4.50	5.00	5.00	0.50
Q8	4.20	4.00	4.00	4.00	4.50	0.50
Q9	4.20	5.00	3.00	5.00	5.00	2.00
Q10	4.40	5.00	3.50	5.00	5.00	1.50
Q11	3.80	4.00	3.00	4.00	4.50	1.50
Q12	3.80	4.00	3.00	4.00	4.50	1.50
Q13	4.00	4.00	3.00	4.00	5.00	2.00
Q14	4.60	5.00	4.00	5.00	5.00	1.00
Q15	4.40	5.00	3.50	5.00	5.00	1.50
Q16	4.60	5.00	4.00	5.00	5.00	1.00
Q17	4.40	5.00	3.50	5.00	5.00	1.50
Q18	4.40	5.00	3.50	5.00	5.00	1.50

This round found a maximum IQR value of 2 for all items, which indicates that consensus was reached for all competency items. For questions Q1-Q8, Q14, and Q16, the IQR values were less than or equal to 1, indicating a strong consensus with a high concentration of the respondents' opinions on the competencies represented by these questions. And for Q9-Q13, Q15, Q17-Q18 questions, the IQR values were greater than 1 and less than or equal to 2, indicating moderate consensus with a moderate concentration of respondents' opinions. Furthermore, the median values for all items were greater than or equal to 4, indicating that the respondents perceived all the competencies to be of high importance. Therefore, as shown in Table 9, this round of research found strong consensus and high importance for 10 competencies (Q1-Q8, Q14, Q16) and moderate consensus and high importance for 8 competencies (Q9-Q13, Q15, Q17-Q18). All six competencies in dimension one had strong consensus and were of high importance.

Table 9. The Results in Round 2

Level	Description	Questions
Strong Consensus- High Importance	(IQR ≤ 1) and (M ≥ 4)	Q1-Q8, Q14, Q16
Moderate Consensus -High Importance	(1<IQR≤2) and (M≥4)	Q9-Q13, Q15, Q17-Q18

4.3   Round 3

Table 10 demonstrates the scores from the third round of the study. Similar to the results of the previous round of research, this round also found that the maximum IQR value for all questions was 2, indicating that consensus was reached for all competency items and the median for all items was higher than or equal to 4, suggesting that respondents perceived the importance of all competencies to be high. As shown in Table 11, 16 competencies (Q1-Q8, Q10-Q14, Q16-Q18) were found to have strong consensus and high importance in this round of the study, which is a significant increase from the previous round of the study, and 6 of the items (Q10-Q13, Q17-Q18) shifted from moderate consensus to strong consensus. Moderate consensus and high importance existed for only two competencies (Q9 and Q15).

Table 10. The Scores in Round 3

| Items | Mean | Median | Percentiles | | | IQR |
			25	50	75	
Q1	5.00	5.00	5.00	5.00	5.00	0.00
Q2	5.00	5.00	5.00	5.00	5.00	0.00
Q3	4.80	5.00	4.50	5.00	5.00	0.50
Q4	4.60	5.00	4.00	5.00	5.00	1.00
Q5	4.40	4.00	4.00	4.00	5.00	1.00
Q6	4.40	4.00	4.00	4.00	5.00	1.00
Q7	4.80	5.00	4.50	5.00	5.00	0.50
Q8	4.40	4.00	4.00	4.00	5.00	1.00
Q9	4.20	4.00	3.50	4.00	5.00	1.50
Q10	4.60	5.00	4.00	5.00	5.00	1.00
Q11	4.00	4.00	3.50	4.00	4.50	1.00
Q12	4.00	4.00	3.50	4.00	4.50	1.00
Q13	4.00	4.00	3.50	4.00	4.50	1.00
Q14	4.60	5.00	4.00	5.00	5.00	1.00
Q15	4.40	5.00	3.50	5.00	5.00	1.50
Q16	4.40	4.00	4.00	4.00	5.00	1.00
Q17	4.60	5.00	4.00	5.00	5.00	1.00
Q18	4.60	5.00	4.00	5.00	5.00	1.00

Table 11. The Results in Round 3

Level	Description	Questions
Strong consensus - high importance consensus - high importance	(IQR ≤ 1) and (M ≥ 4)	Q1-Q8, Q10-Q14, Q16-Q18
Moderate consensus - high importanceconsensus - high importance	(1<IQR≤2) and (M≥4)	Q9, Q15

As shown in Table 12, the medians of two items (Q9, Q16) changed compared to Round 2, both decreasing from 5.0 to 4.0, while the medians of all other items remained the same. Although these two medians decreased, they still show high importance.

In the final round, 10 items (Q1-Q3, Q9-Q13, Q17, Q18) showed a decrease in IQR, indicating an increase in the level of respondent consensus. 7 items (Q4-Q7, Q14-Q16) showed a constant IQR. However, one item of the item Q8 had an increase in IQR, indicating a decrease in the level of respondent consensus for this competency, but still at a high level of consensus.

Table 12. Comparison of scores between Round 2 and Round 3

Items	Median		IQR	
	Round 2	Round 3	Round 2	Round 3
Q1	5.00	5.00	0.50	0.00
Q2	5.00	5.00	0.50	0.00
Q3	5.00	5.00	1.00	0.50
Q4	5.00	5.00	1.00	1.00
Q5	4.00	4.00	1.00	1.00
Q6	4.00	4.00	1.00	1.00
Q7	5.00	5.00	0.50	0.50
Q8	4.00	4.00	0.50	1.00
Q9	5.00	4.00	2.00	1.50
Q10	5.00	5.00	1.50	1.00
Q11	4.00	4.00	1.50	1.00
Q12	4.00	4.00	1.50	1.00
Q13	4.00	4.00	2.00	1.00
Q14	5.00	5.00	1.00	1.00
Q15	5.00	5.00	1.50	1.50
Q16	5.00	4.00	1.00	1.00
Q17	5.00	5.00	1.50	1.00
Q18	5.00	5.00	1.50	1.00

5.   Findings and Discussion

In this study, three Delphi rounds were conducted. The first round identified and confirmed 18 core competencies for teacher trainees in promoting cultural sustainability in traditional Chinese musical instrument education, covering musical knowledge, teaching skills, and cultural attitude. The second round had experts score these competencies, which shows high importance and consensus. In the third round, experts rescored the items using the previous round's data, resulting in increased consensus, with 16 competencies reaching high consensus and importance, validating their centrality in fostering teacher training.

5.1   Musical Knowledge

Within the musical knowledge dimension, the six competencies achieved high consensus and importance in three Delphi rounds, highlighting the critical role of musical knowledge in teacher training. These competencies are ranked according to third-round scores:

Table 13. Musical Knowledge Rank

Rank	Competency	Mean	Median	IQR
1	Mastering and Showcasing Musical Intricacies	5.00	5.00	0.00
1	Upholding Professional Standards in Music Performance	5.00	5.00	0.00
2	Appreciation of theof the Aesthetic Values of Traditional Chinese Music	4.80	5.00	0.50
3	Practical and Stage Performance Competency	4.60	5.00	1.00
4	Professional Competency in Music Theory	4.40	4.00	1.00
4	Acoustic Recognition Skills	4.40	4.00	1.00

The mastery and presentation of musical intricacies and the protection of professional standards in music performance were ranked highest, indicating their essential role in teacher training. Proficient performance skills are necessary to effectively teach and present traditional music, which

supports the transmission of musical knowledge and enhances the students' appreciation of traditional music and culture (Du & Leung, 2021). Similarly, maintaining high professional standards in music performance is crucial for providing quality instruction and preserving traditional performance skills.

The appreciation of the aesthetic values of traditional Chinese music also ranked highly, highlighting the importance of teachers understanding and conveying the artistic aspects of the music. This capability allows teachers to guide students in to appreciate and analysing music deeply, fostering a greater love for the art form.

Practical and stage performance competency is vital to inspiring students and demonstrating artistic skills effectively. This competency helps teachers engage students and stimulate their interest in music.

Professional competence in music theory and acoustic recognition skills was also identified as crucial. A solid foundation in music theory is essential for effective teaching and deep musical understanding. Acoustic recognition skills are important for identifying and interpreting musical elements, which improves musical literacy for both teachers and students.

In this study, all of the above six competencies reached strong consensus and high importance in the two rounds of research, showing that experts agreed that competencies in musical knowledge have an indispensable place in traditional Chinese instrument education, which provides a scientific basis and empirical support for the design and implementation of teacher training programs.

5.2   Teaching Skills

The study identified six core competencies within the dimension of teaching skills, emphasizing the need for teachers to use teaching strategies effectively, lead student teams, express emotions through music, innovate with contemporary elements and integrate interdisciplinary approaches. These competencies, ranked by third-round scores, are:

Table 14. Teaching Skills Rank

Rank	Competency	Mean	Median	IQR
1	Pedagogical skills	4.80	5.00	0.50
2	Emotional expression competency	4.60	5.00	1.00
3	Teaching Design and Implementation Skills	4.40	4.00	1.00
3	Creativity and Innovation	4.00	4.00	1.00
4	Competency to Integrate Interdisciplinary Approach	4.00	4.00	1.00
5	Collaborative skills	4.20	4.00	1.50

Pedagogical skills were ranked highest, emphasizing the need for teachers to have solid foundational skills to guide students in acquiring instrumental knowledge and techniques. Systematic teaching methods and strategies improve student learning and skills transfer, aligning with previous research on the importance of effective teaching practices (Gultom et al., 2020; Teoh et al., 2022).

Emotional expression competency ranked second, highlighting the need for teachers to convey emotions and stories through music. This ability is essential for guiding students to appreciate the deeper meaning of music and achieve artistic excellence.

Teaching design and implementation skills were also critical, as teachers must design instructional programs that align with students' needs and utilize various methods to engage and motivate students. Effective instructional design increases student engagement and learning outcomes.

Creativity and innovation were emphasized as necessary to maintain the essence of tradition while incorporating modern elements to stimulate student creativity and broaden their performance opportunities. This aligns with the view that innovation is crucial to fostering artistic creativity.

Interdisciplinary integration skills are important for enriching students' learning experiences by combining traditional music with other art forms. This approach enhances the students' holistic understanding of music.

Collaborative skills, though crucial, received moderate consensus, suggesting some uncertainty about their evaluation. Collaboration in music education is important to enhance student

performance skills and teamwork. Further research could clarify the role of collaborative skills in music education and strengthen their development in teacher training.

5.3 Cultural Attitude

In the dimension of cultural attitudes, experts highlighted several key competencies essential for teaching traditional Chinese music, which emphasize the role of teachers in preserving and promoting traditional culture. Ranked by third-round scores:

Table 15. Cultural Attitude Rank

Rank	Competency	Mean	Median	IQR
1	Cultural sensitivity, identity, and responsibility	4.60	5.00	1.00
1	Global perspective, and cultural ambassadorship	4.60	5.00	1.00
1	Lifelong learning approach	4.60	5.00	1.00
2	Cultural adaptability competency	4.40	4.00	1.00
3	Research Skills and Knowledge Dissemination	4.00	4.00	1.00
4	Competency in Traditional Chinese Music Promotion and Cultural Exchange	4.40	5.00	1.50

Expert. No.3 noted that teacher trainees must embody a strong sense of cultural inheritance and inspire students to appreciate and uphold traditional music. This aligns with Guan & Matsunobu (2023), who stressed the importance of cultural transmission and identity in education.

The global perspective and cultural ambassadorship were also emphasized with Expert. No.2 advocates for teachers to promote traditional music internationally, fostering cultural exchange. This view is supported by Wong (2020), who underscored the role of a global perspective in expanding the international presence of traditional music.

An approach of lifelong learning was identified as crucial by Expert. No.3 highlights the need for teachers to continually update their skills and knowledge; ongoing learning is vital for educators to remain competitive and innovative.

Cultural adaptation competency involves the combination of traditional and modern elements, as suggested by Expert. No.3. This approach helps traditional music resonate with contemporary aesthetics while preserving its essence.

Research skills and knowledge dissemination are also important. Expert. No.5 emphasized that teachers must improve their academic skills to contribute to the field through high-quality research.

Finally, the competence in the promotion and cultural exchange of traditional Chinese music showed moderate consensus. Expert. No.2 observed that the role of technology in education is becoming more and more important with time. However, the competency of Traditional Chinese Music Promotion and Cultural Exchange Competency showed a moderate consensus with an IQR of 1.50 in both rounds of scoring, indicating that there are some differences and uncertainties in the experts' assessment criteria for this competency. This competency requires further exploration to enhance the visibility and impact of traditional music.

5.4 Recommendation

The study recommends that the 18 identified competencies be incorporated into teacher training curricula to ensure comprehensive skill coverage. Additionally, recommendations include focusing on the dimension of music knowledge, given its high consensus of experts. Specific competencies such as mastering musical intricacies, upholding professional standards, appreciating aesthetic values, practical performance, music theory, and acoustic recognition are particularly important.

In addition, the study suggests that teaching skills be enhanced to enhance professional development in music education. Educational institutions should design and implement professional development programs that focus on improving instructional design and delivery, fostering teamwork,

encouraging innovation, and integrating interdisciplinary approaches. These programs will help teachers improve their pedagogical skills and practices.

To promote cultural sustainability, it is also essential to focus on teachers' cultural attitudes and encourage cross-cultural collaboration. This can be achieved through cooperation with international organizations to promote traditional Chinese music globally. Organizing international music festivals, cultural exchange programs, and collaborative research projects can improve global dissemination and awareness of traditional Chinese music.

Further research on specific competencies is recommended, especially those with moderate expert consensus, such as collaborative skills and traditional Chinese music promotion and cultural exchange competency. Through further research, it will be possible to deepen the understanding of these competencies, improve assessment tools, and refine training methodologies to improve the effectiveness and quality of teacher training.

5.5   Limitations and Future Direction

This study has several limitations which also suggest new directions for future research. Firstly, the small sample size due to time and resource constraints limits the diversity of experts in the selected fields, affecting the generalizability of the findings. Future research should increase the sample size and diversity, covering different geographic regions, professional backgrounds, and experience levels. Conducting cross-national studies could provide perspectives from professors in different countries, ensuring comprehensiveness and representativeness, and offering valuable references for international educational exchanges.

Secondly, while the Delphi method integrates expert opinions, it may be influenced by expert subjectivity and individual differences. Variations in educational and practical experiences among experts can lead to divergent opinions, affecting the consensus level. Future research could employ longitudinal studies to track the impact of these competencies on teacher performance and student achievement over time, which can reveal the dynamic process of competency development and its lasting impact on educational outcomes.

Furthermore, this study focused on identifying core competencies for teacher trainees without exploring specific strategies to implement training and improve these competencies. While providing theoretical insight, it lacks practical application details. Future research should delve deeper into practical strategies, such as adapting curricula, enhancing teaching skills, and improving teachers' cultural attitudes. This would offer concrete guidance for educational practice.

Lastly, the study primarily addresses traditional Chinese music, which can limit its applicability to other instrumental or musical fields. Chinese traditional musical instrument education has a unique cultural background and teaching methods, making the findings potentially less relevant to other areas of music education. Future research could explore a wider range of music domains to assess the applicability of these core competencies in different cultural contexts.

In summary, addressing these limitations by expanding sample diversity, employing longitudinal studies, exploring practical implementation strategies, and assessing applicability across different music domains will enhance the robustness and applicability of future research in music education.

6.   Conclusions

This study identified 18 core competencies that teacher trainees need to promote cultural sustainability and effectively teach traditional Chinese musical instruments. Among them, 16 competencies reached a high consensus and were considered highly important, while the other two competencies reached a moderate consensus and were also considered highly important. This study has confirmed that the development of musical education is heavily dependent on the musical knowledge and skills of teachers in the 16 competencies regarding mastering the competencies to perform and appreciate the aesthetic values of traditional music; teaching skills, which include pedagogical, emotional, creative, integration of interdisciplinary approaches and collaborative skills; and cultural attitudes in responsibility, adaptation, research skills, and cultural exchange of traditional music.

Nevertheless, the less emphasis was placed on teaching design and lifelong approach, as measured by the two competencies. These findings could be explained based on previous studies, which highlight that the current focus of music education development is more on emphasizing teacher experiences and creativity in addressing and adapting challenges, particularly regarding demands for administrative support in the use of modern technology to promote traditional music (Zhang & Leung, 2023; Zhao Liang & Rozniza Zaharudin, 2023).). Even though less emphasis is placed on teaching design and lifelong learning, these two competencies are indirectly embedded in pedagogical skills and cultural attitudes, since the drives towards competencies were highly rated.

Therefore, the 18 competencies are critical for teacher training programs and can be integrated into curriculum development and professional development programs. By strengthening and enriching the Competency-Based Education (CBE) model, the study achieves a balance between musical knowledge, teaching skills and cultural attitude, ensuring that teacher trainees not only acquire the skills needed to provide quality music education, but also develop cultural awareness and promote sustainable development.

Closely aligned with the United Nations Sustainable Development Goal 4 (SDG4), the study explored the competencies of trainee teachers in three dimensions: musical knowledge, teaching skills, and cultural attitude. These dimensions not only guarantee high-quality music education and effective teaching, but also strive to develop a sense of cultural identity and responsibility among teacher trainees. By aligning with the goals of inclusiveness, equity, and lifelong learning promoted by SDG4, the study provides a scientific basis for improving educational practices and promoting global dissemination of traditional music, further enhancing cultural sustainability.

Understanding musical education should not be limited to traditional teaching of music lessons. The use of musical development as a source of income has increased professional development by elevating the quality of musical education. Maintaining the pace of quality education, reaffirming SDG-4, and fostering educational innovation have all been critical. A sign of reminder has also informed the need to have alternative multiple teaching content and to bring connectivity among the society (Liu, 2024). Therefore, the findings of this study have reinforced the importance of maintaining professional standards by maintaining professional standards in music performance, which drives the effort to obtain up-to-date and innovative demands.

In addition, this study expands the understanding of teacher competencies in traditional music education and provides valuable insights for curriculum designers, policy makers, and educators. It fills a gap in existing research and lays the foundation for further exploration of effective teacher training and development strategies. Overall, the results of this study are expected to inform and inspire future research and practice in the field, ultimately contributing to the development of more effective and culturally sustainable music education programs.

7.   Co-Author Contribution

ZX – Conceptualisation, methodology, instrument development, data analysis, preparing the draft paper, reviewing and editing; PM– Conceptualisation, methodology, instrument development, data analysis, preparing the draft paper, reviewing and editing, supervision; TSH- Paper writing, reviewing and editing the final paper; GX- data analysis and analytical insights in the discussion section, language checking and editing. LC- planning and collecting data, data validation.

8.   References

Barrios, M., Guilera, G., Nuño, L., & Gómez-Benito, J. (2021). Consensus in the delphi method: What makes a decision change? *Technological Forecasting and Social Change*, 163, 120484.
Çalışkan, S. A., Demir, K., & Karaca, O. (2022). Artificial intelligence in medical education curriculum: An e-Delphi study for competencies. *PLoS One*, 17(7), e0271872.
Du, J., & Leung, B. W. (2022). The sustainability of multicultural music education in Guizhou Province, China. *International Journal of Music Education*, 40(1), 131-148.
Eremenko, V., Morsi, A., Narang, J., & Serra, X. (2020). Performance assessment technologies for the support of musical instrument learning.

Foster, M. R. B., & Jones, C. M. (2020). The effects of competency-based education delivery methods on competency level: A quantitative study. *The Journal of Competency-Based Education*, 5(4), e1226.

Guan, T., Luo, N., & Matsunobu, K. (2023). Nurturing student ethnic identity through culturally responsive music teaching in China. *International Journal of Music Education*, 41(4), 598-615.

Gultom, S., Hutauruk, A. F., & Ginting, A. M. (2020). Teaching skills of teacher in increasing student learning interest. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences*, 3(3), 1564-1569.

Hoon, T. S., Muthukrishnan, P., Choo, K. A., Kam, N. K. B. M. Z., & Singh, P. (2022). Preservice teachers' motivation and adoption of 21st-century skills. *Computer-Assisted Language Learning Electronic Journal, 23*(4), 205-218.

Jia, Q. (2021). Application of Chinese traditional musical instruments. *Scientific and Social Research, 3*(1).

Kallia, M., van Borkulo, S. P., Drijvers, P., Barendsen, E., & Tolboom, J. (2021). Characterising computational thinking in mathematics education: a literature-informed Delphi study. Research in mathematics education, 23(2), 159-187.Peng, Y., & Zhan, Y. (2024). *Quality Education and the Reform of Ethnic Instrumental Music Teaching in Basic Music Education. Cultura: International Journal of Philosophy of Culture and Axiology*, 21(1).

Liu, X. (2024). Research on the Innovative Development of Chinese Music Education in the Context of the New Era. *Lecture Notes in Education Psychology and Public Media*, *41*(1), 79–83. https://doi.org/10.54254/2753-7048/41/20240733

Lu, D. (2022). Inheritance and promotion of Chinese traditional music culture in college piano education. *Heritage Science*, 10(1), 75.

Ma, Y., & Chen, Y. (2024). Exploring the Model of Contemporary Chinese Ethnic Musical Instrument Improvement Mechanisms: Based on Grounded Theory. *SAGE Open*, 14(1), 21582440241235018.

McNeill, J., & McPhail, G. (2020). One Direction: strategic challenges for twenty-first century school music. *Music Education Research*, 22(4), 432-446.

Nordin M.N., Hashim S.N.A., Maidin S.S., Rahman A.A., Yusuf R., Abbas M.S., Mosbiran N.F. (2024). Exploring Previous Studies Related to the Relationship and Influence Between Teacher Competence, Individual Education Plans and the Development of Pupils with Special Education Needs Visual Impairment. *African Journal of Biological Sciences (South Africa)*. https://doi.org/10.33472/AFJBS.6.6.2024.224-230

Wang, L. (2019). Exploration on the reform and innovation of national instrumental music teaching in colleges and universities under the new situation. In 2019 1st International Education Technology and Research Conference (IETRC 2019). *UK: Francis Academic Press* (pp. 153-7).

Wang, N., & Luo, M. (2021, January). Discussion on the teaching reform of "Cross-Border E-Commerce" based on CBE teaching mode. *In 2021 2nd International Conference on Education, Knowledge and Information Management* (ICEKIM) (pp. 199-203). IEEE.

Wong, J. Y. (2020). Chinese musical culture in the global context–modernization and internationalization of traditional Chinese music in twenty-first century. *Chinese culture in the 21st century and its global dimensions: Comparative and interdisciplinary perspectives*, 105-122.

Xia, J. (2022). Shaping selves in the diaspora: contemporary professional Chinese instrumental musicians and transnational/intercultural music-making in North America (*Doctoral dissertation, Memorial University of Newfoundland*).

Xie, L. (2024). Ways In Which New Media Promote Traditional Chinese Music. Journal of Education, *Humanities and Social Sciences*, 26, 251–256. https://doi.org/10.54097/mw2e7471

Zhang, E., & Choatchamrat, S. (2023). Dissemination of Folk Song Literacy in China's Northern Shaanxi Province. *International Journal of Education and Literacy Studies*, 11(4), 131-140.

Zhang, L.-X., & Leung, B.-W. (2023). Context matters: adaptation of student-centred education in China school music classrooms. *Music Education Research*, *25*(4), 418–434. https://doi.org/10.1080/14613808.2023.2230587

Zhang, Z. (2023). Rural Music Education in China: Perceptions of Music Educators in Henan Province (*Doctoral dissertation*).

Zhao Liang, & Rozniza Zaharudin. (2023). A Case Study of China Music Teachers in the Use of Assistive Technology in Teaching. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, *34*(1), 328–336. https://doi.org/10.37934/araset.34.1.328336