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Teaching in Tune with Technology: Insights and Perspectives of Teachers on Information-Assisted Music Education

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Abstract

The integration of technology in education, particularly in specialized fields such as music teaching, remains a significant challenge worldwide. In China, despite governmental efforts such as the "Internet Plus Education" initiative, there is limited understanding of junior high school music teachers' perceptions and the factors influencing their adoption of information-assisted technology. This study aimed to explore junior high school music teachers' insights on the use of information-assisted technology in music education and to identify the facilitating and hindering factors affecting its integration. The research was conducted in Shaoguan City, Guangdong Province, employing a sequential explanatory mixed-methods approach. Initially, a quantitative survey based on the Unified Theory of Acceptance and Use of Technology 2 (UTAUT 2) was administered to 213 music teachers. This was followed by qualitative semi-structured interviews with selected respondents to gain deeper insights. Findings indicated that performance expectancy, facilitating conditions, hedonic motivation, and habit were significant predictors of teachers' intentions to adopt information-assisted technology. Qualitative analysis further highlighted that, although teachers recognized significant benefits such as enhanced student engagement and improved instructional resources, they also encountered challenges including inadequate training, limited infrastructure, and varying levels of institutional support. The study contributes to the field by extending the applicability of the UTAUT 2 framework to music education and highlighting the critical role of professional identity and institutional culture in technology adoption. It provides valuable implications for educational policy, emphasizing the need for targeted professional development, investment in infrastructure, and participatory leadership approaches to support effective technology integration in music education.

Keywords: Music Education, Information-Assisted Technology, Technology Integration, UTAUT 2

Background of the Study

Due to the ever-developing characteristics of technology, the adoption of information-assisted technology in different fields is expanding continuously. There is also a trend of using information-assisted technology in the education industry. In this context, it is important to highlight the differences between computer-assisted education and information-assisted education. In general, computer-assisted education stresses the use of technology, particularly computers, to improve the learning process. In contrast, information-assisted education is about utilizing an immense amount of information, usually via the Internet, to support and enrich the educational experience.

In the contemporary digital age, technology has become an integral part of education across disciplines, including music education. With the increasing accessibility and innovation of digital tools, educators are finding new ways to integrate technology into teaching and learning processes. This integration is particularly relevant in music education, where traditional practices are being supplemented or transformed through the use of digital audio workstations, virtual instruments, and online learning platforms. In China, national initiatives such as the "Internet Plus Education" strategy have further accelerated the adoption of technology in classrooms.

Within the context of junior high schools in Shaoguan City, Guangdong Province, there has been a growing interest in understanding how music teachers are adapting to this technological shift. While many global studies have documented the benefits and challenges of technology use in music education, localised insights from Chinese junior high school music teachers remain limited. This study seeks to explore the perspectives of these educators to understand the factors influencing their adoption of information-assisted technology and how these tools are reshaping music education.

While global research increasingly explores the integration of technology in music education, the Chinese context, especially at the junior high school level remains underexplored. As a result, there is a limited understanding of how Chinese junior high school music teachers perceive, adapt, and respond to information-assisted technologies in their teaching practices. Thus, this study is significant to fill the geographic and disciplinary void by providing localized, contextualized insights. This study contributes by expanding the understanding of the current state of technology integration in music education within the Chinese context. It also provides empirical evidence that can inform theoretical discussions around the use of UTAUT 2 in music education. The findings can guide policymakers and school administrators in designing targeted interventions to support music teachers. This study is also effective in understanding the facilitators and barriers that can guide the design of professional development programs and improve the effectiveness in allocating the teaching resources.

Problem Statements

Despite policy encouragement and advancements in digital technologies, the integration of information-assisted tools in music education in China remains inconsistent. Various factors ranging from infrastructure and teacher readiness to pedagogical beliefs may influence this integration. There is a lack of empirical research that specifically investigates how junior high school music teachers in Shaoguan City perceive and implement these technologies. Without a clear understanding of their insights and the challenges they face, efforts to promote

effective technology integration in music education may be misaligned or ineffective. Table 1 shows three types of research gaps that contribute to the significance this study.

Table 1
Research gaps and how this study fills the gaps

Type of Gap	Description	How This Study Fills the Gap
Literature Gap	Lack of studies on Chinese junior high music teachers' perspectives on tech integration	Focuses on Shaoguan City's junior high music teachers using empirical data
Theoretical Gap	Limited use of robust models in arts education; UTAUT 2 underutilized in music education in China	Applies UTAUT 2 to a new domain and context, enriching its applicability
Methodological Gap	Over-reliance on single-method (quantitative) designs in previous studies	Employs a mixed-method sequential explanatory design for richer, more nuanced analysis

Research Objectives

1. To investigate the insights of junior high school music teachers in Shaoguan City on the adoption of information-assisted technology in music education.
2. To identify the factors that facilitate or hinder the integration of technology in music education among these teachers.

Research Questions

1. What are the insights of junior high school music teachers in Shaoguan City on the adoption of information-assisted technology in music education?
2. What factors facilitate or hinder the integration of technology in music education in Shaoguan City?

Literature Review

Internationally, music educators have increasingly adopted platforms such as GarageBand, Soundtrap, and MuseScore, enabling students to engage actively in composition, performance, and critical listening activities. Furthermore, during the COVID-19 pandemic, the reliance on digital platforms like Zoom, Google Classroom, and various music-specific online resources highlighted the vital role of technology in maintaining educational continuity and accessibility. One of the most significant research projects to be highlighted throughout the literature review is the research by Nielsen (2011), which is a study of K-12 music educators' attitudes toward technology-assisted assessment tools. In addition, other research studies on the theme of music education and information-assisted technology are also included in the literature review. China's educational reform in the early 2000s laid the foundation for technology integration. Emphasis on ICT literacy and digital infrastructure development has steadily grown over the years. The integration of technology into music education in China has experienced significant transformations.

Initially driven by basic audio-visual aids in the late 20th century, it gradually expanded into comprehensive digitalization with the advent of personal computers and internet connectivity. Key milestones include the introduction of digital keyboards and notation software in classrooms during the 1990s and early 2000s, which marked the beginning of technology-assisted music teaching practices. Government initiatives such as the National Educational Technology Plan in the 2000s further accelerated the adoption of technology by advocating for digital resources and infrastructure improvements. These developments have set the foundation for broader educational reforms aimed at modernizing music instruction nationwide.

The "Internet Plus Education" Initiative

The "Internet Plus Education" initiative, launched by the Chinese government in 2015, represents a major strategic effort aimed at integrating digital technology deeply into educational practices (State Council of the People's Republic of China, 2015). This initiative seeks to leverage internet technologies to enhance educational equity, resource accessibility, and pedagogical innovation across various disciplines, including music education. Under this framework, schools are encouraged to adopt digital teaching platforms, cloud-based resources, and smart classrooms equipped with interactive multimedia capabilities. Consequently, music educators have increasingly utilized online platforms to facilitate collaborative music-making, virtual performances, and interactive lessons, contributing significantly to educational equity by bridging resource gaps between urban and rural schools.

Despite substantial governmental support and investment, the integration of technology in Chinese music classrooms remains uneven. In urban areas, schools often have robust infrastructures and well-trained staff capable of effectively utilizing technology in music education. Conversely, rural schools frequently face challenges such as limited access to reliable internet connectivity, inadequate equipment, and insufficient teacher training. Moreover, resistance to change among some educators, coupled with rigid curricular demands and traditional assessment practices, hinders widespread adoption. Addressing these issues requires targeted professional development, equitable resource distribution, and policy adjustments focused on fostering flexible, innovation-friendly teaching environments.

Methodology

Conceptual Framework of the Study

This study employs the Unified Theory of Acceptance and Use of Technology 2 (UTAUT 2) as its conceptual framework to examine the factors influencing music teachers' adoption of information-assisted technology. UTAUT 2 incorporates constructs such as performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit, all of which provide a comprehensive lens for analyzing teachers' behavioural intentions and usage patterns regarding technology integration. By leveraging this model, the study aims to identify critical determinants of technology acceptance among junior high school music teachers, thus providing practical insights for enhancing educational practices and informing policy initiatives aimed at supporting effective technology adoption in music education.

Research Design

The study adopts a sequential explanatory mixed-methods design, which combines quantitative and qualitative approaches in two distinct phases. This design allows the researcher to first collect and analyze numerical data and subsequently follow up with qualitative data to provide deeper insights and context. Initially, quantitative data are gathered through a structured questionnaire based on the UTAUT 2 model. The findings from this phase inform the selection of participants and development of the interview guide for the qualitative phase, thus enabling a comprehensive exploration of the research questions. Based on Creswell (2022), the rationale behind this approach is that the quantitative data and findings give a general overview of the research problem; further analysis primarily through the gathering of qualitative data is then needed to refine, broaden or explain the complete idea of the research. This design also provides richer contextual understanding of the statistical findings.

Research Phases and Procedures

Table 2 shows the detailed research phases and procedures of this study.

Table 2

Research Phases and Procedures

Phase	Activity	Details
Phase I: Quantitative Data Collection	Distribution of UTAUT 2-based questionnaire	Questionnaire distributed to junior high school music teachers in Shaoguan City; validated through a pilot study
Phase II: Quantitative Data Analysis	Analysis of survey data	Descriptive statistics (mean, frequency, SD) and inferential statistics (correlation and regression)
Phase III: Selection of Qualitative Respondents	Participant selection for interviews	Purposive sampling based on response patterns from Phase I
Phase IV: Qualitative Data Collection	Conducting interviews	Semi-structured interviews with selected participants to explore deeper insights
Phase V: Qualitative Data Analysis	Thematic analysis of interview transcripts	Transcription, coding, and thematic analysis using ATLAS.ti software
Phase VI: Integration of Results	Merging and interpreting findings	Joint interpretation of quantitative and qualitative results to comprehensively address research questions

Participants

The target population of this study comprises junior high school music teachers working in Shaoguan City, Guangdong Province. Determining the exact number of junior high school music teachers in Shaoguan City, Guangdong Province, presents a challenge due to the lack of publicly available subject-specific teacher data. However, based on available statistics from the Shaoguan City Education Bureau (2022), there are a total of 126 junior high schools across

the city, which includes both standard junior high schools and nine-year compulsory education schools. These institutions collectively employ approximately 8,833 full-time teaching staff.

In the context of the Chinese education system, music is classified as a non-core subject (yìshù kēmù, 艺术科目), typically offered as part of the general curriculum in junior high schools. National and provincial staffing patterns suggest that music teachers constitute a relatively small percentage of the total teaching workforce. Studies and policy documents from comparable educational contexts indicate that music teachers generally represent approximately 2% to 5% of a school's total teaching staff, depending on school size, policy emphasis on arts education, and available resources. The estimated number of junior high school music teachers in Shaoguan City ranges between 177 and 442. This range provides a reasonable approximation for sampling and planning purposes, particularly in studies focusing on music education. This estimation serves as a practical basis for determining the target population size in this study, which focuses specifically on junior high school music teachers' perceptions of information-assisted technology in music education. It should be noted that this is an inferred estimate; future research could benefit from direct access to official staffing records from the local education bureau or school-level human resource data for increased accuracy.

To ensure that the findings of this study are statistically valid and generalizable to the broader population of junior high school music teachers in Shaoguan City, it is important to determine an appropriate sample size. This study adopts Cochran's (1977) modified sample size formula, which is widely used in social science research when estimating proportions in finite populations. For the purposes of sample size calculation, the upper limit of N = 392 (rounded from the middle of the range) is used to reflect a conservative yet practical estimate. The estimated sample size calculated using Cochran's modified formula, assuming a population of 392 junior high school music teachers in Shaoguan City, a confidence level of 95%, and a margin of error of ±5% yielded a required sample size of approximately 194 teachers.

Instrumentation

The primary instrument for the quantitative phase is a structured questionnaire adapted from the UTAUT 2 framework developed by Venkatesh et al. (2012). To tailor the instrument to the context of music education, the term "mobile Internet" was replaced with "information-assisted technology," and the modifications were conducted with appropriate permission from the original authors. A pilot test involving 30 music teachers from Shaoguan was conducted to examine the instrument's reliability and validity. Cronbach's alpha was calculated to assess internal consistency, and expert reviews were used to ensure content validity.

For the qualitative phase, a semi-structured interview guide was developed based on the UTAUT 2 constructs and the results from the quantitative analysis. This allowed the interviews to probe deeper into the individual experiences and contextual variables influencing technology use in music education.

The quantitative data collection instrument used in this study was a structured questionnaire developed by adapting the UTAUT 2 model proposed by Venkatesh et al. (2012), Hussein et

al. (2020), Teo (2011), Weng et al. (2018), Attuquayefio and Addo (2014), Berry (2017), Nikolopoulou et al. (2020) and Ameri et al. (2020)'s questionnaires. To suit the context of music education, the term "mobile Internet" was replaced with "information-assisted technology" in all relevant items. This adaptation was made with proper authorisation from the original researchers to ensure intellectual property compliance and to enhance contextual relevance. The questionnaire comprised several items aligned with the core constructs of the UTAUT 2 model, including performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit. Each item was measured using a five-point Likert scale ranging from "strongly disagree" to "strongly agree."

Data Analysis Techniques

Prior to the main data collection, a pilot study was conducted to examine the reliability and validity of the adapted questionnaire. A total of 30 junior high school music teachers from Shaoguan City participated in this pilot phase. The purpose was to identify any ambiguities or difficulties in interpreting the items, as well as to evaluate the internal consistency of the constructs. Cronbach's alpha coefficients were calculated for each construct, and items that did not meet reliability thresholds were revised or removed.

The quantitative data obtained from the questionnaires were analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics such as means, standard deviations, and frequencies were employed to summarize the demographic data and individual responses to the UTAUT 2 constructs. In addition, inferential statistics, including correlation and multiple regression analysis, were used to identify relationships between the independent variables (e.g., performance expectancy, effort expectancy) and the dependent variable (intention to use information-assisted technology). This analysis enabled the researcher to assess the predictive power of each UTAUT 2 construct in the context of music education. The qualitative data collected through interviews were analyzed thematically using ATLAS.ti software. The analysis involved multiple stages including data familiarisation, initial coding, theme identification, and interpretation. An inductive approach was employed to allow themes to emerge organically from the data, while a deductive lens guided by UTAUT 2 constructs ensured alignment with the study's theoretical framework. Coding consistency was ensured through iterative review and refinement of codes and categories. This rigorous approach facilitated the discovery of nuanced insights into teachers' attitudes and experiences.

The final phase of analysis involved the integration of quantitative and qualitative data to produce a comprehensive understanding of the research questions. This process, known as triangulation, aimed to corroborate and enrich findings from both strands of data. A joint display matrix was developed to align themes and statistical findings, highlighting areas of convergence and divergence. This integrative approach enabled the researcher to draw more nuanced conclusions and offer practical recommendations grounded in both breadth and depth of evidence.

Data Analysis and Findings

Demographic Profile of Respondents

A total of 213 junior high school music teachers participated in the quantitative phase. The demographic analysis revealed a relatively balanced representation of male (about 48%) and

female respondents (about 52%). The age distribution showed that most participants were between the ages of 30 and 54, with varying lengths of teaching experience, ranging from novice educators to those with over 30 years in the profession. In general, the mean age of the respondents was approximately 42.11 years, indicating a generally experienced group of educators. On average, the participants had about 15.37 years of teaching experience, suggesting a strong foundation of practical knowledge and classroom expertise among the sample. Educational qualifications were predominantly at the diploma and undergraduate level, although a significant number held postgraduate degrees. Furthermore, the distribution of school area is also quite evenly distributed on both the rural and urban area, this will influence their access to technology or even their level of prior exposure to educational technologies. These demographic variables provide essential context for understanding the responses to the UTAUT 2-based questionnaire.

Descriptive Analysis of UTAUT 2 Constructs

Descriptive statistics were employed to evaluate teachers' perceptions of the constructs outlined in the UTAUT 2 model. The analysis included calculating means and standard deviations for each item within the constructs. Results indicated that teachers generally perceived information-assisted technology positively. High scores were observed in performance expectancy and effort expectancy, suggesting that respondents believed the technology to be beneficial and relatively easy to use. Social influence and facilitating conditions received moderate scores, indicating room for improvement in terms of institutional support and peer encouragement. Hedonic motivation and habit also displayed positive trends, while price value, although relevant, was less influential due to the context of state-funded schools where cost considerations were less pressing.

Inferential Statistics

Inferential analysis was conducted to determine the predictive relationships between the independent variables and the behavioral intention to adopt information-assisted technology. Correlation analysis revealed statistically significant associations among most UTAUT 2 constructs, especially between performance expectancy, facilitating conditions, and behavioral intention. Multiple regression analysis was subsequently performed to identify the most influential predictors. The findings showed that performance expectancy, habit, and facilitating conditions were the strongest predictors of behavioral intention, explaining a substantial portion of the variance in teachers' willingness to integrate technology into their music instruction. These results affirm the applicability of the UTAUT 2 model in the context of music education in China and highlight specific constructs that may serve as leverage points for policy and training interventions.

Qualitative Findings

The qualitative phase of the study aimed to enrich the understanding of quantitative trends by exploring participants' experiences and perspectives on using information-assisted technology in music education. Through semi-structured interviews, a total of 22 teachers provided nuanced insights into the facilitators and barriers they encountered, as well as the personal, institutional, and cultural factors influencing their adoption of technology.

Table 3
Themes of Qualitative Findings

Theme	Description
Perceived Benefits of Information-Assisted Technology	Enhanced student engagement, improved access to resources, and increased creativity in music learning
Challenges and Constraints	Lack of training, poor infrastructure, and unsupportive school environments limit the adoption of technology
Support and Encouragement	Supportive leadership and peer collaboration help build confidence and promote experimentation with new tools
Professional Identity and Motivation	Teachers' intrinsic passion and identity as innovators encourage openness to technology integration in music pedagogy

Integration of Quantitative and Qualitative Findings

This section presents a synthesis of the quantitative and qualitative findings, following the principles of triangulation to enhance the validity and comprehensiveness of the research outcomes. The integration process involved comparing data obtained from the UTAUT 2-based questionnaire with the themes derived from semi-structured interviews. Areas of convergence were noted primarily in the domains of performance expectancy and facilitating conditions. Both quantitative and qualitative data strongly suggested that teachers believe information-assisted technology enhances instructional efficiency and student engagement. Teachers who rated performance expectancy highly in the survey echoed similar sentiments during interviews, citing examples of how technology allowed them to create more interactive and effective learning experiences. Similarly, facilitating conditions emerged as a significant predictor in the regression analysis and were also thematically prominent in the qualitative data. Respondents highlighted the importance of school leadership, peer support, and technical infrastructure as enabling factors. However, discrepancies were observed in the construct of habit. While quantitative data suggested moderate influence of habit on technology use, interview responses revealed varied levels of personal comfort and routine in using technology, often shaped by prior exposure and professional development opportunities.

The triangulated findings reveal a complex, yet cohesive picture: while measurable constructs such as performance expectancy and facilitating conditions are crucial predictors, qualitative data reveal that cultural, contextual, and personal factors intricately shape the adoption of technology in music teaching. This synthesis offers a more nuanced understanding and highlights the need for policies and training that consider both structural enablers and individual experiences.

Limitations and Recommendations

While the study offers meaningful insights, it is not without limitations. The sample was confined to one geographic area—Shaoguan City—which may limit the generalisability of the results. Although the use of random sampling strengthens the reliability of the survey data, the qualitative component relied on purposive sampling, which could introduce bias based on participant selection. Additionally, the reliance on self-reported data, particularly in the survey, may be affected by social desirability or personal bias. While the mixed-methods design mitigates some of these concerns, future research could benefit from triangulating these perspectives with observational or administrative data.

Future research could adopt a longitudinal design to track how technology integration evolves over time, especially as policies and resources change. Studies comparing urban and rural contexts or exploring different regions in China would offer a broader understanding of the variability in adoption practices. Furthermore, researchers could investigate the student perspective to understand how learners experience information-assisted technology in music education. Such insights could inform more learner-centred approaches to curriculum design and instructional strategy. Exploring additional theoretical frameworks that consider identity, motivation, and agency could also enrich future studies. Integrating UTAUT 2 with psychological or sociocultural models could provide a more comprehensive view of the adoption process.

Conclusion

This study explored the perspectives of junior high school music teachers in Shaoguan City on the use of information-assisted technology in music education. Through a sequential explanatory mixed-methods approach grounded in UTAUT 2, the study revealed both the structural and psychological dimensions of adoption. Teachers expressed optimism about technology's potential, but also raised concerns about training, infrastructure, and institutional support. The research confirms that successful integration requires more than digital tools as it demands supportive ecosystems that nurture innovation, collaboration, and teacher identity. As music education continues to adapt in the digital age, such holistic approaches will be key to unlocking its full potential. Ultimately, this study contributes to a growing body of research on educational technology in the arts and calls for contextually grounded, teacher-driven strategies to foster meaningful change.

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