

Building Digital Pedagogical Capacity for Music Teachers In VET: Challenges, Competencies, And Professional Learning in Chinese VET Colleges

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ABSTRACT

Globally, music graduates face increasing challenges in employability due to market saturation and persistent misalignment between academic training and the demands of the job market. Although many aspire to traditional roles such as teaching or performing in state-supported ensembles, these positions are limited and highly competitive. At the same time, the rapid rise of digital technologies and the use of artificial intelligence is reshaping the professional landscape, introducing new opportunities while also threatening certain conventional roles within the music sector. These technological shifts have had a particularly strong impact on the delivery of music education in Vocational Education and Training (VET) colleges in China, where the industry's growing reliance on digital production tools and AI-assisted composition requires educators to acquire new technological competencies. Yet, many VET music teachers continue to struggle with limited digital literacy, inadequate pedagogical strategies, and insufficient institutional support, which collectively hinder effective integration of technology into teaching. Despite national reforms aimed at strengthening digital capacity in education, challenges such as constrained professional development, outdated curricula, and inadequate infrastructure remain prevalent. This concept paper adopts a conceptual research design based on an integrative and thematic analysis of relevant literature to explore the competencies required for technology-based teaching among music teachers in VET colleges in China, examine barriers to professional learning, and propose a Competencies and Professional Learning Framework to support educators. Findings highlight competency gaps, the absence of structured training pathways, and institutional barriers. The proposed framework provides core digital competencies, professional learning strategies, institutional support mechanisms, and curriculum integration models, offering practical recommendations for enhancing technology-based music education in China's VET sector.

Keywords: Music Education, Technology Integration, Professional Learning, VET Colleges, Digital Competencies.

INTRODUCTION

Music education should prioritize music aesthetics as its core. For vocational and technical colleges specializing in music, in addition to emphasizing music aesthetics, greater focus should be placed on enabling students to apply professional knowledge and skills through practical experience relevant to their future work. The rapid advancement of information technology (IT) and artificial intelligence (AI) has reshaped multiple industries, including the music sector. As digitalization transforms music pedagogical practices, conventional teacher-centered instructional approaches have become increasingly inadequate for preparing students for contemporary careers, necessitating a shift toward technology-based educational models (Boateng et al., 2025; Dai, 2021). In this context, Vocational Education and Training (VET) colleges serve a vital function in providing students with practical skills that meet industry requirements.

Educational reform in China put emphasis on IT-based instructional design to foster personalized learning, real-time feedback, and data-based teaching models (Z. Zhong & Juwaheer, 2024). Although technologies such as learning analytics, AI-assisted instruction, and Digital Audio Workstations (DAWs) offer significant pedagogical potential in music education (Grubaugh & Levitt, 2023; Wei et al., 2022) their effective integration remains constrained by teachers' limited digital competencies, insufficient professional training, outdated curricula, and inadequate institutional support (Wei et al., 2022; X. Zhang et al., 2025).

The role of music educators has transitioned from merely imparting knowledge to enabling technology-based learning (Sheffield et al., 2015). Research on IT integration in music education highlights its benefits in enhancing student engagement, expanding learning opportunities, and improving instructional efficiency (Wei et al., 2022). For instance, in composition courses, DAWs support music production, arranging, and mixing, enhancing students' ability to create professional-quality compositions (Universiti Sains Malaysia et al., 2024). These advancements highlight the critical importance for educators to cultivate digital competencies, thereby maintaining the relevance of music instruction within an increasingly technology-based creative industry. To address these issues, this study adopts a conceptual research approach based on an integrative analysis of existing literature to develop a Competencies and Professional Learning Framework for technology-based music education in Chinese VET colleges.

Research Problem

Notwithstanding these advancements, the integration of information technology in music instruction inside China's vocational education and training colleges is still constrained (Liu & Zhang, 2024; Wan, 2022). The incorporation of information technology into music education continues to pose a challenge, as numerous educators lack the essential skills, specialized training, and institutional support required to effectively adopt technology-based learning (Hwang et al., 2022). Numerous schools possess inadequate infrastructure, and educators frequently encounter challenges in utilizing music technology software due to insufficient training and resource limitations.

Based on surveys conducted within China, most colleges continue to rely heavily on traditional teaching models. For music programmes, instructional methods remain relatively limited and largely teacher-centred. Current music teaching practices generally fall into three common modes:

- (1) Large-class teaching (40–60 students), which primarily focuses on delivering foundational theoretical knowledge.
- (2) Small-group professional skills teaching, where one teacher instructs three to four students simultaneously.
- (3) One-to-one professional skills instruction, typically used for specialised areas such as vocal training, where a teacher works individually with a single student.

Among these, large-class teaching remains the dominant method for music courses. In this model, students with diverse learning needs and varying levels of musical background are grouped together to receive uniform instruction in basic knowledge, singing techniques, or instrumental skills, and often engage with the same musical material regardless of individual readiness. As noted in *Exploration of Information Technology Utilization in Music Teaching in Primary and Secondary Schools*, this approach offers limited room for differentiation, fails to respect students' subjectivity, restricts the development of individuality and creativity, and ultimately inhibits students' musical and aesthetic growth. This traditional, receptive mode of instruction has resulted in many music courses devolving into lectures on composers, historical background, and contextual information, with the music itself no longer serving as the central focus. As *Talking about Emotionality in Music Education* notes, students in such environments become passive recipients of information, losing opportunities for active musical experience, expression, and creative engagement. Consequently, students often develop an excessive dependence on the teacher, who assumes the dominant role in the learning process and becomes the sole evaluator of students' professional standards.

These dynamic produces two key problems. First, the teacher's absolute authority discourages students from questioning or identifying inaccuracies in instruction, even when mistakes occur. Second, this authority fosters a form of respect rooted in compliance rather than genuine academic trust-students may refrain from expressing differing views for fear of negatively affecting their grades. Under such conditions, neither students' musical competence nor teachers' professional growth is likely to progress meaningfully, and the overall quality of music teaching cannot be guaranteed. Furthermore, the entrenched authority of teachers-combined with limited understanding of the music profession among administrators and departmental leaders-has led educators to import learning objectives from non-music disciplines into music courses. This often results in the neglect of the aesthetic, expressive, and vocational orientations that are fundamental to music education. Instruction becomes confined to the transmission of theoretical knowledge and the training of technical skills, while overlooking the cultivation of musical interest, creativity, personal development, and other distinctive contributions of music education to holistic growth.

Against the backdrop of rapid social and technological change, the 21st century is widely recognized as an information society, marking a new stage of global development. This transformation creates a sense of urgency for music programmes in vocational and technical colleges, as traditional receptive teaching methods are increasingly incompatible with contemporary learning needs and risk becoming obsolete. At the same time, the information society offers valuable opportunities to enhance students' professional competencies through the support of modern information technologies, enabling them to acquire current, in-demand skills relevant to the evolving music industry. To meet these emerging requirements, it is essential for vocational and technical colleges to integrate modern information technologies into the teaching of music majors. Such integration allows teaching and learning to be effectively connected and supported through digital platforms, facilitating more interactive, student-centred, and technologically enriched instructional practices. Through this process, students can develop stronger knowledge literacy and professional skills, positioning them to engage more effectively with the demands of the information society.

Regardless of the specific focus, music students in vocational and technical colleges can use IT to enhance both their aesthetic appreciation and professional skills. For example, IT can support learning in vocal music, instrumental performance, piano practice, chorus, conducting and musical expression. Music composition - another essential professional skill for modern music majors - also benefits from technology. Current composition courses include melody and lyric writing, polyphonic music composition (covering various instruments and choral works), and computer-based music production, all of which rely heavily on IT. However, such IT-integrated music courses remain scarce in vocational institutions. There are two main reasons for the limited availability of it-integrated music courses:

- (1) Insufficient infrastructure: To teach music using IT effectively, colleges need adequate resources, such as computers for student use, pianos for music production, and specialized software. Currently, most institutions only provide basic multimedia equipment, such as projectors, all-in one computers, and stereos, which are insufficient for hands-on IT-based music learning.
- (2) Limited teacher capacity: Many music teachers in vocational colleges rely on outdated course materials (often 2-3 years old) and have not updated their teaching methods to match societal and industry developments. This gap leads to a misalignment between teaching content and current professional demands.

Given the nature of vocational and technical education and the profound impact of IT on daily life (X. Zhang et al., 2025), colleges must recognize societal needs, move beyond traditional receptive teaching methods, and implement technology-integrated learning programs. With IT, the ways music is presented and disseminated have expanded, providing students with broader opportunities to learn and master music knowledge and skills. Often, students can absorb new concepts more quickly and deeply than teachers. Therefore, the information society requires educators not only to continually update their professional knowledge and IT skills but also to effectively transfer their teaching experience and expertise to students through technology.

Studies indicate that cultivating authentic technology-based pedagogical competences is crucial for enhancing the quality of music instruction in vocational education and training institutions (Antera, 2021; Partti et al.,

2021). Music educators are urged to pursue ongoing study and engage in practical training to enhance their competencies and understanding of music education technology. To ensure career sustainability, tailored professional learning pathways are essential for facilitating instructors' ongoing development in IT-based pedagogy, thereby guaranteeing that students have industry-relevant training in music technology (Wei et al., 2022).

Research Focus

This study examines the pedagogical competencies and professional learning strategies required to support effective technology-based music education in VET colleges. Specifically, it seeks to identify the barriers that hinder IT integration, evaluate current teaching practices, and develop a competency-based framework to enhance educators' digital and pedagogical skills. As traditional music education models become increasingly insufficient in meeting contemporary industry and learner needs, the shift toward intelligent teaching models that is supported by AI and information technologies has become essential for cultivating a digitally capable generation of music professionals. By addressing these emerging demands, this study contributes to ongoing discussions on educational transformation. It also highlights the need for improved professional learning structures and stronger institutional support to support meaningful and sustainable IT integration in music education.

Research Aim and Research Questions

This study aims to explore the competencies and professional learning strategies required for authentic technology-based teaching and learning in music education within VET colleges in China. It seeks to identify barriers to technology integration, assess current teaching practices, and develop a structured professional learning framework to enhance educators' digital skills and pedagogical competencies. The findings will contribute to the development of effective training models and institutional policies to support the successful adoption of technology-based music education. To achieve this aim, the study will address the following research questions:

RQ1: What digital and pedagogical competencies do music educators in VET colleges need in order to implement technology-based teaching and learning effectively?

RQ2: How are digital tools such as DAWs, virtual instruments, and online collaboration platforms currently being used in VET music education, and what challenges do educators face in integrating these technologies?

RQ3: What professional learning opportunities and institutional supports are required to strengthen music educators' competencies for technology-based music education in VET colleges?

LITERATURE REVIEW

International research widely recognizes the integration of information technology into education as a strategic priority for enhancing teaching and learning (Gnana Jothi J & D. Ponrani, 2024). In the field of music education in vocational and technical colleges (Cheng et al., 2022), cultivating music professionals with high-level skills and competencies to meet the evolving demands of society has become an important research focus in China in recent years. The "Implementation Program of Vocational Education Industry-Teaching Integration Empowerment and Enhancement Actions (2023-2025)" (Y. Zhang & Hall, 2024), enacted in 2023, emphasizes that "based on the grand perspective of building a strong educational nation, vocational education should focus on comprehensive student development, serve economic and social progress, and promote professional teaching reforms centred on talent cultivation".

Teaching Competencies of Music Educators

The integration of IT and AI into education has significantly transformed pedagogical approaches, particularly in music education. As digital technologies become more embedded in the creative industries, there is an increasing demand for technology-based teaching and learning strategies in VET colleges (Wei et al., 2022).

Educators are now expected to incorporate digital tools, online platforms, and AI-assisted music composition technologies into their instruction, ensuring students develop industry relevant skills. However, many VET music educators in China lack the necessary competencies, training, and institutional support to integrate these technologies effectively into their teaching practices (Seegobin, 2024). Despite efforts to modernize the education system, research indicates that many VET institutions still rely on traditional, face-to-face instructional methods, limiting the full potential of IT-based music education (Y. Zhang et al., 2024). This section critically reviews the theoretical framework, global trends in digital music pedagogy, barriers to technology integration, and professional learning strategies necessary for enhancing music educators' competencies.

Theoretical Framework: TPACK in Music Education

The Technological Pedagogical Content Knowledge (TPACK) framework provides a comprehensive structure for understanding how educators integrate technology into their teaching. Originally developed by Mishra and Koehler (Mishra & Koehler, 2006), the TPACK model outlines three core areas of knowledge: Technological Knowledge (TK), Pedagogical Knowledge (PK), and Content Knowledge (CK) (H. Yang, 2025). TK refers to educators' ability to use and integrate digital tools into their teaching practices, while PK encompasses the strategies necessary for engaging students and enhancing learning outcomes. CK represents the subject-specific expertise required to teach music effectively. In the context of technology-based music education, TPACK highlights the importance of blending all three components to create a holistic and engaging learning experience (Universiti Sains Malaysia et al., 2024). Recent research by Frytsiuk (Frytsiuk et al., 2025) found that VET music educators lack Technological Knowledge (TK), which hinders their ability to effectively implement digital tools, such as Digital Audio Workstations (DAWs), virtual instruments, and AI based music composition platforms. Without a solid understanding of how to use technology in a pedagogically meaningful way, educators may struggle to fully utilize digital resources (Beirnes & Randles, 2023). This gap underscores the need for structured professional learning pathways to equip music teachers with the skills required to successfully integrate technology into their instruction (Wei et al., 2022).

Research on Technology-based and IT-supported Music Instruction

The broader TVET literature also underscores the importance of digital skills. Song & Xu (Song & Xu, 2024) argues that ICT competencies are essential for improving individuals' employability and highlights initiatives aimed at strengthening ICT skills among TVET students and graduates. Research in the field of music education has also begun to explore the pedagogical potential of emerging technologies in music classrooms such as artificial intelligence (Merchán Sánchez-Jara et al., 2023) with inspiring modern reflective practices that can be used as guidance for other educators. For example, a study by Dai (Dai, 2021) examines how artificial intelligence can support music teaching by leveraging intelligent perception, learning analytics, and affective computing (Dey et al., 2025). The study proposes an intelligent music teaching model and illustrates how big-data-based online learning platforms provide teachers with diverse instructional tools while offering students personalized evaluation and adaptive learning pathways to enhance teaching efficiency. Similarly, Rexhepi and Lam (Gagica Rexhepi et al., 2024; Sancar et al., 2021) investigate the implementation of digital technologies in music training, emphasizing their role in creating a more flexible, self-directed learning environment. These studies highlight how computer-based tools support continuous skill development and strengthen professional competence in music.

More directly related to music education, various studies have demonstrated that students respond positively to multimedia-supported instruction. In Yang (R. Yang, 2020) and Rexhepi (Gagica Rexhepi et al., 2024) studies, music students perceive such lessons as practical, engaging, understandable, dynamic and aligned with contemporary teaching needs. The study concludes that the effective use of multimedia can significantly enhance students' knowledge, skills, and competencies. It also stresses the need for both teachers and students to be adequately trained in the use of educational technologies to ensure pedagogical effectiveness and the quality of multimedia materials (Gentile et al., 2023).

Global Trends in Technology-based Music Pedagogy

International research highlights the growing role of digital tools in music education. In Finland and the UK, blended learning models that combine face-to-face instruction with technology-based learning have been shown to increase student engagement and creativity (Sartori et al., 2015). In Australia, cloud-based collaboration tools allow students to compose and perform music remotely, making music education more interactive and accessible (Skantz-Åberg et al., 2022). Studies also show that integrating AI-based composition tools and digital performance platforms enhances students' ability to experiment with music production and sound design. Perception of the ternary arch-form in Western concert music: evidence from college music education. However, in China's VET colleges, digital adoption remains limited and inconsistent. According to Xin (Xin et al., 2024), music educators in rural areas face significant challenges in accessing technology, while urban institutions have more resources but lack standardized training programs. Many teachers continue to rely on traditional, non-digital teaching methods, which restrict students' exposure to industry relevant tools and techniques (Liu & Zhang, 2024). These disparities highlight the urgent need for structured professional development programs to support technology adoption in music education.

Information Technology Adoption in Music Education in China

Currently, many colleges have begun implementing IT training for educators and adopting tools such as electronic smart classrooms ("e-white class") and online learning platforms. These efforts reflect teachers' attempts to respond to the rapid development of the information society driven by digital technologies. In music education specifically, numerous institutions have already incorporated IT into teaching practices, and these initiatives have been positively received by both teachers and students (Lin, 2021).

Teachers note that, compared with traditional instructional approaches, modern IT allows the use of diverse audio visual materials and dynamic sound image presentations that enhance classroom interaction. The ability to capture, replay, and analyze audio supports deeper musical analysis, facilitates personalized learning, and addresses many limitations of conventional music teaching methods.

In China, numerous music colleges and teacher training institutions have also established new digital music related specialties, such as MIDI music production, computer-based composition, and sound recording. Distance music education, multimedia instruction, and other technology-supported learning modes are becoming increasingly widespread. Additionally, the development of digital courseware, software design, and theoretical research in music education has entered a period of rapid growth (Jääskeläinen, 2022).

Barriers to Technology Integration in Music Education

Research indicates that VET music educators face multiple challenges in adopting digital tools in their teaching. Bingimlas (Bingimlas, 2009) and Wan (Wan, 2022) categorize these challenges into technical, institutional, and personal barriers (Figure 1).

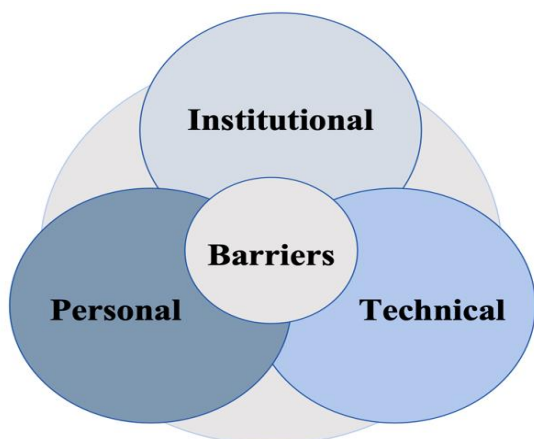


Figure1: Barriers to Technology Integration in Music Education

Technical Barriers

One of the major challenges is the lack of access to high quality digital tools and software. Many VET institutions do not have fully equipped music technology labs, and educators struggle with limited internet connectivity, outdated hardware, and insufficient funding (Liu & Zhang, 2024).

Institutional Barriers

At the institutional level, curriculum misalignment and policy constraints limit the adoption of technology-based teaching methods. Despite national efforts to modernize education, many VET curricula still do not prioritize digital music training (J. Zhong, 2023). Educators report a lack of structured professional development programs, leaving them without clear guidelines on how to integrate technology into their lessons (Wei et al., 2022).

Personal Barriers

On a personal level, many educators lack the confidence to integrate technology into their teaching. Research by Wei (Wei et al., 2022) shows that teachers who did not receive formal training in digital music technology are often hesitant to adopt new instructional strategies, fearing that technology requires extensive expertise.

Professional Learning Strategies for Music Educators

To address these barriers, research highlights the need for structured professional learning pathways for music educators. Previous studies suggest a multi-dimensional approach to professional development, which includes:

- (1) Workshops and Hands-On Training - Training educators in DAW operation, AI-assisted composition, and virtual performance tools.
- (2) Mentorship and Collaborative Learning - Creating peer-learning networks where educators can exchange knowledge and best practices.
- (3) Industry Partnerships - Engaging with music technology companies to provide training in emerging digital tools.
- (4) Blended Professional Development Models - Offering a combination of online courses, practical workshops, and industry-based projects.

These strategies align with research findings that emphasize the importance of continuous learning in technology-based music education. By implementing structured professional learning initiatives, educators can develop the skills and confidence needed to integrate IT into their pedagogy (David J. Lucian, 2025), ultimately enhancing student learning outcomes (Ertmer & Ottenbreit-Leftwich, 2010).

METHODOLOGY

Research Design

This study adopts a conceptual research design grounded in an integrative literature review approach to examine technology-based teaching competencies and professional learning among music educators in VET colleges in China, with the aim of developing a structured conceptual framework based on existing research (Sartori et al., 2015).

Within the field of vocational and music education, conceptual approaches have been widely used to consolidate research on teacher competencies, digital transformation, and professional development (Antera, 2023; Skantz-Åberg et al., 2022). Accordingly, this study focuses on systematically organizing existing knowledge related to music teachers' digital and pedagogical competencies, barriers to technology integration, and professional learning strategies in VET contexts.

Literature Selection and Scope

The literature reviewed in this study was drawn from peer reviewed journal articles, policy oriented research, and authoritative conceptual studies related to four core domains:

- (1) Digital and technological competencies of teachers in Vocational and Technical education
- (2) Technology-based and AI-supported music education
- (3) Professional learning and development of music educators
- (4) Institutional and systemic factors influencing technology integration in VET settings

Priority was given to studies that explicitly address music education, vocational or technical education, and teacher digital competencies, including both international research and studies situated in the Chinese educational context (Wan, 2022; Wei et al., 2022; Xin et al., 2024). Foundational theoretical frameworks, such as TPACK, were included due to their established relevance in explaining technology integration in teaching practice (Mishra & Koehler, 2006; Sheffield et al., 2015).

Analytical Approach

An integrative thematic synthesis was used to analyze the selected literature. Relevant studies were reviewed comparatively to identify recurring themes related to technology-based music teaching in vocational education contexts, with attention to teaching competencies, barriers to technology integration, and professional learning approaches (Skantz-Åberg et al., 2022).

In line with common approaches in the literature, factors influencing technology integration were examined across technical, institutional, and personal dimensions (Bingimlas, 2009; Wan, 2022). Professional learning strategies were synthesized from studies emphasizing structured training, collaborative learning, institutional support, and reflective professional development in music and vocational education (Partti et al., 2021; West, 2024; Z. Zhong & Juwaheer, 2024). This thematic synthesis provided the analytical basis for developing the conceptual framework presented in the following section.

Conceptual Framework Development

The Competencies and Professional Learning Framework was developed through conceptual integration of themes identified in the literature synthesis, including music teachers' digital and pedagogical competencies, factors influencing technology integration, and professional learning approaches (Antera, 2023; Mishra & Koehler, 2006; Skantz-Åberg et al., 2022). Recurring emphases across studies on teacher preparation, classroom practice, reflective evaluation, and ongoing professional inquiry informed the identification of four interrelated dimensions: Training, Implementation, Evaluation, and Research (Partti et al., 2021; West, 2024; Z. Zhong & Juwaheer, 2024).

The Training dimension reflects literature highlighting structured professional development and competency-building for music educators (Sartori et al., 2015; Skantz-Åberg et al., 2022). The Implementation dimension draws on research addressing the integration of digital technologies into music teaching practice and curriculum design (Dai, 2021; Wei et al., 2022; J. Zhong, 2023). The Evaluation dimension is informed by studies emphasizing reflective practice and competency-oriented assessment in teacher development (West, 2024). The Research dimension reflects literature that positions continuous inquiry and engagement with emerging technologies as central to sustained professional learning in music education (Partti et al., 2021; Sirek & Sefton, 2024).

Together, these four dimensions provide a concise conceptual structure for understanding how competencies and professional learning processes discussed in the literature can be organized to respond to key influencing factors in technology-based music education within Chinese VET colleges.

CONCEPTUAL FRAMEWORK DISCUSSION

Building on the conceptual framework developed in the preceding section, this discussion focuses on how the framework clarifies technology-based teaching competencies and professional learning pathways for music educators in Chinese VET colleges. The discussion emphasizes the internal logic of the framework and its alignment with factors influencing technology integration and competency development identified in prior research (Antera, 2023; Skantz-Åberg et al., 2022). Accordingly, a Conceptual Framework (Figure 2) was developed in this study to provide a coherent research pathway for examining the authentic technology-based teaching and learning competencies of music teachers in VET colleges in China (Antera, 2023).

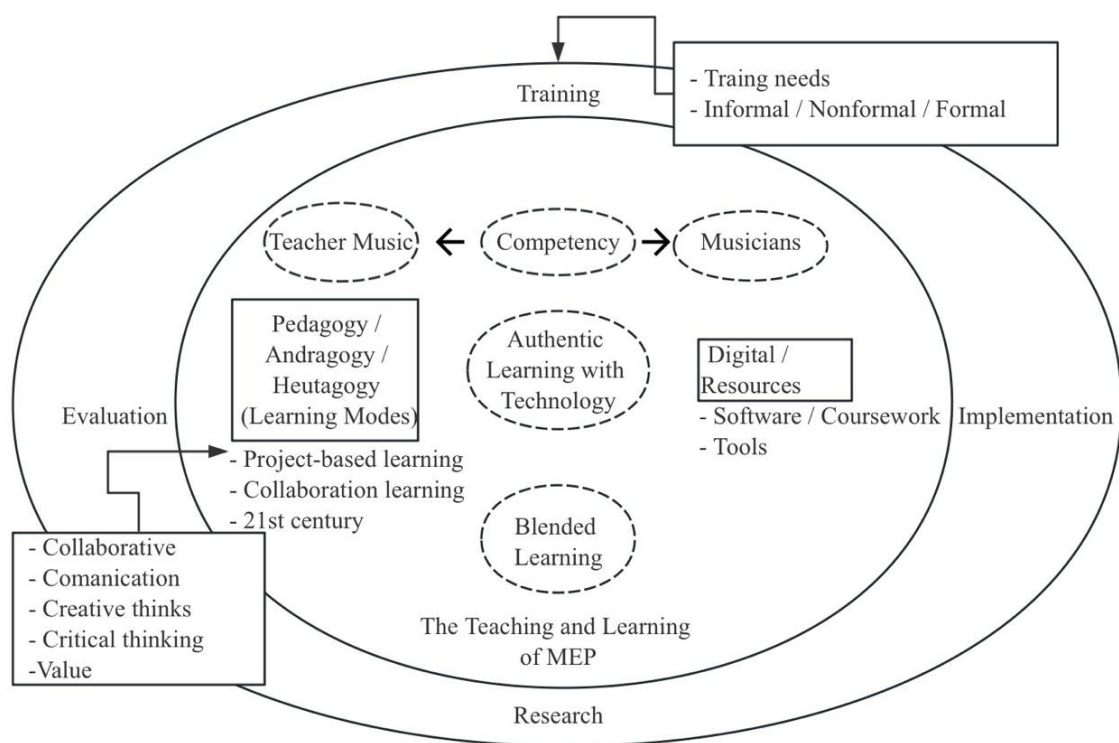


Figure 2: Conceptual Framework-Competencies and Professional Learning for Technology-based Music Education for Music Educators in VET colleges

In line with the perspectives of West (West, 2024) and Sirek and Sirek (Sirek & Sefton, 2024), music teacher professional development takes into account several key factors, including technological tools, software applications, and teachers' professional abilities. The conceptual framework illustrates the dynamic interrelationships among teacher competencies, technological integration, and authentic music education practices within the context of Music Editing and Production (MEP) courses in VET colleges. Aligned with the overarching aim of enhancing both music teachers' authentic teaching competence and their professional learning competencies, the framework comprises four central dimensions: Training, Implementation, Evaluation and Research.

The four interrelated dimensions provide a structured lens for understanding how technology-based teaching and professional learning are sustained over time. The Training dimension reflects the role of structured professional development in supporting teachers' digital and pedagogical competency development (Sartori et al., 2015; Skantz-Åberg et al., 2022). Implementation emphasizes the integration of digital resources, music software, and curriculum design to enact technology-based teaching in vocational music contexts, particularly within MEP courses (Dai, 2021; Wei et al., 2022; J. Zhong, 2023). Evaluation foregrounds reflective practice and competency-oriented assessment as mechanisms for continuous professional growth (Ertmer & Ottenbreit-Leftwich, 2010; West, 2024). The Research dimension frames ongoing inquiry as a cyclical process that supports adaptation to emerging technologies and evolving vocational demands in music education (Partti et al., 2021; Sirek & Sefton, 2024).

At the center of the framework is competency development, understood as a relational process linking music teachers' instructional practice with students' vocational skill formation. This positioning reflects research highlighting the interdependence between teacher competencies and student learning outcomes in vocational and music education contexts (Antera, 2021; Mishra & Koehler, 2006).

Overall, this framework provides a holistic and systemic perspective on how technology-supported authentic teaching practices can be effectively designed, enacted, and evaluated to cultivate music educators' professional growth and enhance teachers' competency development in VET colleges.

CONCLUSIONS AND IMPLICATIONS

This study contributes to the field of vocational music education by conceptually clarifying the competencies and professional learning dimensions required for authentic technology-based teaching in Chinese VET colleges. Through an integrative synthesis of existing literature, the study highlights that effective technology-based music teaching depends on the alignment of teacher competencies, authentic learning with technology, and sustained professional learning processes rather than on digital skills alone (Antera, 2023; Skantz-Åberg et al., 2022). The proposed Competencies and Professional Learning Framework organizes these insights into four interrelated dimensions: Training, Implementation, Evaluation and Research, providing a coherent reference for understanding how technology-based teaching can be supported in vocational music contexts. The framework offers practical value for policymakers in aligning professional development policies with technology-based and industry-oriented education, for VET institutions in structuring integrated support systems for music teachers, and for educators in reflecting on their instructional practices and professional learning needs. Overall, the study provides a concise conceptual foundation for advancing technology-based music education and supporting the modernization of teaching and learning in Chinese VET colleges.

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