

Notation Bilingualism and Cross-Cultural Competence: A Conceptual Framework for Reimagining Early Music Literacy in Guzheng Education

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ABSTRACT

In an era characterized by rapid globalization and increasing cultural interconnectedness, contemporary educational systems face a dual imperative: preserving national cultural heritage while simultaneously adapting to internationally recognized educational practices. This conceptual framework paper examines the phenomenon of notation bilingualism, defined as the ability to achieve parallel mastery and fluent navigation of traditional Chinese numbered notation (Jianpu) and Standard Western Notation (SWN) within the context of primary school extracurricular Guzheng education in Taizhou, China. As a conceptual study, this paper does not involve empirical data collection; rather, it develops a theoretically grounded framework to guide future research and instructional practice. Historically, Guzheng pedagogy has relied predominantly on Jianpu, an intuitive notation system that lowers entry barriers for novice learners but offers limited capacity for representing complex harmonic structures, polyphonic textures, and advanced ensemble configurations. Consequently, traditional music education stands at a critical crossroads as contemporary curriculum reforms increasingly introduce the five-line staff system into formal school music programs, creating potential fragmentation between school-based and extracurricular learning environments. To address this pedagogical divide, the paper proposes a comprehensive conceptual model that synthesizes Social Constructivist Learning Theory and Cognitive Load Theory (CLT) within the ADDIE instructional design framework. It argues that musical notation should be understood not merely as a technical tool for decoding musical symbols, but as a socio-culturally mediated artifact through which musical meaning is constructed, interpreted, and transmitted. When implemented through systematic scaffolding, multimodal learning resources, and culturally responsive pedagogies, notation bilingualism has the potential to preserve cultural authenticity while simultaneously expanding learners' musical and intercultural competencies. The proposed framework suggests that dual-notation learning can reduce unnecessary cognitive burden, strengthen symbolic flexibility, enhance music cognition, and support the development of technical and expressive musical skills. Ultimately, notation bilingualism is conceptualized as a pathway toward cross-cultural competence, enabling young musicians to navigate both traditional Chinese and global musical contexts within an increasingly interconnected cultural landscape.

Keywords: notation bilingualism, cross-cultural competence, early music literacy, Guzheng education, ADDIE model

INTRODUCTION

Music education in contemporary China is increasingly shaped by the intersection of cultural preservation and educational modernization. As globalization continues to influence educational policy and pedagogical practice, traditional music education faces the dual challenge of safeguarding cultural heritage while preparing learners to participate in increasingly interconnected artistic and social environments (Ho, 2021; Peng, 2022; Dushniy et al., 2024). Within this evolving landscape, the Guzheng occupies a particularly significant position. As a traditional Chinese plucked zither with a history spanning more than two thousand years, the Guzheng functions

not only as a musical instrument but also as an important symbol of Chinese cultural identity and artistic heritage (Liu, 2019; Chen & Li, 2023). In recent decades, Guzheng education has expanded rapidly through extracurricular programs, private music academies, and community-based learning initiatives, particularly in culturally vibrant regions such as Taizhou, China (Song, 2021; Peirong et al., 2023).

Historically, the transmission of Guzheng repertoire has relied extensively on Numbered Musical Notation, commonly known as Jianpu. Developed through the adaptation of the French Galin-Paris-Chev  system during the late nineteenth century, Jianpu employs Arabic numerals to represent scale degrees and has become deeply embedded within Chinese music pedagogy (Chang, 2022; Kaminski, 2022). Its simplicity, accessibility, and close alignment with oral learning traditions make it particularly effective for beginner musicians and traditional instrumental instruction (Yao, 2020; Sparks, 2023). Furthermore, Jianpu represents more than a practical notation system; it embodies a significant component of Chinese musical heritage and continues to play an important role in preserving traditional musical knowledge across generations (Yang, Giraud, & Lev , 2025; Huang, Chuangprakhon, & Santaveesuk, 2024).

Despite the continued prominence of Jianpu, educational reforms and globalization have increased the importance of Standard Western Notation (SWN) within Chinese music education. The five-line staff system serves as the dominant international language of written music, facilitating access to global repertoire, cross-cultural collaboration, and advanced music literacy (Ho, 2021; Peng, 2022). Consequently, Chinese curriculum reforms have increasingly encouraged the integration of Western notation alongside traditional pedagogical approaches to enhance students' theoretical understanding, sight-reading ability, and intercultural musical competence (Tu, 2022; Yang & Welch, 2023). This shift reflects broader efforts to modernize music education while simultaneously maintaining connections to national cultural traditions.

However, the coexistence of these notation systems has created a pedagogical challenge. Many primary school students encounter Western Staff Notation during formal school music lessons while continuing to learn Guzheng primarily through Jianpu in extracurricular settings. This separation frequently results in fragmented learning experiences and inconsistent development of music literacy skills (Gu & Liu, 2019; Zhu, 2022). Research suggests that students often experience difficulties transferring knowledge between notation systems, potentially affecting confidence, motivation, sight-reading accuracy, rhythmic understanding, and broader musical development (Arthurs & Petrini, 2024; Sparks, 2023). From a cognitive perspective, learners may also face increased processing demands when required to navigate multiple symbolic representations without adequate instructional scaffolding (Sweller et al., 2019; Mayer, 2024).

At the same time, contemporary research in music cognition suggests that engagement with multiple representational systems can promote cognitive flexibility, symbolic reasoning, and deeper musical understanding when supported through appropriate instructional design (Honing, 2021; Jacoby et al., 2020; Vuust et al., 2022). Studies on music notation indicate that reading music involves complex interactions between visual processing, auditory imagination, memory, and motor coordination (Brodsky et al., 2008; Fourie, 2004; Arthurs & Petrini, 2024). Exposure to multiple notation systems may therefore strengthen learners' capacity to recognize patterns, translate symbolic information, and develop broader musical schemas. Such findings suggest that the relationship between Jianpu and Western Staff Notation should not necessarily be viewed as a pedagogical conflict but rather as a potential opportunity for educational innovation.

Against this backdrop, this paper introduces the concept of notation bilingualism as a new framework for understanding music literacy development in traditional instrumental education. Drawing inspiration from bilingual education and intercultural learning theories, notation bilingualism refers to the ability to read, interpret, and perform music fluently across two distinct notation systems while understanding the cultural meanings embedded within each. Rather than positioning Jianpu and Western Staff Notation as competing approaches, notation bilingualism conceptualizes dual-notation learning as a form of symbolic and cultural fluency that enables learners to navigate both local and global musical contexts.

From a social science perspective, notation bilingualism extends beyond technical music literacy. Music functions as a cultural language through which values, identities, and traditions are transmitted across generations (Gay, 2018; McKoy & Lind, 2022). Consequently, the ability to engage with multiple musical

symbol systems may contribute to the development of cross-cultural competence, defined as the capacity to understand, appreciate, and interact effectively across cultural boundaries (Prest, 2020; Junyi, 2023). In this sense, notation bilingualism may serve as a bridge between cultural preservation and global participation, allowing young learners to maintain connections with Chinese musical heritage while acquiring skills necessary for engagement within international musical communities.

Accordingly, this paper does not seek to empirically test the framework but rather to develop a theoretically grounded conceptual model that can guide future research and instructional innovation in Guzheng education. Grounded in Constructivist Learning Theory (Vygotsky, 1978; Fosnot & Perry, 1996; Zajda & Zajda, 2021), Cognitive Load Theory (Sweller, 2020; Sweller et al., 2019), and contemporary scholarship on music cognition and intercultural education, the framework seeks to explain how dual-notation learning can simultaneously strengthen music literacy, support cognitive development, reinforce cultural identity, and promote intercultural understanding. By reimagining the relationship between traditional and Western notation systems, this paper contributes to broader discussions concerning educational innovation, cultural sustainability, and the future of traditional arts education in an increasingly globalized world.

The Socio-Cultural Landscape of Guzheng Pedagogy

To fully comprehend the challenges and opportunities associated with modernizing Guzheng instruction, it is necessary to examine the historical, cultural, and social functions of musical notation within Chinese music education. Musical notation is far more than a technical tool for recording sound; it is a cultural artifact that shapes how musical knowledge is transmitted, interpreted, preserved, and legitimized across generations (Treitler, 2023). The choice of notation system influences not only pedagogical practice but also broader questions of cultural identity, accessibility, and participation. Within Guzheng education, the coexistence of Numbered Musical Notation (Jianpu) and Standard Western Notation (SWN) reflects the wider tension between cultural preservation and educational modernization that characterizes contemporary Chinese music education (Ho, 2021; Tu, 2022).

The Democratizing Role of Jianpu

Throughout the twentieth century, Jianpu emerged as one of the most influential tools for democratizing music education in China. Adapted from the French Galin–Paris–Chevé system, Jianpu simplified music reading by representing pitches through Arabic numerals rather than staff-based notation, making musical learning more accessible to broad segments of society (Chang, 2022; Kaminski, 2022). This accessibility was particularly important during periods of educational expansion when music literacy was promoted among populations with limited access to formal musical training.

Within Guzheng pedagogy, Jianpu remains deeply embedded in instructional practice because it aligns closely with oral transmission traditions and community-based learning approaches (Liu, 2021; Yao, 2020). Its numerical structure enables beginning students to recognize pitch relationships quickly and perform simple melodies with relatively little theoretical preparation. As a result, learners often experience early success, which contributes positively to motivation, engagement, and sustained participation in music learning (Asmus, 2021; Moneva & Bacante, 2020). The system's simplicity also supports culturally responsive approaches to music education by preserving pedagogical traditions that have historically facilitated the transmission of Chinese musical heritage (Gay, 2018; McKoy & Lind, 2022).

Beyond its pedagogical practicality, Jianpu carries significant cultural value. Recent scholarship has emphasized its role as an important repository of Chinese musical knowledge and a medium through which traditional repertoire continues to be preserved and disseminated (Kaminski, 2022; Yang, Giraud, & Levé, 2025). Digital humanities initiatives aimed at documenting and preserving traditional notation systems further highlight Jianpu's importance as part of China's intangible cultural heritage. In this sense, Jianpu functions not merely as a notation system but as a cultural symbol that reflects historical practices, educational values, and collective musical memory (Huang, Chuangprakhon, & Santaveesuk, 2024).

Nevertheless, the pedagogical strengths of Jianpu are accompanied by structural limitations. While the system effectively facilitates the acquisition of basic repertoire, it primarily emphasizes melodic and rhythmic representation and provides comparatively limited capacity for communicating harmonic structures, expressive markings, dynamic nuances, and complex polyphonic relationships (Sparks, 2023; Chang, 2022). As contemporary Guzheng performance increasingly incorporates innovative compositional techniques and intercultural influences, these limitations become more apparent. The expanding repertoire of modern Guzheng music frequently demands greater interpretive precision and technical flexibility than traditional numbered notation alone can efficiently support (Cao & Kantasiri, 2023; Ning & Maneewattana, 2024).

Furthermore, the rapid globalization of music education has exposed young musicians to increasingly diverse musical traditions and performance contexts. In such environments, exclusive reliance on Jianpu may constrain opportunities for broader musical engagement, particularly when students seek to participate in ensemble settings, international exchanges, or interdisciplinary collaborations where staff notation functions as the dominant communicative medium (Peng, 2022; Ho, 2021).

The Global Imperative of Standard Western Notation

In contrast to Jianpu, Standard Western Notation operates as a globally recognized symbolic language capable of communicating complex musical information with a high degree of precision. Through its systematic representation of pitch, rhythm, harmony, dynamics, articulation, and form, staff notation enables musicians from diverse cultural backgrounds to interpret and perform music within a shared framework (Stenberg & Cross, 2019; Arthurs & Petrini, 2024).

The increasing integration of SWN into Chinese music education reflects broader processes of globalization and educational internationalization. Contemporary music curricula increasingly emphasize comprehensive music literacy, intercultural communication, and global participation, all of which are facilitated by familiarity with internationally recognized notation systems (Ho, 2021; Yang & Welch, 2023). For Guzheng students, the ability to read staff notation provides access to a wider range of repertoire, pedagogical resources, digital learning platforms, and collaborative opportunities that extend beyond local cultural contexts (Wan, 2022; Huralna et al., 2024).

Importantly, SWN should not be understood as a replacement for traditional notation systems but rather as an additional communicative resource. Research on the development of contemporary Guzheng performance suggests that the future vitality of the instrument depends upon balancing cultural preservation with openness to new artistic influences and performance practices (Cao & Kantasiri, 2023; Ning & Maneewattana, 2024). The integration of Western notation has contributed to the expansion of Guzheng repertoire, enabling performers to engage with contemporary compositions, intercultural collaborations, and experimental musical forms while maintaining connections to traditional performance aesthetics (Junyi, 2023).

From a social science perspective, the significance of SWN extends beyond technical musicianship. As global cultural exchanges intensify, musical literacy increasingly functions as a form of cultural capital that enables participation within broader transnational artistic communities (Ho, 2021; Peng, 2022). Cross-cultural music cognition research suggests that engagement with diverse symbolic and musical systems enhances learners' capacity to recognize alternative cultural frameworks, interpret unfamiliar artistic practices, and develop greater intercultural sensitivity (Jacoby et al., 2020). Thus, learning staff notation may contribute not only to musical proficiency but also to the development of cross-cultural competence.

The contemporary challenge for music educators therefore lies not in choosing between Jianpu and Standard Western Notation but in identifying pedagogical approaches that allow learners to benefit from both systems. Rather than viewing traditional and Western notation as competing paradigms, a more productive perspective recognizes them as complementary forms of musical literacy that support different yet interconnected dimensions of learning. This perspective provides the foundation for the concept of notation bilingualism proposed in this paper.

By developing fluency in both Jianpu and SWN, students may acquire the ability to move flexibly between local and global musical contexts while maintaining a strong sense of cultural identity. Such dual literacy has the potential to strengthen music cognition, broaden artistic opportunities, and foster cross-cultural competence without undermining the cultural authenticity of traditional Guzheng education. In this regard, notation bilingualism represents not merely an instructional strategy but a framework for reconciling cultural heritage with educational innovation in the twenty-first century.

Theoretical Synthesis: Intersecting Cognitive Load Theory and Social Constructivism

The conceptual foundation of notation bilingualism rests upon the integration of two influential educational perspectives: Cognitive Load Theory (CLT) and Social Constructivist Learning Theory. Although these frameworks are frequently presented as representing different traditions within educational research, they offer complementary explanations for how learners acquire, process, and internalize complex symbolic systems (Sweller et al., 2019; Zajda & Zajda, 2021). Within the context of dual-notation music education, Cognitive Load Theory explains how instructional design can optimize cognitive processing, whereas Social Constructivism explains how learners actively construct meaning through social interaction and cultural engagement. Together, these perspectives provide a robust theoretical foundation for understanding notation bilingualism as both a cognitive and socio-cultural process.

Cognitive Load Theory: Managing Symbolic Complexity in Dual-Notation Learning

Originally developed by Sweller (1988), Cognitive Load Theory argues that effective learning depends upon managing the limited capacity of working memory. Learning becomes difficult when instructional materials overwhelm cognitive resources or present information in ways that require unnecessary mental effort (Sweller, 2020; Sweller et al., 2019). This principle is particularly relevant in music education, where learners must simultaneously process auditory, visual, motor, and symbolic information during performance and practice.

Research suggests that music reading represents a highly complex cognitive activity involving the coordination of notation recognition, auditory imagination, rhythmic processing, motor planning, and expressive interpretation (Fourie, 2004; Brodsky et al., 2008; Arthurs & Petrini, 2024). Contemporary neuroscience studies further demonstrate that musical learning activates distributed neural networks associated with perception, memory, prediction, and motor coordination, making music literacy a cognitively demanding undertaking (Vuust et al., 2022; Honing, 2021). Consequently, introducing a second notation system into Guzheng instruction may initially increase cognitive demands, particularly for young learners whose symbolic schemas remain under development.

The challenge becomes especially evident when students accustomed to Jianpu encounter Standard Western Notation. Because the two systems encode musical information differently, learners may experience what Sweller et al. (2019) describe as a split-attention effect, whereby cognitive resources are divided between multiple sources of information. Similarly, poorly designed instructional materials may create excessive extraneous load that interferes with meaningful learning (Sentz et al., 2019; Mayer, 2024). Without appropriate pedagogical support, dual-notation instruction may therefore overwhelm working memory and hinder learning efficiency (Castelino, 2024).

To address these challenges, the proposed notation bilingualism framework applies the three forms of cognitive load identified within CLT.

Intrinsic Cognitive Load: Managing Content Complexity

Intrinsic cognitive load refers to the inherent complexity of the learning material itself (Sweller et al., 2019). In music education, this complexity emerges from the need to coordinate pitch recognition, rhythmic understanding, notation reading, finger movements, and expressive performance simultaneously (Owens & Sweller, 2008; Arthurs & Petrini, 2024). Within notation bilingualism, intrinsic load is managed through progressive sequencing and scaffolded instruction. Students first engage with simple melodic patterns and familiar musical structures before gradually introducing more complex notation translation tasks and

performance demands. Such progression aligns with developmentally appropriate music instruction that emphasizes gradual mastery and confidence building among young learners (Adjepong, 2021).

Extraneous Cognitive Load: Reducing Instructional Clutter

Extraneous cognitive load arises from ineffective instructional design rather than from the content itself (Sweller, 2020). In dual-notation learning environments, excessive visual complexity, fragmented materials, or poorly coordinated notation displays can divert learners' attention away from meaningful musical understanding. To minimize such barriers, notation bilingualism promotes the use of clear layouts, integrated visual representations, comparative notation charts, and multimodal learning resources that align auditory, visual, and kinesthetic information (Mayer, 2024; Huralna et al., 2024). Such strategies reduce unnecessary cognitive effort and support efficient information processing.

Germane Cognitive Load: Building Musical Schemas

Germane cognitive load refers to the productive mental effort devoted to constructing long-term knowledge structures, or schemas (Paas, Renkl, & Sweller, 2003). Within the notation bilingualism framework, germane load is intentionally enhanced through activities that require learners to compare, translate, and interpret equivalent musical information across notation systems. Comparative reading exercises, notation conversion tasks, and multimodal learning experiences encourage students to establish deeper conceptual connections between symbolic representations (Leikvoll, 2025; Brodsky et al., 2008). Such activities strengthen pattern recognition, symbolic flexibility, and long-term retention while promoting the development of transferable music literacy skills.

Viewed collectively, these principles suggest that notation bilingualism is not merely an additive process of learning two notation systems. Rather, it represents a carefully designed cognitive environment in which instructional strategies optimize working memory and facilitate the development of integrated musical schemas.

Social Constructivism: Notation as a Cultural and Symbolic Tool

While Cognitive Load Theory explains how learners process information, Social Constructivist Learning Theory explains how learners construct meaning from that information. Rooted in the work of Vygotsky (1978), Social Constructivism proposes that learning occurs through interaction, dialogue, and engagement with cultural tools. Knowledge is not passively transmitted from teacher to student; rather, it is actively constructed through participation in socially and culturally meaningful activities (Fosnot & Perry, 1996; Zajda & Zajda, 2021).

Within music education, constructivist approaches emphasize active musical engagement, exploration, reflection, and collaborative learning (Pierard & Lines, 2022; Johnson, 2024). Students develop understanding not simply by memorizing musical symbols but by interpreting, performing, and contextualizing them within authentic musical experiences. This perspective is particularly relevant for notation bilingualism because musical notation itself can be understood as a cultural artifact that mediates musical thinking and communication.

From a constructivist standpoint, Jianpu and Standard Western Notation represent distinct symbolic systems that embody different historical traditions, pedagogical values, and cultural perspectives (Kaminski, 2022; Yang et al., 2025). Learning to navigate between these systems therefore involves more than acquiring technical literacy; it requires learners to engage with multiple ways of representing and understanding musical knowledge. Such experiences encourage symbolic flexibility and foster deeper awareness of the cultural dimensions of music learning.

Central to Vygotsky's theory is the concept of the Zone of Proximal Development (ZPD), which describes the distance between what learners can accomplish independently and what they can achieve with appropriate guidance (Vygotsky, 1978). Within notation bilingualism, teachers function as facilitators who provide scaffolding that enables students to connect familiar Jianpu knowledge with unfamiliar elements of Western notation. Through guided comparison, collaborative interpretation, and structured practice, learners gradually internalize increasingly sophisticated forms of musical understanding (Kim, Belland, & Axelrod, 2019).

This shift redefines the role of the music teacher. Rather than functioning solely as an authority who transmits knowledge through demonstration and imitation, the teacher becomes a mediator who supports exploration, reflection, and meaning-making. Research in learner-centered music education consistently demonstrates that such approaches enhance engagement, motivation, autonomy, and conceptual understanding (Beirnes, 2022; Abdullah et al., 2021; Ng et al., 2022).

Furthermore, constructivist learning environments encourage peer interaction and collaborative problem solving. Through group discussions, shared performances, and collective interpretation of musical texts, learners participate in the co-construction of musical meaning. Such social processes not only support music literacy development but also cultivate communication skills, empathy, and intercultural understanding (Salvador et al., 2020; Prest, 2020).

Toward an Integrated Theory of Notation Bilingualism

The integration of Cognitive Load Theory and Social Constructivism provides a comprehensive explanation of how notation bilingualism may function as both a cognitive and socio-cultural phenomenon. CLT explains how dual-notation instruction can be designed to avoid cognitive overload and facilitate efficient schema construction, while Social Constructivism explains how learners actively interpret notation systems as meaningful cultural tools.

Together, these theories suggest that notation bilingualism extends beyond the acquisition of technical music-reading skills. Through carefully scaffolded instruction and socially mediated learning experiences, students develop the ability to navigate multiple symbolic systems, construct flexible musical knowledge, and engage with diverse cultural traditions. In this way, notation bilingualism becomes a mechanism for fostering not only music literacy but also broader forms of cognitive flexibility, cultural awareness, and cross-cultural competence.

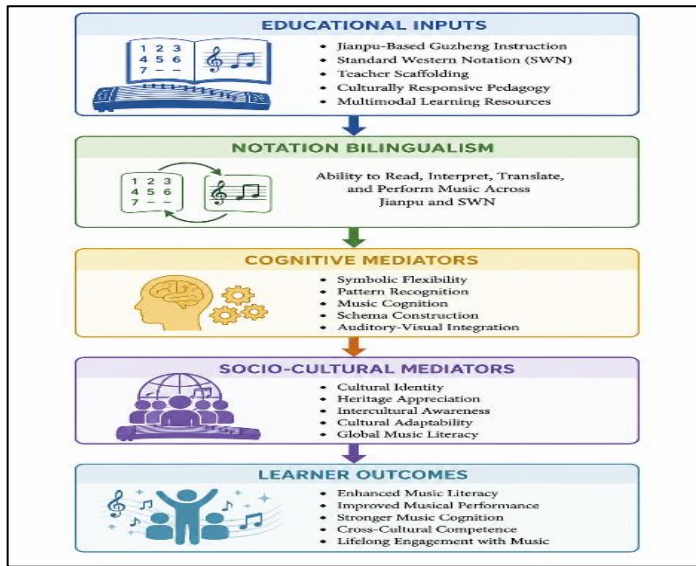
Consequently, the integration of Standard Western Notation into Guzheng education should not be viewed as a replacement of tradition. Instead, it can be understood as a pedagogical expansion that enriches learners' interpretive capacities while preserving the cultural significance of Jianpu. By bringing together cognitive efficiency and cultural meaning-making, notation bilingualism offers a theoretical pathway for reconciling heritage preservation with educational innovation in contemporary music education.

Conceptual Framework of Notation Bilingualism and Cross-Cultural Competence

The central argument of this paper is that notation bilingualism serves as a bridge between cultural preservation and global musical participation. Rather than conceptualizing Jianpu and Standard Western Notation (SWN) as competing systems, the proposed framework positions them as complementary symbolic languages that collectively support music literacy, cognitive flexibility, cultural identity, and cross-cultural competence. Drawing upon Cognitive Load Theory, Social Constructivist Learning Theory, and contemporary perspectives on intercultural education, the framework explains how dual-notation learning can transform traditional Guzheng instruction into a platform for both cultural sustainability and global engagement.

Figure 1 presents the proposed conceptual framework of notation bilingualism and cross-cultural competence. The framework is organized into five interconnected layers: Educational Inputs, Notation Bilingualism, Cognitive Mediators, Socio-Cultural Mediators, and Learner Outcomes. Together, these components illustrate the theoretical pathways through which dual-notation instruction contributes to both musical and intercultural development.

Figure 1. Conceptual Framework of Notation Bilingualism and Cross-Cultural Competence



As illustrated in Figure 1, the framework begins with a set of educational inputs consisting of Jianpu-based Guzheng instruction, Standard Western Notation (SWN), teacher scaffolding, culturally responsive pedagogy, and multimodal learning resources. These instructional elements provide the foundation for creating a learning environment that simultaneously values traditional Chinese musical heritage and contemporary music literacy. The inclusion of culturally responsive teaching ensures that students remain connected to the cultural significance of Jianpu while developing competence in internationally recognized notation systems (Gay, 2018; McKoy & Lind, 2022).

At the center of the framework lies notation bilingualism, which represents the ability to read, interpret, translate, and perform musical repertoire using both Jianpu and Standard Western Notation. Similar to bilingual language education, notation bilingualism does not require the replacement of one symbolic system by another. Instead, learners develop fluency across multiple representational systems while recognizing the cultural and musical meanings embedded within each notation tradition. This dual fluency enables students to navigate both local and global musical contexts with greater confidence and flexibility.

The framework proposes that notation bilingualism influences learning through two interconnected mediating processes. The first consists of cognitive mediators, including symbolic flexibility, pattern recognition, music cognition, schema construction, and auditory-visual integration. Drawing upon Cognitive Load Theory, these cognitive processes enable learners to establish meaningful relationships between different symbolic representations of musical information (Sweller et al., 2019; Sweller, 2020). Through activities such as notation comparison, translation exercises, and multimodal music-making, students develop integrated cognitive schemas that support deeper musical understanding and more efficient information processing (Honing, 2021; Vuust et al., 2022).

The second layer consists of socio-cultural mediators, including cultural identity, heritage appreciation, intercultural awareness, cultural adaptability, and global music literacy. This component reflects the social constructivist view that notation systems are not merely technical tools but cultural artifacts that shape how musical knowledge is created, interpreted, and transmitted (Vygotsky, 1978; Fosnot & Perry, 1996). Continued engagement with Jianpu strengthens learners' connection to Chinese musical heritage, while exposure to Standard Western Notation broadens their participation in international musical communities. Consequently, notation bilingualism promotes both cultural rootedness and intercultural openness.

The interaction between these cognitive and socio-cultural processes ultimately contributes to a range of learner outcomes. As shown in Figure 1, the framework anticipates improvements in music literacy, musical performance, music cognition, cross-cultural competence, and lifelong engagement with music. Enhanced music literacy emerges through increased fluency across notation systems, while improved musical performance results

from greater symbolic understanding and interpretive flexibility. At the same time, the framework suggests that dual-notation learning contributes to broader educational goals by fostering intercultural awareness and preparing students to participate meaningfully in increasingly interconnected cultural environments.

Importantly, Figure 1 illustrates that notation bilingualism should not be viewed solely as a technical music-reading skill. Rather, it functions as a developmental mechanism through which learners acquire cognitive flexibility, strengthen cultural identity, and cultivate cross-cultural competence. In this sense, notation bilingualism serves as a conceptual bridge connecting heritage preservation with educational innovation. By enabling students to move fluidly between traditional and global musical systems, the framework offers a pathway for reimagining early music literacy within contemporary Guzheng education.

Based on the relationships illustrated in Figure 1, the framework proposes that educational inputs influence learner outcomes indirectly through the development of notation bilingualism and the subsequent activation of cognitive and socio-cultural mediating processes. This proposition provides the theoretical foundation for the instructional model presented in the following section, where the ADDIE framework is introduced as a practical mechanism for operationalizing notation bilingualism within extracurricular Guzheng education.

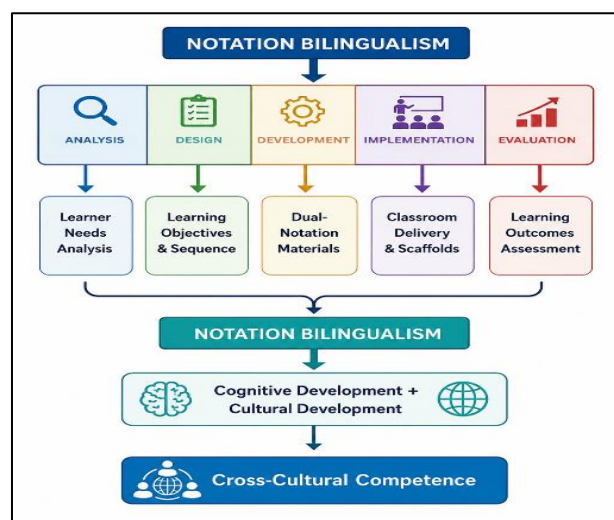
Operationalizing Notation Bilingualism Through the Addie Model

While the conceptual framework presented in Figure 1 explains the theoretical relationships between notation bilingualism, music cognition, cultural identity, and cross-cultural competence, educators require a practical mechanism through which these relationships can be translated into meaningful learning experiences. To bridge theory and practice, this paper adopts the ADDIE instructional design model (Analysis, Design, Development, Implementation, and Evaluation) as an operational framework for integrating Standard Western Notation (SWN) into Guzheng education.

The ADDIE model is widely recognized as one of the most systematic approaches to instructional design and has been successfully applied across diverse educational contexts, including music education (Li & Abidin, 2024; Arum & Jacob, 2024). More importantly, the model aligns closely with the theoretical foundations underpinning notation bilingualism. From a Cognitive Load Theory perspective, ADDIE facilitates the careful management of instructional complexity and cognitive demands. From a Social Constructivist perspective, it supports the creation of learner-centered environments that promote exploration, collaboration, and active meaning-making (Sweller et al., 2019; Zajda & Zajda, 2021).

Within the proposed framework, ADDIE serves as a pedagogical bridge connecting cultural preservation, cognitive development, and intercultural learning. Figure 2 illustrates how the five phases of ADDIE collectively support the development of notation bilingualism, which subsequently contributes to cognitive development, cultural development, and ultimately cross-cultural competence.

Figure 2. Operationalization of the Notation Bilingualism Framework Through the ADDIE Model



As shown in Figure 2, the process begins with the five interconnected phases of ADDIE. The Analysis phase examines learner readiness and contextual factors, the Design phase structures learning objectives and instructional sequences, the Development phase produces dual-notation learning materials, the Implementation phase facilitates guided classroom experiences, and the Evaluation phase assesses learning outcomes. Collectively, these phases support the systematic development of notation bilingualism. Once learners acquire fluency across Jianpu and Standard Western Notation, they experience growth in both cognitive and cultural domains, ultimately contributing to the development of cross-cultural competence. Thus, ADDIE functions not merely as an instructional design framework but as a mechanism for transforming notation bilingualism from a theoretical construct into an educational reality.

To further illustrate the relationship between the ADDIE model and the theoretical foundations of notation bilingualism, Table 1 summarizes how each instructional design phase aligns with Cognitive Load Theory and Social Constructivist Learning Theory while contributing to specific educational outcomes.

Table 1. Alignment of ADDIE Phases with Theoretical Foundations and Intended Outcomes

ADDIE Phase	Cognitive Load Theory Contribution	Social Constructivist Contribution	Intended Outcome
Analysis	Identifies learner readiness and prior knowledge	Examines cultural and learning contexts	Appropriate instructional planning
Design	Sequences tasks to manage cognitive load	Promotes active knowledge construction	Structured dual-notation learning
Development	Creates multimodal resources and reduces extraneous load	Provides meaningful learning artifacts	Improved notation accessibility
Implementation	Supports schema formation through guided practice	Facilitates collaboration and scaffolding	Development of notation bilingualism
Evaluation	Measures cognitive growth and learning efficiency	Assesses reflection and social learning	Enhanced music literacy and intercultural competence

Analysis Phase: Understanding Learners and Contexts

The Analysis phase focuses on identifying learner characteristics, prior knowledge, instructional needs, and contextual factors that influence learning. Within the notation bilingualism framework, this stage recognizes that primary school Guzheng learners often possess varying degrees of familiarity with Jianpu while having limited exposure to Standard Western Notation (Gu & Liu, 2019; Sparks, 2023).

From a developmental perspective, learners around the age of ten demonstrate increasing capacities for symbolic reasoning, abstract thinking, and pattern recognition, making this an appropriate stage for introducing dual-notation learning (Piaget, 1972; Adjepong, 2021). Analysis therefore involves examining students' existing music literacy, technical proficiency, motivational characteristics, and learning preferences.

In addition to cognitive readiness, educators must consider the socio-cultural context in which learning occurs. Since Jianpu functions as both a pedagogical tool and a cultural symbol, any instructional intervention should preserve its cultural significance while expanding students' access to broader musical literacies (Ho, 2021; Huang et al., 2024). This phase establishes the foundation upon which culturally responsive notation bilingualism can be developed.

Design Phase: Structuring Progressive Dual-Notation Learning

The Design phase translates instructional goals into structured learning experiences. Guided by Cognitive Load Theory, instructional tasks should be sequenced from simple to complex in order to minimize cognitive overload and facilitate schema construction (Sweller, 2020; Mayer, 2024).

Within notation bilingualism, learning objectives focus on helping students recognize, compare, and eventually translate musical information between Jianpu and Standard Western Notation. Early learning activities may involve simple melodic comparisons, while later tasks introduce more sophisticated notation-reading and interpretive skills.

The Design phase also incorporates constructivist principles by encouraging active engagement rather than passive memorization. Learning experiences are intentionally structured to promote exploration, discussion, reflection, and collaborative music-making (Pierard & Lines, 2022; Johnson, 2024). Such experiences encourage students to construct meaningful relationships between notation systems and their corresponding musical concepts.

Development Phase: Creating Multimodal Learning Resources

The Development phase focuses on producing instructional materials that facilitate dual-notation learning while reducing unnecessary cognitive burden. Research on multimedia learning suggests that instructional resources should integrate visual, auditory, and kinesthetic elements to support meaningful learning and long-term retention (Mayer, 2024; Huralna et al., 2024).

Within the notation bilingualism framework, learning resources may include side-by-side Jianpu and SWN scores, color-coded notation charts, notation conversion guides, interactive digital activities, video demonstrations, and performance-based exercises. Such materials help students visualize correspondences between notation systems and strengthen symbolic flexibility.

To ensure instructional quality, resources should undergo expert validation involving music educators, Guzheng specialists, curriculum designers, and cultural practitioners. This process helps maintain pedagogical rigor, practical feasibility, and cultural authenticity (Wang & Ong, 2024).

Implementation Phase: Facilitating Meaningful Musical Experiences

The Implementation phase involves the delivery of dual-notation instruction within authentic learning environments. Consistent with Social Constructivist Learning Theory, teachers assume the role of facilitators who guide learners through increasingly complex tasks while providing appropriate scaffolding and support (Vygotsky, 1978; Kim et al., 2019).

Students engage in notation comparison activities, collaborative music-making, guided sight-reading, peer discussions, and reflective performance tasks. Through these experiences, learners actively construct understanding rather than simply memorizing symbolic information. This instructional approach aligns with contemporary learner-centered music education practices that emphasize engagement, autonomy, and conceptual understanding (Beirnes, 2022; Abdullah et al., 2021).

The implementation process also acknowledges the embodied nature of musical learning. Physical demonstration, performance practice, imitation, and tactile interaction with the Guzheng enable students to connect visual notation with auditory perception and motor execution (Feldman et al., 2020). Through repeated interaction, learners gradually internalize both notation systems and develop confidence in navigating between them.

Evaluation Phase: Assessing Holistic Musical Development

The Evaluation phase serves as a continuous process for monitoring learning progress and refining instructional practices. Within the notation bilingualism framework, evaluation extends beyond technical performance to include cognitive, cultural, and intercultural dimensions of learning.

Formative evaluation occurs throughout instruction through teacher observations, reflective journals, peer feedback, performance reviews, and self-assessment activities (McPherson et al., 2022). These strategies provide ongoing information regarding learner progress and instructional effectiveness.

Summative evaluation focuses on the broader outcomes identified in Figure 1 and Figure 2, including music literacy, musical performance, music cognition, cultural identity, and cross-cultural competence. Rather than emphasizing a single measure of achievement, evaluation captures the multidimensional nature of learning associated with notation bilingualism (Mantie, 2019; Moura et al., 2024).

To ensure that the implementation of notation bilingualism can be evaluated systematically, the framework incorporates three complementary assessment domains: student engagement, musical performance skills, and music cognition. These domains operationalize the key educational outcomes associated with notation bilingualism and provide a balanced assessment of affective, psychomotor, and cognitive development. Together, they offer measurable indicators through which the effectiveness of the proposed framework can be examined. Table 2 summarizes the proposed assessment framework and associated evaluation instruments.

Table 2. Assessment Framework for Evaluating Outcomes of Notation Bilingualism

Outcome Domain	Assessment Instrument	Key Dimensions
Student Engagement	Student Engagement Rating Scale (SERS)	Attention, Enthusiasm, Persistence, Active Participation
Musical Performance Skills	Practical Performance Assessment Rubric	Technical Execution & Tone Accuracy, Temporal & Rhythm Stability, Expressive Control & Phrase Interpretation
Music Cognition	Music Cognition Assessment	Pitch Recognition, Rhythm Understanding, Notation Decoding, Music Theory Knowledge

Although the present framework identifies student engagement, musical performance skills, and music cognition as the primary measurable outcomes, future research should also focus on developing and validating instruments capable of assessing notation bilingualism, cultural identity, and cross-cultural competence. Such measures would enable researchers to examine more comprehensively the cognitive and socio-cultural relationships proposed within the conceptual model.

While student engagement, musical performance skills, and music cognition represent the primary measurable outcomes of the framework, they also function as foundational mechanisms that support broader socio-cultural development. Increased engagement encourages sustained participation in musical learning, improved cognition strengthens symbolic flexibility across notation systems, and enhanced performance skills facilitate meaningful interaction with diverse musical traditions. Collectively, these educational outcomes contribute to the development of cultural identity, global music literacy, and cross-cultural competence, enabling learners to navigate both traditional Chinese and international musical contexts with greater confidence and understanding. Thus, the measurable outcomes identified in Table 2 serve not only as indicators of instructional effectiveness but also as pathways toward the broader educational and socio-cultural aspirations of notation bilingualism.

From Notation Bilingualism to Cross-Cultural Competence

As illustrated in Figure 2, the successful completion of the ADDIE cycle contributes to the development of notation bilingualism, which acts as a catalyst for both cognitive and cultural growth. Cognitive development emerges through enhanced symbolic flexibility, pattern recognition, schema formation, and music cognition. Simultaneously, cultural development occurs through sustained engagement with Chinese musical heritage alongside increased exposure to global musical practices.

The interaction between these dimensions creates the conditions necessary for cross-cultural competence. Students become capable of navigating multiple musical systems, appreciating diverse cultural traditions, and participating more confidently within both local and international musical communities. In this sense, notation bilingualism extends beyond technical music literacy to become a mechanism for intercultural learning and cultural sustainability.

Consequently, the ADDIE model provides more than a framework for instructional planning. It serves as a practical pathway through which traditional Guzheng education can preserve cultural authenticity while equipping learners with the competencies required for meaningful participation in an increasingly interconnected world.

Educational And Social Implications of Notation Bilingualism

The proposed framework of notation bilingualism extends beyond the technical acquisition of music-reading skills and offers broader implications for music education, cultural sustainability, and intercultural learning. By positioning Jianpu and Standard Western Notation (SWN) as complementary rather than competing systems, the framework provides a pathway through which traditional music education can respond constructively to the demands of globalization while preserving cultural authenticity (Ho, 2021; Peng, 2022; Yang & Welch, 2023). The implications of this approach are particularly relevant within contemporary educational contexts where learners are increasingly expected to navigate multiple cultural, linguistic, and symbolic systems (Prest, 2020; Junyi, 2023).

Implications for Music Education

One of the most significant contributions of notation bilingualism lies in its potential to transform traditional approaches to music literacy. Conventional music instruction often treats notation systems as isolated entities, requiring students to master one system before encountering another. Such approaches may inadvertently limit students' ability to transfer knowledge across musical contexts and reduce opportunities for broader musical participation (Gu & Liu, 2019; Sparks, 2023).

The notation bilingualism framework challenges this assumption by proposing that learners can develop fluency across multiple notation systems simultaneously through carefully scaffolded instruction. By engaging with both Jianpu and SWN, students gain access to a wider range of musical resources, repertoire, and learning opportunities (Yang & Welch, 2023; Wan, 2022). This dual-literacy approach promotes symbolic flexibility and encourages students to view musical symbols as interconnected representations of shared musical concepts rather than isolated systems (Jacoby et al., 2020; Honing, 2021).

Furthermore, the framework aligns with contemporary learner-centered pedagogies that emphasize active engagement, critical thinking, and meaningful knowledge construction (Pierard & Lines, 2022; Johnson, 2024). Through comparative notation activities, collaborative learning experiences, and multimodal instructional resources, students become active participants in the learning process rather than passive recipients of information. Such experiences are likely to enhance motivation, engagement, and long-term commitment to musical learning (Beirnes, 2022; Abdullah et al., 2021; Ng et al., 2022).

Implications for Cultural Sustainability

The rapid globalization of education has generated concerns regarding the preservation of traditional cultural practices and indigenous knowledge systems (Ho, 2021; Huang et al., 2024). Within music education, these concerns are particularly evident when internationally dominant systems appear to overshadow local traditions. In the Chinese context, the growing prominence of Standard Western Notation has sometimes been perceived as a potential threat to traditional notation systems such as Jianpu (Chang, 2022; Kaminski, 2022).

The framework proposed in this paper offers an alternative perspective. Rather than replacing traditional practices, notation bilingualism promotes coexistence and mutual enrichment between notation systems. Continued engagement with Jianpu enables learners to maintain connections with Chinese musical heritage, while exposure to SWN broadens their access to global musical communities (Yang et al., 2025; Cao & Kantasiri, 2023).

From this perspective, cultural preservation and educational innovation are not contradictory goals. Instead, they become complementary processes that support the sustainable transmission of musical heritage across generations (Gay, 2018; McKoy & Lind, 2022). By equipping students with the ability to operate within both

traditional and international musical environments, notation bilingualism contributes to the long-term vitality and relevance of Guzheng education in contemporary society (Ning & Maneewattana, 2024; Wang & Ong, 2024).

Implications for Cross-Cultural Competence

A central contribution of the notation bilingualism framework is its potential to support the development of cross-cultural competence. Contemporary educational systems increasingly recognize the importance of preparing learners to interact effectively within diverse cultural environments (Prest, 2020; Junyi, 2023). While cross-cultural competence is often associated with language learning and international education, music education provides an equally valuable platform for cultivating intercultural understanding (Ho, 2021).

Musical notation systems function as symbolic representations of cultural knowledge. Learning to navigate multiple notation systems requires students to interpret different modes of representation, understand alternative musical conventions, and appreciate diverse historical traditions (Kaminski, 2022; Yang et al., 2025). Through this process, learners become more aware of the cultural assumptions embedded within symbolic systems and develop greater flexibility in approaching unfamiliar forms of knowledge (Jacoby et al., 2020).

Consequently, notation bilingualism can be viewed as a form of symbolic intercultural learning. Students who become proficient in both Jianpu and SWN acquire not only technical music literacy but also the ability to move between local and global musical contexts. Such experiences may foster intercultural awareness, empathy, adaptability, and openness to diversity, qualities that are increasingly important in multicultural societies and global educational environments (Prest, 2020; Junyi, 2023).

Implications for Curriculum Development and Educational Policy

The proposed framework also carries important implications for curriculum designers, educational administrators, and policymakers. Current music curricula often separate traditional and Western musical knowledge into distinct instructional domains. Such separation may inadvertently reinforce the perception that cultural traditions and international competencies are mutually exclusive (Tu, 2022; Yang & Welch, 2023).

The notation bilingualism framework suggests that more integrated approaches may be possible. Curriculum developers may consider designing dual-notation learning experiences that encourage students to explore relationships between different musical systems while maintaining respect for cultural traditions (Gay, 2018; McKoy & Lind, 2022). Such integration may be particularly beneficial in extracurricular music programs where flexibility in instructional design allows for experimentation with innovative pedagogical approaches (Li & Abidin, 2024).

For policymakers, the framework highlights the importance of balancing cultural preservation with global educational goals. Educational reforms aimed at increasing international competitiveness need not come at the expense of local cultural traditions. Instead, policies that encourage dual-literacy approaches may provide a more sustainable pathway for preparing learners to participate confidently in both national and global cultural contexts (Ho, 2021; Peng, 2022).

Toward a New Vision of Early Music Literacy

Taken together, these implications suggest that notation bilingualism represents more than an instructional strategy for Guzheng education. It offers a broader vision of early music literacy in which cultural heritage, cognitive development, and intercultural learning are viewed as interconnected dimensions of educational practice (Sweller, 2020; Vygotsky, 1978; Zajda & Zajda, 2021).

In this vision, students are not asked to choose between tradition and modernity, nor between local identity and global participation. Rather, they are encouraged to develop the knowledge, skills, and dispositions necessary to engage meaningfully with both. Through the integration of Jianpu and Standard Western Notation, music education becomes a site where cultural continuity and educational innovation coexist, enabling young learners

to become both guardians of cultural heritage and participants in an increasingly interconnected musical world (Ho, 2021; Yang & Welch, 2023; Prest, 2020).

Future Research Directions and Research Propositions

The conceptual framework proposed in this paper positions notation bilingualism as a mechanism through which traditional music education can simultaneously support music literacy, cognitive development, cultural sustainability, and cross-cultural competence. Although the framework is theoretically grounded in Cognitive Load Theory (Sweller et al., 2019; Sweller, 2020), Social Constructivist Learning Theory (Vygotsky, 1978; Fosnot & Perry, 1996; Zajda & Zajda, 2021), and contemporary scholarship on intercultural education (Prest, 2020; Junyi, 2023), its effectiveness remains to be empirically validated. Consequently, future research is necessary to examine, refine, and extend the relationships proposed throughout this paper.

A primary direction for future research involves evaluating the effectiveness of notation bilingualism in enhancing student engagement within Guzheng education. Student engagement is widely recognized as a critical predictor of academic achievement, persistence, and long-term participation in learning activities (Fredricks et al., 2004; Abdullah et al., 2021). The present framework suggests that dual-notation learning environments may enhance engagement by creating interactive, multimodal, and learner-centered experiences that encourage active participation and sustained motivation (Beirnes, 2022; Ng et al., 2022). Future studies may therefore investigate whether students exposed to notation bilingualism demonstrate higher levels of attention, enthusiasm, persistence, and active participation than those receiving conventional single-notation instruction.

A second area for investigation concerns music cognition. The framework proposes that engagement with multiple symbolic systems promotes pattern recognition, auditory-visual integration, schema construction, and symbolic flexibility. These cognitive processes are central to the development of music literacy and may represent one of the primary mechanisms through which notation bilingualism influences broader educational outcomes (Honing, 2021; Jacoby et al., 2020; Vuust et al., 2022). Future empirical studies may explore the extent to which dual-notation instruction enhances learners' music cognition when compared with traditional pedagogical approaches. Particular attention should be given to the development of notation decoding skills, pitch recognition, rhythmic understanding, and symbolic transfer across representational systems (Arthurs & Petrini, 2024).

Future research should also examine the relationship between notation bilingualism and musical performance skills. The proposed framework assumes that stronger notation decoding abilities and more flexible cognitive schemas will translate into improved technical execution, rhythmic stability, and expressive interpretation. Previous studies have demonstrated that music-reading proficiency is closely associated with performance accuracy and interpretive quality (Brodsky et al., 2008; Fourie, 2004). Quasi-experimental and longitudinal studies may therefore provide valuable evidence regarding the effectiveness of dual-notation learning in supporting performance development among primary school Guzheng learners.

Beyond educational outcomes, additional research is required to investigate the socio-cultural dimensions of notation bilingualism. While the framework proposes that dual-notation learning strengthens cultural identity by maintaining learners' engagement with traditional Chinese musical practices, empirical evidence is needed to determine how students perceive and negotiate the relationship between traditional and global musical literacies. Existing scholarship suggests that culturally responsive educational practices contribute to stronger identity formation and heritage appreciation (Gay, 2018; McKoy & Lind, 2022). Future qualitative studies involving interviews, reflective journals, and classroom observations may provide valuable insights into these cultural processes.

Perhaps the most significant avenue for future research concerns the relationship between notation bilingualism and cross-cultural competence. Existing literature has extensively explored intercultural competence within language education and international learning contexts; however, relatively little research has examined how symbolic systems such as musical notation contribute to intercultural understanding (Prest, 2020; Junyi, 2023). As globalization continues to influence educational systems worldwide, there is increasing interest in identifying pedagogical approaches that simultaneously preserve local cultural traditions and promote global awareness (Ho,

2021; Peng, 2022). Future studies may therefore investigate whether learners who develop proficiency in both Jianpu and Standard Western Notation demonstrate greater cultural adaptability, intercultural awareness, and openness toward diverse musical traditions.

Furthermore, future research may explore the applicability of notation bilingualism beyond Guzheng education. Similar approaches may be adapted for other traditional Chinese instruments, including the Pipa, Erhu, Dizi, and Yangqin, as well as traditional music education contexts in other cultural settings. Comparative studies may help determine whether notation bilingualism represents a broader pedagogical model capable of supporting cultural sustainability and intercultural learning across diverse musical traditions (Yang et al., 2025; Ho, 2021).

In addition to examining the anticipated benefits of notation bilingualism, future research should investigate potential challenges associated with dual-notation learning. Although the framework proposes that carefully scaffolded instruction can mitigate cognitive difficulties, learners may initially experience symbolic confusion, cognitive overload, increased learning demands, or resistance when navigating multiple notation systems simultaneously. Experimental and quasi-experimental studies comparing single-notation and dual-notation instructional approaches would provide valuable evidence regarding both the benefits and limitations of notation bilingualism. Such investigations would contribute to a more balanced understanding of its educational effectiveness, implementation challenges, and practical feasibility.

Based on the conceptual relationships illustrated in Figure 1 and operationalized through the ADDIE model in Figure 2, eight research propositions are proposed for future empirical validation. These propositions are summarized in Table 3.

Table 3. Proposed Research Propositions for Future Empirical Investigation

Proposition	Statement
RP1	Notation bilingualism positively influences student engagement in Guzheng learning environments.
RP2	Notation bilingualism positively influences music cognition through enhanced symbolic flexibility, pattern recognition, and auditory-visual integration.
RP3	Notation bilingualism positively influences musical performance skills, including technical execution, rhythmic stability, and expressive interpretation.
RP4	Student engagement positively contributes to the development of music cognition within dual-notation learning environments.
RP5	Music cognition positively contributes to the development of musical performance skills.
RP6	The combined development of student engagement, music cognition, and musical performance skills contributes to stronger cultural identity and appreciation of Chinese musical heritage.
RP7	Cultural identity and global music literacy positively contribute to the development of cross-cultural competence.
RP8	Notation bilingualism indirectly promotes cross-cultural competence through its influence on student engagement, music cognition, musical performance skills, and cultural identity.

Collectively, these research propositions establish a foundation for empirical testing of the notation bilingualism framework. Future quantitative, qualitative, and mixed-methods studies may validate the proposed relationships and refine the conceptual model. Such investigations would contribute to a deeper understanding of how dual-notation instruction influences cognitive, musical, and socio-cultural development among young learners.

Ultimately, empirical evidence is necessary to determine whether notation bilingualism can serve as a sustainable model for balancing cultural preservation and global participation within contemporary music education.

Limitations of the Conceptual Framework

While the proposed framework offers a theoretically grounded model for understanding notation bilingualism in Guzheng education, several limitations should be acknowledged. First, the framework remains conceptual in nature and has not yet been empirically tested. Consequently, the relationships proposed among notation bilingualism, student engagement, music cognition, cultural identity, and cross-cultural competence should be viewed as theoretical propositions requiring validation through future research.

Second, the framework assumes that dual-notation learning can generate positive educational and socio-cultural outcomes when implemented through appropriate instructional design. However, it is possible that learners may experience challenges during the transition from Jianpu to Standard Western Notation. These challenges may include temporary confusion, increased cognitive demands, learner resistance, or difficulties associated with managing multiple symbolic systems simultaneously. Although Cognitive Load Theory and instructional scaffolding strategies are incorporated to mitigate such risks, future empirical studies are needed to determine the extent to which these challenges affect learning outcomes.

Third, several constructs proposed within the framework, including notation bilingualism, cultural identity, and cross-cultural competence, require further operationalization and measurement development. While this paper identifies potential assessment domains and evaluation strategies, additional research is necessary to establish reliable and valid instruments capable of capturing these multidimensional constructs.

Finally, the framework is developed specifically within the context of primary school Guzheng education in China. Its applicability to other traditional instruments, educational settings, and cultural contexts remains uncertain. Future comparative studies may therefore be necessary to determine the broader generalizability of the proposed model.

Despite these limitations, the framework provides a valuable starting point for understanding how dual-notation learning may contribute to music literacy, cultural sustainability, and cross-cultural competence in contemporary music education.

CONCLUSION

This paper has proposed notation bilingualism as a conceptual framework for reimagining early music literacy within contemporary Guzheng education. Situated at the intersection of cultural preservation and educational innovation, the framework responds to a growing challenge facing traditional music education in an increasingly globalized world: how to maintain cultural authenticity while preparing learners to engage confidently within diverse musical and cultural environments. Rather than viewing Jianpu and Standard Western Notation (SWN) as competing systems, the framework positions them as complementary symbolic languages capable of supporting both local cultural continuity and global musical participation.

Drawing upon Cognitive Load Theory and Social Constructivist Learning Theory, the paper conceptualized notation bilingualism as the ability to read, interpret, translate, and perform musical repertoire across multiple notation systems. From a cognitive perspective, dual-notation learning encourages symbolic flexibility, pattern recognition, schema construction, and music cognition. From a socio-cultural perspective, it strengthens cultural identity, promotes appreciation of traditional musical heritage, and fosters greater openness toward diverse musical traditions. Together, these dimensions provide a theoretical explanation for how notation bilingualism may contribute not only to music literacy and musical performance but also to the development of cross-cultural competence.

The conceptual framework further demonstrates that notation bilingualism functions as a mediating mechanism linking educational inputs with broader learner outcomes. Through the integration of Jianpu-based instruction, Standard Western Notation, teacher scaffolding, culturally responsive pedagogy, and multimodal learning

resources, learners are provided with opportunities to develop dual-symbol fluency while maintaining meaningful connections to Chinese musical traditions. The framework therefore extends existing discussions of music literacy beyond technical proficiency and positions musical learning as a process of cognitive, cultural, and intercultural development.

To translate these theoretical relationships into educational practice, the paper proposed the ADDIE model as an operational mechanism for implementing notation bilingualism within Guzheng education. Through the phases of Analysis, Design, Development, Implementation, and Evaluation, educators can systematically introduce dual-notation learning while managing cognitive demands and supporting meaningful knowledge construction. The alignment between ADDIE, Cognitive Load Theory, and Social Constructivist Learning Theory provides a practical foundation for designing culturally sensitive and pedagogically effective learning environments.

The broader significance of the framework lies in its contribution to discussions surrounding cultural sustainability and globalization. Contemporary educational systems are increasingly challenged to preserve cultural heritage while simultaneously equipping learners with competencies necessary for participation in global communities. Within this context, notation bilingualism offers a balanced approach that neither rejects traditional practices nor uncritically embraces global standardization. Instead, it proposes a model of educational integration in which cultural heritage and global literacy coexist as complementary dimensions of learning. By enabling learners to navigate both traditional Chinese and international musical systems, notation bilingualism contributes to a more inclusive and culturally responsive vision of music education.

The framework also contributes to the social science literature by extending the concept of bilingualism beyond spoken language and into the domain of symbolic and cultural literacy. Musical notation systems represent culturally embedded forms of knowledge, and the ability to move between them may be understood as a form of symbolic intercultural competence. Consequently, notation bilingualism offers a novel perspective for examining how educational experiences shape cultural identity, intercultural understanding, and participation within increasingly interconnected societies.

Although the framework remains conceptual in nature, it provides a foundation for future empirical research. The research propositions advanced in this paper offer pathways for investigating the relationships among notation bilingualism, student engagement, music cognition, musical performance, cultural identity, and cross-cultural competence. Future studies will be essential in validating and refining the framework, as well as determining its applicability across diverse musical traditions and educational settings.

Ultimately, this paper argues that the future of traditional music education does not lie in choosing between heritage and innovation, nor between local identity and global participation. Rather, it lies in creating educational approaches that enable learners to engage meaningfully with both. Through notation bilingualism, Guzheng education can become a powerful site for fostering music literacy, preserving cultural heritage, and cultivating cross-cultural competence among future generations. In this way, notation bilingualism offers not merely a pedagogical innovation for Guzheng education, but a broader educational model demonstrating how traditional cultural practices can remain vibrant, relevant, and globally connected in the twenty-first century.

REFERENCES

1. Abdullah, F. P. Y., Cheong, K. W., Alizadeh, F., & Poon, C. H. (2021). The role of instructional scaffolding to facilitate problem solving skills in music improvisation. *MIER Journal of Educational Studies Trends and Practices*.
2. Adjepong, B. (2021). Developmentally appropriate practice and music education in the primary school. *Asian Research Journal of Arts & Social Sciences*, 15(1), 35–42. <https://doi.org/10.9734/ARJASS/2021/v15i130250>
3. Arthurs, Y., & Petrini, K. (2024). Musicians' views on the role of reading music in learning, performance, and understanding. *Musicae Scientiae*, 28(1), 3–17. <https://doi.org/10.1177/1029864922114911>
4. Arum, T. A. S., & Jacob, D. W. (2024). Exploring innovative music teaching management systems: A systematic literature review. *Jurnal Syntax Admiration*, 5(7), 2589–2600. <https://doi.org/10.46799/jsa.v5i7.1302>

5. Asmus, E. P. (2021). Motivation in music teaching and learning. *Visions of Research in Music Education*, 16(5), 31.
6. Beirnes, S. (2022). Learner-centered pedagogy and student engagement in a virtual elementary instrumental music program. *International Journal of Music Education*, 40(4), 530–541. <https://doi.org/10.1177/02557614221074378>
7. Brodsky, W., Kessler, Y., Rubinstein, B. S., Ginsborg, J., & Henik, A. (2008). The mental representation of music notation: Notational audiation. *Journal of Experimental Psychology: Human Perception and Performance*, 34(2), 427–445.
8. Cao, M., & Kantasiri, K. (2023). Inheritance and development of contemporary Guzheng performance techniques. *The Journal of Sirindhornparithat*, 24(2), 550–558.
9. Chang, C.-L. (2022). Staff notation or numbered music notation: A brief history of numbered music notation and an examination of its effectiveness in music learning. *Arts Studies and Criticism*, 3(4), 310–318. <https://doi.org/10.32629/asc.v3i4.1037>
10. Chen, H., & Li, Y. (2023). Archaeological insights into the evolution of Chinese traditional music: The influence of Guzheng playing techniques. *Mediterranean Archaeology and Archaeometry*, 23(1), 296–306. <https://doi.org/10.5281/zenodo.13710047>
11. Dushniy, A., Shafeta, V., Salii, V., Storonska, N., & Molchko, U. (2024). The impact of globalization on performance musicology: Challenges and opportunities for music education in the 21st century. *Amazonia Investiga*, 13(76), 323–332. <https://doi.org/10.34069/AI/2024.76.04.26>
12. Feldman, E., Lutch, M., Contzius, A., & Bugaj, K. (2020). Instrumental music education: Teaching with the musical and practical in harmony. Routledge. <https://doi.org/10.4324/9780429028700>
13. Fosnot, C. T., & Perry, R. S. (1996). Constructivism: A psychological theory of learning. In C. T. Fosnot (Ed.), *Constructivism: Theory, perspectives, and practice* (pp. 8–33). Teachers College Press.
14. Fourie, E. (2004). The processing of music notation: Some implications for piano sight-reading. *Journal of the Musical Arts in Africa*, 1(1), 1-23.
15. Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59–109.
16. Gay, G. (2018). *Culturally responsive teaching: Theory, research, and practice* (3rd ed.). Teachers College Press.
17. Gu, M. Y., & Liu, Y. F. (2019). A case study on the interactive use of numbered notation and staff notation in Guzheng teaching. *Beifang Yinyue*, 39(17), 80–81.
18. Ho, W. C. (2021). *Globalization, nationalism, and music education in the twenty-first century in Greater China*. Amsterdam University Press.
19. Honing, H. (2021). *Music cognition: The basics*. Routledge. <https://doi.org/10.4324/9781003158301>
20. Huang, Y., Chuangprakhon, S., & Santaveesuk, P. (2024). Preservation and transmission of Shaanxi Guzheng musical instruments: Challenges and strategies for cultural sustainability. *International Research Journal of Multidisciplinary Scope*, 5(4), 147–158.
21. Huralna, S., Demianko, N., Sulaieva, N., Irklienko, V., & Horokhivska, T. (2024). Multimedia technologies for teaching musical art under present-day conditions. *International Journal of Computer Science & Network Security*, 24(5), 165–171. <https://doi.org/10.22937/IJCSNS.2024.24.5.18>
22. Jacoby, N., Margulis, E. H., Clayton, M., Hannon, E., Honing, H., Iversen, J., & Wald-Fuhrmann, M. (2020). Cross-cultural work in music cognition: Challenges, insights, and recommendations. *Music Perception*, 37(3), 185–195. <https://doi.org/10.1525/mp.2020.37.3.185>
23. Johnson, D. C. (2024). Music listening and critical thinking: Teaching using a constructivist paradigm. *International Journal of the Humanities*, 2(2), 1161–1169.
24. Junyi, L. (2023). Cross-cultural musical transformation: Shaping Chinese traditions. *Scientific Journal of Polonia University*, 59(4), 43–48. <https://doi.org/10.23856/5906>
25. Kaminski, J. S. (2022). Jianpu simplified notation and the transnational in musical repertoires of New York's Chinatown. In *Material Cultures of Music Notation* (pp. 110–123). Routledge.
26. Kim, N. J., Belland, B. R., & Axelrod, D. (2019). Scaffolding for optimal challenge in K–12 problem-based learning. *Interdisciplinary Journal of Problem-Based Learning*, 13(1), Article 3. <https://doi.org/10.7771/1541-5015.1712>
27. Leikvoll, K. J. (2025). How the use of music writing can enhance the understanding of a musical notation system among instrumental pupils. *Cogent Arts & Humanities*, 12(1), 2515328.

28. Li, C. L., & Abidin, M. J. B. Z. (2024). Instructional design of classroom instructional skills based on the ADDIE model. *Technium Social Sciences Journal*, 55, 167–180.
29. Liu, Y. (2019). Research on the inheritance and innovation of Guzheng art performance techniques from the perspective of culture. *Development*, 15(5), 1–8.
30. Mantie, R. (2019). The philosophy of assessment in music education. In G. E. McPherson & G. F. Welch (Eds.), *The Oxford handbook of assessment in music education* (Vol. 1, pp. 33–55). Oxford University Press.
31. Mayer, R. E. (2024). The past, present, and future of the cognitive theory of multimedia learning. *Educational Psychology Review*, 36(1), Article 8. <https://doi.org/10.1007/s10648-023-09842-1>
32. McKoy, C. L., & Lind, V. R. (2022). Culturally responsive teaching in music education: From understanding to application. Routledge. <https://doi.org/10.4324/9781003208136>
33. McPherson, G. E., Blackwell, J., & Hattie, J. (2022). Feedback in music performance teaching. *Frontiers in Psychology*, 13, 891025.
34. Ng, D. T., Ng, E. H., & Chu, S. K. (2022). Engaging students in creative music making with musical instrument application in an online flipped classroom. *Education and Information Technologies*, 27(1), 45–64. <https://doi.org/10.1007/s10639-021-10568-2>
35. Ning, H., & Maneewattana, C. (2024). The inheritance and development situation of contemporary Chinese Zheng music. *Journal of Roi Kaensarn Academi*, 9(9), 110–122.
36. Peng, B. (2022). Chinese music under the background of cultural globalization. *International Communication of Chinese Culture*, 9(1), 99–108. <https://doi.org/10.1007/s40636-022-00247-3>
37. Pierard, T., & Lines, D. (2022). A constructivist approach to music education with DAWs. *Teachers and Curriculum*, 22(2), 135–145. <https://doi.org/10.15663/tandc.v22i2.406>
38. Prest, A. (2020). Cross-cultural understanding: The role of rural school–community music education partnerships. *Research Studies in Music Education*, 42(2), 208–230.
39. Salvador, K., Paetz, A. M., & Tippetts, M. M. (2020). A constructivist grounded theory of transformative learning processes for practicing music teachers encountering social justice. *Journal of Research in Music Education*, 68(2), 193–215. <https://doi.org/10.1177/0022429420920630>
40. Sparks, Y. (2023). Usage of the Chinese notation system versus the Western notation system among elementary students (Master’s thesis, Liberty University).
41. Stenberg, A., & Cross, I. (2019). White spaces, music notation and the facilitation of sight-reading. *Scientific reports*, 9(1), 5299. <https://doi.org/10.1038/s41598-019-41445-1>
42. Sweller, J. (2020). Cognitive load theory and educational technology. *Educational Technology Research and Development*, 68, 1–16. <https://doi.org/10.1007/s11423-019-09701-3>
43. Sweller, J., van Merriënboer, J. J. G., & Paas, F. (2019). Cognitive architecture and instructional design: 20 years later. *Educational Psychology Review*, 31, 261–292. <https://doi.org/10.1007/s10648-019-09465-5>
44. Tu, X. (2022). Opportunities and challenges of Chinese music curriculum standards: The gap between urban and rural areas music education (Master’s thesis, University of Auckland).
45. Vuust, P., Heggli, O. A., Friston, K. J., & Kringelbach, M. L. (2022). Music in the brain. *Nature Reviews Neuroscience*, 23(5), 287–305.
46. Vygotsky, L. S., & Cole, M. (1978). *Mind in society: Development of higher psychological processes*. Harvard University Press.
47. Wan, W. (2022). Digital technologies in music education: The case of Chinese students. *Musica Hodie*, 22.
48. Wang, X., & Ong, E. T. (2024). Development and validation of information data for the traditional music teaching module of Nanyin and analysis of requirements. *Revista Ibérica de Sistemas e Tecnologias de Informação*, E67, 513–522.
49. Yang, R., Giraud, M., & Levé, F. (2025). Music with numbers: Jianpu number-based notation in cultural heritage and digital humanities. Paper presented at the Music Encoding Conference (MEC 2025), London, United Kingdom.
50. Yang, Y., & Welch, G. (2023). A systematic literature review of Chinese music education studies during 2007 to 2019. *International Journal of Music Education*, 41(2), 175–198. <https://doi.org/10.1177/02557614221096150>

51. Yao, Y. (2020). How beginning Guzheng learners can accurately grasp intonation, tone quality, and fingering methods. *Wencun Yuekan*, 5, 37.
52. Zajda, J., & Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. In *Globalisation and education reforms: Creating effective learning environments* (pp. 35–50). Springer. https://doi.org/10.1007/978-3-030-71575-5_3
53. Zhu, T. (2022). An exploration of blended music classrooms: A case study of Guzheng teaching. *Xiju Zhi Jia*, 20, 1–3.