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Higher-Order Thinking Skills in Music Education: A Comprehensive Analysis

Jiarui Pu [1]

Abdul Rahman bin Safian [2*]

Mohd Nizam bin Nasrifan [3]

[1] Tianping College of Suzhou University of Science and Technology, Jiangsu, China

[2-3] Sultan Idris Education University, Perak, Malaysia

***email:** rahmansafian@fmsp.upsi.edu.my

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Abstract

Researchers have continued to urge the importance of strengthening students' higher-order thinking skills (HOTS) as a key factor for education. Researchers in the field of music education are actively advocating for the enhancement of HOTS among students. To advance research in this area, a thorough and comprehensive literature review is necessary. This review synthesized existing findings to elucidate how HOTS can enhance musical education and performance and offer insights into effective pedagogical strategies. By systematically examining the integration of HOTS in musical contexts, pointing out gaps in research, the study contributed to advancing educational practices and theoretical understanding in this domain. Furthermore, offers insights that can inform the development of future research on HOTS in music teaching and learning.

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INTRODUCTION

In contemporary education, higher-order thinking skills (HOTS) are increasingly essential in teaching and learning, as well as in professional and everyday contexts. Consequently, HOTS has garnered significant attention from researchers. The landscape of 21st-century teaching and learning is undergoing profound transformations (Malik, 2018). The advancement of information technology has facilitated easier access to information for both teachers and students (Basal, 2015). A growing body of research suggests that teaching effectiveness relies not only on the actions of teachers but also on the engagement and participation of students (Glaser et al., 2001). As Healey (2005) points out, activity alone does not guarantee learning; it must be integrated with critical thinking. The critical factor lies in the application of effective learning methods to the challenges currently faced within a discipline.

HOTS refer to the cognitive processes utilized to address new challenges (Onosko & Newmann, 1994). This definition aligns closely with that of Lewis and Smith (1993), who describe higher-order thinking (HOT) as the mental activity that is triggered when individuals confront unfamiliar problems, uncertainties, issues, or dilemmas, and engage in thought processes to solve problems and make everyday decisions. This conceptualization has significantly influenced educators, inspiring the development of teaching practices aimed at fostering HOTS. Regarding research progress, international studies on HOTS have generally shown an upward trend, particularly after 2014, when research related to HOTS entered a period of rapid development (Liu et al., 2022; Nainggolan, 2022). This surge may be attributed to the recognition of HOTS as a key predictor of success (Lee & Choi, 2017; Wei et al., 2021).

Today, educational institutions worldwide are increasingly recognizing the importance of instilling HOTS to prepare students for the 21st-century workforce (Mainali, 2013). For many years, numerous countries and institutions around the world have recognized HOTS as a fundamental component of their core literacy frameworks (European Union, 2018; Curriculum Development Division, Ministry of Education Malaysia, 2014). Researchers widely agree that HOTS plays a crucial role in applying, connecting, and adapting existing knowledge to effectively solve new problems (Miri et al., 2007; Scully, 2019). To navigate new situations, students must enhance their HOTS, enabling them to apply and manipulate newly acquired information or knowledge effectively. While traditional approaches that emphasize passive learning—where students are expected to sit, listen, and follow instructions—effectively train students to follow directions, a skill valued by future employers, they are no longer sufficient. Modern employers often emphasize the necessity for graduates to possess decision-making abilities, as well as critical and creative thinking skills, before entering the workforce (Heong et al., 2012). In an era where artificial intelligence will make facts easily accessible and machines capable of performing basic repetitive tasks, it is essential for graduates to go beyond merely knowing basic facts and skills.

HOTS equips students with the ability to understand concepts holistically, fostering effective thinking attitudes that are metacognitively competent and grounded in strong values (Lau, 2015). To thrive in the future, students must master decision-making, sequencing, strategy, and collaborative problem-solving skills, as well as cultivate a commitment to lifelong learning and creativity. Teachers who support lifelong learning goals in their classrooms offer meaningful opportunities for all students. Helterbran (2005) advocated for actively guiding students into the practice of higher-order thinking (HOT), rather than leaving them to navigate it on their own. HOTS can be developed over time and through targeted instruction, making it essential for students of all ages and backgrounds to enhance their HOTS (Sheldon & DeNardo, 2005).

In the field of music, research on HOTS is ongoing and has been explored in various contexts such as improvisation and composition (Wing et al., 2014), sight-reading (Siow, 2015), music education (Ng et al., 2022; Russell, 2007; Sheldon & DeNardo, 2005), band rehearsal, and instrumental music instruction (Sheldon et al., 2010; Woody, 2024). These studies have identified HOTS as an effective factor in music curriculum instruction. Many researchers advocate for the stimulation of HOTS in music classrooms to better develop musical abilities (Costes-Onishi & Kwek, 2022; Musselwhite, 2018; Ng et al., 2022). HOTS can contribute to talent selection (Sheldon & DeNardo, 2005), skill refinement (Blackwell, 2021), professional growth (Carey et al., 2013; Glazer et al., 2004), enhanced reflection (Gaunt, 2021), and surpassing mere "perfection" (Ng et al., 2022).

Given the critical role of HOTS in fostering cognitive development and creativity, this study aims to provide a thorough review of research on the application of HOTS within the field of music. This review synthesized existing findings to elucidate how HOTS can enhance musical education and performance and offer insights into effective pedagogical strategies. By systematically examining the integration of HOTS in musical contexts, pointing out gaps in research, the study contributed to advancing educational practices and theoretical understanding in this domain. Furthermore, offers insights that can inform the development of future research on HOTS in music teaching and learning.

RESEARCH METHODS

The literature review for this study was conducted following Cooper et al.'s framework for literature review procedures. 通After an extensive literature-guided review and summary, Cooper et al. (2018) outlined an eight-step framework designed to guide and support research, which includes the following steps: i) who should literature search; ii) aims and purpose of literature searching; iii) preparation; iv) the search strategy; v) searching bibliographic database searching; vi) supplementary searching; vii) managing references; viii) reporting the searching process.

This review will focus on the terms "higher-order thinking skills" (HOTS) and "music teaching and learning". Cooper et al. (2018) suggest that individuals with expertise in literature retrieval should be included in the review team. In this study, the research review team consisted of three researchers. The process began with the preparation phase, where the criteria were clearly defined. This was followed by the formulation of a comprehensive search strategy. Next, bibliographic databases were searched to identify relevant studies, supplemented by additional searching through alternative sources. References were then organized and managed systematically to ensure thorough documentation and tracking of all sources.

RESULTS AND DISCUSSION

Review Of Hots Research In Music

The overview will be presented in two areas: theoretical studies, experimental studies. From these studies, suggestions of teaching practice in music were claimed. Figure 1 shows the full picture of the literature review.

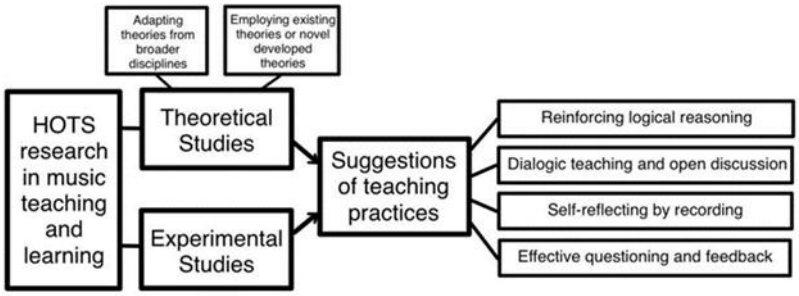

Figure 1. Visualisation of research results

Theoretical Studies

The development of HOTS in music research can be categorized into two main approaches: the first approach typically adapts frameworks from broader disciplines to define HOT, while the second approach either selectively integrates mainstream theoretical frameworks of HOT or employs existing music theories or novel self-developed theories to construct higher-order frameworks.

In music research, the Revised Bloom's Taxonomy (Anderson & Krathwohl, 2001) serves as a significant theoretical foundation. Hanna (2007) advocated for the integration of the Revised Bloom's Taxonomy into music education, proposing its use as a tool to align music education outcomes with targeted educational standards. Wing et al. (2014) utilized the Revised Bloom's Taxonomy as a theoretical framework to design scales for assessing students' higher-order thinking skills in improvisation. Similarly, Siow (2015) employed 0this taxonomy as a basis for a case study examining HOT in sight-reading. Woody (2024) analyzed the relationship between Bloom's Taxonomy and higher-order thinking skills in the design and implementation of an effective beginning band curriculum. The study demonstrates how innovative, research-based strategies can be concurrently applied in the beginning band setting to enhance and deepen the learning experience in this stage of music education.

Researchers asserted early on that habits of logical thinking can be cultivated through targeted instructional strategies aimed at understanding human behavior. Logical reasoning entails the use of a priori knowledge for reasoning and problem-solving (Cook & Décary, 2020; Glaser, 1985) and depends on analogical reasoning to produce meaningful and accurate statements, with the denial of which leading to a process devoid of meaning (Grossen, 1991). Within the realm of music, some scholars also regard logical reasoning as a component of higher-order thinking skills (HOTS), highlighting its importance for independent thinking and problem-solving. Sheldon and DeNardo (2005) posited that HOTS involve transcending mere cognitive understanding of available information to explore, organize, argue from ambiguity, and ascribe potential meanings, underscoring that the development of such thinking skills demands substantial time and effort.

In contrast, the second group of researchers appears to deliberately distance themselves from mainstream HOT theories, drawing upon them only minimally. This group is more prominent in its approach. Influenced by Resnick's (1987) "non-algorithmic" characterization of HOT, Cuskelly (2008) contended that thinking skills elude precise definitions but can be recognized when they manifest in music teaching and learning. Kruger and Van Merwe (2012) similarly suggested that HOT is redefined within educational strategies through music, noting that such problem-solving in music does not necessarily correlate with lived experiences. Based on a redefinition informed by Brother Jacques, Kruger and Van Merwe argued that HOT represents instinctive, adaptive behavior, though it often appears in informal, nascent forms. Ng et al. (2022) critiqued cognitive taxonomies such as SOLO and Bloom's Taxonomy, asserting that these frameworks address only cognitive aspects of learning. They argued that applying these taxonomies in isolation to the performing arts overlooks the affective and psychomotor domains of learning. Since performance involves a complex interplay of mental, physical, and emotional domains, the teaching and learning process must be integrative and holistic.

More ambitious researchers have sought to construct cognitive models of HOTS based on the nature of music learning. These researchers have either linked HOT in music to existing music theories or developed cognitive theoretical frameworks grounded in musical practice. Cuskelly (2008) highlighted Kodály's concept of "inner hearing" and Gordon's (1999) notion of "audiation" as critical skills in musical thinking processes. Most scholars agree that teaching performance is integral to the musical thinking process, generally viewing it as part of the application of fundamental musical knowledge and skills, while aspects related to improvisation or composition fall within the domain of HOT. Swanwick (1991) proposed a model of musical thinking encompassing sensory responses, manipulation of musical material, and skill acquisition. Kruger and Van Merwe (2012) developed a strategy for teaching HOT in music education, drawing on both the Revised Bloom's Taxonomy (2002) and Swanwick's (1991) model. Their framework includes seven components: "1) performing existing music; 2) analyzing; 3) creating or arranging; 4) performing one's own music; 5) evaluating one's own music in terms of existing structures; 6) revising one's own music; and 7) performing and re-evaluating" (Kruger & Van Merwe, 2012). In this model, performing existing music represents the lowest-order component, corresponding to the application level (Level 3 in Bloom and Anderson-Krathwohl). HOTS encompass analyzing, reflecting, creating, arranging, evaluating, and performing one's own music.

Experimental Studies

Sheldon was an early researcher in the field of music studies who focused on HOTS and conducted several significant studies in this area. Sheldon and DeNardo (2005) conducted a major evidence-based study demonstrating the potential for the development of HOTS. This study assessed the HOTS of 116 high school students aspiring to become music educators and 115 advanced music students in higher education. HOTS were measured based on the participants' ability to provide descriptive and inferential statements during an observation task. The results indicated that senior students exhibited higher HOTS compared to prospective freshmen. Sheldon et al. (2010) conducted a core observation of vocal technique among 38 middle and high school band directors, focusing specifically on evidence of instruction utilizing HOTS. Typical rehearsals (excluding warm-up and closing activities) included instruction (50.91%), feedback (15%), modeling (12%), questioning (10.40%), and non-instruction (10.86%). Unfortunately, nearly 70% of the instruction was composed of musical commands or "do" statements, with minimal language designed to stimulate HOTS. This research corroborates a showing that instrumental music teachers predominantly convey information in a prescriptive manner rather than encouraging students to develop problem-solving strategies.

In examining the role of music within productive pedagogy, Letondal and Mackay (2007) explored the intellectual demands of music and assessed how classroom music teachers' beliefs, assumptions, and teaching practices contribute to the development of HOTS in music students. In their study, the focus was on critical thinking in HOTS. The study involved 20 music classroom teachers in Queensland, who were observed teaching lessons from Year 6 to Year 10. Drawing on research from music cognition and developmental psychology, the findings highlight the necessity for developing music curriculum documents that explicitly identify and support critical thinking skills in music. The study reveals discrepancies between research and instructional practices related to HOTS and underscores how the development of HOTS and instructional practices are intricately linked to the enhancement of auditory music skills and the acquisition of music literacy.

Acknowledging the deficiency of improvisational skills in classical music, Wing et al. (2014) conducted a quasi-experimental study to investigate HOTS in musical improvisation. The study involved 65 piano students aged 10 to 16, who had some experience with listening to and performing music and improvisation but lacked formal, systematic training in improvisation. The research aimed to assess the impact of two instructional strategies—auditory imitation and auditory motivation—on HOTS and creative musical productions in improvisation. The study employed a pretest-posttest design and a between-subjects experimental approach to compare the effects of these two instructional strategies. Data were collected using two instruments: the Higher Order Thinking Skills Test and the Creative Music Product Test, administered before and after the intervention. The Higher Order Thinking Skills Test, which comprises two dimensions—procedural and meta-cognitive knowledge—includes six items for each cognitive process dimension: remember, understand, apply, analyze, evaluate, and create. Results after 8 weeks of instruction indicated that the auditory motivation strategy significantly enhanced the subjects' HOTS and creative music product.

To assess the impact of HOTS on children's visual reading improvement, Siow (2015) conducted a qualitative analysis of sight-reading sessions with four young piano players aged 7, 8, 9, and 10. Data were collected through observations of video recordings of each student, focusing on their visual reading and behavioral performance during the curriculum. The curriculum was tailored to address the individual differences in behavior and visual reading abilities among the students. The study found a correlation between students' visual-playing ability and HOTS. Based on Bloom's cognitive taxonomy, the research also indicated that effective motivation of HOTS requires prior mastery of LOTS. Consequently, it is essential to consider LOTS in conjunction with HOTS when analyzing student engagement in the curriculum, as LOTS contribute to the development of HOTS.

Regarding music theory instruction, Ng et al. (2022) conducted a study utilizing an online flipped classroom model to teach 122 students in Hong Kong the music ballad "Shubailan." The study demonstrated that the flipped classroom approach was effective in enhancing student motivation for learning music, as well as improving their knowledge of "Shubailan," HOTS, and creativity.

Suggestions Of Teaching Practice

Based on theoretical frameworks and empirical studies, researchers have developed recommendations and perspectives on the implementation of HOTS in music teaching and learning. Generally, researchers have emphasized the importance of developing HOTS within music education (Sheldon & DeNardo, 2005; Russell-Bowie, 2007; Ng & Well & Ng, 2022; Costes-Onishi & Kwek, 2022; Mao, 2023; Woody, 2024), particularly from a cognitive perspective, to address the overly subjective and ambiguous standards traditionally present in music teaching (Hanna, 2007). Reinforcing logical reasoning (Sheldon et al., 2010), dialogic teaching (Woody, 2006; Meissner & Timmers, 2020; Trapkus, 2020), self-reflecting by recording (Ng et al. 2022), effective questioning and feedback (Sheldon et al., 2010; Bolden et al., 2023)

Researchers have identified the deliberate cultivation of student autonomy, assessment skills, reasoning, verbal communication skills, and reflection as effective strategies for developing HOTS. Sheldon et al. (2010) advocated for the use of logical reasoning to prevent students from relying solely on background knowledge to reach illogical conclusions. By applying concepts to new situations and progressing from basic understanding to reasoning, students are better equipped for independent music learning compared to those whose critical thinking skills remain underdeveloped.

In instrumental music instruction, dialogic teaching and open discussions, have been demonstrated to enhance students' reflective and critical thinking (Woody, 2006; Meissner & Timmers, 2020; Trapkus, 2020; Mao, 2023). In line with Mao (2023) providing students with challenging, open-ended questions and projects encourages them to apply their knowledge creatively and analytically. This approach helps in nurturing higher-order thinking by pushing students to explore and solve complex problems Moreover, promoting an environment where students are encouraged to ask questions and explore various solutions fosters critical thinking and problem-solving skills. This method helps students to engage deeply with the material and develop a more profound understanding.

Researchers have advocated for the integration of educational technology into music teaching to enhance and advance higher-level skills and knowledge. Recordings, in particular, have been identified as valuable tools for self-reflection and feedback in instrumental performance instruction (Fuller & Manning, 1973; Rowe, 2009; Meissner, Timmers, & Pitts, 2021). Shuler (2011) outlined effective practices that teachers should employ to ensure that students gradually take responsibility for making musical decisions. These practices include interpreting existing music or composing original works, adhering to quality standards for self-assessment, diagnosing weaknesses and devising strategies for improvement, and selecting music appropriate to their abilities for performance or listening. By empowering students to engage in these processes, music teachers foster the development of HOTS in their students. Ng et al. (2022) observed that asynchronous digital instruction, such as viewing videos, can effectively improve students' reflective skills, critical thinking, and metacognition. They proposed that the use of recordings—serving as a "third ear" or "third eye"—enables students to identify areas for improvement more effectively than relying solely on memory of a lesson or performance (Delzell, 1989). This approach creates a "fourth-dimensional" learning space (Ng et al., 2022). The value of audio recordings in arts education has been recognized across various

disciplines, including dance (Alpert et al., 2009). The advantages of virtual and online learning environments include fostering collaborative learning spaces where teachers, students, and stakeholders can collectively develop students' self-directed learning, problem-solving abilities, and HOTS (synthesis, analysis, reasoning, comprehension, application, and evaluation) (Alpert et al., 2009; Ng et al., 2022). Additionally, asynchronous environments and online collaborations contribute to the formation of learning communities and prepare students to become innovative team players.

In addition to recording, effective questioning and feedback are crucial teaching methods. Sheldon et al. (2010) highlighted that a key objective of instrumental music education is to achieve optimal student performance, with an emphasis on developing eye-hand coordination and kinesthetic responses. However, this approach often fails to provide students with the deep understanding of musical concepts necessary for independent music-making outside of the rehearsal setting. This observation aligns with Carpenter's (1988) findings. In lessons and rehearsals, "verbal-technical instructions" are the most prevalent and closely associated with HOT and conceptual teaching, whereas "verbal imagery" and "questioning" are scarcely utilized. Goolsby (1997) found that conductors who employed questioning techniques were more successful in guiding students to higher levels of cognition rather than merely improving performance, thereby critiquing performance-based music education. Sheldon et al. (2010) also observed that more experienced directors often use graphic language, problem-solving, reasoning statements, and questioning techniques, which are indicative of a focus on fostering students' critical thinking skills. Thus, the use of language skills and conceptual teaching is vital for the development of HOT (Blocher et al., 1997; Sheldon et al., 2010).

Music educators can cultivate creativity through assessment for learning by developing flexible success criteria, providing feedback, activating self-assessment, and optimizing the classroom context for creativity-nurturing assessment. Assessing creativity presents significant challenges in teaching. However, Bolden et al. (2023) highlights the potential for using assessment to foster creativity. They explores how music educators can harness formative assessment as an effective method to encourage creativity in various music activities. Four key strategies are discussed: i) establishing adaptable success criteria, ii) offering and facilitating meaningful feedback, iii) promoting self-assessment, and iv) creating a classroom environment conducive to creativity-enhancing assessment. This means that, among the strategies to stimulate practices of HOT, formative assessment strategies may be a key factor.

Discussion And Future Research

Among HOTS theoretical research in music teaching and learning, overall, the evolving discourse on HOTS in music research highlights the diverse methodologies and theoretical perspectives shaping the field. While the integration of established frameworks like the Revised Bloom's Taxonomy provides a structured approach, the exploration of novel and music-specific theories underscores the complexity of developing HOTS in music education. Further research is needed to reconcile these approaches and advance the understanding of HOTS in musical contexts. it is crucial to consider the role of musical performance within the hierarchy of thinking. Music performance is characterized by varying levels of cognitive engagement depending on the type of course. Ng et al. (2022) classified music performance as a HOT activity within theoretical contexts, alongside practices involving HOTS such as production and problem-solving. In contrast, Kruger and Van Merwe's (2012) model positions performance as a lower-order component. However, Hanna (2007) contended that performance encompasses different cognitive skills. It is considered a lower-order skill when it involves the application, execution, and implementation of musical fundamentals, but it becomes a higher-order skill when it encompasses the generation, planning, and production of new ideas.

In terms of HOTS experimental studies in music teaching and learning, the research on HOTS in music education reveals a complex landscape of instructional practices and theoretical frameworks. While significant progress has been made, particularly through innovative teaching strategies and technology integration, challenges remain in bridging theoretical research with practical applications. Further empirical investigation is needed to refine instructional methods and enhance the development of HOTS in music education.

Many scholars advocate for considering HOTS in music teaching practices and designs from a broader perspective (Kruger & Van Merwe, 2012; Cuskelly, 2008; Hanna, 2007; Sheldon & DeNardo, 2005). Whilst many researchers in current music education research have claimed through interviews, observations and

experience that there is a lack of practice in developing HOTS in teaching and learning. To confirm the lack of HOTS practices in actual WCIM classrooms, comprehensive data collection from student perspectives through qualitative methods, and broader teacher surveys would be instrumental. Qualitative data collection from students could involve in-depth interviews or focus group discussions to explore their perceptions of critical thinking, problem-solving, and creativity in relation to their music learning experiences. Additionally, conducting observation among western classical music classrooms across various institutions would provide insights into current instructional practices and the perceived barriers to integrating HOTS effectively. These data collection efforts would help validate the observed gap in HOTS development within WCIM education and inform future strategies for improvement.

A variety of strategies for developing students' HOTS have been proposed, but there is currently a lack of clarity about the impact and relationship of these strategies on the development of HOTS in actual teaching and learning. Therefore, more comprehensive experimental research is a critical, including quasi-experimental study and experimental case study. Alternatively, single-case experimental design, which often used in studies of behavioural therapy or modification, is a direction to try. Currently, single-case experimental design has produced a variety of design principles, including ABAB designs, multiple-baseline designs, multielement designs, multiple treatment designs, and changing-criterion designs. Such research would enhance our understanding of effective educational practices in fostering cognitive skills through music education, providing valuable insights for educators and policymakers internationally.

In terms of teaching practice on HOTS in music, researchers advocating for HOTS in music teaching generally do not perceive technique as the ultimate goal of music education. Musical excellence is not solely achieved through dexterous fingers or exceptional vocal ability; instead, prioritizing thinking and perception is essential. Current research on HOTS in music education is still in its nascent stages, and the practice of HOTS in western classical music teaching appears to face obstacles. As Sheldon et al. (2010) noted, there seems to be a divide between proponents of greater conceptual development in teacher instruction and those focused on developing young instrumentalists. Therefore, further empirical investigation and theoretical research are necessary, given the current limited body of research on music teaching, especially in one-to-one western classical music contexts.

Of particular note is the fact that there is currently a gap in HOTS research on the teaching of western classical music in higher education. In current western classical music Teaching, some researchers have identified improving students' thinking skills as a central and challenging goal of contemporary WCIM teaching practice (Sheldon & DeNardo, 2005; Russell-Bowie, 2007; Ng & Well & Ng, 2022; Costes-Onishi & Kwek, 2022). Leech-Wilkinson (2020) has highlighted the crucial role of deep reflective and critical thinking within conservatory curricula and daily orchestral practices. According to Leech-Wilkinson, such cognitive engagement supports not only musical interpretation and artistic ownership but also contributes to the dynamism and artistic responsibility essential in advanced music education. Extensive research into this musical form of HOTS developing is needed to substantiate the call for the development of students' cognitive abilities.

CONCLUSION

The importance of higher-order thinking skills (HOTS) in music education is increasingly recognized. While current research has made some progress in this area, HOTS research in music teaching and learning remains in its early stages compared to other fields. However, the experiences of other disciplines indicate significant potential for further development. Music, with its unique artistic and performative dimensions, presents specific challenges. For cognitively focused music instruction, frameworks such as Revised Bloom's Taxonomy and the SOLO Taxonomy can be effectively applied to support HOTS. In performance-based music teaching, however, integrating these theories presents greater difficulty. Although numerous strategies for fostering HOTS in students have been proposed, more experimental research is needed to validate these approaches. The focus on enhancing students' higher-order thinking skills through meaningful instructional practices has critical implications for both individual learners and the broader field of music education.

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