Investigating the Roles of Pedagogical Content Knowledge in Music Education: A Systematic Literature Review

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Abstract

Despite the growing recognition of the importance of Pedagogical Content Knowledge (PCK) in music education, there is a significant knowledge gap regarding the precise nature of its role and how it contributes to effective teaching and learning. The objective of this systematic literature review is to examine and synthesize existing research on the roles of teachers' PCK in music education. Specifically, the study aims to explore how the PCK of music educators influences their teaching strategies, curriculum development, student engagement, and assessment practices. The research seeks to examine how these roles may vary across different scenarios and the implications of these variations for teaching and learning, especially in the context of music education across various educational settings. By synthesizing findings from diverse educational levels and cultural contexts, this review seeks to offer profound insights into the optimization of music education across various educational settings. The study follows the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. The analysis focused on the research question and identified themes related to the PCK in music education. The analysis revealed four emerging themes: understanding of music concepts, pedagogical strategies, student-centered teaching approaches, and assessment practices. These findings provide insights into effective practices for music curriculum designers and instructors in designing and developing strategies in teaching and learning in music education. These insights can inform the development of effective teaching strategies, curriculum design, and assessment practices in music education, ultimately enhancing the quality of instruction and learning experiences for students.

Keywords: music education, Pedagogical Content Knowledge (PCK), systematic literature review

Introduction

The dynamic interplay of teacher knowledge, student engagement, and learning outcomes forms the nexus of the educational process. Within this complex interplay, the concept of Pedagogical Content Knowledge (PCK) has taken a central role, particularly in the context of music education. PCK, as a

critical component of teaching expertise, refers to the specific set of knowledge and skills that teachers need to provide quality instruction and foster meaningful learning experiences (Manila, 2020). In the realm of music education, PCK encompasses not just a deep understanding of music theory and technique, but also a rich toolkit of teaching strategies, student engagement approaches, curriculum implementation skills, and evaluative methods for assessing student aptitude across diverse aspects of music (Wacker, 2020).

Extant research in music education has spotlighted several arenas wherein PCK is crucial. Cross-national studies exploring student music teachers' perceptions of PCK-in-action in three different countries have shown its significant role in shaping pedagogical perspectives and teaching effectiveness (Mateiro, et al., 2012). Further, there is a growing body of evidence illustrating the significant role music plays in developing children's phonological awareness, language skills, and future reading abilities. This underscores the importance of PCK in music education, particularly for elementary school teachers, and highlights the potential broader implications for general educational outcomes.

In terms of the content of PCK in music education, emerging research with Dutch specialist preschool music teachers has identified a new form of bodily-based PCK. This entails instructional and representational gestures and guiding movements that contribute to creating a multisensory learning experience (Bremmer, 2021). This indicates that PCK is not just about what teachers know, but also how they communicate and demonstrate this knowledge in the classroom. Despite the growing recognition of the importance of PCK in music education, there is still much to be understood about the precise nature of its role and how it contributes to effective teaching and learning. Jossan et al. (2021) asserted that The efficacy of specific teaching methodologies anchored in PCK can be subjective. Their success can vary depending on student demographics, individual learning styles, and cultural contexts. Despite anecdotal evidence supporting various methods, there's a dearth of empirical research that systematically evaluates which PCK-driven techniques resonate most effectively with diverse student groups in the realm of music education (Bond, 2017; Hart, 2019; Wacker, 2020).

Moreover, music is a multifaceted discipline that goes beyond mere rhythm and melody. It's a tapestry of emotions, historical narratives, and cultural significances (McCarthy, 2007; Song, 2023). Understanding how educators with a robust PCK framework can seamlessly weave these elements into their teaching practices, offering students a holistic music education experience. The influence of PCK doesn't end at teaching; it also potentially shapes assessment practices in music education (Payne et al., 2019). The extent and efficacy of PCK's role in assessment remain areas of further inquiry. The incorporation of PCK into assessment practices is essential because it ensures that assessments are grounded not just in technical competence but also in contextual comprehension and interpretive nuance (Mat Yusoff et al., 2023). A PCK-driven assessment can place more weight on a student's ability to communicate the emotional or historical significance of a work than just flawless performance. A PCK-based holistic assessment approach like this promotes a more thorough comprehension of music and acknowledges the complexity of musical competence (Vadivel, 2021). These gaps are particularly noticeable in the exploration of teachers' PCK roles across different educational levels and in diverse cultural contexts. A robust understanding of these roles can potentially guide the development of professional development programs for music educators and inform curriculum design and pedagogical strategies.

The current study aims to address this knowledge gap and extend the understanding of the roles of teachers' PCK in music education and thus to address the knowledge gap and extend the understanding of the roles of teachers' PCK in music education. Specifically, the study aims to explore how the PCK of music educators influences their teaching strategies, curriculum development, student engagement, and assessment practices. The research seeks to examine how these roles may vary across different scenarios and the implications of these variations for teaching and learning, especially in the context of music education across various educational settings. Given the multifaceted nature of PCK and the diverse contexts in which music education occurs, it is crucial to examine how these roles may vary across different scenarios and the implications of these variations for teaching and learning. In particular, the study seeks to explore how the PCK of music educators influences their teaching strategies, curriculum development, student engagement, and assessment practices. The potential implications of this study could offer profound insights into the optimization of music education across a range of educational settings.

Literature Review

Shulman's (1986) theory of Pedagogical Content Knowledge (PCK) underscores the crucial role that teachers play in translating subject matter into effective learning experiences for students. This concept becomes particularly salient within the context of music education, as teachers are required to integrate their understanding of musical concepts with instructional strategies, curriculum development, student engagement strategies, and appropriate assessment practices. In light of the importance of PCK, this article seeks to delve into its relevance and application within the field of music education.

Effective teaching strategies, born from the integration of musical understanding and pedagogical expertise, represent a crucial aspect of teachers' PCK in music education. In line with Swanson (2013), the deployment of innovative teaching strategies that move beyond mere rote learning is vital. Such strategies could include problem-based learning, where students are encouraged to explore real-world musical issues, fostering a deeper understanding and critical engagement with the subject matter. Alongside these innovative methods, the integration of technology into teaching strategies is paramount. Utilising tools such as digital audio workstations, music composition software, and interactive music learning apps can significantly enhance the delivery of lessons, making musical concepts more tangible and engaging for students (Tsugawa, 2022).

Another vital component of teachers' PCK is their involvement in curriculum development. The teacher's expertise allows for the design of a curriculum that covers a broad spectrum of musical genres and cultures while balancing between theory and practice. Sungurtekin (2021) emphasises the importance of experiential learning opportunities within the music curriculum, such as ensemble playing, concerts, and field trips to music concerts or music composition projects. These activities enhance students' practical skills while expanding their understanding and appreciation of music's multifaceted nature.

A teacher's PCK in music education also shines through in their ability to foster student engagement. A stimulating and inclusive learning environment created by the teacher can enhance student involvement and understanding (Rizk & Hillier, 2022). Diverse teaching materials and resources, such as popular music or film scores, can be used to contextualise musical concepts and capture students' interests. Additionally, a technique such as the 'flipped classroom', which allows students to study materials outside of class and then use class time for discussions and practising, can significantly enhance student engagement. Engagement shouldn't be confined to the classroom, and students should be encouraged to participate in extracurricular music activities, such as school orchestras or choirs.

Lastly, teachers' PCK plays an essential role in the execution of appropriate assessment practices in music education. As Yan and Carless (2022) highlights, effective assessment should capture both the process and product of students' learning. Formative assessment strategies, such as ongoing feedback during music rehearsals or compositions, provide students with timely, actionable feedback. Simultaneously, promoting peer and self-assessment practices aids in developing students' ability to critically reflect on their own work and others, fostering a sense of responsibility and independence in their learning. In conclusion, teachers' PCK in music education is multi-dimensional, encompassing a deep understanding of effective teaching strategies, curriculum development, student engagement strategies, and assessment practices. By elucidating these aspects, this article hopes to provide practical insights to educators and those involved in curriculum design and policymaking, contributing to the enhancement of music education.

Theoretical Foundation of Pedagogical Content Knowledge

Pedagogical Content Knowledge (PCK) is a fundamental principle highlighting that effective teaching extends beyond merely delivering Content Knowledge (CK) to students. As Shulman (1987) emphasized, PCK is the distinguishing factor between content specialists and educators, providing the pedagogue with a unique, multifaceted understanding of knowledge transmission (p. 8). Shulman (1986) introduced the concept of Pedagogical Content Knowledge (PCK) as a distinct and significant form of knowledge specific to teachers. PCK is characterised by teachers' capacity to effectively connect their pedagogical knowledge, which pertains to their understanding of effective teaching methods, with

their subject matter knowledge, which reflects their expertise in the content they teach. Pedagogical Content Knowledge (PCK) can be understood as the integration of two distinct domains, wherein teachers utilise their expertise in subject matter to enhance instructional practises. Since its inception in the 1980s, the concept of PCK has been intensively explored, particularly in science and mathematics education, to uncover its specific components. Research has underscored several key aspects of PCK that teachers need to possess. These include understanding students' interests (Ball, et al., 2008; Hill, et al., 2004), recognizing common challenges students face in grasping content (Koehler & Mishra, 2009; Tamir, 1988), and utilizing specific strategies tailored to teaching concepts within their discipline (Magnusson, et al., 1999; Rowan et al., 2001). On top of that, Cochran, DeRuiter, and King (1993) conducted a revision of Shulman's original model in order to better align it with a constructivist viewpoint on the processes of teaching and learning. The authors of the study proposed an expanded framework for Pedagogical Content Knowledge (PCK), which presents a model that arises from the seamless integration of four key components which are known as;

- subject matter knowledge

- and pedagogical knowledge.

- Teachers' understanding of students' abilities and learning strategies, ages and developmental levels, attitudes, motivations, and prior knowledge of the concepts to be taught.

- The other component of teacher knowledge that contributes to pedagogical content knowledge is teachers' understanding of the social, political, cultural and physical environments in which students are asked to learn.

This model enhances our comprehension of the strategies employed by teachers to effectively communicate subject matter to their students as illustrated in Figure 1 below.
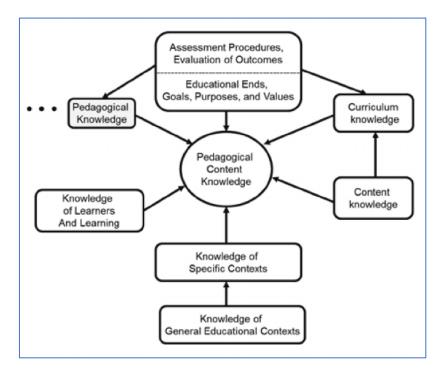

Figure 1. Components of PCK Model

Moreover, PCK requires educators to sequence instruction appropriately (Hill et al., 2008), comprehend typical student errors and common misunderstandings of content (Hill et al., 2008), and interpret student performance and work effectively (Ball, et al., 2008; Hill et al., 2004). These PCK aspects, although initially studied in science and mathematics education, have been extended and

applied to other fields, including music education. This broad application of PCK principles across disciplines underscores their universal relevance and the necessity for educators to acquire these multifaceted skills. A robust understanding of PCK enriches the teaching process, enabling educators to provide instruction that is not only knowledge-rich but also tailored to their students' unique needs and learning styles. This reinforces the assertion that effective teaching necessitates a profound grasp of both content and pedagogy, embodied in the concept of PCK.

In music education, Pedagogical Content Knowledge (PCK) is uniquely defined as the knowledge of teaching strategies in music, engaging students meaningfully with music, effective implementation of the music curriculum, assessment of student abilities across music's different facets, and the ability to demonstrate and explain musical concepts (Ballantyne & Packer, 2004, p. 302). PCK extends beyond the realm of Content Knowledge (CK) by focusing on how to teach musical concepts rather than just the knowledge of these concepts. For instance, if a teacher recognizes that a clarinet player is not properly playing tenuto markings, they are applying CK. PCK, however, involves knowing how to instruct the player on tongue placement, air usage, and note duration to achieve the correct tenuto articulation. Research in music education has deeply explored the elements of teaching that encompass PCK and its application in implementing music curricula (Haston, 2018; Millican, 2012; Raiber & Teachout, 2014). Additionally, researchers have investigated various rehearsal skills such as providing feedback (Goolsby, 1999; Incognito, et al., 2022), pacing (Price & Byo, 2002; Worthy, 2005), and error detection (DeCarbo, 1982; Forsythe & Woods, 1983). These studies aim to better understand the preparation of preservice educators and its impact on teaching.

Applying Shulman's PCK framework, Millican (2013) explored the thought processes of expert beginning band teachers. The findings revealed that these expert band directors identified elements of PCK while analyzing videotaped performances of beginner bands. The most frequently observed elements were mental imaging/modeling, understanding how to manipulate variables to positively impact student performance, and collecting and interpreting specific data to help students master performance principles. Supporting these findings, Forrester (2018) conducted interviews with experienced school band directors. Her results suggested that instrumental music teaching calls for a specialized form of knowledge that merges teaching and conducting, advocating for an integrated approach rather than teaching these aspects separately.

In-service teachers concur on the significance of PCK in teaching music (Millican, 2008, 2013), stating that preservice teachers need to strengthen their PCK through experiences like observing and interacting with experienced teachers (Millican, 2008; Paul, 1998). Such opportunities can be created through field experiences (Wolfgang, 1990), lab classes (Butler, 2001; Paul, 1998), and reflective teaching and planning activities (Barry, 1996). These experiences provide preservice teachers with successful applications of PCK, which can then be replicated in their classrooms. Further research is needed to investigate the most effective methods for developing PCK and Technological Pedagogical Content Knowledge in preservice music teacher preparation.

Music education demands a diverse range of PCK applications, with leading a rehearsal as a significant example. This activity involves various skills such as beat pattern and gestural techniques (Silvey, et al., 2020; Johnson & Fredrickson, 1995; Mayne, 1992), conceptual understanding of the musical score (Lane, 2006; Silvey et al., 2017), and instrumental fingerings and repair techniques (Millican, 2008). Knowledge of secondary instruments is also a vital aspect of PCK in music education (Millican, 2017). Another essential aspect of PCK in music education revolves around score study. This area has been extensively researched, shedding light on how both expert and novice musicians internalize music (Lane, 2006; Gromko, 2021) and how PCK influences novice musicians' preparation for rehearsals (Silvey & Montemayor, 2014; Wacker, 2018). While the methods of score study may vary among conductors, the importance of this practice remains consistent in preparing to lead a rehearsal. Historically, music education research focusing on instrumental ensemble preparation has predominantly addressed PCK (Crowe, 1996; Lane, 2006; Montemayor & Moss, 2009; Sætre & Zhukov, 2021). However, having a high level of PCK is not the sole determinant of a music teacher's success (Millican, 2008). Some music educators believe that more explicit instruction on private lesson teaching might enhance their practice (Bresler, 2021; Villarreal, 2010). Even though PCK is crucial in teaching, the mere possession of knowledge doesn't guarantee the teacher's ability to effectively impart this knowledge to students (Loughran et al, 2012; Oztay & Boz, 2022). Thus, knowing how to teach the content can be as significant and impactful as knowing the content itself.

Methodology

The Systematic Literature Review (SLR) is a method to identify, assess, interpret, and analyse existing research findings related to a specific topic, research question, or phenomenon. The objective of this study was to conduct an SLR to summarise the literature on the roles of PCK educational settings to support teaching and learning. The review was conducted according to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009), which consist of four steps: identification, screening, eligibility, and inclusion criteria. The identification step involves finding relevant articles using keywords and database searches. The screening step involves selecting articles based on predetermined criteria, and the eligibility step involves evaluating articles to ensure they meet the inclusion criteria. The final step is the inclusion criteria, where the remaining articles are analysed. There are several benefits of using PRISMA as a guide for conducting an SLR, as its searching procedures are systematic, it provides a clear understanding of the process, and it makes the evaluation of the sources of information easier (Mohamed et al., 2020). Figure 2 below illustrates the process of conducting the SLR in this study.
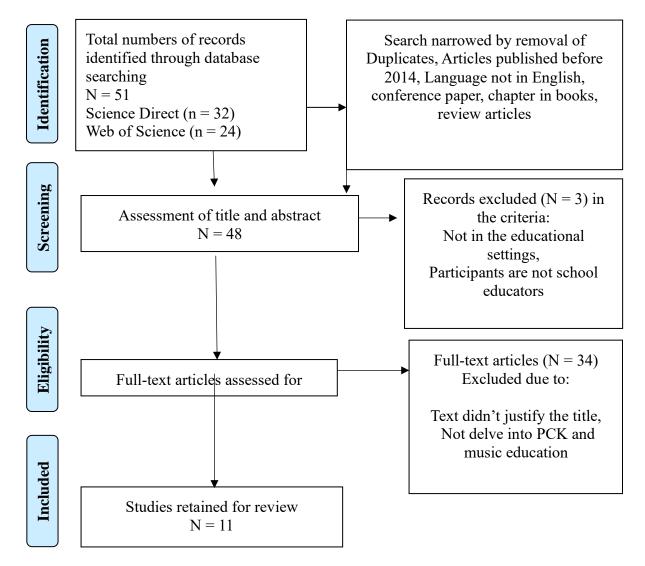

Figure 2. Stages of analysis (Adapted from Moher et al. 2009).

Identification

The initial step in conducting the SLR using PRISMA is the identification process, where the main keywords are expanded by identifying and listing synonyms to retrieve as many articles from the database as possible. The researcher used the WOS and Science Direct databases at Universiti Malaya to generate search strings using the keyword " PCK in music education ". The search strings were then entered in the Advanced menu's Enter query string. This allowed for the documents to be retrieved in the first phase.

Screening

The second stage is the screening process, where articles are selected or discarded based on criteria established by the researcher and obtained from the database. Articles that meet the criteria are referred to as "included articles", while those that do not meet the criteria are removed and are referred to as "excluded articles." The search was carried out in WOS and Science Direct using the keyword "PCK in music education" from 2014 to 2023, with a restriction to studies written in English. The inclusion and exclusion criteria are summarised in Table 1.

Table 1.

The Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Types of Articles	Journal (research articles)	Conference paper, chapter in book, review articles
Language	English	Non-English
Timeline	From 2014 until 2023	Published before 2014

The researcher continued the process by selecting "article" as the type of document in the database and limiting the search to those in the English language. This was accomplished by clicking on the left side box of the website interface and selecting the "Limit to" button at the bottom of the checkboxes. This resulted in 97 articles being produced from the screening process. The researcher then analysed the distribution of the articles, considering the year of publication, subject area, authors, countries, and universities the authors were affiliated with. Out of the 48 articles, 3 were excluded for reasons such as being irrelevant to the study context, lack of access to the full text, as well as insufficient information in the abstracts regarding the results and a comprehensive understanding of the topic.

Eligibility

The next step in the SLR process was the eligibility phase, where 45 articles were chosen. The articles were thoroughly assessed by reading through the titles, abstracts, methods, results, and discussions to make sure they satisfied the inclusion criteria and were aligned with the current research goals. The selection of articles to be reviewed was carried out in three stages. The first stage involved screening the titles and abstracts, the second stage involved analysing the articles based on established selection criteria and organising the results into a table, and the third stage involved reading and synthesising all results into one document. The researcher only included articles that were relevant to the research questions and excluded those that did not examine PCK in music education. After eliminating articles that were not applicable to the study of PCK in music education, 11 articles remained and were deemed suitable for analysis. Table 1 summarises the review of research on PCK in music education.
        The study employed thematic analysis, a qualitative technique, as its chosen methodology. According to Xu and Zammit (2020), qualitative analysis is synonymous with synthesis through interpretation and explanation. The process began with a comprehensive review of all 16 publications, focusing specifically on the abstract, findings, and discussion sections. The data was then abstracted based on the study topics. Relevant data from the investigations that could address the research questions were collated and abstracted for further evaluation. Thematic analysis was then conducted on

the abstracted data, involving tasks such as identifying similarities, counting, clustering, detecting patterns and themes, and establishing linkages. The aim of thematic analysis is to identify and analyze key elements of the data, guided by the research question (Clarke & Braun, 2013). Thematic analysis is considered the most effective method for synthesizing data from an integrative (mixed research design) approach (Flemming et al., 2019). The author employed both deductive and inductive thematic analysis. Deductive thematic analysis involved identifying themes related to the research question initially, while inductive thematic analysis involved identifying themes based on patterns observed in previous research.

Results

The research resulted in 51 hits, however, only 11 studies satisfied the inclusion criteria and were analysed. Table 2 shows the themes of these 11 studies. The studies included in the review were conducted in Philippines (1), Australia (3), United States (5), Finland (1), Spain (1), and China (1). They were published between 2014 and 2023, with the majority being published in 2022. The sample sizes of the studies varied and the data was mainly collected through interviews and surveys. The systematic review uncovered four main themes related to the PCK, with a focus on the understanding of music concepts, pedagogical strategies, student-centered teaching approaches, and assessment practices (as shown in Table 2).

Table 2.

Review of the research on the pedagogical content knowledge in music education

Author & Year	Country	Respondents	Theme 1 Understanding of music concepts	Theme 2 Pedagogical strategies	Theme 3 Student-centered teaching approaches	Theme 4 Assessment practice
Manila, B. M. (2020)	Philippines	54 elementary teachers from the District of Mariveles, Bataan, Philippines	/			
Yin (2022)	China	100 music teachers from colleges and universities in China	/			
Lee, D. A. (2018)	Australia	15 Australian electric guitarists, including professional musicians, music educators, and students	/			
Hart Jr., J. T. (2019)	United States	100 music education faculty and conducting instructors from colleges and universities in the United States		/		
Haston, J. L. (2018)	United States	5 in-service secondary band teachers from the United States		/		
Shaw, R. (2016)	United States	2 urban choral music educators		/		

Beltman, S., Glass, C., Dinham, J., Chalk, B., & Nguyen, B. (2015)	Australia	125 pre-service music teachers from an Australian university			/	
Tsugawa, Y. (2022)	United States	16 undergraduate music education students and 5 current and former teaching assistants from a university in the United States			/	
Draves, T. J. (2019)	United States	a first-year music educator in the United States			/	
Calderón-Garrido, D., & Gustems-Carnicer, J. (2021)	Spain	335 compulsory education music teachers from Spain				/
Partti, H., Westerlund, H. & Lebler, D. (2015)	Finland and Australia	Program leaders from the Sibelius Academy in Finland and the Queensland Conservatorium in Australia				/

Understanding of Music Concepts

To make music comprehensible to students, teachers need to have a deep understanding of music, including its historical, theoretical, and practical aspects. However, research specifically investigating Pedagogical Content Knowledge (PCK) in Music Education remains limited, as noted by Manila (2020). Manila conducted a descriptive research study in Mariveles, Bataan, during the 2019-2020 school year, involving 54 elementary teachers selected purposively. The study utilized both questionnaires and interviews to gather data, which were analyzed using the SPSS software. The findings revealed that the respondents demonstrated insufficient knowledge of elementary-level music content and pedagogy, posing a significant barrier to effective teaching and learning in music education. Teachers identified challenges such as their lack of subject knowledge, negative student attitudes towards music, inadequate facilities, and a lack of teaching resources. Manila (2020) emphasizes the importance of teachers improving their content and pedagogical knowledge in music and highlights a positive correlation between teachers' content knowledge and the number of relevant seminars and trainings they attended. Moreover, pedagogical knowledge variations were influenced by teachers' specialization and the number of relevant seminars and trainings they attended, further highlighting the need for professional development opportunities to enhance PCK and improve music education quality. While Manila's study underscores the vital role of PCK in grasping music concepts, it seems to indirectly suggest that the mere accumulation of content knowledge may not translate to effective music pedagogy. The intricate nature of musical concepts demands not just knowledge, but a nuanced understanding and the ability to contextualize them for students of varying competencies. Besides, the emphasis on seminars and trainings, although beneficial, might overshadow the essential experiential and reflective processes that facilitate a profound comprehension of music concepts in pedagogical scenarios.

Another study by Yin (2022) underscores the critical role of PCK in deepening content understanding in music education, particularly in the context of modern music instruction. Yin proposes an innovative approach that integrates PCK with information fusion-oriented multimedia technology to enhance teaching effectiveness. By studying music teachers' practices in colleges and universities, a

theoretical framework was developed to equip them with strategies to augment their PCK and enhance students' comprehension of music content. The study also presents the construction of an intelligent music teaching system based on multimedia technology and PCK principles. This system aims to create a more immersive and enjoyable learning environment by recharacterizing subject knowledge in a way that appeals to students. The results of the experiment indicate a significant positive impact when PCK and information fusion-oriented multimedia technology are applied in music education, leading to improved educational outcomes in modern music. Integrating PCK into music instruction not only promotes a deeper understanding of the content but also increases student engagement in the learning process. Furthermore, although multimedia can support instructional strategies, a heavy reliance on technology could take away from the experiential, hands-on component of music education, which is essential for deeply internalising and comprehending musical concepts.

Lee (2018) focuses on the development of an up-to-date pedagogical canon for electric guitar in popular music education in Australia. The study employed both quantitative and qualitative methodologies, analyzing data from various industry sources. It revealed a significant cultural insight into Australian music education, showing that the development of electric guitar culture in Australia was heavily influenced by international trends from the United States and the United Kingdom. However, the study highlights the importance of Pedagogical Content Knowledge (PCK) in considering the specific cultural and contextual factors that influence students' engagement with and understanding of music. The findings suggest a potential gap in the content understanding aspect of PCK in Australian music education, as the focus on international content may hinder the growth of a distinct Australian electric guitar culture. Lee emphasizes that PCK in content understanding should involve considering the cultural context and tailoring instruction to better reflect and incorporate local influences, thereby making music education more engaging and relevant for learners and promoting a deeper understanding of the subject. This study emphasises the nuanced nature of teaching electric guitar in Australia, but it also highlights concerns about striking a balance between indigenous musical traditions and global influences. International trends certainly influence music education, but it's crucial to acknowledge and celebrate Australia's own musical legacy and original ideas. A wider lesson for music education worldwide is implied by the focus on PCK's cultural context adaptation: be cautious of universal pedagogies that could unintentionally homogenise musical training, therefore dilution of regional musical expressions and traditions.

Pedagogical strategies

Studies also show the importance of not only content knowledge but also effective pedagogical strategies in teaching music, specifically conducting. However, limited real-world conducting experiences suggest a need for more practical applications of Pedagogical Content Knowledge (PCK) in this field to improve music education outcomes. Hart Jr. (2019) conducted a study examining conducting courses completed by undergraduate music education majors, focusing on course structure, content, pedagogical values, and the emphasis instructors placed on various areas of teacher knowledge. The study utilized Shulman's PCK framework as a guiding structure. The findings revealed that music education divisions generally required two conducting courses across different degree specializations. Instructors were predominantly male, highly educated, and held assistant or full professor ranks, with significant college teaching experience. However, their experience in K-12 music teaching was comparatively limited. Both music education faculty and conducting instructors emphasized the highest importance on music content knowledge, followed by music PCK and general pedagogical knowledge. Despite this emphasis, opportunities for students to conduct in authentic learning contexts were minimal. These findings highlight the role of PCK in music education, particularly in the context of pedagogical strategies. Instructors recognized the value of PCK in effectively teaching specific content to students, which involves different teaching strategies, understanding student learning processes, and addressing common difficulties. However, the limited opportunities for authentic conducting practice suggest an area for improvement. Enhancing these opportunities could facilitate a better application of PCK by providing students with real-world experiences to connect their content knowledge with effective pedagogical strategies. Thus, the role of PCK in music education extends beyond content understanding to encompass mastering pedagogical strategies for effective teaching. It is essential for

future practices, policies, and research to address these aspects and ensure a comprehensive and practical approach to music education.

Pedagogical strategies in music education are derived from a combination of professional training, personal intuition, and social interactions. These strategies are tailored to effectively teach music content to students, underscoring the critical role of PCK in shaping practical teaching approaches. Haston (2018) investigated the perceived sources of PCK used by five in-service secondary band teachers. The teachers participated in an exercise involving planning, teaching, and video-recording a 30-minute band rehearsal. The researcher identified instances of PCK application, which were confirmed by an independent researcher. All participants agreed with the identified instances. The findings revealed diverse sources of PCK among the participants, including observation apprenticeship, methods courses, intuition, peer influence, and cooperating teachers. These varied sources indicate that PCK in music education is derived from a range of experiences and influences. This study emphasizes the importance of PCK as a guiding framework that informs and shapes teaching approaches used by band teachers in real-world settings. The reliance on various sources of PCK demonstrates how teachers tailor their pedagogical strategies to effectively teach music content. Additionally, the participants acknowledged the positive impact of metacognition on their teaching practices. Reflecting on their sources of PCK and observing it in action facilitated a deeper understanding of their teaching strategies. This awareness, along with their expressed interest in future reflection on PCK, highlights the ongoing role of PCK in shaping and refining pedagogical strategies in music education.

Teachers showcased their ability to adjust their pedagogical strategies based on their Pedagogical Content Knowledge (PCK), employing different approaches to accommodate each classroom's distinct characteristics. This highlights the critical role of PCK as a flexible tool in tailoring teaching methods to optimize student learning outcomes. Shaw (2016) investigated the contextual knowledge possessed by urban music educators about their students, schools, communities, and broader cultural contexts. The study observed two urban choral music educators working in multiple, demographically diverse classrooms each week, allowing for an examination of how these teachers adjusted their pedagogical strategies based on their understanding of each unique context. PCK played a prominent role in this scenario, as teachers modified their approach according to the unique characteristics of each classroom. This demonstrates the application of PCK as an adaptable tool that teachers utilize to customize their teaching strategies to suit their students' needs, acknowledging the influence of the wider school, community, and cultural contexts. Despite these context-based adjustments, consistent elements in the teachers' practices were observed across different settings, reflecting their underlying pedagogical principles. This further underscores the role of PCK in shaping teaching practice in music education. Notably, the teachers employed culturally relevant and anti-racist pedagogies, highlighting the critical role of PCK in addressing the complexities of urban and multicultural learning environments. The application of PCK in this sense enhances not only content understanding but also promotes inclusivity and responsiveness to cultural diversity, crucial aspects of contemporary music education. The study concludes by discussing the implications of these findings for music teacher education, emphasizing the importance of equipping future music educators with the skills to adapt their PCK to the unique demands of various urban contexts.

Student-centered teaching approaches

PCK plays a crucial role in developing the identity of teachers, fostering positive relationships, and creating enjoyable learning experiences, thereby emphasizing a student-centric teaching approach. Beltman (2015) conducted a study on the formation of professional teacher identity among pre-service teachers in an Australian university, using drawings as a method to understand their perception of themselves as future teachers. The findings revealed that the participants envisioned themselves as teachers who foster positive student relationships, create enjoyable learning experiences, and exude confidence. This study highlights an important aspect: student understanding. The pre-service teachers' drawings indicate their intention to focus on the student experience, indicating their recognition of the need for student-centered teaching strategies. This understanding is a vital component of PCK, which emphasizes the adaptation of teaching strategies to meet the needs and learning styles of students for effective instruction. However, the study also identified a potential gap in the pre-service teachers' understanding of the complexities and challenges of teaching, which are critical aspects of the PCK

framework. This suggests that while they grasp the need for student-centered pedagogy, they may not fully comprehend the multidimensional nature of teaching and the significance of content knowledge, contextual factors, and pedagogical skills. This finding presents a challenge to music teacher educators to strike a balance between preparing pre-service teachers for the realities of the profession while preserving their enthusiasm and positive approach. It underscores the need for music teacher education programs to enhance students' PCK by integrating content knowledge with an understanding of pedagogical strategies and the realities of the teaching profession.

In addition, by understanding and adapting to generational differences, teachers can effectively engage and connect with their learners, enhancing their pedagogical content knowledge and preparing them for future careers in inclusive and diverse music education. This is demonstrated in a study by Tsugawa (2022) that explored the intergenerational dynamics between pre-service music teachers and senior adult musicians in a New Horizons ensemble as part of a university's music teacher preparation program. Through an intrinsic qualitative case study methodology, data from 16 undergraduate music education students and interviews from 5 current and former teaching assistants were analysed to understand how younger teachers adapted to generational differences, the PCK acquired through their teaching experiences, and the impact of these experiences on their future careers. The findings underscored the importance of aligning the goals of music teacher education programs and adult ensembles while fostering opportunities that prepare students for adult music education. It also emphasized the need to reimagine partnerships between New Horizons and music teacher education to encourage greater national, racial, cultural, and musical diversity.

Furthermore, studies highlight the significance of teacher identity development in music teacher education programs and its impact on student learning experiences. Draves (2019) conducted a particularistic case study that followed the journey of Paul, a first-year music educator, focusing on the development and transformation of his teacher identity. Drawing from Olsen's sociocultural view of teacher identity, the research examined Paul's personal teaching beliefs, their interaction with his professional development experiences, and how he perceived himself as a teacher. The study revealed three significant themes: Becoming Student Focused, Learning to Be Myself as a Teacher, and Taking Ownership. The findings emphasize the need for increased awareness and activities promoting teacher identity development in music teacher education programs. The researcher suggests that more scholarship on teacher identity focused on music student teachers and beginning music educators would be beneficial. In terms of student understanding, this study underscores the profound impact a teacher's evolving identity can have on pedagogy and student outcomes. As Paul developed a student-focused approach and took ownership of his role, it likely influenced the way he communicated and interacted with his students, shaping their learning experiences. Moreover, by learning to be himself as a teacher, Paul likely created a more authentic, relatable educational environment. This authenticity could enhance student engagement, fostering a more productive and enjoyable learning environment. In essence, understanding the transformation and nuances of a teacher's identity is pivotal not only for the teachers themselves but also for significant implications for student learning.

Assessment Practice

The COVID-19 pandemic prompted a sudden shift to remote education in Spain, significantly impacting music education. Calderón-Garrido & Gustems-Carnicer (2021) conducted a study involving 335 compulsory education music teachers, which found that their adaptation to remote teaching involved contemplative activities, with notable disparities among public, private, and semi-private institutions. While teachers reported increased contact with students, the learning primarily took place asynchronously. Significant differences emerged in the content taught, including musical styles, instrument playing, singing, and physical expression. Interdisciplinary teaching was underutilized, despite the potential benefits offered by digital technology. The study also revealed a gender gap in the perception of online teaching advantages, with more male teachers seeing benefits. Advantages included increased organization, family participation, and time for students, while concerns included inadequate content coverage, lack of government instructions, and evaluation challenges. The pandemic highlighted the importance of emotional aspects in music education and its role in emotional well-being. Teacher age significantly influenced their evaluation of remote teaching. Despite concerns about job security, most teachers felt they had learned something from the experience and recognized the need

for post-pandemic investment in schools. These findings underscore the urgent need for enhanced support for teachers in crisis-induced transitions to online education, including pedagogical skills development, reflective practice, and addressing social divides among students. Importantly, these data highlight the value of pedagogical content knowledge (PCK) in assessing student learning in music education, even in remote settings. PCK can be instrumental in navigating online teaching challenges, particularly in effectively evaluating students' musical abilities and understanding, thus ensuring a comprehensive, meaningful, and efficient learning process.

Another study by Partti et al. (2015) explores the potential for innovative assessment practices in higher music education, considering the role of PCK and positioning assessment as a participant in the learning process. The study conducted an instrumental case study comparing assessment practices in folk music education in Finland and popular music education in Australia. Drawing on theories of communities of practice, the researchers aimed to understand assessment as learning and the development of professional identity through student participation in assessment processes. Qualitative data was collected through semi-structured interviews with program leaders from the Sibelius Academy in Finland and the Queensland Conservatorium in Australia. The interviews were treated as narratives, transcribed, and analysed, focusing on the development of assessment practices, goals, and success criteria. The results highlighted the learning value derived from participatory assessment practices and the contrast between the current state of the community and its aspirations. In this context, pedagogical content knowledge (PCK) plays a crucial role in assessment practices, allowing educators to effectively design and adjust assessment tasks to the specific context, fostering a deeper understanding of the subject matter, and aiding students in their professional identity development. This case study illuminates the potential of integrating PCK in assessment practices within higher music education.

Discussion

The findings from the studies by Manila (2020), Yin (2022), and Lee (2018) highlight the critical role that Pedagogical Content Knowledge (PCK) plays in fostering a deep understanding of music concepts in education. Manila's research illustrates the significance of PCK in delivering quality instruction and facilitating meaningful student learning in music education, underlining that a lack of such knowledge presents a significant barrier to effective teaching and learning. The study illuminates that teachers' content and pedagogical knowledge in music can be greatly improved through professional development opportunities, like seminars and training sessions, emphasizing the importance of continuing education for teachers to enhance PCK. Manila (2020) emphasizes the importance of PCK in delivering high-quality music instruction. This resonates with earlier studies, such as Shulman (1986), which introduced the idea of PCK and highlighted its crucial role across different subject areas, not just music. While it underscores the necessity of professional development to boost PCK, previous research by Opfer & Pedder (2011) points out that the effectiveness of professional development varies based on its duration, focus, and active learning opportunities. Therefore, simply advocating for more seminars and training may not be sufficient. The content and nature of these training programs, as well as their adaptability to different teaching environments, should be thoroughly assessed.

Yin (2022) provides insight into how PCK can transform music education when combined with innovative technologies such as multimedia, proposing an intelligent music teaching system based on multimedia technology principles and PCK. This system, by restructuring subject knowledge in ways that appeal to students, aims to create a more immersive and engaging learning environment, demonstrating the potential of PCK in modernizing music education and making it more effective. Although this study showed that integration of PCK with multimedia technologies in music education is a progressive move, previous research like Mayuni and Dhieni (2022) on multimedia learning, suggests that well-designed multimedia resources can significantly enhance learning. However, as pointed out by Mercader and Gairín (2020), there are barriers to technology integration in education, such as lack of resources, training, and institutional support. Thus, while Yin's intelligent music teaching system sounds promising, its broad applicability and the prerequisites for its effective implementation should be studied further.

Lee's study focuses on the need for a culturally responsive PCK in music education, particularly in the context of electric guitar culture in Australia. The research suggests that the lack of a distinctively Australian guitar culture could be due to an insufficient understanding and consideration of the cultural

context in the pedagogical content knowledge applied in music education. This indicates the importance of integrating cultural awareness into PCK for it to be truly effective in engaging learners and fostering deep understanding. The study focuses on culturally responsive PCK, especially concerning electric guitar culture in Australia, aligns with Donahue-Keegan et al. (2019)'s research emphasizing culturally responsive teaching as a means to engage diverse learners better. Not only that, Abacioglu et al. (2020) has previously discussed the importance of teachers understanding their students' cultural backgrounds to make content more relevant and engaging. While Lee's study on the lack of a distinct Australian guitar culture is an important observation, it would be beneficial to consider broader cultural elements beyond just the guitar culture. In summary, these studies emphasize the transformative potential of PCK in music education, whether by enhancing teacher competency, integrating with modern technology, or adapting to cultural context, thus fostering an enriched understanding of music concepts among learners.

The pivotal role of Pedagogical Content Knowledge (PCK) in developing and deploying effective pedagogical strategies within music education is amply demonstrated in the studies by Hart Jr. (2019), Haston (2018), and Shaw (2016). Hart Jr.'s research underscores the importance of providing authentic learning contexts, such as opportunities for student conducting, to facilitate the practical application of PCK in music education. It reveals that despite an emphasis on music content knowledge, there is a clear recognition of the value of PCK, underlining the importance of coupling content with effective pedagogical strategies. This study reflects earlier findings by Ekiz-Kiran and Boz (2020), which discussed the intricate interplay between subject matter knowledge and pedagogical techniques, emphasizing the importance of PCK. Also, Mat Yusoff et al. (2023) argued that practice-based opportunities in real classrooms are vital for the development of effective teaching. While the highlights the limited opportunities for authentic conducting practice, it's worth to understand that even in authentic settings, the quality of the experience matters. Further, Kong et al. (2020) denotes that the authenticity of practice must be combined with reflection and expert feedback for maximal impact on developing PCK.

Similarly, Haston's study provides insight into the multifarious sources of PCK that shape music educators' teaching approaches, including apprenticeships, intuition, peer influence, and the impact of a cooperating teacher. This underscores PCK as a flexible, adaptable framework informed by a variety of influences and experiences, capable of refining music education strategies. Shaw's study extends the scope of PCK in music education, emphasizing its role in adapting pedagogical strategies to unique classroom, school, and community contexts, further enhancing its relevance and application. This demonstrates PCK's dynamic role in not just enhancing content understanding but also promoting inclusivity and cultural responsiveness. Collectively, these studies illuminate the multifaceted nature of PCK in shaping effective pedagogical strategies in music education. They highlight the need for music educators to possess a robust PCK that integrates deep content knowledge with versatile teaching strategies, informed by a broad range of experiences and adaptable to diverse learning contexts. Haston's findings resonate with the notion that PCK is a complex, multifaceted construct, a perspective well-documented by Kind and Chan (2019). They argued that PCK evolves from a blend of content knowledge, pedagogical knowledge, and knowledge of context. While diverse sources of PCK (like peer influence, methods courses, etc.) are highlighted, it would be beneficial, as Shulman (1987) suggests, to discern which sources are most impactful in developing robust PCK. Not all experiences or influences contribute equally to effective pedagogical strategies. Hence, PCK serves as a vital framework guiding the continual refinement and adaptation of music education strategies to ensure optimal learning outcomes.

The studies conducted by Beltman (2015), Tsugawa (2022), and Draves (2019) distinctly underscore the role of Pedagogical Content Knowledge (PCK) in shaping student-centered teaching approaches in music education. Beltman's study delves into the emerging teacher identity among pre-service teachers, highlighting their intention to cultivate positive relationships and enjoyable learning experiences for students. This points to a crucial element of PCK: the understanding and adaptation of teaching strategies based on student needs and learning styles. However, it also uncovers a potential gap in comprehending the multi-dimensional aspects of teaching, such as content knowledge and pedagogical skills, which are integral to PCK. Beltman's focus on pre-service teachers' teacher identity formation is similar to Maaranen and Stenberg (2020) research on teacher identity. They asserted that the process of forming a teacher's identity is continual and affected by environmental, professional, and

personal factors. Further, Sevinc (2023) highlighted that PCK is not just about content or pedagogy, but the intersection of the two. While Beltman underscores the importance of cultivating positive relationships, the study could benefit from a deeper exploration of how these intentions translate into effective PCK development, especially when adapting to diverse student needs.

Tsugawa's study takes this a step further by examining intergenerational dynamics, emphasizing the necessity to adapt teaching methods to cater to generational differences in learners. This not only amplifies PCK's scope by incorporating diverse learning needs but also lays emphasis on inclusivity and diversity in music education, enhancing teacher preparedness for versatile learning environments. The study focuses on intergenerational dynamics in teaching is in line with Jarrahi and Eshraghi's (2019) digital native versus digital immigrant dichotomy, emphasizing the evolving learning preferences across generations. Although Tsugawa emphasizes the need to understand generational differences, researchers like Rudolph et al. (2021) have warned against overgeneralizing and labeling entire generations. Hence, while PCK should indeed adapt to cater to different learners, care should be taken not to make broad assumptions about generational learning needs without considering individual contexts.

Draves' study rounds up this exploration of PCK's role in student-centric teaching approaches, tracing the transformation of a teacher's identity and its consequent influence on pedagogy and student learning experiences. It posits that a teacher's evolving identity, characterized by a student-focused approach and authenticity, impacts the learning environment and student engagement, underlining a teacher's identity as a vital facet of PCK. The interplay between teacher identity and pedagogy finds resonance in Meesuk et al. (2020) work, suggesting that one's understanding of oneself is central to being an effective teacher. While Draves emphasizes the transformation of teacher identity, Labbaf et al. (2019) argue that teacher identities are continually evolving, influenced by both internal and external factors. Understanding how these dynamic identities interact with the development and application of PCK would provide a more comprehensive picture. Together, these studies reinforce the role of PCK as a guiding framework that encompasses content knowledge, pedagogical strategies, and a deep understanding of student needs to craft effective, student-centered teaching approaches in music education.

The studies by Calderón-Garrido & Gustems-Carnicer (2021), Payne et al. (2019) and Partti et al. (2015) strongly highlight the critical role of Pedagogical Content Knowledge (PCK) in shaping and executing effective assessment practices in music education, be it remote or traditional, across different levels of education. Calderón-Garrido & Gustems-Carnicer's research into remote music teaching during the COVID-19 pandemic underscores the need for PCK in evaluating student learning even in virtual environments. By incorporating PCK, teachers can better navigate the challenges of remote teaching, enabling a more holistic understanding of students' musical abilities. Their study of PCK in remote music education during the pandemic is consistent with the TPACK approach developed by Koehler & Mishra (2009), which emphasises the integration of content, pedagogy, and technological knowledge. While Calderón-Garrido & Gustems-Carnicer stress the importance of PCK in virtual learning, Greenhow et al. (2022) points out that technology-mediated environments introduce new types of interactions, requiring an evolved form of PCK. The study might benefit from incorporating TPACK principles more explicitly to address the unique challenges of remote music education.

Payne et al. (2019) underscore the importance of a systematic six-step assessment process to enhance student performance and guide instructional decisions in music education. Here, PCK acts as the foundation that allows educators to create customized assessment tasks, scoring devices, and feedback mechanisms that closely reflect and support individual students' musical progress. The systematic six-step assessment process mirrors Hassanien et al. (2013) work, which suggests that assessments should be interwoven with teaching to optimize learning. Payne et al. (2019) emphasize structured assessment. However, as Matsunobu (2023) notes, the danger is that a too rigid structure can sometimes sideline the essence of musical creativity. There's a balance needed between a systematic approach and fostering an organic, creative learning process, which may not have been deeply explored in this study.

Meanwhile, Partti et al.'s study delves into higher music education, exploring the potential of innovative assessment practices that view assessment as part of the learning process. Through the lens of PCK, educators can better design and adapt assessment tasks to specific contexts, deepening students' understanding of the subject matter and aiding in their professional identity development. Partti et al.'s

approach to viewing assessment as part of the learning process resonates with Oliveira et al.'s (2019) argument for embedding assessment within the pedagogical process for it to be truly transformative. However, de la MoraVelasco and Hirumi (2020) caution that innovative assessments in music, without proper calibration to reflect true learning outcomes, can sometimes mislead educators. There might be a need to balance innovation with validity and reliability in assessment methods. Overall, these studies emphasize that a nuanced understanding of PCK, combined with effective assessment strategies, could significantly elevate the quality and efficacy of music education, regardless of the teaching and learning environment. As a dynamic and adaptable framework, PCK plays a central role in shaping assessment practises that are tailored to the specific requirements and circumstances of music students, thereby fostering their musical growth and development.

Conclusion

This systematic literature review elucidates the multifaceted nature of PCK in shaping and influencing effective pedagogical strategies in music education. The review draws together insights from a range of studies, highlighting the interplay between PCK and various elements of music education, such as teacher competency, understanding of music concpets, pedagogical strategies, student-centered approaches, and effective assessment practices. A notable conclusion from this review is the recognition of PCK as a dynamic and adaptable framework that, when properly understood and applied, can significantly enhance the teaching and learning processes in music education. In the landscape of music education, PCK has demonstrated its transformative potential. It is clear from the literature that a deep understanding of both content and pedagogical knowledge is essential for effective music instruction. This amalgamation becomes particularly potent when combined with innovative technology, as it offers an engaging, immersive, and modernized learning environment. Furthermore, it's evident that PCK must be culturally responsive to resonate with learners' experiences and contexts, a factor that can significantly influence engagement and understanding. PCK also plays an instrumental role in shaping student-centric teaching approaches, which accommodate diverse learning needs and styles, thereby fostering a more inclusive and effective learning environment.

Nonetheless, gaps and challenges in the effective application of PCK remain. There is a need for more professional development opportunities, like seminars and training sessions, to equip music teachers with the necessary PCK. Similarly, the review identifies the need to enhance music teachers' cultural responsiveness, integrating it into their PCK to reflect local influences better. Also, the necessity for educators to adapt their PCK to the unique dynamics of each learning environment, be it traditional or remote, is evident, particularly in the design and execution of assessment practices. In conclusion, the role of PCK in music education, as revealed in this systematic literature review, is undeniably significant. It serves as a cornerstone for delivering quality instruction, fostering a deeper understanding of music concepts, ensuring effective pedagogical strategies, and enhancing assessment practices. For the potential of PCK to be fully realized in music education, there is a pressing need for targeted interventions aimed at addressing the identified gaps, including improved professional development opportunities, increased cultural responsiveness, and adaptable pedagogical strategies tailored to diverse learning environments. Only then can the transformative potential of PCK be fully harnessed, leading to an enriched, effective, and inclusive music education for all learners.

However, the study also acknowledges several limitations. It identifies the potential for language bias due to the restriction of the search to English language articles, and the temporal limitation, with only articles published between 2014 and 2023 being included. Furthermore, the variance in methodology, sample size, and intervention design across the studies could affect the comparison and synthesis of findings, thus presenting another limitation of this review. Despite these potential limitations, the study's findings offer valuable insights into the role of PCK in shaping the learning within music education.

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Biographies

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Anwar Farhan bin Mohd Marzaini is an English language lecturer at Universiti Teknologi MARA in Pulau Pinang. He is currently pursuing his Ph.D. in Education at UiTM. In addition to his academic pursuits, Anwar Farhan is deeply interested in exploring the intersection of music and language education. His research focuses on how music can be used as a dynamic tool in teaching English, particularly in enhancing language retention and improving pronunciation skills.

Muhammad Hafiz bin Hassan, a graphic design lecturer with a Master's in Design Technology, is not just passionate about visual arts and education, he is also deeply interested in music. His scholarly pursuits also encompass an avid interest in music, exploring its elements and their interplay with design technology. Alongside his work in crafting educational tools for children with autism, Hafiz integrates musical elements into his teaching approach at Universiti Teknologi MARA, Sarawak.

Noorhayati Zakaria is a teacher at Tenby International School and is currently pursuing her Ph.D. in Education, focusing on Language and Literacy Education at the University of Malaya. Her research delves into the literacy of EAL integrated with music. She explores how music can support and enhance literacy development, positing that musical elements like rhythm and melody can reinforce language patterns and structures. Her innovative approach aims to examine the effectiveness of incorporating music into literacy instruction to improve student engagement and achievement in language learning.