



Mapping the Use of Digital Game-Based Learning in Music Education: A Scoping Review

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ABSTRACT

Music education supports creative expression, emotional development, and cognitive growth. During the last several years, digital game-based learning (DGBL) has been used to maintain student engagement, but its presence in music education varies considerably. Some teachers experiment with small-scale game tools, while others adapt existing commercial games for classroom use. This study maps how digital games were used in music education from 2020 to 2025, a period shaped by the shift to remote and hybrid learning after COVID-19, when many educators had to reconsider how students could practice musical skills without face-to-face instruction. A scoping review was conducted using Publish or Perish to identify studies indexed in Scopus and Google Scholar. The review followed the PRISMA 2020 framework and included peer-reviewed publications as well as relevant grey literature (e.g., theses, classroom-developed projects), acknowledging that many pedagogical innovations in music education are not always disseminated through formal journals. The initial search resulted in 124 records; after screening for eligibility and methodological clarity, 26 studies were included in the synthesis. Most studies emphasized ear-training and quiz-based game formats, while rhythm-based, exploratory, and curriculum-integrated designs appeared less frequently. Research contexts were dominated by beginner learners, elementary education, and university courses, with only a small number of studies focusing on senior high school contexts. These findings highlight gaps in current research and indicate the need for future game designs that support sustained perceptual training and integrate culturally grounded approaches to music learning.

Keywords: *Music Education, Game-Based Learning, Musical Perception, Educational Technology*

INTRODUCTION

Music education is recognized as a space where creativity and perception are actively formed (Sungurtekin, 2021). When remote and hybrid formats became common, many teachers experimented with digital games in response to engagement challenges rather than formal policy changes (Tulaskar & Turunen, 2022). These attempts included using simple browser-based ear-training tools or rhythm challenges (Pedersen, Hulusic, Amelidis, & Slattery, 2020). As a result, DGBL in music education has developed in a patchwork way, with approaches that vary widely between classrooms (Qian & Jiang, 2024). Recent studies show that ear-training applications and notation-based puzzle or quiz games are the most frequently used formats in music learning, while rhythm games, curriculum-integrated platforms, and exploratory or VR-based performance environments are less common. Most implementations are also concentrated at the beginner or university level, with very few studies addressing senior high school learners (Council, Education, & Standards, 2015). Although approximately ten studies directly targeted aural-skill development, the diversity of musical outcomes, instructional contexts, and cultural relevance remains limited (Seow, 2024).

Recent studies reveal distinct patterns in how DGBL is applied in music education. Lesser (2020), in an investigation of DGBL software in elementary general music classrooms, found that rhythm and note-reading games were most prevalent, primarily serving as supplementary tools rather than core instructional components. Similarly, Pesek et al. (2020) developed a rhythmic dictation application that successfully motivated students for ear-training, though their study focused primarily on university-level learners. At the secondary education level, Rusnak (2024) explored band gamification among high school students with autism spectrum

disorder, demonstrating the potential of game elements in specialized contexts but leaving mainstream high school music education largely unaddressed. Meanwhile, Cheng (2024) analyzed the educational affordances of commercial music video games and mobile apps, noting their strong engagement potential but limited alignment with formal curriculum standards, particularly for adolescent learners (Cheng, 2024; Cheng & Leong, 2017).

Thus, previous research has not yet mapped how game genres, learning objectives, and educational levels intersect within music education, nor how DGBL may support perceptual training in adolescent learners (Weatherly, Wright, & Lee, 2024). This study maps recent uses of DGBL in music education (2020–2025) to identify game types, learning goals, and learner groups, and to highlight the lack of work at the senior high school level, particularly in aural perception development.

These studies collectively highlight several critical gaps in the current research landscape (Bogers et al., 2017). First, there is a conspicuous scarcity of DGBL research focusing on senior high school music education, with most implementations concentrated at elementary or university levels (Wu, 2015). Second, existing studies tend to emphasize ear-training and rhythm games while neglecting broader musical dimensions such as harmony, timbre, improvisation, and cultural contextualization (Hou, Rattachaiwong, & Liu, 2024). Third, there remains a lack of comprehensive mapping that systematically connects game genres, specific learning objectives, and appropriate educational levels within music education (Yusoff, Marzaini, Hassan, & Zakaria, 2023).

The urgency of this research is underscored by the post-pandemic transformation of educational delivery models and the growing need for effective digital tools that can support comprehensive music learning across diverse contexts (Karim, Chowdhury, & Karim, 2024). The persistent gap in senior high school music education is particularly concerning, as this developmental stage is crucial for advancing musical perception and artistic identity (Pitts, 2019). The novelty of this scoping review lies in its systematic mapping of the intersection between game genres, learning objectives, and educational levels in music DGBL from 2020 to 2025 (Tirazona, 2025). While previous reviews have examined DGBL in music education broadly, none have specifically focused on this critical period of educational transformation or provided the detailed cross-tabulation of game types against educational levels and learning objectives that this study offers.

The purpose of this study is to systematically map the use of digital game-based learning in music education between 2020 and 2025, with specific objectives to: (1) identify predominant game genres and their distribution across educational levels, (2) analyze the alignment between game-based interventions and specific musical learning objectives, and (3) highlight significant gaps in current research and practice, particularly regarding senior high school education and comprehensive musical skill development. The findings of this review are expected to benefit music educators by providing evidence-based guidance for DGBL implementation, inform game developers about underserved educational needs, and contribute to research by identifying priority areas for future investigation in music education technology.

RESEARCH METHOD

This study employed a scoping review approach to map the use of digital game-based learning (DGBL) within music education. The objective was to identify the types of digital games utilized, the educational goals addressed, the learner levels targeted, and to highlight existing gaps in the literature. The review was conducted following the methodological framework proposed by Arksey and O'Malley, which consists of identifying the research question, locating relevant studies, applying inclusion and exclusion criteria, charting the data, and synthesizing the results.

The literature search was performed in July 2025 using Harzing's Publish or Perish 8 (2025)

software, drawing from the Scopus and Google Scholar databases. The search strategy combined terms such as “music education,” “digital game-based learning,” “educational game,” “rhythm training,” and “musical literacy.” The search covered peer-reviewed publications and relevant grey literature published between 2020 and 2025 in either English or Indonesian.

Studies were included if they (1) explicitly addressed the use of digital games in music education, (2) were empirical in nature, and (3) provided full-text access. Articles were excluded if they (1) focused on non-musical subjects, (2) discussed digital games without an educational purpose, or (3) were purely conceptual reviews without empirical data. Duplicate entries were removed prior to the screening process.

The screening and selection process was guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) 2020 guidelines. The initial search yielded 124 records. After removing 15 duplicates, 109 records remained for title and abstract screening. Following the exclusion of 38 irrelevant sources, 71 reports were sought for retrieval; of these, 20 could not be retrieved. A total of 51 full-text reports were assessed for eligibility, with 25 excluded for not meeting the inclusion criteria. Ultimately, 26 studies were included in the final review. The complete selection process is illustrated in Figure 1.

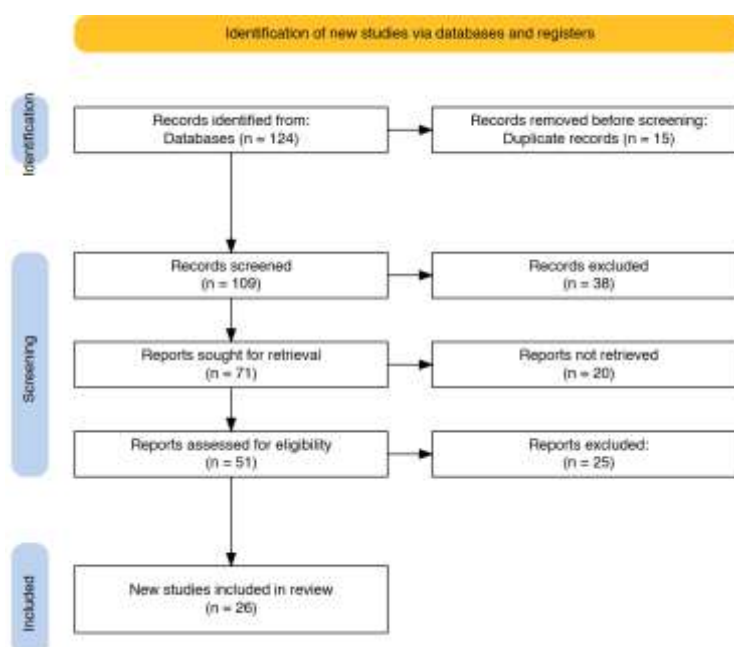


Figure 1. PRISMA Flow Diagram of the article screening and selection process.

Source: Authors' own work, based on the PRISMA 2020 guideline

Thematic synthesis was used to analyze the patterns found across the studies. No formal quality appraisal or statistical meta-analysis was conducted, as the purpose of this review was to explore the breadth rather than evaluate the effectiveness of interventions. Efforts to ensure the reliability of classification included independent re-checking of extracted data and cross-validation with the full texts. The methodological scope was limited to descriptive synthesis due to the heterogeneity of study designs and outcomes.

RESULTS AND DISCUSSION

This review analyzed 26 empirical studies published between 2020 and 2025 that applied digital game-based learning (DGBL) in music education. Three major findings emerged. First,

the distribution of game genres (Figure 2) shows that ear-training platforms (n=8) and puzzle/quiz games focusing on theory or notation (n=7) were the most common. Rhythm games (n=4), curriculum/practice-oriented games (n=4), and exploratory or experimental games such as RPGs or soundscapes (n=3) were less frequent.

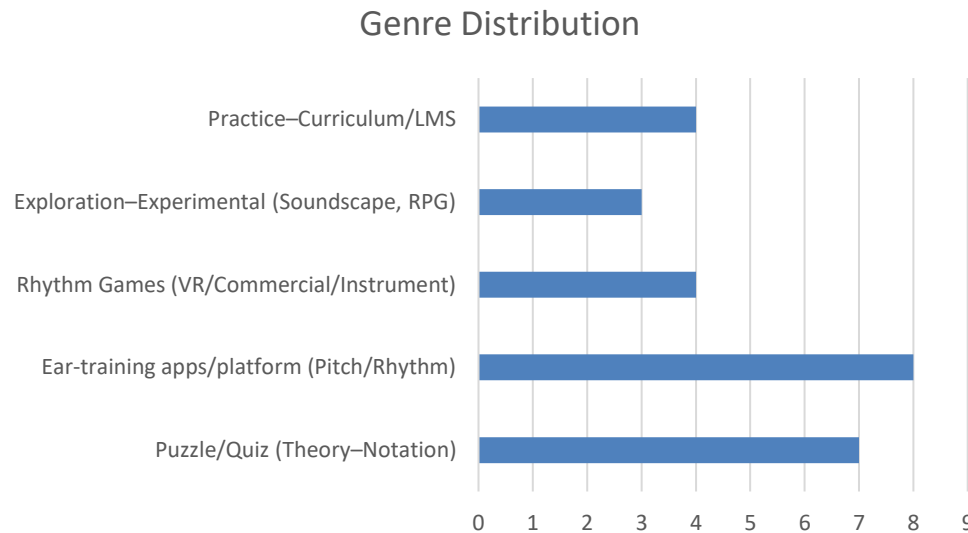


Figure 2. Distribution of game genres across 26 included studies.

Source: Research data synthesis (2025)

Second, with respect to educational objectives, 11 studies directly trained aural skills, while 15 did not include ear-training (Figure 3). This finding highlights that perceptual training has been a frequent focus in DGBL, although a majority of studies pursued different aims without explicitly incorporating ear-training.

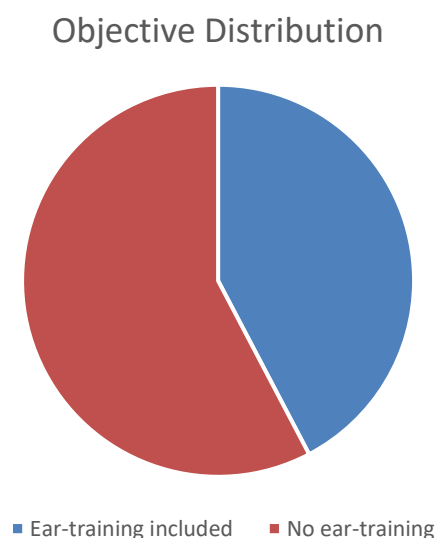


Figure 3. Proportion of studies focusing on ear-training objectives.

Source: Research data synthesis (2025)

Third, in terms of learner level, most studies were conducted in general beginner contexts (n=13), universities (n=6), or elementary schools (n=4). Only two studies targeted junior high school students and one focused on senior high school students, revealing a substantial gap at

the secondary level (Figure 4).

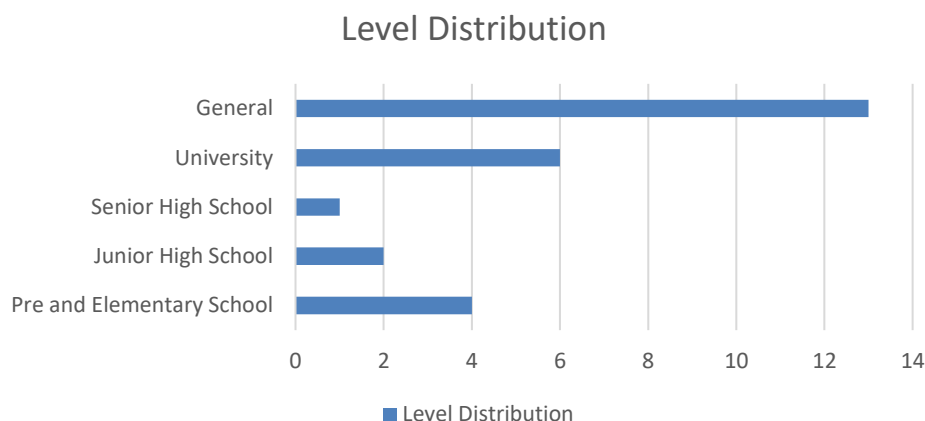


Figure 4. Distribution of educational levels targeted by included studies.

Source: Research data synthesis (2025)

The predominance of ear-training and quiz formats indicates that DGBL in music has been used mainly to reinforce perceptual accuracy and literacy skills. These findings align with earlier reviews that emphasized rhythm and aural training as common genres in music learning games, but the present review contributes empirical confirmation by mapping actual implementations. The narrow emphasis on perceptual training highlights the limited scope of current interventions, suggesting that broader aspects of musicianship such as harmony, timbre, and improvisation remain underexplored. The scarcity of high-school studies may reflect infrastructure limitations in schools, curricular pressures that prioritize examinations, or assumptions that games are more suitable for younger learners. Nevertheless, this represents an important pedagogical gap, as adolescents are developmentally prepared to engage with more complex musical concepts.

The implications of these results extend to both practice and research. For teachers, rhythm and ear-training games provide accessible, evidence-based models that can be adapted to various educational contexts, including senior high schools. For researchers, the findings point to opportunities to design games that target broader musical skills and incorporate cultural elements such as local instruments or regional scales. Integrating traditional music into serious games could both enhance learning outcomes and strengthen students' cultural identity.

Beyond these general implications, several broader issues emerge from the patterns identified in this review. The findings of this review intersect with broader curricular directions in Indonesian music education. Within the Merdeka Curriculum, music learning emphasizes creativity, contextual learning, cultural reflection, and student agency. However, most DGBL applications identified in this review primarily targeted discrete technical outcomes such as pitch matching or rhythmic accuracy. While these skills are foundational, they represent only one dimension of the competencies encouraged at the senior high school level, where students are expected to develop interpretive understanding, stylistic awareness, and the ability to connect musical experience with personal identity and social context. In other words, there is a tension between the holistic aims of the curriculum and the narrow instructional focus of many existing game-based tools.

If DGBL is to be meaningfully integrated into Indonesian classrooms, it must align with the curriculum's emphasis on exploration, collaboration, and cultural grounding. This alignment requires game mechanics that not only assess correctness but also facilitate musical reasoning, encourage students to form interpretive judgments, or prompt reflection on cultural meaning. For instance, rhythm or pitch games could be expanded to include tasks that require

students to compare musical expressions across genres or local traditions. Such integration would shift DGBL from a supplementary drill tool to a medium for deeper musical engagement.

For classroom practice, the results suggest several considerations. First, teachers may introduce DGBL in stages, beginning with familiar ear-training or notation games while gradually expanding into exploratory activities. This gradual approach may reduce the perception that games are only for younger students or for entertainment. Second, teachers may adapt locally available traditions and musical materials into the game environment, which can enhance relevance and student ownership of learning. Even when commercial or pre-existing digital games cannot be modified directly, teachers can contextualize gameplay through discussion prompts, performance follow-ups, or collaborative composition activities based on game content.

Additionally, the review indicates that the success of DGBL implementation is shaped not only by the game itself but also by how teachers frame and guide the learning experience. Games that appear simplistic can become meaningful when embedded in dialogic teaching, reflection, or ensemble activities. This suggests that teacher professional development is essential: educators require not only technical skills to operate digital tools but also pedagogical strategies to connect gameplay with conceptual understanding, creativity, and cultural reflection.

This review is informed by an awareness of the varying material conditions of music classrooms in Indonesia, including differences in digital access, institutional support, and cultural orientation. These conditions influence how, when, and why teachers adopt DGBL. Therefore, any future development or implementation of game-based tools must be adaptable to diverse school environments, acknowledging that pedagogical innovation is shaped by both technological and cultural resources.

This review has several limitations. The heterogeneity of study designs prevented formal quality appraisal or meta-analysis, and the restriction to English- and Indonesian-language publications may have excluded other relevant studies. In addition, many of the included works were small-scale or exploratory, limiting the generalizability of conclusions.

Future research should therefore expand empirical work at the senior high school level, explore underrepresented musical dimensions beyond pitch and rhythm, embed cultural traditions into game design, and conduct longitudinal studies to examine sustained effects on musical skills, motivation, and identity.

CONCLUSION

This scoping review of 26 empirical studies from 2020 to 2025 found that digital game-based learning (DGBL) in music education primarily focuses on ear-training and puzzle/quiz games, with limited research targeting senior high school students and advanced musicianship skills. While current practices emphasize foundational perceptual skills, they often neglect the developmental needs of adolescents and the broader musical dimensions such as cultural traditions and expressive creativity. By confirming these trends against earlier conceptual work, the review highlights a significant pedagogical gap and suggests future research should expand DGBL to secondary education, incorporate culturally relevant content, and diversify learning goals beyond rhythm and pitch to create more inclusive and contextually meaningful music learning experiences.

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