

MONOGRAPH

Problem-based Learning: Composing in the classroom as a music learning challenge

Aprendizaje basado en problemas: la composición en el aula como desafío para aprender música

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Abstract

Problem-based Learning (PBL), one of the most widespread student-centered teaching models, prioritizes cooperative and challenge-based learning, with teachers acting as "facilitators", and formative assessment processes. In music, the search for ways to enhance the (co)construction of learning and complementary responses to expository methods resonates with composition centered proposals, with some incorporated into Music Education curricula as in the Portuguese case. What characterizes PBL, what data exists on its application and what links can we establish with musical learning to systematize its implementation and study through composition reflect the questions motivating this literature review. *Thinking in sound, thinking in music, holistic learning, creative thinking*, provide the constructs and references through which we discuss the foundations of this model. The summaries, in turn, produce the following conclusions: the study of PBL generates both benefits and constraints, and research on its theoretical principles continues to be far more abundant; composition in itself represents a problem-solving process, and musical learning through composition, when viewed according to the aforementioned constructs, can take shape in a way that aligns with PBL; it works as a guiding model for musical and educational planning, action and research, particularly through composition.

Key words: Problem-based Learning; Cooperative Learning; Music Education; Musical Composition.

Resumen

El Aprendizaje Basado en Problemas (ABP), uno de los modelos centrados en el estudiante, prioriza el aprendizaje cooperativo/basado en desafíos, los docentes como "facilitadores" y procesos de evaluación formativa. En música, la búsqueda de formas para mejorar la (co)construcción del aprendizaje y respuestas complementarias a los métodos expositivos resuena con propuestas de composición, algunas de las cuales se han incorporado en los planes de estudios de Educación Musical en Portugal. Lo que caracteriza el ABP, qué datos existen sobre su aplicación y qué vínculos podemos establecer con el aprendizaje musical para sistematizar su implementación y estudio a través de la composición reflejan las preguntas de esta revisión bibliográfica. *Pensar en el sonido/música, aprendizaje holístico, pensamiento creativo*, proporcionan los conceptos a través de los cuales discutimos los fundamentos del modelo. Los resúmenes generan las siguientes conclusiones: el estudio del ABP arroja tanto beneficios como limitaciones, y la investigación sobre sus principios teóricos es más abundante; la composición representa un proceso de resolución de problemas, y el aprendizaje musical a través de la composición puede tomar forma que se alinee con el ABP; el ABP funciona como un modelo orientador para la planificación, acción e investigación musical/educativa, particularmente a través de la composición.

Palabras claves: Aprendizaje Basado en Problemas; aprendizaje cooperativo; educación musical; composición musical.

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1. Introduction

The challenges posed by contemporary society have broadened the issue of learning, placing it at the center of political and educational discourse. The development of autonomy, critical and creative thinking, research and cooperation competencies, curiosity, and learning to learn, not only configure guiding principles of curricular and ministerial discourses, but also demand alternative and complementary models to expository, imitative, and direct instruction. Problem-based Learning (PBL) represents one such path and provide a source of inspiration for developing other approaches, such as Challenge-based Learning, Project-based Learning, Inquiry-based Learning, or Team-based Learning, which, although differentiated, share the same philosophy. Even though its study aggregates scientific literature, its application to music education requires continuous consolidation, particularly regarding the reflection, conception, and empirical treatment of appropriate action plans, not only for curricular purposes, but also for those ideals.

Consisting of a literature review, this paper sketches the scope for learning music through creation and composition, a path that, in line with the thinking of various authors, brings together ingredients that seem to meet the principles of that model. The article represents one output of a broader research project, conducted in the Portuguese educational system, hence the references to this topic made in the text.

2. Defining PBL

2.1. Exploring theoretical foundations and problems as levers of knowledge

PBL, as a widely disseminated teaching and learning model or process, originated at the Faculty of Health Sciences of McMaster University, in Canada, in the 1950s and 1960s, in response to dissatisfaction with common practices in medical education (Barrows, 1996). From a philosophical point of view, it is based on the principles of constructivism, rooted in the Socratic *maieutic* of classical Greece, particularly in the privilege given to dialogue and the pursuit of knowledge through inquiry, as well as in the ideals of the *active school*, that emphasizes the value placed on the student as an agent in their own learning. This additionally draws on the pragmatic view of education promoted by Dewey, emphasizing the social, interactive, and experimental nature of the phenomenon of learning (Arends, 1995; Yew, & Schmidt, 2012). Thus, this configures the image of subjects who, in their process of development and learning, also construct knowledge, motivation, beliefs and interests, rooted in the cognitive movement emerging out of the works produced by Piaget, Vygotsky, and, later, Bruner (Abeles, & Custodero, 2010; Gigbels, *et al.*, 2005; Schunk, 2012), theories that inherently reflect concepts and perspectives on literacy – and their consequential impact, as we all know, on the widespread development of curricula and educational practices (what is important to learn and know, how it is promoted and translated into meaningful and useful experiences for students, including in the socio-emotional realm, etcetera). In this unfolding of ideas, *learning by discovery* (Bruner, 1961) also gains particular relevance, including its characteristic aspects such as student set problems that require solving through discussion with peers, and the intrinsic motivation to learn– which, encountering especially favorable conditions for its maximization in environments closest to non-formal learning,

contributes as mobilizers or facilitators for the assimilation and retention of information that acquires personal meaning for students (Torp, & Sage, 2002).

"Problems are the heart of PBL" (Hung, 2006, p.56). In the field of medicine, they often take the form of a patient's description involving a series of signs or symptoms (Schmidt, 1994). However, their formulation in education may have more complex contours as this focuses on competencies and/or content and often requires interdisciplinary, or even multidisciplinary, solutions (Hmelo-Silver, 2004). Most research on problems approaches issues related to design and substance, aspects that arise from considering the self-regulated learning paths associated with perspectives on the scope for mobilizing prior knowledge, intrinsic motivation, and the relationship of challenges with reality (Blumenfeld, *et al.*, 1991; Mauffette, *et al.*, 2004; Rotgans, & Schmidt, 2012; Schmidt, *et al.*, 2011). Authenticity establishes the basis for problem selection as the underlying curricular approach aims to stimulate and prepare students for the challenging and demanding environments of the real world, hence, to become practical problem solvers (Savin-Baden, & Major, 2004; Stepien, & Gallagher, 1993; Strobel, & Barneveld, 2009).

The role of prior knowledge or experiences takes on relevance as both the desirable articulation between their level and range, and the degree and type of challenges posed, depend on, and determine the scope for achievement: inquiry, questioning, formulation of multiple hypotheses and/or results (Jonassen, 2011; Schmidt, *et al.*, 2011). Nevertheless, the phenomenon of self-regulation underlies the entire process and experience of problem-solving, and, perceived as one of the guiding principles of this model, it simultaneously emerges as an end and a learning competence. Examples of problems arising in the music curriculum context would be, among many others and focusing here on composing: researching sound solutions for graphic or pictorial representations or images, unveiling, classifying and interpreting them through musical instruments, including the ear, body and/or voice, allegorically, associations or dichotomies (timbres, textures, combinations of durations, rhythms and pitches, forms, temporal structures); classifying and sonorizing stories or characters through metaphorical imagination –achievements also capable of integrating specific artistic, interdisciplinary and cultural projects (performances, theater, movies, etcetera).

2.2. Cooperation, sharing and teacher as “facilitator”

While Hung (2006) maintains problems are at the heart of PBL, according to Mennin (2007), the same can be said about small-group learning. Drawing on Delisle's (1997) narrative, when someone unfamiliar with PBL observes a class in this context, they may consider it different to what they usually think of as education: they do not see students sitting in rows but rather working together in small groups; they may expect absolute silence while students listen to the teacher but eventually encounter background noise from ongoing group activities. This references cooperative learning, a current topic incorporated into the OECD's universal programs for education and the 21st century educational policy agenda (OECD, 2023; Silva, & Fernandes, 2019). Emotional and social development, which are associated with highly valued soft skills, account for one of the main reasons for advocating cooperative learning, with its philosophical roots in socio-constructivist theories. This particularly shapes perceptions of the actions and the nature of the learning subject: respectively, inter-agent and social (Schunk, 2012; Schunk, & Zimmerman, 2013); in fact, constant features of non-formal learning, a process also receiving attention from leading figures in psychology and education, and now established on curricular

agendas and reflections, including for music (Green, 2012; Mans, 2009; Smart, & Green, 2017). The reference to the school's cultural role and, therefore, to its positioning in the social construction of knowledge, contributes to supporting such concerns and, correspondingly, to teaching visions driven by the co-construction of learning in the classroom, in accordance with the respective social reality of scientific and empirical thinking and acting (Dewey, 2002; Verenikina, 2010; Vygotsky, & Cole, 1978). This outlines the context that renders theoretical support to cooperative learning, often portrayed in the literature and empirical research alongside the potential for ensuring the mobilization of aspects such as communication, sharing, and creativity; the same ingredients highlighted for managing and constructing motivational and self-regulatory processes (Brandt, 1991; Culclasure, *et al.*, 2019; Gillies, 2014; Johnson, *et al.*, 2000; Johnson, & Johnson, 2009; Luy-Montejo, 2019; Savin-Baden, & Major, 2004; Slavin, 1980).

Returning to the idea described above, someone unfamiliar with the topic being discussed here may not have encountered the teacher lecturing at the board or reading to students from the front of the classroom. Instead, they may see the teacher sitting at a group's desk, commenting on what they have accomplished or, alternatively, over in a corner of the room writing notes about class activities, or carrying out research outside or during recess. There may even be a false sense that teachers do not have to expend much effort, simply observing groups learning on their own. However, this is not the case considering the time required to construct problems, monitor students throughout projects, encourage their autonomy, and evaluate their performances and success in dealing with challenges. Clearly, the teacher's role is vital for the effectiveness of this experience (Delisle, 1997). Thus, we are not talking here about the teacher as the source of knowledge (Prodan, 2016) but rather as a guide for learning or as the "facilitator" (Charlin, *et al.*, 1998; Hmelo-Silver, 2006; Williams, 2012). The promotion of environments favorable to community spirit, cooperation, and dialogue is therefore a crucial teacher competency (Johnson, & Johnson, 2008; Weeb, 2009).

2.3. Assessment as construction and learning

Assessment continues to pose a challenge in the PBL implementation context (Moust, *et al.*, 2005; Savin-Baden, & Major, 2004), especially as this approach deals with learning reaching beyond factual and declarative knowledge about a specific subject and results mainly from self-directed student-centered trajectories (Waters, & McCracken, 1997). Understanding and the processes involved in this, broader in nature (Torp, & Sage, 2002), including interpersonal competencies, bring complexity to a subject that seems to be the face and challenge of the model itself. Issues such as the validity and reliability of assessment instruments arise as recurrent problems within this dimension although possibilities that have been experienced emerge out of the literature analyzed (Hargreaves, 2007; Wiggins, 1993). Thus, there is a diversity of approaches (Vleuten, & Schuwirth, 2019) to assessing PBL, ranging from traditional exams to other techniques, such as case-based assessment, performance-based assessment, portfolio assessment, as well as self- and peer-assessment (Gigbels, 2005). Other aspects highlighted include the monitoring functions (teacher) and self-monitoring (students), and their respective strategic implications, such as initial and regular dialogues (teacher-student) about the goals to be achieved, frequent feedback, group presentations, as well as the complementary instruments or mechanisms to stimulate critical thinking (Savery, 2006). The essentially formative nature of assessment, and thus its assumption as the learning, and the process of social construction of the subject, finally raises reflection on the topic within the context of the broader problem this involves. In particular,

the debate between models focused more on product and performance, and on teacher authority, or on processes, and what students significantly construct, mobilize, and recognize as learning. Given not only the interest this raises but also in keeping with the complexity of these processes, this topic deserves further analysis that shall be published in a specific article.

3. Understanding music learning through composition

3.1. Exploring definitions, meanings, and curricular pathways

It is unquestionable that the approach to composition in educational contexts is determined by the respectively prevailing aesthetic, historical, social, cultural, and curricular contexts, including the corresponding perceptions in terms of its substance, meaning, and place in the learning process. From a psychological and educational point of view, the notion of composition as a domain of knowledge and know-how, which establishes the basis for the reflections in studies carried out by various authors whether approaching through the lens of fields such as philosophy, aesthetics, and sociology, seems to have contributed to the development of its definition, function, and place in curricula; as well as educational conceptions about music and musical literacy in almost every part of the world (Bamberger, 1977; Barrett, 1990; Burnard, 1995/1999; Burnard, & Younker, 2004; Elliot, 2005; Hickey, 2003; Hickey, & Webster, 2001; Kratus, 1989/1991; Malotti, 2023; McPherson, & Gabrielsson, 2002; Mills, & McPherson, 2006; Mills, & Paynter, 2008; Wiggins, 1992/1994/2003; Odena, 2018), which includes the Portuguese educational system (ME, 2001/2021; Silva, 2008; Vasconcelos, *et al.*, 2016/2022; Veloso, & Mota, 2021). Specifically, the study that encompasses psychological and cognitive processes, allows us to position composition not only in terms of what it constitutes as a process, nature, or quality of musical knowledge, but also in terms of what it demands for its realization, even on the emotional and social level. That is, individually or collectively, what it represents and signifies as a mode or methodology of inquiry, research, and interpretation of musical knowledge and learning, including social skills and (self)assessment.

The ideas of Schafer (1965) in Canada, and Paynter and Aston (1970) in the United Kingdom, were instrumental in fostering the development of composition within music education, particularly as a holistic and curricular pathway of learning (Paynter, 2000; Paynter, & Aston, 1970; Rusinek, 2012). These and other authors, including those contributing to the well-known *Comprehensive Musicianship* movement, driven by various initiatives developed in Canada and the USA throughout the 1960s, such as the *Young Composers Project*, the *Canadian Music Centre*, and the *John Adaskin Project*, and later in the USA, the *Contemporary Music Project*, with replications in several countries –such as in the UK, led by Self, Denis, and Foster; in Germany, by Agosti-Gherban and Rapp-Hess; and in France, by Delalande, Jarrié, Reibel, and Renaud (Comeau, 1995)– have played decisive roles in developing experiences and ideas in formal and non-formal contexts, especially around contemporary and avant-garde music, whose impact on pedagogy and curricula still resonates today. One example would be the *Manhattanville Music Curriculum Program* (Thomas, 1970), which was, in 1991, ascertained as having influenced the conception and assumptions of the Portuguese Music Education curriculum for the general education (ages 10-12), particularly in the emphasis placed on the action of creating and composing, in close articulation with expressive and instrumental performance, listening and analysis, including in the context of a cultural and social repertoire that extends outwards to the

world, ultimately transforming the very concepts of musical literacy. That is, what is understood as musical literacy and learning music.

In the Portuguese context of general education, curricula have been reflecting concerns over highlighting paths of musical learning that involve, in addition to other types of experiences (of a technical, performative, and imitative nature), the active engagement of students in seeking and discovering questions and solutions for challenges. Swanwick's CLASP (*Composition, Literature studies, Audience listening, Skill acquisition, Performance*), which is configured as an organizer of diversified music learning processes, recommended by the Portuguese Music Education program since 1991, reflects the theoretical and concrete result of this same curricular concern (Swanwick, 1979/1988); and which suggests obvious implications for the way in which musical literacy is perceived and defined –what and how it is planned, emphasized, valued and mobilized to promote it. The trend of prioritizing the process of thinking, making mistakes, and constructing meaning through the challenge posed by inquiry and discussion (rather than the knowledge and subject matter for their intrinsic and epistemological value), aligning with the principles of constructivism and social constructivism, has continued to advance, as witnessed by the most recent normative documents. Especially due to the relevance they emphasize giving to experimentation/creation, considered "basic to the development of meaningful learning" (ME, 2021, p.3). Additionally, because the processes of experimenting, creating, and imagining constitute a privileged domain for the experience of holistic musical experiences; namely, through the integrated and cross-exploration of aspects such as timbre, rhythm, pitch, expressive elements, form, genres, and world cultures –perceived and presented as "clarifiers, facilitators, and systematizers of students' listening, practice, and creation" (ME, 2021, p. 4). Therefore, there is a sufficiently rich history and theoretical framework to assist in understanding how composing, individually or in small groups, "solo" or cooperatively, has become an established activity, also within the educational frameworks of many countries (Barnes, 2001; Barrett, 2003; Fautley, 2010; ME, 2021; Odena, 2018; Philpott, & Evans, 2016; Rusinek, 2012; Vasconcelos, *et al.*, 2022).

In recent years, approaches concerning the composition and exploration of expressive skills focused on sound have been advocated and proposed through constructs such as *sound education*, as an alternative to *music education*, especially with the aim of critically emphasize the inclusive and universal nature of education and music within the context of the different formal education systems and teaching practices (Recharte, 2019; Veloso, *et al.*, 2023). The belief that "music" and "musical", associated to curriculum processes and guidelines, are concepts that convey intentions or possibilities of musical learning that are not always truly participatory and democratic in nature, shapes the ongoing debate. Among the arguments invoked, stands out, besides others –such as the need to align classroom learning processes with those developed in non-formal contexts– the associations to which these constructs have been confined: either to specific idiomatic conventions, particularly of the western culture (repertoire, instruments, practices, etcetera), or to beliefs, especially regarding "talent", generally rooted in concepts of performance and technical skills validated by the previous ones.

3.2. *Thinking in sound, creating meaning: an active and holistic approach*

The association of composing with formulations such as *thinking in sound* and *thinking in music* appears recurrently in the educational literature, stemming from the somewhat longstanding debate around the definition of musical literacy (McPherson, & Gabrielsson, 2002;

Mills, & McPherson, 2006), which links closely to issues bound up with comprehension and the construction of meaning. The emphasis placed on ways of *thinking*, and not just on ways of *knowing*, as well as *in* sound and *in* music rather than *about* music, produced debates led by philosophers such as Elliot (2005), and Reimer (2022), and expanded upon by numerous other educators (McPherson, & Gabrielsson, 2002; Mills, & McPherson, 2006; Swanwick, 1979/1988), as well as Gordon (2000), through the construct of *audiation*, among others (Azzara, 1991; Caspurro, 2006/2007), epistemologically reflecting on what constitutes the issues under debate. Above all, underlying the choice and focus on experiences of sound and the inquiring nature (*thinking in* sound and *in* music, *audiate*), a deeper discussion emerges that encompasses, in the field of music, views and approaches to the nature and quality of learning processes, contents, and meanings; particularly the role of the subject, subjects, modes, and contexts of learning and assessment as well as introducing more complex psychological and cultural processes (motivation, social interaction, cultural engagement, etcetera) into the construction of meanings around what is deemed most relevant to achievement within the scope of that defined as learning.

Here, we critically refer, especially in music conservatory practices, among others, to the preponderance weighting attributed to: musical performance as a competency that most closely resembles forms of performative and virtuosic realization and knowledge (in which creative processes are to a greater or lesser extent conditioned by the emphasis placed on memorization and music reproduction); to notational reading and writing (regardless of the processes of sound signification expressed through the concept); to theoretical contents (not necessarily representing formulated and induced interpretations of experiences and relationships constructed from sound phenomena or problems); to the prioritization of logical and theoretical inferences over fundamental sensory and perceptual learning for the construction of meanings connected with concrete reality (*sound before symbol* in keeping with the recognized theories of Piaget and Ausubel); to the attention paid to isolated concepts and phenomena (scales, intervals, chords, figures, notes, measures) and regardless of the holistic nature that is otherwise recognized as crucial for their assimilation and understanding (*Gestalt* theory); to the development of skills centered around the concept of the solo musician and within the scope of the so-called "classical" or "erudite" repertoire (despite the cultural diversity and complexity prevailing in contemporary society); to the primacy awarded to individual teaching and to learning methods that, even when in group contexts, rely either on experiences guided by the exposition given by the teacher or on the reproduction and memorization of knowledge (singing, playing, memorizing repertoire and representative composers, writing scales, identifying figures, intervals), particularly emphasized in test and exam evaluation procedures (dictations, readings) –examples of which, in the abundant literature, provide the core of the discussions ongoing in the music education field, which, as previously pointed out, intersects various scientific domains, such as psychology, philosophy, aesthetics, and sociology (Ausubel, 1963; Cobussen, *et al.*, 2020; Elliot, 2005; Gordon, 2000; Hallam, 2006; Piaget, 1970; Reimer, 2022; Sloboda, & Juslin, 2001; Vasconcelos, 2023; Webster, 2011).

Representing that valued and distinguished by educational systems and their stakeholders as the goals of music and artistic education, the examples described reflect dialectically and within the context of various educational systems, cultures, and concepts of music, learning, education as well as teaching practices in which the values and ideals of the *active school* encounter little resonance. Indeed: composition practices as well as improvisation; the exploratory experiences associated with student-centered teaching, learning, and assessment pathways –attributing

priority to the challenge of imagining sounds and sound relationships as ways of solving musical problems; ways of interpreting, problematizing, relating and comparing, classifying and transferring constructed on sound and musical experiences and realities (*thinking in sound, thinking in music, sound before symbol, audiation*); the importance paid to motivation and its self-regulatory processes and, for this reason, also to the social, cognitive, psychological, and cultural contexts most favorable to the "natural" and authentic conditions in which it thrives (social interaction and co-operation, non-formal environments, group work, access to and contact with diversified instrumental experimentation and listening activities); connections between the musical reality of the world and culture (contact with different musical styles and languages with practices and cultures approximating their interests and reality)— account for some of the concepts, formulations, and proposals that, in what they reveal from an educational perspective and echoing different theories and authors, seem to more closely resemble the scope for the co-constructing of meaningful music learning (Webster, 2011; Wiggins, 2001/2003). Furthermore, through this approach, alternative models to teacher-centered methods may be considered, discussed, planned, and researched.

Regarding the works and research developed and reported in literature, which underpin the strengthening and deepening of these formulations, the relationship between composing process (also seen in analogy with improvisation) and forms of musical thought that demonstrate modes of understanding and creating meaning have been highlighted by Kratus (1991), Burnard (2000), Wiggins (2003), Barrett (2003), Burnard and Murphy (2017) in studies involving children from primary and lower secondary education, along with others covering different age groups (Burnard, & Younker, 2004; Caspurro, 2006; Swanwick, & Tillman, 1986). This encapsulates the importance attributed to what seems to characterize composing as a personal and social vehicle for expression and the construction of learning in different musical performance contexts (Barrett, 2003; Veloso, & Mota, 2021; Webster, 2011; Wiggins, 2003); furthermore, in addition to improvisation, constructs such as *audiation, thinking in sound* and *thinking in music*, as well as sequentially anchored learning proposals based on the principle of *sound before symbol*, critically absorb issues surrounding the scope for learning music through the creation of sound and musical meaning and, as previously mentioned, also interrelating with the aforementioned concepts and approaches (Azzara, 1991; Caspurro, 2006/2007; Gordon, 2000; McPherson, & Gabriellson, 2002; Mills, & McPherson, 2006; Priest, 2002). This also highlights the holistic nature of the knowledge experiences managed by these approaches. In fact, the view that learning meanings are constructed out of phenomena perceived as totalities is advocated by several authors, with evidences regarding the development and construction of musical structures and passages as entireties reported within the empirical experiences of creation and composition produced by children and adolescents (Bamberger, 1977; Gómez, *et al.*, 2022; Hickey, 2003; Kratus, 2001; Odena, 2012; Reese, 2003; Stephens, 2003; Veloso, 2017; Veloso, & Carvalho, 2012; Wiggins, 2003).

3.3. Solving challenges and assessment: creative and critical thinking

Finally, another finding particularly worth highlighting arises from associating the composing process with problem-solving approaches that closely resemble that commonly described as means or routes of creative thinking (Berkley, 2004; Burnard, & Younker, 2004; Kuzmich, 1987). Thus, this correspondingly privileges forms of applying imagination, *divergent thinking* (the quest for more than one answer and solution to the same problem) coordinated with

convergent thinking (problems with a single solution), insight, authenticity and spontaneity, assessment and critical thinking; as well as contact and confrontation with the challenge itself, the risk of uncertainty in achieving results, errors, and overcoming them (Barrett, 2003; Burnard, & Younker, 2004; Gardner, 2008; Guilford, 1973; Odena, 2018; Sawyer, 2003; Swanwick, 1988; Torrance, 1995; Wiggins, 2003). Although somewhat underexplored from an empirical and educational perspective, particularly in music, the importance today attributed to creativity, especially since the works of Guilford (1973), in its relationship to cognition and intelligence, reflects a feature that simply cannot be overlooked within the configuration of issues shaping the broader educational, political, and curricular debate –including the question of just what it means to know music, how this translates in terms of attitudes, expectations, and cognitive, expressive, performative, personal, and social performance, as well as culturally– with its impact reflecting far beyond (or otherwise) the level of intentions prevailing in virtually every education system (Goleman, *et al.*, 1998; Lowe, 2002; Odena, 2018; Robinson, 2001; Robinson, & Lee, 2011; Sawyer, 2003; Vincent-Lancrin, *et al.*, 2019).

The phenomena underlying the actions of applying, relating, evoking, and synthesizing knowledge, thus, in our view, transferring knowledge, also position composing as a privileged resource and strategy for assessment. This applies not only to the processes and contents of musical thinking and learning, their different dimensions, and interrelationships (through listening, feeling, interpreting, imagining, seeing/reading, associating, designing, singing, and performing music), but especially to the peer and self-assessment processes that the literature relates to develop critical thinking and, therefore, to self-regulation phenomena. This may also derive from how composing music mobilizes and enhances *divergent thinking* –which, unlike that required in *convergent thinking*, requires discussion– and, for these same reasons, forms of cooperative work.

4. Studying PBL, music and learning through composition

4.1. Method

The methodology applied in this literature review stems from its goal of gathering theoretical and empirical data connecting the field of music and learning through composition with what characterizes and underpins PBL, and the benefits and limitations of its application.

Initially, we carried out a literature review through searching for different sources (books and articles) about PBL, especially in the field of education but also reaching out to other areas (such as medicine given the significant amount of literature found). We utilized the *Web of Science*, *Scopus*, *ERIC*, and *JSTOR* databases, primarily considering titles containing the terms 'Problem-based Learning', 'PBL' or 'Problem Solving' and prioritizing open-access publications. We also added references both to theoretically contextualize PBL (including authors such as Bruner, Dewey, Gardner and Vygotsky), and to develop specific issues (for example cooperative learning, creativity, and self-regulation). The complete selection made features in the article's references. Furthermore, we simultaneously analyzed the articles published in the open access international journals "The Interdisciplinary Journal of Problem-based Learning" and "Journal of Problem-based Learning", from, respectively, 2006 and 2014 (the dates of their first publication) until 2021 (when we carried out the review of these specific journals). As this collection of articles

is so extensive, and with the respective journals hereby identified, the decision was made not to list the texts analyzed in the final references.

Regarding PBL in music context, we made recourse to the same databases, also prioritizing open-access publications but now applying a combination of terms related to both fields of research: 'Problem-based Learning', 'PBL', 'Problem Solving', 'Music', 'Music Education', 'Musical Learning', 'Composition', and 'Composing'. In this case, we employed the criteria based on whether the terms 'Problem-based Learning', 'PBL' or 'Problem Solving' were present in the titles of the texts published prior to 2021 for inclusion or exclusion. In parallel with this selection, we felt the need to complement the present review with literature focused on the formulations and theoretical constructs frequently reported in the field of musical learning through composition –improvisation, *audiation*, *creative thinking*, *divergent thinking*, *holistic learning*, *sound before symbol*, *thinking in sound*, and *thinking in music*– developed throughout the 20th and 21st centuries, and featuring throughout this article; as well as normative documents reflecting on the impact of these formulations and constructs on the Portuguese Music Education curriculum. All of these article references are detailed in the final bibliography.

We present the results below organized into the distinct categories that emerged from the data analysis procedure. At the end, with the purpose of systematizing the literature in the field of music, we set out a table with the selection of the articles that include the terms 'Problem-based Learning', 'PBL', or 'Problem Solving' in their titles, combined with 'Music', 'Music Education', 'Musical Learning', 'Composition', or 'Composing'. This table is organized by study typology, domains, and subjects, with the identification of the year/author of the publications. All the studies identified with an asterisk (*) have been published within Sarrazin's book (2018), thus the decision was made to solely cite the book within the ultimate references.

4.2. Results

The literature analysis demonstrates that the most extensively explored field in the context of PBL is healthcare, particularly medicine and nursing. Furthermore, when examining the articles published in "The Interdisciplinary Journal of Problem-Based Learning" and the "Journal of Problem-Based Learning", approaches have also emerged in fields including engineering, technology/multimedia, mathematics, education, and professional teacher development. In the music context, the set of articles analyzed reflects experiences and studies carried out in diverse domains, such as, among others, composition, instrumental interpretation, music teaching, ethnomusicology, music history, theory, and appreciation.

After collecting all the texts in the related aim, we classified the synthesized formulations into five distinct categories: (i) PBL definition and problem design; (ii) learning process; (iii) effects on skills acquisition; (iv) assessment process; and (v) tensions and challenges.

- (i) PBL definition and problem design. Concepts including self-directed and student-centered learning are reported by most studies, including those in the field of music. The '3C3R' problem design model, proposed by Hung (2006), stands out as one of the relevant approaches for the design of problems, considered one of the main challenges and constraints to implementing PBL. "Content, context, and connection" (3C) and "researching, reasoning, and reflecting" (3R) represent the variables of the model the author proposes as a methodology for designing and

planning the challenges to be undertaken in different domains. The first set of variables relate to the subject matter itself, which should consider the design of dimensions such as complexity, real-world relevance, and the utilization of prior knowledge; the second pertains to the skills of research, reasoning, and reflection required by learning through challenges. While this model has not been reported in PBL studies applied to music, the treatment of content clearly covers diverse domains and contexts, mostly related either to musical experiences (listening, performance, notation reading, composition, movement) or to music learning anchored in processes of formulating and responding to challenges aligning with the 3Rs proposed by Hung.

(ii) Learning process. Working in small groups and the teacher's role as a guide and "facilitator", defining and characterizing distinct learning approaches from traditional methods account for recurring themes in the literature on PBL across all domains. This produces significant impacts, particularly in studies focused on its theoretical and philosophical foundations (Brandt, 1991; Gillies, 2014; Delisle, 1997; Hmelo-Silver, 2006; Hmelo-Silver, & Barrows, 2008; Johnson, *et al.*, 2000; Johnson, & Johnson, 2009; Savin-Baden, & Major, 2004; Slavin, 1980). In the context of studies applied across different educational settings, including those related to music, from an empirical standpoint, the information available primarily pertains to the effects of this model on learning. It is worth mentioning the exploratory study by Vasconcelos *et al.* (2016) in which cooperative work and teacher feedback, one of the competencies within the "facilitator" role, were highlighted by students undertaking music learning activities, involving creation and composition, of general education (ages 13-14). The work of Berkley (2004) reports the understanding of composing as a problem-solving process (complex, knowledge-mobilizing, and demanding in terms of developing skills associated with hypothesis testing and verification), a relationship also explored by Burnard and Younker (2004), who identify levels of creative thinking (from simple to sophisticated) as well as the common characteristics and differences in how students compose – despite being studies in distinct contexts, such as preparation for General Certificate of Secondary Education (GCSE) composition exams by student composers, and the analysis of individual composition strategies by students aged 11 to 20 from various parts of the world, respectively. While the mobilization of creative thinking has not been empirically studied as an outcome, this nevertheless gets both advocated and applied in research on PBL, particularly associated with Creative Problem Solving (CPS) and, in the music context, by authors including Berkley (2004) and Kuzmich (1987). In his pedagogical study, Kuzmich (1987), drawing upon data derived from his teaching experience across various curriculum levels, incorporates dimensions of learning into this concept beyond composition, suggesting that CPS serves as a comprehensive methodology that transcends different teaching and music education designs and practices. Closer to a therapeutic study applied to group dynamics, although not specifically in areas related to music, is the work of Lindvang and Beck (2015) who propose a model of musical listening as an instrument to promote its achievement, associating problem solving in a social context with metaphorical images extracted from specific musical experiences, namely improvisation and composition, here identified with the concepts of "journey" and "musicality". Other studies focus on more individualized musical contexts centered around the

application of problem-solving principles and strategies to the composition of musical pieces, the preparation of works by performers, and decision-making by arrangers, conductors, or composers (Chaffin, *et al.*, 2003; Lisboa, *et al.*, 2011; McAdams, 2004; Whitaker, 1996).

(iii) Effects on skills acquisition. The highest long-term knowledge retention, from which extrapolates gains for lifelong learning acquisition (of a self-regulatory nature, such as flexibility in relating to, formulating, and dealing with concrete problems, associated with capacities for comprehension, interest, curiosity, and autonomy), constitutes the factor most reported in the empirical studies analyzed (Blackwell, & Roseth, 2018; Yew, & Schmidt, 2012; Ventura, 2014). The presentation of better performance concerning socio-emotional skills in children from pre-school to 12th grade, and the impact on the development of emotional intelligence in university students, derived from the use of the model in cooperative work, were also empirically investigated in studies such as, respectively, Culclasure *et al.* (2019) and Luy-Montejo (2019). On the field of music and interconnected with those ideas, Whitaker's study (1996) puts forward a model based on problem-solving and decision-making strategies not only as an alternative to learning of a merely reproductive and imitative nature, typical of music conservatory practices and traditions of music and instrumental education, but also sets out pathways for the development of processes such as *audiation*, *perception*, *aptitude*, and *attitude* – which, according to the author, characterize Dewey's concept of reflective thinking. Blackwell and Roseth (2018) interprets the high levels of student motivation and an appreciation of the opportunities to experience real teaching scenarios as reasons for applying PBL in a woodwind instrument method teaching course; Ventura (2014) highlights how the model enables students to become self-directed and develop problem-solving skills within music technology in the high school; and Yang (2014) notes benefits related to the more active and engaged form of learning by students in the teaching of Music History.

(iv) Assessment process. Authentic assessment is applied both explicitly and implicitly in the literature on PBL, in pedagogical and empirical studies, incorporating strategies such as the use of checklists and portfolios, as well as peer and self-assessment (Garrison, 2018; Lenhouse, 2018; Savin-Baden, 2003/2004; Savin-Baden, & Major, 2004; Tai, & Yuen, 2007; Waters, & McCracken, 1997), with these latter strategies also reported in theoretical-pedagogical articles on the music field (Garrison, 2018; Leenhouts, 2018; Sarrazin, 2018; Shaffer, 2014; Thomerson, 2018). The literature also extends to other evaluative procedures, such as the 'triple jump' (Painvin, *et al.*, apud Savin-Baden, 2003), designed for the context of PBL while not involving cooperative work as the problem assigned to students are solved individually, discussed with the teacher, and with the solutions subsequently presented. Another approach is the 'tripartite assessment', created and applied by Savin-Baden (2003), which includes three components, one provided by a group and two individually developed. From an empirical standpoint, an important output relates to the effectiveness of the peer assessment process in the two experiments made by Segers and Dochy (2010) with economics and educational sciences university students. The study by Machado *et al.* (2008), also relating to peer and self-assessment, but among medical students, emphasizes the reliability of these strategies while highlighting how they are not considered valid in cases of

summative assessment that result in final grades. Furthermore, in a study involving students from social science programs, Lenkauskaite *et al.* (2021) present results portraying how students feel empowered when faced with the scope for assessing the entire educational process, as well as self-assessing their own involvement in improving assessment strategies. The exploratory study by Vasconcelos *et al.* (2016), as previously mentioned, also reveals results indicating an appreciation for the regulatory role of the feedback provided by the teacher to the students.

(v) Tensions and challenges. Defining problems, the initial adaptation of teachers and students, individual and group learning/assessment processes, time management, the complexity of didactic design and planning, as well as the unpredictability of the process and increased workload, feature among the difficulties and constraints highlighted in various studies (Aparicio, *et al.*, 2020; Blackwell, & Roseth, 2018; Duker, 2014; Garmendia, *et al.*, 2021; Koç, 2018; Lindvang, & Beck, 2015; Stevens, 2014; Yang, 2014).

We present below the selection of the analyzed articles that include the terms 'Problem-based Learning', 'PBL', or 'Problem Solving' in their titles, combined with 'Music', 'Music Education', 'Musical Learning', 'Composition', or 'Composing'.

Table 1. Articles in the field of music

Study typology	Domains	Subject	Year, Author
Empirical	Composition	Teaching and learning composition as a creative problem-solving approach in preparation for the GCSE exam	2004, Berkley
		Transcultural perspective on creative thinking, with a focus on problem-solving and composition	2004, Burnard, & Younker
		Problem-solving strategies in musical composition	2004, McAdams
		Ideas on musical composition based on PBL and possibilities for practical implementation	2016, Vasconcelos, <i>et al.</i>
	Instrumental interpretation	Application of problem-solving principles by concert pianists in preparation of musical pieces	2003, Chaffin, <i>et al.</i>
		Artistic strategies, thoughts, and behaviors involved in learning a musical piece	2011, Lisboa, <i>et al.</i>
	Interpretation, conduction, arrangement, composition	A problem-solving and decision-making model for interpreters, arrangers, conductors, and composers	1996, Whitaker
	Music Technology	Application of PBL and E-learning in Music Technology classes	2014, Ventura
	Instrumental teaching	Training for woodwind instrument teachers	2018, Blackell, & Roseth
	Music teaching	Creative problem-solving approaches to learning	Components of PBL and examples of how they are used in music classes
PBL principles in a musical context			2012, Goodin, & Goodin
Assessment of problem-based learning		Training for music teaching using PBL and interdisciplinary strategies	2014, Stevens
			2014, Shaffer
		2018, Sarrazin*	

Theoretical Pedagogical	Ethnomusicology	Design and implementation of PBL in Ethnomusicology	2018, Hunter*
		Application of PBL in Ethnomusicology	2018, Nicely*
		Introduction of PBL in an Ethnomusicology curriculum	2018, Webb*
	Music History/ Music Theory	Application of PBL in Music History classes.	2014, Yang
		Application of PBL in Music Theory classes	2014, Duker
	Music Appreciation	Application of PBL in Music History/ Music Theory	2018, Thomerson*
		Heightening Music Appreciation via PBL	2018, Garrison*
		Application of PBL in a Music Appreciation course	2018, Leenhouts*
	Introduction to Music	Application of PBL through exploring musical kinetics	2018, Horsington*
	Therapy with music listening/improvisation	Relations between creative processes in PBL, communication, and group dynamics	2015, Lindvang, & Beck
	Music ensembles	Principles of PBL and their application in music courses	2018, Laprise
	Music teaching in Special Education	Training for music teaching using PBL in Special Education classrooms	2018, Wanamaker*
Music and movement	Interdisciplinary and integrative approach of movement as a vehicle for PBL	2018, Wilcox*	

5. Discussion and conclusions

Interweaving the results set out above with the literature on composition identifies valuable intersections that we believe contribute to defining music learning through composition. Right away, student-centered learning stands out, interconnecting PBL and composing as a pedagogical and musical trajectory from both the philosophical and the educational perspectives within the constructivist paradigm (Webster, 2011). This is reinforced by a set of formulations, such as those relating to its definition as an approach model, the teaching-learning process, the effects on skills acquisition, the assessment process, and tensions and challenges, factors that in the previous chapter guided the collected readings regarding the study of PBL and within the context of music. In summary, we would highlight the beliefs that underpin the definitions applied to both PBL and music learning through composition: perceived as approaches that facilitate motivation and the development of meaningful learning (Rusinek, 2012; Waters, & McCracken, 1997). Furthermore, the identification of the composing process with problem-solving generates educational implications, particularly regarding that described as one of the most complex and challenging aspects for educators and researchers: definition, conception, and problem design (Hung, 2006; Maudsley, 1999; Mauffette, *et al.*, 2004; Savery, 2006; Savin-Baden, & Major, 2004; Schmidt, *et al.*, 2011).

Cooperative work (Hmelo-Silver, 2006; Mennin, 2007; Schmidt, *et al.*, 2011) and the role of the teacher as a guide and “facilitator” (Horsington, 2018; Lindvang, & Beck, 2015; Vasconcelos, *et al.*, 2016) characterize both approaches across various practical applications. There is already a considerable number of reported experiences of music learning through composition even when not explicitly associated with the PBL model (Berkley, 2004; Burnard,

& Younker, 2004; Veloso, 2017; Wiggins, 1994/2003). Forms of questioning and reflection, such as creative thinking, feature in the literature on PBL (Lubart, & Mouchiroud, 2003) and composition, with the latter particularly associated with CPS in studies like those of Berkley (2004) and Kuzmich (1987). As a particularly challenging subject in music learning, what the literature reports reinforces not only the relationship between problem-solving and discovery processes, upon which the construction of meanings and significance also depends (Hickey, 2003; Veloso, 2017; Webster, 1991; Wiggins, 1994/2003), as often portrayed in the literature, but also the connection between these processes and the conditions necessary for fostering *divergent thinking* (Barrett, 2003; Burnard, & Younker, 2004; Odena, 2018; Sawyer, 2003; Wiggins, 2003). Connected to those phenomena are processes such as *thinking in sound*, *thinking in music*, and *audiation*, which the literature also views as ways of constructing meanings whether of a cognitive, emotional, social, or cultural nature.

The mobilization of prior knowledge by students is considered a fundamental factor for the conception and planning of problems within the PBL context although sufficient empirical data have not yet been found for its implementation and support (Blumenfeld, *et al.*, 1991; Mauffette, *et al.*, 2004; Schmidt, *et al.*, 2011). The translation of this issue into the educational realm of music seems to be encapsulated in the principle of *sound before symbol*, often invoked in the literature associated with music learning through problem-solving, which include student-centered pedagogies and processes of listening, expression, discovery, and sound exploration (including those related to the body, movement, and singing) as well as improvisation and composition (McPherson, & Gabrielsson, 2002; Mills, & McPherson, 2006). The importance attributed to holistic experiences, specifically by authors who have extensively researched music learning through composition, such as Wiggins (1994/2003) and Hickey (2003), interrelates both with the approach to the 'real' world (ideal environment for PBL implementation) and with the interdisciplinary aspects required in the PBL model-based designs and practical contexts and environments. The idea that, in music learning, meanings are constructed from phenomena perceived as wholes, in keeping with the *Gestalt* principles and cognitive theories (Dewey, 1937/1997; Reimer, 2022; Paynter, 2000; Paynter, & Aston, 1970; Rusinek, 2012; Wiggins, 2003) clearly emerges, including empirical evidence, in the creative and compositional experiences implemented by authors such as Wiggins (1994/2003), Bamberger (1977), and Hickey (2003). Alongside that advocated as regards non-formal modes of learning (Green, 2012), these perspectives seem to resonate with those concepts. Indeed, the 'real' context is characterized by diversity and holism, where learning reaches beyond the school environment. Learning music through creation and composition itself involves mobilizing a diverse and interconnected set of skills, such as listening, interpreting, improvising, memorizing, reading/writing (potentially), observing, relating, making decisions, and ultimately, problem-solving. This also relates to the prevailing level of interdisciplinarity. Although the field of music has produced no reports as regards gains in long-term knowledge retention, extrapolations developed by authors such as Blackwell and Roseth (2018), Sarrazin (2018), Strobel and Barneveld (2009), Yew and Schmidt (2012), and Ventura (2014) about self-regulatory phenomena –such as motivation, flexibility in relating to, formulating and dealing with the concrete problems in association with the capacities for comprehension, interest, curiosity, and autonomy– are powerful as they underline and synthesize formulations developed in the pedagogical and musical literature. Once again, we here refer to already referenced concepts, such as the processes of understanding connected to listening and sound thinking, musical thinking, *audiation*, improvisation, and problem-solving skills (Gordon, 2000; Whitaker, 1996; Wiggins, 2003). Also, regarding the promotion of socio-

emotional skills, the studies by Veloso and Carvalho (2012), as well as Wiggins (2003), involving primary school children, allow us to perceive composing as a powerful and transformative experience, impacting not only the cognitive aspect but also the emotional and social dimensions.

Although empirical data regarding the specific study of assessment in musical learning situations through PBL were not found, research carried out in other contexts, especially in higher education, reinforces the validity of peer and self-assessment. These studies provide elements which also allow to verify the reliability of these strategies in non-summative situations (Machado, *et al.*, 2008; Segers, & Dochy, 2010). Lenkauskaite *et al.* (2021) also highlight issues revealed by the study subjects, such as the empowerment felt by the students while active participants in the assessment of the educational process and while self-evaluators of their own participation. The significance of these data for educational reflection in the field of music can be envisioned primarily because they contribute to the consolidation of theoretical formulations, stated, and described, regarding the relevance of learning and assessment in participative and group dynamics and, thus, the application of the PBL model itself as a guide for concrete action plans. In this sense, we revisit, again, the exploratory study conducted (Vasconcelos, *et al.*, 2016), especially one of the syntheses resulting from it, related to the feedback provided by the educator (and researcher) in activities centered on musical creation and on problem-solving, also involving group dynamics. As a matter of fact, the emphasis given and described by the students to that dimension may not only explain the regulatory nature or function of the feedback process but also help to interpret it as one of the plausible factors for the development and implementation of assessment situations in cooperative learning contexts, particularly in the field of music.

Finally, despite all the findings here reported, this literature review did not involve an assessment of the validity and reliability of the analyzed studies. Given this limitation, there is a need for focused and more comprehensive research on the issues discussed.

In conclusion, this article sought to deepen the understanding of the PBL concept as an active, holistic, and learning management process that highlights cooperation, teachers as “facilitators”, and the formative nature of assessment in conjunction with other important ideas such as self-regulation, lifelong learning, and reflective, critical, and creative thinking. Another objective, based on a set of constructs and assumptions about musical learning through composition, reflected in both the pedagogical and the scientific literature, as well as curriculum documents and emerging practices, involved identifying bridges and connections capable of confirming and substantiating the PBL model as an organizer of learning process focused educational actions. From the researched and intersected data, six core points deserve highlighting.

The first stems from how, considering the data available and the literature analyzed, support for PBL regarding its constructs and principles continues to be more closely connected with theoretical and pedagogical studies than empirical findings, which also conditions the nature of the conclusions formulated for the musical and educational dimension under study.

The second encapsulates how PBL, although not at the same pace as other fields of knowledge, has generated interest in studying and debating in music even if less extensive in terms of the role of composition as a pathway to solving challenges. As in other contexts, this also replicates the most reported constraints –despite the value placed on the model’s theoretical assumptions– given the complexity it entails as a planning instrument, time and scope of

implementation, the subjective and intersubjective nature of the actors, the short and long-term verification of results, and the need for ongoing research.

The third relates to the observation that what might constitute a challenge or learning problem in music spans areas such as composition, instrumental interpretation, music teaching, ethnomusicology, music history, theory, and appreciation, etcetera. This allows for the confirmation of another of the facets that motivated this study: the perception that expository and teacher-centered models, although prominent in music education as they are shaped by the practices emphasized in conservatories and artistic schools, and especially in Portugal, may not be sufficient to meet the complex and diverse demands of what constitutes, in contemporary culture and society, learning and knowing music. The debate over defining just what constitutes musical literacy, inherently justifying the need for this present research, immediately intersects with this problem while generating clues about what may encompass and underlie the design of music learning problems. Indeed, the assertion that learning to know and knowing to make music encompasses, among other aspects, competencies that reach beyond the exclusive interpretation of repertoire by memory, performative and notational virtuosity, almost always centered around the individual perceived and primarily valued as a soloist –and which reflect equally in the most common modes of teaching– encounters continuity and resonance, if not outright support, in the PBL principles and studies applied to music learning. There is also the interrelated realization that self-regulatory processes also appear to arise from shared learning situations that emphasize cooperation. This returns insights, and empirically substantiated (including in the musical domain), into the meaning of learning in a group context, especially as regards that which also translates into the mobilization of *creative* and *critical thinking* in the field of music education and alongside the management of motivations applied to solving task posed challenges.

The fourth factor, directly addressing the main issue of this research, approaches the specific process of composing, which is identified in the educational literature, albeit not specifically versed in PBL, as a means of problem-solving. A concept that, by incorporating the philosophy of that model, addresses the primary hypothesis raised and inferred from relatively numerous sources and concepts: learning music through composition, while not presented as a theoretically organized and structured epistemological model structured to pedagogically support and guide student-centered music teaching paths and approaches from different authors, nevertheless reflects and embodies ways of conceiving and acting in education that identify and connect with the paradigm underlying and grounding PBL itself.

As the fifth study summary point, the processes of thinking and meaning construction, intrinsic or inherent to the challenge-solving experience enhanced by the act of composing, as described and practiced in different pedagogical texts and contexts, such as thinking in sound, sound before symbol, improvisation, audiation, some of which integrate components of the widely recognized music curriculum or teaching methods, can be clarified, discussed, structured, and implemented from an epistemological and educational perspective through reflection and study of the model. Specifically, the processes and pathways on which the construction and definition of problems occurs are not just relevant but also critical.

The sixth and final conclusion derives from all the above and addresses the issue in this study pertaining to the practical implications aimed at the development, enhancement, and study, in real teaching contexts, of *musical* and sound thinking, learning music through seeking and discovering responses to problems and challenges, through cooperation and sharing. This emerges

in conjunction with the didactic designs that, based on the data obtained and continuous study, seem able to assist in promoting creative and critical thinking in music, issues that have never held such a high profile in educational debates around the world. Indeed, it is pertinent to argue that learning music through pathways engaging with these processes enables us to grasp music learning through composition as one of the itineraries for the educational context of music within PBL itself. Thus, while acknowledging the limitations of the present study, as previously reported, this summary point clearly supports the sheer relevance of considering PBL not only as a consistent theoretical instrument but also as a guiding model for instructional designs and educational actions that set out to develop and study musical learning through challenges and composition.

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