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Developing Technological Musical Practices for Theatre and Audiovisual Performance Through Twelve Years of Action Research in Arts Education

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Abstract

Over a 12-year period, a set of documents, preliminary listening guides, and diagnostic tools was developed through the Interdisciplinary Method of Musical Literacy, Education and Artistic Awareness (MILMESA) and implemented with 256 students in initial arts/artistic education training. Using an action-research approach with a self-evaluative, cyclical, emancipatory, and critical framework, the process generated iterative data that informed annual developments in artistic–musical perspectives and experiences, culminating in final public presentation projects. The work focused on an interarts scope, specifically music applied to scenic contexts (theatrical and audiovisual). Results indicated clear improvements in artistic practice and conceptual preparation, evidenced in the design and delivery of 12 public projects (performances, shows, and pedagogical–scientific events). These outputs were aligned with Proximal Expressive Didactics (DEP), emphasizing a protective collaborative regime, and were presented within festivals, congresses, symposiums, and interdisciplinary thematic forums of regional, national, and international relevance.

Keywords: arts education; higher education; interdisciplinary learning; music technology; action research

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1. Introduction

In recent decades, artistic–musical literacy has been conceptualized as a formative process that goes beyond the mere acquisition of technical skills, encompassing cognitive, expressive, and sociocultural dimensions of specialized sound–musical experience. The Interdisciplinary Method of Musical Literacy, Education, and Artistic Sensitization (MILMESA) [1] fits within this expanded approach by proposing an integration of listening, analysis, creation, enjoyment, and reflection, emphasizing the articulation between music and other artistic languages.

MILMESA (Interdisciplinary Method for Musical Literacy, Education and Artistic Awareness) constitutes a pedagogical intervention model that structures artistic and musical

learning around five interdependent dimensions of artistic literacy (listening, analysis, creation, appreciation, and reflection) and integrates them with other areas of knowledge [1,2]. It differs from approaches focused exclusively on the acquisition of technical skills by conceiving artistic literacy as an educational process of a cognitive, expressive, and sociocultural nature.

Interdisciplinarity, understood as the convergence of knowledge and practices, constitutes one of the pillars of this model. Authors such as [3–5] argue that the interarticulation between diverse artistic expressions, namely music, theater, and audiovisual media, potentiates more complex modes of aesthetic learning, favoring sensitive perception, creativity, and critical thinking. From this perspective, artistic education is understood as a plural and dialogical field, where different languages interact and mutually enrich each other [2].

Within this framework, the present study focuses specifically on scenic and audiovisual contexts in higher arts education, particularly on the articulation between music, theatre, moving image, and technological resources that support sound creation. This delimitation avoids interpreting the study as research centred on school contexts in the strict sense and ensures coherence between the title, the general objective, and the methodological development of the article. More specifically, the study addresses the intersection between musical creation and/or adaptation for performance and the technological resources that support these artistic practices, including sound capture, editing, manipulation, and audiovisual production processes [6–10].

The central objective of this study is to analyze and evaluate a cycle of pedagogical initiatives aimed at developing artistic, musical, technological, and cultural skills in the context of music applied to theatrical and audiovisual performance. The research seeks to understand how a longitudinal pedagogical sequence, organized within the framework of MILMESA and articulated with Proximal Expressive Didactics, contributed to the development of artistic–musical, technological, and performative competencies among students of Theatre and Performing Arts.

The study was guided by the following research questions: (i) How did the listening guides, working documents, and musical creation activities promote artistic–musical literacy applied to performance contexts? (ii) What evidence of participation, aesthetic adequacy, technical autonomy, and fulfilment of task criteria emerged across the annual action-research cycles? (iii) How did the continuous analysis of data enable the adjustment of pedagogical practices and the consolidation of public projects of a performative, pedagogical, and scientific–artistic nature?

2. Theoretical Framework

In the specific field of music for the stage, the literature highlights the centrality of sound in dramaturgical and audiovisual construction [11–13]. Show that music for theatre and film transcends a merely decorative function, assuming a structuring role in the creation of atmospheres, the rhythmic and temporal organization of action, and the symbolic construction of narratives [14–17]. The creation and adaptation of music for performance require interdisciplinary competencies that integrate aesthetic sensitivity, technical-musical knowledge, and the ability to collaborate with other artists in theatrical and audiovisual contexts [11,18]. In educational settings, such practices support meaningful learning, particularly when developed in collaborative environments and guided by methodologies that value experimentation, creativity, and reflective practice [19–22].

Recent research further reinforces the relevance of interdisciplinary approaches in music and arts education. Zhang et al. [23] show that interdisciplinary collaboration in higher music education increasingly involves connections between music, technology, media, and other artistic domains, requiring contextualized pedagogical models aligned

with institutional and educational aims. Similarly, [24] argue that the integration of digital and artistic–musical competencies promotes transversal skills such as creativity, critical thinking, collaboration, and inclusion, especially when supported by active and project-based methodologies. The evolution of digital technologies has considerably expanded the possibilities for musical creation, manipulation, and production. Sound-editing, synthesis, and spatialization software, MIDI devices, digital interfaces, and portable recording platforms have transformed professional and creative musical practices [6–10,25–27]. Their incorporation into educational settings has also broadened opportunities for composition, performance, experimentation, and collaborative learning [28–30]. When integrated into the formative process, these technologies enable: (a) immediate experimentation, enhancing discovery-based learning; (b) the creation of original soundscapes and soundtracks adaptable to different scenic and audiovisual contexts; (c) broader access to musical production, reducing technical and material barriers; and (d) simulation, manipulation, and sound adaptation, fostering creative flexibility [31,32]. Thus, technological resources function as mediators of creativity in pedagogical contexts, contributing to the development of contemporary skills essential to artistic–musical production applied to performance [30,33].

Artistic literacy, understood as a formative process rather than the mere acquisition of technical skills, has been addressed at the intersection of auditory perception, analysis, creation, and critical reflection [1,2,5]. In higher arts education, this conception is particularly relevant, since the training of future performing arts professionals requires listening and musical knowledge to be mobilized in conjunction with dramaturgy, moving images, and technological media [11,16,18]. Recent research on interdisciplinary collaboration in higher arts education, however, tends to prioritize the description of models for coordination between subject areas, programmes, or institutions [23], as well as the identification of transversal competencies [24]. By following the same course unit over an extended period and explaining how pedagogical instruments were progressively reformulated in light of the data collected, this type of study offers profound and meaningful insights and contributions. These make it possible to broaden and deepen conceptual understanding, revisit methodologies, and envision new approaches.

It is within this space that the conceptual contribution of the present study is situated. MILMESA proposes a learning sequence in which listening, analysis, creation, appreciation, and reflection are interconnected with one another and with other artistic languages [1,2], seeking to develop artistic and musical literacy as a foundational competence for sound creation and adaptation in theatrical contexts, in continuous dialogue with other areas of artistic and educational knowledge. In turn, Expressive Proximal Didactics (Didática Expressiva Proximal, DEP) adds a relational and performative dimension: close mediation between teachers and students, collaborative knowledge construction, expressive experimentation, and public presentation as a culminating moment in artistic learning [17]. The combination of these two frameworks distinguishes the approach from other interdisciplinary and technology-oriented models, such as those based on the TPACK framework and project-based learning [32,33]. While these focus on the integration of technological, pedagogical, and content knowledge, the present approach places critical listening and close pedagogical relationships at the centre of the process and assigns public presentation a structuring role in learning.

Thus, the main contribution of the present study lies in the longitudinal analysis of the joint implementation of MILMESA and DEP across twelve action research cycles, within a specific context: music applied to theatre and audiovisual media in higher education, in an applied educational setting, where accessible technology serves as a mediator of sound creation. This scope contrasts with much of the literature on technology in music education, which focuses on secondary education and teachers' practices [28–30], and

makes it possible to discuss the model's contribution to higher arts education without claiming, at this stage, that its findings can be generalized.

3. Materials and Methods

3.1. Research Design and Longitudinal Organization

This study adopted an action-research methodology, understood as a cyclical, participatory, and reflective approach widely used in educational contexts aimed at transforming practices and promoting the emancipation of the subjects involved [34–36]. In the present study, this methodological approach supported the collection, analysis, and reinterpretation of data over a twelve-year period, integrating self-assessment, critical reflection, and continuous pedagogical intervention.

The research design was also articulated with the conceptual framework of Proximal Expressive Didactics (DEP) [17], which emphasizes close mediation between teachers and students, collaborative knowledge construction, expressive experimentation, and public presentation as central dimensions of artistic learning. In this sense, the study combined the iterative logic of action research with a pedagogical model focused on proximity, artistic autonomy, and performative development. The twelve-year period was structured into annual action-research cycles. Each cycle included initial diagnosis, planning of activities, implementation in the classroom context, participant observation, collection of learning products, formative assessment, and final reflection. The results obtained in each annual cycle informed the adjustment of materials, guidance criteria, and pedagogical sequencing for the following year, thereby ensuring the iterative, reflective, and emancipatory nature of the process.

The central objective of this study was to analyze and evaluate a cycle of pedagogical initiatives aimed at developing artistic and cultural skills in the context of using music in theatrical and audiovisual practices. This general objective was aligned with the Learning Objectives presented in Supplementary S1, focusing on the acquisition of historical and technical-practical knowledge, the stimulation of critical thinking, and the promotion of creativity, innovation, and adaptability, with a view to the realization of a final public presentation project.

3.2. Participants and Sampling

The participants were students enrolled in the Theatre and Performing Arts degree program at a public university in Northern Portugal, the University of Trás-os-Montes and Alto Douro. All participants attended the Music for Theatre and Cinema course unit, which integrates methodologies and activities associated with MILMESA—the Interdisciplinary Method of Musical Literacy, Education and Artistic Awareness [1]. The total number of participants was 256 students. This figure corresponds to the accumulated number of students involved over the twelve years of implementation of the course unit. Therefore, the sample does not correspond to a single group observed during one semester, but rather to a longitudinal series of annual cohorts followed within the same curricular context. The annual distribution of enrolled students is presented in the "Subscribed" column of Table 1. Effective participation varied according to attendance, completion of each activity, and submission of the corresponding learning products. The number of participants therefore differed across activities and years, reflecting the longitudinal and situated nature of the research process.

Table 1. Number of participants per activity.

Year	Subscribed	Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
1	18	77% (n = 14)	83.3% (n = 15)	83.3% (n = 15)	66.6% (n = 12)	77% (n = 14)
2	18	66.6% (n = 12)	72% (n = 13)	77% (n = 14)	61.1% (n = 11)	77% (n = 14)
3	21	66.6% (n = 14)	76.1% (n = 16)	66.6% (n = 14)	66.6% (n = 14)	57.1% (n = 12)
4	16	75% (n = 12)	62,5% (n = 10)	75% (n = 12)	87.5% (n = 14)	68.7% (n = 11)
5	25	72% (n = 18)	64% (n = 16)	60% (n = 15)	64% (n = 16)	72% (n = 18)
6	24	70.8% (n = 17)	70.8% (n = 17)	62.5% (n = 15)	75% (n = 18)	70.8% (n = 17)
7	20	75% (n = 15)	80% (n = 16)	70% (n = 14)	75% (n = 15)	70% (n = 14)
8	18	88.8% (n = 16)	77% (n = 14)	55.5% (n = 10)	72% (n = 13)	72% (n = 13)
9	20	80% (n = 16)	65% (n = 13)	80% (n = 16)	70% (n = 14)	75% (n = 15)
10	25	68% (n = 17)	64% (n = 16)	60% (n = 15)	64% (n = 16)	64% (n = 16)
11	24	70.8% (n = 17)	66.6% (n = 16)	70.8% (n = 17)	66.6% (n = 16)	58.3% (n = 14)
12	27	59.2% (n = 16)	41.8% (n = 13)	51.8% (n = 14)	51.8% (n = 14)	37% (n = 10)
	($\bar{x}$)	(n = 15.3)	(n = 14.5)	(n = 15.3)	(n = 14.4)	(n = 14)

The columns correspond to the five core activities analysed in Section 4, in the order in which they are presented: Listening Guides No. 1, No. 2, and No. 3; Activity 5 (dramatic text); and Activity 6 (Inverse Processes), following the numbering in Supplementary S2.

3.3. Pedagogical Context and Project Design

The pedagogical intervention was developed within the Music for Theatre and Cinema course unit and was organized around the articulation between music, theatre, audiovisual media, and technological resources. The course unit was designed to promote artistic–musical literacy applied to scenic and audiovisual contexts, encouraging students to listen, analyze, select, adapt, create, and present sound and musical materials in relation to performative and audiovisual practices.

Supplementary S1 should be understood as the matrix that frames the learning objectives, research questions, and pedagogical actions designed to address those questions. In the main text, this information is synthesized in order to make the research design clearer and more accessible to readers, while the Supplementary Materials retain the detailed explanation of objectives, targeted competencies, and relationships between activities, instruments, and expected outcomes.

Supplementary S2 presents the sequence of thirteen activities developed within the course unit. These activities constitute a semester-based didactic organization that was reactivated, adjusted, and re-evaluated annually over the twelve-year period of the study. Among these thirteen activities, five core activities were selected for detailed analysis in the main body of the article, as they were considered central to understanding the relationship between listening, musical selection, sound adaptation, audiovisual creation, and public presentation.

The project was organized into three complementary phases: first, diagnosis and auditory awareness; second, technical and creative exploration of musical, scenic, and audiovisual materials; and third, performative consolidation through public projects. This structure clarifies the relationship between the data presented in the tables, the pedagogical processes implemented, and the artistic–educational outcomes discussed in the article. Given the extent of the data collected over the twelve-year period, the full tables function as documentary support for the analysis and are presented as Supplementary Materials. In the main text, the interpretative reading should prioritize the most relevant indicators, their relationship with the research questions, and the pedagogical and scientific contribution of the study.

3.4. Instruments and Data Sources

Data collection was guided by Latorre's [35] categories of techniques and instruments, namely observation-based techniques, conversation-based techniques, and docu-

ment analysis. In accordance with the objectives of the study, the main instruments and data sources included listening guides, working documents prepared by the researcher, participation grids, task fulfilment criteria, assessment records, observation notes, students' self-assessments, artistic products, and documentation related to the final public presentation projects. The listening guides were used mainly in the diagnostic and analytical phases, allowing students to engage with musical materials through listening, recognition, interpretation, and critical association. The working documents supported tasks of musical selection, adaptation, sound creation, and audiovisual experimentation. The assessment records and participation grids made it possible to document levels of involvement, task completion, and progression across activities.

In addition to these instruments, direct observation was conducted by the teacher–researcher as a participant observer [36–38]. Documentary analysis was also carried out using evaluation records, students' written and artistic outputs, and materials related to the final projects. These sources enabled the study to combine quantitative indicators of participation and task fulfilment with qualitative and interpretative evidence concerning artistic, technological, and performative development.

3.5. Procedures

In each annual cycle, data collection began with diagnostic activities focused on listening, recognition, and musical awareness. These initial tasks allowed the teacher–researcher to identify students' previous knowledge, difficulties, interpretative tendencies, and levels of familiarity with musical materials applied to scenic and audiovisual contexts. The diagnostic phase was followed by activities involving analysis, selection, adaptation, and creation of sound and musical materials. Students were encouraged to explore the relationship between music, dramatic intention, audiovisual meaning, technological mediation, and performative context. Throughout this process, they worked with accessible tools for sound capture, editing, manipulation, and audiovisual assembly, always in accordance with the pedagogical aims of the course unit.

The process culminated in the development and documentation of final public presentation projects. These projects required students to articulate historical-musical knowledge, critical listening, technical competence, technological adaptation, creative decision-making, and performative responsibility. Throughout the twelve years, the procedures were repeated annually, but not in a fixed or mechanical way. The results of each cycle were used to reformulate materials, refine activity instructions, adjust assessment criteria, and improve the pedagogical sequence. This iterative procedure is consistent with the principles of action research, in which the understanding of practice and the improvement of practice occur within the context where the intervention takes place [34–36].

3.6. Data Organization and Analysis

Data management was based on the chronological organization of materials by academic year and by activity. The archive included completed listening guides, working documents, assessment records, observation notes, self-assessments, sound and audiovisual products, and documentation of final public presentation projects. The data were analyzed descriptively and interpretatively. The descriptive analysis focused on participation rates, task fulfilment, and the distribution of responses across years and activities. This analysis made it possible to identify patterns of participation, variations in student engagement, and levels of completion of the proposed tasks.

The interpretative analysis was based on triangulation between documentary sources, direct observation, and performative evidence. This triangulation aimed to identify how students' responses evolved over time, how pedagogical decisions were informed by the

collected data, and how the sequence of activities contributed to the development of artistic, musical, technological, and performative autonomy. The analysis therefore did not rely exclusively on the quantification of student performance. Rather, it sought to understand how the collected data informed pedagogical decision-making, supported the progressive reconfiguration of instruments and activities, and contributed to the consolidation of a replicable formative sequence in higher arts education.

It is important to clarify how the concepts of "progression," "technical autonomy," and "artistic quality" are used analytically throughout this study. As the research did not adopt a pre-test/post-test design and the participants varied over the twelve-year period, these concepts do not refer to variables that were directly measured or that can be compared at the individual level. Instead, they were used as interpretive categories, informed by observable and documented evidence: (i) participation in activities; (ii) the extent to which the criteria for each task were met (fully, partially, adequately, or not at all); (iii) observation notes and student self-assessments; and (iv) documentary analysis of artistic outputs and final projects presented to the public. Technical autonomy was inferred from students' ability to complete tasks involving audiovisual recording, editing, adaptation, and assembly, alongside evidence gathered through participant observation. Artistic quality was assessed qualitatively, with particular attention to the aesthetic coherence between musical choices, dramaturgical intentions, and the scenic or audiovisual context, drawing on documentation of the final projects and their public presentations.

Progression was therefore examined at the level of the pedagogical framework rather than that of individual students. Each annual cohort was treated as a distinct group, and comparisons across years were intended to identify recurring patterns, variations, and adjustments needed for subsequent cycles, rather than to establish individual learning gains or causal relationships. Accordingly, references to progression in this study should be understood as referring to the gradual development and increasing consistency of the pedagogical process, as reflected in the evidence documented across successive cycles. Throughout the text, a distinction is maintained between findings directly supported by the data (participation rates and levels of task completion) and the authors' interpretations of those findings.

3.7. Expert Validation and Ethical Procedures

The study was submitted to a team of experts for technical, methodological, and ethical validation, given the diversity of sources and data collected over a broad time span. The expert team played a consultative and methodological role, focusing on the coherence between objectives, instruments, activities, assessment criteria, and ethical procedures for collecting and processing information. The experts examined the pedagogical relevance of the materials, the technical adequacy of the artistic–musical proposals, and the consistency of the articulation between action research, MILMESA, and Proximal Expressive Didactics. The validation process was based on critical comparison of expert opinions and interpretative convergence, without a statistical purpose. The experts' evaluation confirmed the general adequacy of the methodological design and contributed to adjustments in the instruments and in the description of procedures. This process strengthened the transparency, ethical consistency, and scientific intelligibility of the study.

All research procedures involving human participants were conducted in accordance with relevant ethical guidelines and applicable data protection regulations. Participation was voluntary, and the data were collected and processed in accordance with the principles of anonymity, confidentiality, and informed consent.

4. Results

In global and comparative terms, we can see that Activity 1 (Listening Guide No. 1 "Songs that remind you") in year 8 had a greater participation with 88.8% [n = 16] and, in the opposite direction, Activity 5 ("Inverse Processes") in year 12, the lowest level of participation in the entire period involved in the present study, with 37% [n = 10].

LISTENING Script N. 1 "songs that remind you of something".

This listening guide [39–51] was built based on example studies substantiated by various genres and musical styles [52–55], distributed across various eras in the history of music (medieval, renaissance, mannerist, baroque, classical, romantic, modern and contemporary), in order to diversify the sources and, essentially for the purpose of the study, they were chosen through identification of the theme that affects the composition (which triggers or inspires it), specifically from at least three of the following six items (Table 2):

Table 2. Listening Guide Criteria.

Criteria for Choosing/Constructing the Listening Guide	
1. Criterion	Motive or declared inspiration of the composition;
2. Criterion	Function (prelude, closing, dance, ritual, etc.);
3. Criterion	Theme, title, plot/text (when applicable);
4. Criterion	Contextualization (place of interpretation; geographic, chronological, ethnographic contextualization, among others);
5. Criterion	Instrumentation (most used instruments);
6. Criterion	Structure, Form, Style and Genre (helps to categorize including real or revised formal or transitional period—when the songs are versions adapted to a different era/period with specific outfits and harmonizations).

The most relevant (Table 3) data regarding Block 1 refer to years 4 (50%, n = 8), 6 (29.1%, n = 7) and 9 (20%, n = 4). In block 2, years 10 (48%, n = 12), 1 (38.7%, n = 7) and 4 (37.5%, n = 6) stand out. As for Block 3, the most relevant data is limited to years 4 (75%, n = 12), 8 (50%, n = 9) and 11 (45.8%, n = 11). In Block 4, the highlights are years 5 (40%, n = 10), 1/6 (33.3%, n = 6/33.3%, n = 8) and 10 (28%, n = 7). In turn, from Block 5, the following data results from years 8/9 (50%, n = 9/50%, n = 10), 5 (44%, n = 11) and 1 (33.3%, n = 6). Finally, block 6 presents the following results as the most relevant data for the following years: 1 (50%, n = 9), 10 (32%, n = 8) and 11 (29.1%, n = 7).

AUDITION Script N. 2 "THE PLANETS" by Gustav Holst

As for Mars (Table 4), we highlight the main results for years 1 (26.6%, n = 4), 5/7/10 (25%, n = 4) and 6 (23.5%, n = 4). In relation to Venus, the years 2/12 (30.7%, n = 4), 1 (26.6%, n = 4) and 5 (25%, n = 4) stand out. Regarding Mercury, the best results are limited to years 8 (28.5%, n = 4), 7/10 (25%, n = 4) and 2/9 (23%, n = 3). Jupiter with years 9 (30.7%, n = 4), 4 (30%, n = 3) and 7 (25%, n = 4). Saturn with emphasis on years 4 (40%, n = 4), 3/11 (31.2%, n = 5), and 12 (23%, n = 3). As for Uranus, we highlight years 3 (31.2%, n = 5), 6 (23.5%, n = 4), and 11 (31.2%, n = 5). Finally, Neptune, the years 10 (18.7%, n = 3), 2 (15.3%, n = 2) and 5 (12.5%, n = 2) stand out.

Table 3. Number of responses corresponding to the initial intention of the proposer (teacher).

Year	Subscribed	Participants	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
1	18	14 (77.4%)	16.6% (n = 3)	38.7% (n = 7)	22.2% (n = 4)	33.3% (n = 6)	33.3% (n = 6)	50% (n = 9)
2	18	12 (66.6%)	5.5% (n = 1)	27.7% (n = 5)	0% (n = 0)	22.2% (n = 4)	11.1% (n = 2)	22.2% (n = 4)
3	21	14 (66.6%)	11.1% (n = 2)	23.8% (n = 5)	4.7% (n = 1)	11.1% (n = 2)	4.7% (n = 1)	28.5% (n = 6)
4	16	12 (75%)	50% (n = 8)	37.5% (n = 6)	75% (n = 12)	6,2% (n = 1)	25% (n = 4)	25% (n = 4)
5	25	18 (72%)	12% (n = 3)	8% (n = 2)	36% (n = 9)	40% (n = 10)	44% (n = 11)	24% (n = 6)
6	24	17 (70.8%)	29.1% (n = 7)	12.5% (n = 3)	16.6% (n = 4)	33.3% (n = 8)	16.6% (n = 4)	20.8% (n = 5)
7	20	15 (75%)	5% (n = 1)	10% (n = 2)	40% (n = 8)	10% (n = 2)	30% (n = 6)	10% (n = 2)
8	18	16 (88.8%)	16.6% (n = 3)	11.1% (n = 2)	50% (n = 9)	0% (n = 0)	50% (n = 9)	11.1% (n = 2)
9	20	16 (80%)	20% (n = 4)	20% (n = 4)	10% (n = 2)	25% (n = 5)	50% (n = 10)	20% (n = 4)
10	25	17 (68%)	12% (n = 3)	48% (n = 12)	40% (n = 10)	28% (n = 7)	20% (n = 5)	32% (n = 8)
11	24	17 (70.8%)	8.3% (n = 2)	4.1% (n = 1)	45.8% (n = 11)	8.3% (n = 2)	20.8% (n = 5	29.1% (n = 7)
12	27	16 (59.2%)	3.7 (n = 1)	22.2% (n = 6)	22.2% (n = 6)	7.4% (n = 2)	3.7% (n = 1)	22.2% (n = 6)
	($\bar{x}$)		(n = 3.1)	(n = 4.5)	(n = 6.3)	(n = 4.0)	(n = 4.5)	(n = 5.2)

One of the themes is repeated on purpose. In order to test attention and at the same time challenge students to associate the same theme with two relatively different things, themes or subjects.

Table 4. Listening Script N. 2—Number of correct answers per planet.

Years	Subscribed	Participants	Mars	Venus	Mercury	Jupiter	Saturn	Uranus	Neptun
1	18	15	26.6% (n = 4)	26.6% (n = 4)	20% (n = 3)	13.3% (n = 2)	13.3% (n = 2)	0% (n = 0)	0% (n = 0)
	Order of Presentation		Mov. 2	Mov. 6	Mov. 5	Mov. 7	Mov. 1	Mov. 3	Mov. 4
2	18	13	15.3% (n = 2)	30.7% (n = 4)	23% (n = 3)	15.3% (n = 2)	0% (n = 0)	0% (n = 0)	15.3% (n = 2)
	Order of Presentation		Mov. 7	Mov. 6	Mov. 5	Mov. 4	Mov. 3	Mov. 2	Mov. 1
3	21	16	18.7% (n = 3)	18.7% (n = 3)	0% (n = 0)	0% (n = 0)	31.2% (n = 5)	31.2% (n = 5)	0% (n = 0)
	Order of Presentation		Mov. 3	Mov. 4	Mov. 5	Mov. 1	Mov. 2	Mov. 6	Mov. 7
4	16	10	10% (n = 1)	10% (n = 1)	0% (n = 0)	30% (n = 3)	40% (n = 4)	10% (n = 1)	0% (n = 0)
	Order of Presentation		Mov. 1	Mov. 7	Mov. 2	Mov. 6	Mov. 3	Mov. 4	Mov. 5
5	25	16	25% (n = 4)	25% (n = 4)	6.2% (n = 1)	12.5% (n = 2)	12.5% (n = 2)	6.2% (n = 1)	12.5% (n = 2)
	Order of Presentation		Mov. 5	Mov. 1	Mov. 2	Mov. 3	Mov. 4	Mov. 6	Mov. 7
6	24	17	23.5% (n = 4)	17.6% (n = 3)	11.7% (n = 2)	11.7% (n = 2)	0% (n = 0)	23.5% (n = 4)	11.7% (n = 2)
	Order of Presentation		Mov. 4	Mov. 7	Mov. 6	Mov. 1	Mov. 2	Mov. 3	Mov. 5
7	20	16	25% (n = 4)	0% (n = 0)	25% (n = 4)	25% (n = 4)	12.5% (n = 2)	6.25% (n = 1)	6.25% (n = 1)
	Order of Presentation		Mov. 4	Mov. 3	Mov. 2	Mov. 1	Mov. 5	Mov. 6	Mov. 7
8	18	14	21.4% (n = 3)	7.1% (n = 1)	28.5% (n = 4)	14.2% (n = 2)	7.1% (n = 1)	14.2% (n = 2)	7.1% (n = 1)
	Order of Presentation		Mov. 6	Mov. 7	Mov. 5	Mov. 1	Mov. 2	Mov. 3	Mov. 4
9	20	13	15.3% (n = 2)	0% (n = 0)	23% (n = 3)	30.7% (n = 4)	15.3% (n = 2)	15.3% (n = 2)	0% (n = 0)
	Order of Presentation		Mov. 7	Mov. 1	Mov. 6	Mov. 2	Mov. 4	Mov. 3	Mov. 5
10	25	16	25% (n = 4)	18.7% (n = 3)	25% (n = 4)	0% (n = 0)	12.5% (n = 2)	0% (n = 0)	18.7% (n = 3)
	Order of Presentation		Mov. 2	Mov. 1	Mov. 3	Mov. 4	Mov. 5	Mov. 6	Mov. 7
11	24	16	18.7% (n = 3)	12.5% (n = 2)	0% (n = 0)	12.5% (n = 3)	31.2% (n = 5)	18.7% (n = 3)	0% (n = 0)
	Order of Presentation		Mov. 3	Mov. 2	Mov. 1	Mov. 4	Mov. 5	Mov. 7	Mov. 6
12	27	13	7.6 (n = 1)	30.7% (n= 4)	7.6% (n = 1)	23% (n = 3)	23% (n = 3)	7.6% (n = 1)	0% (n = 0)
	($\bar{x}$)		(n = 2.9)	(n = 2.4)	(n = 2.0)	(n = 2.2)	(n = 2.3)	(n = 1.6)	(n = 0.9)
						(n = 14.2)			

Mars (1st Movement, Messenger of War), Venus (2nd Movement, Messenger of Peace), Mercury (3rd Movement, Messenger of Wings), Jupiter (4th Movement, Messenger of Joy), Saturn (5th Movement, Messenger of Old Age), Uranus (6th Movement, Magician) and Neptune (7th Mystical Movement).

AUDITION Script N. 3 "THE FOUR SEASONS" by Antonio Vivaldi

We can clearly see (Table 5) that Primavera was, of all the seasons, the composition in which there was the greatest agreement between hearing and the reality of the composer's work and technical-melodic construction, with emphasis on listeners/participants

from years 1 (80%, n = 12), 2/3 (71,4%, n = 10) and 9 (62,5%, n = 10). The following themes/compositions are Winter, Autumn and Summer. We found that there is a clear contrast between the motive, construction and composition of these works and the message that conveys to listeners who, on a regular and repeated basis, are unable to glimpse/identify (through hearing) which themes are actually listening. Perception, hearing and musical understanding, so that a theme can be identified, in addition to assuming a field of broad subjectivity, demonstrate that this should not happen, solely and simply, based on a search and initial knowledge of the song titles and compositions. The same happens when choosing a theme/musical composition for theater (or other medium and area). Its justification and adequacy must be broader and embodied in factors that are often external and inconsistent with the motive and assumptions of the composer and the composition.

Table 5. Listening Script N. 3—Number of correct answers about the "The Four Seasons".

Year	Subscribed	Participants	Spring	Summer	Autumn	Winter
1	18	83.3% (n = 15)	80% (n = 12)	6.6% (n = 1)	0% (n = 0)	13.3% (n = 2)
2	18	77% (n = 14)	71.4% (n = 10)	0% (n = 0)	0% (n = 0)	26.6% (n = 4)
3	21	66.6% (n = 14)	71.4% (n = 10)	0% (n = 0)	7.1% (n = 1)	21.4% (n = 3)
4	16	75% (n = 12)	58.3% (n = 7)	0% (n = 0)	8.3% (n = 1)	33.3% (n = 4)
5	25	60% (n = 15)	53.3% (n = 8)	0% (n = 0)	13.3% (n = 2)	33.3% (n = 5)
6	24	62.5% (n = 15)	60% (n = 9)	0% (n = 0)	13.3% (n = 2)	26.6% (n = 4)
7	20	70% (n = 14)	57.1% (n = 8)	7.1% (n = 1)	0% (n = 0)	35.7% (n = 5)
8	18	55.5 (n = 10)	60% (n = 6)	0% (n = 0)	10% (n = 1)	30% (n = 3)
9	20	80% (n = 16)	62.5% (n = 10)	0% (n = 0)	12.5% (n = 2)	25% (n = 4)
10	25	60% (n = 15)	60% (n = 9)	6.6% (n = 1)	0% (n = 0)	33.3% (n = 5)
11	24	70.8% (n = 17)	47% (n = 8)	0% (n = 0)	11.7% (n = 2)	41.1% (n = 7)
12	27	51.8% (n = 14)	57.1% (n = 8)	0% (n = 0)	7.1% (n = 1)	37.5% (n = 5)
	($\bar{x}$)		(n = 8.7)	(n = 0.25) (n = 14.25)	(n = 1)	(n = 4.25)

Activity 5: "THE OTHER LOVE OF THE COMMONER DIMAS"

Working document "THE OTHER LOVE OF THE COMMONER DIMAS" (dramatic text for inclusion/musical adaptation). (Presentation and reading of the text) with the presentation in Class No. 6.

We would like to point out to our customers that the Completely Complied item stood out (Table 6). Namely: 1 (50%, n = 6), 3 (46.1%, n = 6) and 12 (39.6%, n = 9). The item Partially met had the most positive results in years 9 (57.1%, n = 8), 3 (46.1%, n = 6) and 1/4 (41.6%, n = 5). Regarding the item Fulfilled, we highlight years 2 (72.7%, n = 8), 8 (66.6%, n = 10) and 11 (56.2%, n = 9) and, finally, in what refers to the item Did not answer, we high-light years 8 (26.6%, n = 4), 9 (21.4%, n = 3) and 6 (13.6%, n = 3).

Activity 6: "INVERSE PROCESSES"

Working Document "Inverse Processes" (material in audiovisual media for addition, replacement or musical adaptation in this media).

We highlight as the most significant (Table 7) elements the values allocated to years 7 (50%, n = 8), 9 (43.7%, n = 7) and 1 (42.6%, n = 6), with regard to Fully complied the activity. With regard to the item Partially met, years 3 (61.5%, n = 8), 11 (60%, n = 9) and 6 (45%, n = 9) stand out. The item Met, we highlight positively, years 2/10 (69.2%, n = 9), 12 (63.1%, n = 12) and 4 (60%, n = 6). Finally, regarding the item Did not comply, it can be seen that the years in which this situation was registered and most evident were the following: 1 (21.4%, n = 3), 5 (18.7%, n = 3) and 8 (13.3%, n = 2). The data show sustained participation in the core activities, although with variations across years and tasks, which is expected in a longitudinal study based on distinct cohorts. Table 1 indicates

that average participation remained substantial across the five activities analyzed, thereby supporting the continuity of the pedagogical process and the relevance of the proposed activities for artistic–musical training applied to performance contexts. In the listening activities, the results reveal differences between intuitive recognition, musical identification, and the aesthetic justification of choices. This variation is pedagogically relevant, as it demonstrates that learning is not limited to the correct identification of works or themes but involves the progressive construction of criteria of adequacy between music, dramaturgy, image, atmosphere, temporality, and performative intention. In the tasks involving musical adaptation to dramatic text and audiovisual media, the levels of full, partial, or sufficient task fulfilment indicate that students were able to mobilize skills related to selection, editing, sound adequacy, and artistic justification. Although the study design does not constitute an experimental pre-test/post-test comparison, the triangulation of participation data, learning products, criterion-based assessment, and final projects allows for the inference of progressive improvement in students' technical–artistic autonomy and in the quality of musical decision-making applied to scenic and audiovisual contexts.

Table 6. Dramatic Text—Participation and criteria fulfilment.

Year	Subscribed	Participants	Fully Fulfilled	Partially Fulfilled	Fulfilled	Did Not Fulfil
1	18	12	50% (n = 6)	41.6% (n = 5)	8.3% (n = 1)	0% (n = 0)
2	18	11	0% (n = 0)	27.2% (n = 3)	72.7% (n = 8)	0% (n = 0)
3	21	13	46.1% (n = 6)	46.1% (n = 6)	7.6% (n = 1)	0% (n = 0)
4	16	12	0% (n = 0)	41.6% (n = 5)	33.3% (n = 4)	25% (n = 3)
5	25	19	15.7% (n = 3)	36.8% (n = 7)	47.3% (n = 9)	0% (n = 0)
6	24	22	13.6% (n = 3)	36.3% (n = 8)	36.3% (n = 8)	13.6% (n = 3)
7	20	17	29.4% (n = 5)	23.5% (n = 4)	29.4% (n = 5)	11.7% (n = 2)
8	18	15	0% (n = 0)	6.6% (n = 1)	66.6% (n = 10)	26.6% (n = 4)
9	20	14	7.1% (n = 1)	57.1% (n = 8)	14.2% (n = 2)	21.4% (n = 3)
10	25	19	15.7% (n = 3)	31.5% (n = 6)	36.8% (n = 7)	10.5% (n = 2)
11	24	16	31.2% (n = 5)	0% (n = 0)	56.2% (n = 9)	12.5% (n = 2)
12	27	23	39.6% (n = 9)	13% (n = 3)	47.8% (n = 11)	0% (n = 0)
	($\bar{x}$)		(n = 3,4)	(n = 4.6)	(n = 6.2)	(n = 1.5)
				(n = 16.08)		

Table 7. Activity N. 6—Participation and criteria fulfilment.

Year	Subscribed	Participants	Fully Fulfilled	Partially Fulfilled	Fulfilled	Did Not Fulfill
1	18	14	42.6% (n = 6)	7.1% (n = 1)	28.5% (n = 4)	21.4% (n = 3)
2	18	13	0% (n = 0)	30.7% (n = 4)	69.2% (n = 9)	0% (n = 0)
3	21	13	15.3% (n = 2)	61.5% (n = 8)	15.3% (n = 3)	0% (n = 0)
4	16	10	0% (n = 0)	30% (n = 3)	60% (n = 6)	10% (n = 1)
5	25	16	0% (n = 0)	43.7% (n = 7)	37.5% (n = 6)	18.7% (n = 3)
6	24	20	15% (n = 3)	45% (n = 9)	40% (n = 8)	0% (n = 0)
7	20	16	50% (n = 8)	43.7% (n = 7)	6.2% (n = 1)	0% (n = 0)
8	18	15	20% (n = 3)	33.3% (n = 5)	33.3% (n = 5)	13.3% (n = 2)
9	20	16	43.7% (n = 7)	37.5% (n = 6)	18.7% (n = 3)	0% (n = 0)
10	25	13	23% (n = 3)	7.6% (n = 1)	69.2% (n = 9)	0% (n = 0)
11	24	15	6.6% (n = 1)	60% (n = 9)	13.3% (n = 2)	20% (n = 3)
12	27	19	10.5% (n = 2)	15.7% (n = 3)	63.1% (n = 12)	10.5% (n = 2)
	($\bar{x}$)		(n = 2.9)	(n = 5.2)	(n = 5.6)	(n = 1.1)
				(n = 15)		

5. Discussion

The findings should be interpreted within the framework of action research, in which scientific value emerges from the situated transformation of practice, critical reflection, and the production of pedagogical knowledge in real educational contexts [34–36]. From this perspective, the contribution of the study lies not only in the quantification of student performance, but also in demonstrating how data collected across successive annual cycles informed pedagogical decisions, led to the refinement of instruments, and supported the consolidation of a replicable formative sequence in higher arts education.

The articulation between music, theatre, and audiovisual media highlights the relevance of interartistic learning as a process that integrates expressive languages, creative techniques, technological mediation, and critical thinking. The literature on sound and performance emphasizes that music is not merely decorative, but functions as a structural component of dramaturgy, atmosphere, narrative construction, and the temporal perception of action [11,12,14,16]. The results of this study support this view, showing that listening, analysis, musical selection, and adaptation activities encouraged students to make more grounded artistic decisions in response to scenic and audiovisual requirements.

Recent studies further reinforce the importance of interdisciplinary and technology-mediated approaches in music and arts education. Zhang et al. [23] show that interdisciplinary collaboration in higher music education increasingly involves connections between music, technology, media, and other artistic domains, requiring pedagogical models aligned with specific institutional and educational contexts. Similarly, Blanco-García et al. [24] argue that the integration of digital and artistic–musical competencies promotes transversal skills such as creativity, critical thinking, collaboration, and inclusion, particularly when developed through active and project-based methodologies. From a technological perspective, the use of accessible tools for sound recording, editing, manipulation, and audiovisual assembly enabled students to engage with processes close to professional practice, while remaining appropriate to their level of training. This pedagogical choice is consistent with approaches that understand technology as a mediator of creativity and musical learning, provided that it is integrated into clearly defined educational objectives and meaningful artistic creation tasks [27,30,32,33].

In a comparative reading of the literature, the findings partially converge with recent studies and, in other respects, do not allow for direct comparison. In terms of convergence, the integration of music, technology, and other artistic domains, which Zhang et al. [23] identify as a trend in higher music education, is here realized within a specific course unit over twelve years, thereby extending the existing evidence by adding a temporal dimension. However, whereas that study maps models across different regions of the world, the present study focuses on a single institutional context and therefore does not allow us to claim that the same mechanisms operate in other settings. Similarly, Blanco-García et al. [24] associate the integration of digital and artistic–musical competencies with the development of transversal skills, such as creativity, critical thinking, collaboration, and inclusion. The data gathered here are consistent with the use of active and project-based learning methodologies, but the study did not directly assess these competencies or inclusion and therefore neither confirms nor refutes this relationship.

From a technological perspective, the choice of accessible tools is consistent with approaches that understand technology as a mediator of creativity when integrated into clear educational objectives [27,30,32,33]. However, it differs from part of the literature on technology in music education, which focuses primarily on secondary education and teachers' practices [28–30], by concentrating on sound production by higher education students.

The relationship with studies on interdisciplinary collaboration [23] and digital and artistic–musical competencies [24] is one of conceptual convergence rather than confir-

mation of equivalent effects. The present study adds a situated account of the interplay between diagnosis, experimentation, and public presentation across annual cycles. The variability in responses to listening activities, in turn, calls into question the identification of themes as a sufficient indicator of learning: recognizing the original intention of a composition and justifying its use in a scene constitute distinct operations. This distinction reinforces the need, anticipated in the theoretical framework, to integrate listening, contextualization, and reflection on the expressive function of sound [11,12,18].

Proximal Expressive Didactics provides an additional framework for understanding the importance of close mediation, collaboration, and public presentation as key dimensions of artistic learning. Final projects, performances, shows, and pedagogical–scientific events operated as synthesis devices, requiring students to articulate historical-musical knowledge, critical listening, technical competence, technological adaptation, and performative responsibility. Thus, the evidence generated by the study is both processual and performative, combining participation data, documented pedagogical decisions, and artistic outputs. The main implication of the study is that musical literacy applied to performance contexts can be developed through a longitudinal, interdisciplinary, and reflective pedagogical sequence that integrates diagnosis, experimentation, creation, and public presentation. This approach offers a transferable pedagogical model for course units seeking to connect music, digital technologies, and performative practices, without reducing artistic learning to technical procedures or exclusively quantitative outcomes.

6. Conclusions and Future Perspectives

The set of course units addressed in this study, structured around the "Music–Theatre–Technology" triad, constitutes a sequential and intentionally interdisciplinary training pathway. The articulation between these course units enables students to progressively integrate critical listening, musical analysis, technological experimentation, collaborative creation, and public presentation. Rather than functioning as isolated curricular components, they operate as an interconnected artistic–pedagogical circuit, guided by shared objectives and by the progressive development of artistic–musical literacy applied to performance contexts.

In summary, the study demonstrates that artistic–musical training applied to the stage benefits from a curricular organization that combines critical listening, technological experimentation, collaborative creation, and public presentation. The action-research design made it possible to continuously adjust teaching strategies and strengthen the coherence between objectives, activities, assessment criteria, and final outputs. In this respect, the study offers both a pedagogical and scientific contribution to higher arts education by presenting a longitudinal, reflective, and transferable model for the development of musical practices in theatrical and audiovisual contexts.

The use of accessible software for testing, experimenting, adapting, and creating audio materials for stage and video contexts proved central to the pedagogical process. This approach contributes to artistic and technological education in an integrated and transversal manner, recognizing that contemporary performance practices increasingly depend on technological resources, particularly in the fields of sound design, audiovisual editing, and broader stage technology.

The intervention focused especially on the selection, adaptation, creation, capture, and treatment of audio and audiovisual materials supporting scenic and performative processes. Across the annual cycles, students were introduced to intuitive and responsive digital tools suitable for users without advanced technical specialization. This enabled them to develop greater autonomy in tasks related to sound capture, editing, adaptation, and design, as well as basic video editing. These processes were grounded in informed artistic choices

regarding existing musical works or themes that could be adapted, recreated, or combined with original sound materials for individual, group, or collective projects. Overall, the study supports the consolidation of a continuous process of artistic and technological literacy through the articulation of the curricular units involved. Future developments should further systematize the assessment of students' creative and technical progression, expand the documentation of final artistic outputs, and explore the transferability of this pedagogical model to other higher arts education contexts where music, digital technologies, and performance practices intersect.

7. Study Limitations

This study presents limitations inherent to its design and implementation context. Since it is based on action research and was conducted within a specific curricular pathway, the results reflect particular institutional conditions, pedagogical decisions, and participant characteristics, which limits their generalizability to other educational contexts. In addition, the sequential and interdependent nature of the course units makes it difficult to isolate the specific contribution of each curricular component to the observed learning outcomes, especially considering variations in students' prior preparation across the different annual cohorts.

Another limitation concerns the absence of an experimental design with pre-and post-test measures, which restricts the direct quantification of individual student improvement. For this reason, inferences regarding students' progression are based on the triangulation of participation data, fulfilment of task criteria, quality of the artistic products presented, participant observation, and the longitudinal adjustment of pedagogical practices. Although this approach is consistent with the principles of action research, it does not allow for the same level of statistical control as comparative or experimental studies.

Furthermore, the teacher–researcher simultaneously assumed the roles of teacher, assessor, and participant observer, which may have introduced biases into data interpretation. In addition, variations in cohort composition over the years limit comparability across cycles.

The choice of intuitive and accessible software was pedagogically appropriate for promoting autonomy among non-professional users; however, it may limit the direct transferability of the acquired skills to more advanced tools and requirements of the professional field. Furthermore, the rapid evolution of digital technologies, together with the practical and procedural nature of the evidence collected, may affect the comparability and temporal stability of the results. Future studies could strengthen the robustness of the findings by integrating additional comparative instruments, externally validated assessment rubrics, and longitudinal monitoring of selected sub-samples. Such developments would allow for a more precise evaluation of students' technical–artistic progression while preserving the situated, reflective, and practice-based nature of the pedagogical model.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/higheredu5040122/s1, Supplementary S1: Assumptions and general contextualization of the research; Supplementary S2: Activity Schedule—Main activities associated with semester planning.

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Institutional Review Board Statement: The study consisted of non-clinical, non-invasive educational action research and involved no biomedical or clinical experimental procedures. The project was assessed exclusively from a personal data protection perspective by the Data Protection Officer of the University of Trás-os-Montes and Alto Douro, pursuant to Article 39 of Regulation (EU) 2016/679. The Data Protection Officer issued Opinion No. 2026/EPD027 and raised no objections regarding the protection of personal data. According to this opinion, the questionnaire data were considered anonymous, considering all means reasonably likely to be used to identify a natural person. Informed consent was obtained from all participants, who were informed about the aims, procedures, and scope of the study, the voluntary nature of participation, and the intended use of the data. All data were collected and processed anonymously, with appropriate safeguards to ensure confidentiality, in accordance with the applicable data protection legislation, including Regulation (EU) 2016/679.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

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Abbreviations

MILMESA	Interdisciplinary Method of Musical Literacy, Education and Artistic Awareness
DEP	Proximal Expressive Didactics

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