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RESEARCH AND INNOVATION PERSPECTIVES

Didactics in Music Conservatories

Marcella Mandanici

ABSTRACT

The text discusses the perspectives of research and innovative teaching

in music conservatories. Artistic and musical research struggles to establish its presence and impact on education due to limited interest from the institutions themselves. Currently, it relies on individual teachers' goodwill without institutional verification or evaluation.

Keywords by ChatGPT:

Research

Educational innovation

Music conservatories

Digital technologies

Technological integration

Already introduced in AFAM institutions in 1999 by Law No. 508, artistic and musical research in conservatories struggles to establish its presence and affirm its impact on teaching. This is simply because the institutions that promote it show little to no interest in its existence. In fact, as things stand, research relies on the goodwill of individual teachers, without any verification or evaluation activities by the institutions themselves. While the term "Research" is included in the sections of the annual report of the Evaluation Unit, its relevance appears minimal, given the lack of concern among administrators regarding the scarcity of reported content.

While it cannot be said that research is entirely absent in music conservatories, its impact is minimal both externally (publications, outreach activities, conferences) and internally (controlled experiments, didactic innovations, debates, etc.).

Research as Innovation

The definition, objectives, and characteristics of research have been clearly stated in the Frascati Manual (2015), where the concept of "Research" is paired with "Development" (R&D, Research and Development) in the very title. This highlights the fact that research should not be a mere academic activity, but that some form of impact is expected from it (didactic innovation, organizational and managerial changes, the design of new educational programs, etc.). The full definition states that research is "a creative and systematic activity undertaken to increase the body of knowledge on humankind, culture, and society, and to apply this knowledge to new contexts."

Furthermore, for an activity to be classified as "Research and Development," it must meet at least five criteria: it must be new, creative, uncertain, systematic, and transferable and/or reproducible.

Novelty is not inherently a characteristic of music conservatories, as they are primarily dedicated to instrumental study, where practices are reinforced through daily routines aimed at refining performance skills to the highest level. The ultimate applicability of this approach—and the fact that these practices are often repetitive and unconscious—matters little to instrumental teachers, whose sole objective is to train excellent performers. However, statistics show that the primary career path for AFAM graduates is teaching. Yet, there is still resistance to acknowledging this simple reality, which would lead to the revision and modernization of study programs.

While preserving technical excellence, adopting a more analytical approach to repertoire and techniques from the early stages of instrumental study would encourage critical reflection on instrumental practice and its cognitive, expressive, and social implications—now considered fundamental for the future instrumental teacher, .

Creativity should also be a natural part of every musician's activity. However, it is surprisingly lacking in academic studies, where creative practices such as improvisation—which historically played a crucial role in the musician's profession—are often absent.

Even in Composition classes—where reflection on contemporary languages should play a central role—teaching is often limited to the study of traditional techniques (tonal harmony and counterpoint) at the expense of compositional practices that are at least connected to the recent historical past (dodecaphony, polytonality, structuralism, etc.). As a result, what emerges are nothing more than pale imitations of more or less consonant models, lacking stylistic credibility and innovative vitality.

Finally, uncertainty, systematicity, transferability, and/or reproducibility are characteristics of scientific research, whose relationship with music and its teaching remains, for most, yet to be fully demonstrated.

Despite the existence of numerous scientific disciplines that study music—such as psychology, pedagogy, cognitive neuroscience, systematic musicology, acoustics, physics, mathematics, and computer science, to name just a few—many musicians do not naturally assume that scientific criteria should permeate musical practice, as if music were a separate category of human knowledge.

Research and Digital Technologies

Beyond these considerations, there is one objectively verifiable factor that limits the presence of research in conservatories. If research must be innovative, creative, and have a cultural and social impact, today it cannot exist without some relationship with digital technologies, which have permeated every aspect of culture.

For over forty years, information technologies have been present in Italian conservatories within the Electronic Music department. However, the traditional separateness and vertical structure of conservatory curricula have prevented the experiential heritage and evolving aesthetics of electronic music practices from influencing other sectors of the institution. This situation has now become unsustainable in the current cultural landscape.

If we expand our perspective to the potential that music informatics and ICT (Information and Communication Technologies) offer for the evolution of any musical activity, it becomes clear that the root cause of the delay lies in the failure to connect these potentials with various musical professions, which have undergone significant transformations in the meantime.

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Consider, for example, the emergence of the “performer-composer”, who is not only a musician but also a designer of the very environment in which the musical event takes place. Or the rise of new forms of installation art, where sound is interdependent with other elements such as image, movement, action, and audience participation. Emerging disciplines such as sound design and Sonic Interaction Design (SID) are still awaiting definition and practical contributions—areas in which conservatories, more than universities or art academies, could take the lead.

Moreover, even within the traditional boundaries of what is typically practiced in conservatories, there are many areas where digital technologies could effectively contribute to renewing musical practices. The key step in this evolution involves recognizing and embracing two fundamental processes:

The necessity of technological integration.

The transformation of content due to the use of technologies.

Technological Integration

Technological integration is a process in which information technologies are progressively incorporated into artistic production activities and, consequently, into education. It is not just about taking advantage of the benefits that technologies offer to support various activities, but rather a more complex procedure that significantly expands knowledge and is therefore bound to influence perspectives, practices, and competencies of both teachers and students. Theories of technological integration (TPACK and SAMR) do not describe a static knowledge enhanced by the use of technologies but rather a progressive evolution of knowledge towards forms that are open to various developments. But why is it important that technological integration—already widely present in society—is practiced in schools and conservatories? Because it is of fundamental importance that anyone earning a degree today is educated on the potential that ICT can offer to the cultural world. And not generically, but in a detailed and specific manner, within their field of study. In fact, it is vital that students experiment with information technologies during their learning process, embracing a perspective of discovery and sharing. In the case of musicians, there are numerous possibilities in all six main disciplinary sectors.

In the field of Interpretative Disciplines, it would be important for all instruments—even ancient ones—to include in their training at least one performance experience that involves non-conventional techniques or live sound processing (live electronics). This would contribute to a broader contextualization of instrumental practices and an expansion of the operational and aesthetic horizons of individual instruments.

In the field of Electronic Music—undoubtedly the most technology-oriented sector of the entire conservatory—there is the subject of ‘Musical Informatics,’ which is a mandatory course without an exam for all first-level study programs. This course is particularly important because it currently represents the only educational space open to topics specific to technological integration, such as the development of computational thinking and the practice of so-called transversal skills (critical thinking, creativity, communication, and collaboration). In my ‘Musical Informatics’ course, I introduce students to programming and the numerical control of simple structures, later encouraging their creative development. The final assignment for the course is based

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on an original project conceived by students organized into groups, each with specific tasks. This activity fosters creativity and collaboration, which are rarely practiced in conservatory studies.

The field of Theoretical-Analytical-Practical Disciplines (theory, ear training, harmony) could benefit from the numerous online tools available to students for studying music theory, ear training, and harmony, even at a professional level. These tools should not replace the teacher but can validly integrate and support learning, making it more functional and the learning path more accessible.

Musicological Disciplines could also take advantage of various techniques related to Computational Musicology, which is based on the analysis of scores, symbolic data, or audio recordings. There are many application fields of Computational Musicology, such as the creation of musical archives, music analysis, and computer-assisted composition.

Compositional Disciplines, on the other hand, should be fully adjacent to the field of Electronic Music, sharing with it the experimentation of languages and communication strategies. There are numerous applications of composition in new creative contexts: music for video games, installations, multimedia productions, virtual environments, generative and performative art, etc.

Finally, Didactic Disciplines absolutely need to explore the paths of technological integration since they are responsible for training future music teachers. These teachers—not only educated in the fundamentals of music—must also know the most effective pedagogical strategies for learning. However, in the cultural context of the 21st century, this is not enough. Students strongly demand to learn through digital means, and it is only fair that teachers guide them in this process at every possible opportunity. Integrating digital technologies into music education does not just mean using applications, platforms, and new tools, but also significantly expanding the scope of music education itself, including computational thinking, the multidisciplinary nature of STEAM projects, and sound education and digitization.

The Transformation of Content

Robert P. Taylor, in his memorable book The Computer in the School: Tutor, Tool, Tutee, written in 1980, outlined the three fundamental uses of computers in education. Despite the considerable time gap, his analysis can—except for some necessary updates—still be considered valid.

The computer as a tutor refers to the early CAI (Computer-Assisted Instruction) approaches initiated in the 1960s in the USA. Inspired by the principles of Behaviorism and Programmed Instruction developed by American psychologist B. F. Skinner and directly funded by the government, these programs ensured low-cost, personalized, and scalable training. Knowledge was broken down into small learning units organized in order of difficulty. Completing the program guaranteed the acquisition of knowledge necessary to proceed with subsequent units. This approach, later enriched with multimedia content and the advent of artificial intelligence, makes the computer an ideal study companion, ready to correct errors, suggest solutions, and follow students according to their learning pace. The computer as a tutor can still be found today in platforms for ear training and music theory education, as well as in famous instrumental learning platforms like Yousician. Here, the focus is not so much on content, which is mediated by traditional practices, but on how these platforms are used and their effectiveness, particularly in instrumental learning based on model observation (the teacher first and foremost) and the unconscious assimilation of gestures and behaviors.

The computer as a tool represents by far the most common usage mode. This approach aims to exploit the computational power of machines to improve the efficiency of operations that could otherwise be performed without information technology. Consider, for example, word processing, audio and video recording, information retrieval, and document cataloging. Although in the case of word processing, functionalities can be enhanced compared to traditional writing (text editing, formatting, word count, automatic correction, etc.), this does not impact content, which remains unchanged through the digitalization process. However, the use of computers as tools is not entirely neutral today, considering, for example, the possibilities offered by generative AI platforms such as ChatGPT or DALL-E.

Finally, the use of the computer as a tutee (student) is undoubtedly the most fertile and consequence-rich mode. The pioneer of this approach was Seymour Papert, who, influenced by Jean Piaget's ideas, proposed the Logo programming language in 1967, specifically designed to develop computational thinking. The computer as a tutee requires the user's ability to program it and learn through this practice. As Taylor effectively stated:

Learners acquire new perspectives when they learn to program, while teachers enrich and expand their educational methods when they realize how much their students can benefit from considering the computer as a "tutee." As a result, the extended use of the computer in this sense can shift the focus of education from the final product to the process, from mere information acquisition to its manipulation and understanding.

This is, in summary, the fundamental assumption of Constructivism, which sees computers and all their potential as a powerful "cognitive tool." According to D.H. Jonassen, cognitive tools directly engage students in knowledge construction, providing them with an environment that requires greater reflection and understanding while offering expanded perspectives and the generation of new content. This characteristic is closely linked to critical thinking and creativity, skills considered essential in contemporary society.

From what has been said so far, the necessity clearly emerges to provide every student with the possibility to learn to use the computer as a cognitive tool and to know its potential in the various fields of knowledge. Programming is also associated with the highest degree of transformation of content, because through it concepts can be first implemented, then modified, and finally redefined.

An example of technological integration

The following exposition illustrates a case of practical application of the aforementioned concepts. It concerns a course of study that is based on technological integration, and which thanks to it completely redesigns the disciplines of two historical Schools of the Conservatory: the School of Didactics and the School of Electronic Music. This concerns the two-year program in Technologies for Music Didactics active for three years at the Brescia Conservatory. The study plan of

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the two-year program is composed equally of disciplines taken from both schools. But technological integration is not simply obtained by juxtaposing different skills, but rather by redesigning the contents of the various subjects in a way that is functional to achieving the objective of the two-year program: the formation of a teacher with a solid musical education extended to information technologies, aware of the various pedagogical approaches to education and prepared for the use of ICT for the achievement of their educational objectives. To obtain this result, it is necessary to constantly keep in mind that this new professionalism is constituted by the integration of musical knowledge, pedagogical knowledge, and technological knowledge. This is not a simple operation nor one without risks, starting from the entry-level evaluation of students. There are in fact students who come from the School of Electronic Music who have no pedagogical training or little awareness of the formative power of the sound production technologies learned there; on the contrary, students who have pedagogical training, even simply due to having already taught, have difficulty and in some cases even fear in entering the world of technology, also due to a series of prejudices about technological knowledge (introduction to scientific thinking and its relationship with music, diffidence, low propensity for logical reasoning, resistance to embracing alternative points of view, fear of exploring unknown concepts, etc.). In reality, these limitations are constantly highlighted and overcome during the curriculum, which intervenes in the integration process at various levels. The first and simplest is the theoretical level, where the various theories of learning, technological integration, and new learning strategies related to the use of ICT are examined. Acoustic physics, theories of perception and listening, and general computer science are also covered. The second level is laboratory-based, where in addition to programming activities, interactive environments designed by students, multimodal interaction models, and pedagogical practices based on technologies are experimented with. Finally, there is the level of didactic application and verification of learning, which culminates in internship and experimentation activities both in the classroom and in various contexts (seminars, study days, and workshops). Another fundamental activity of the two-year program is a first introduction to research both as a methodology and as a pedagogical practice. For this reason, in addition to attending the specific course, support is also offered for the drafting of articles and participation in conferences.

Conclusions

Research in conservatories is not only possible but is a fundamental condition for the innovation of teaching and the cultural and social role of these institutions. However, the challenges of technological integration and the transformation of knowledge connected to the use of technologies must be seriously addressed, along with the definition of methods for verifying and evaluating research activities. New educational pathways that meet the cultural needs of an evolving society should be supported and encouraged, also considering that only such an evolution can guarantee adequate job placement for future musicians.

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Note

[1] Frascati Manual. Guidelines for Collecting and reporting data on research and experimental development, 2015, consultabile all'indirizzo: https://www.oecd.org/publications/frascati-manual-2015-9789264239012-en.htm.

Ibidem.

[**2**] https://www.almalaurea.it/sites/default/files/comunicati/2016/almalaurea_indagi- ne_afam_13052016.pdf.

[**3**] A. M. Freschi, R. Neulichedl, Metodologia dell'insegnamento strumentale, ETS, Pisa 2012.

[**4**] J. Tafuri, G. E. McPherson, Orientamenti per la didattica strumentale. Dalla ri- cerca all'insegnamento, Libreria Musicale Italiana, Lucca 2007, p. 230.

[**5**] One of the first teaching post of Electronic Music was given to Teresa Rampazzi by the Conservatory of Padova in 1972.

[**6**] Cfr. M. Mandanici, La formazione digitale del musicista, in R. S. Marafioti, P. Ciancarini, P. Ravotto, M. Gentile (a cura di), Atti Didamatica 2022, AICA, Milano 2022, pp. 35-44.

[**7**] M. Koehler, P. Mishra, What is technological pedagogical content knowledge (TPACK)?, «Contemporary issues in technology and teacher education», IX (2009), n. 1, pp. 60-70.

[**8**] R. R. Puentedura, SAMR: Getting to transformation, «Retrieved May», XXXI (2013), pp. 265-283.

[**9**] M. Mandanici, Fostering Computational Thinking in Undergraduate Music Conserva- tory Students, In CSEDU 2022, pp. 449-457, consultabile all'indirizzo: https://www.scitepress.org/PublishedPapers/2022/111346/111346.pdf

[**10**] Si vedano: https://www.earmaster.com/; https://www.musictheory.net/; https://mdecks.com/mapharmony.html

[**11**] STEAM is an acronym that stands for "Science, Technology, Engineering, Arts and Mathematics."

[**12**] STEAM projects include all of these disciplines, proposing complex and meaningful experiences, taken from the real world.

[**13**] R. P. Taylor, The computer in the school: Tutor, tool, tutee, Teachers College Press, New York – London 1980.

[**14**] https://yousician.com

[**15**] AI chat is a software which, when a question is put forward, gives back answers taking information from a series of texts with which has been previously instructed.

[**16**] DALL-E2 creates a series of realistic images after putting a descriptive and an image.

[**17**] S. Papert, Mindstorms: Children, computers, and powerful ideas. Harvester, Bri- ghton (Sussex) 1980.

[**18**] R. P. Taylor, The computer in the school, cit.

[**19**] D. H. Jonassen, What are cognitive tools?, in Id., Cognitive tools for lear- ning, Springer, Berlin Heidelberg 1992, pp. 1-6.

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