

The integration of generative AI in higher music education: pedagogical innovations and ethical challenges

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Abstract: Generative artificial intelligence (generative AI) is permeating diverse areas of higher education, and higher music education is one of the areas where its effects are becoming visible. This paper reviews recent studies to describe how generative AI supports teaching and learning in university music settings and what ethical questions it raises. On the pedagogical side, the reviewed work points to personalized learning tools, new course designs that enable students to build and explore creative AI systems, and shifts in how music teachers and students view these tools. On the ethical side, the reviewed work points to concerns about academic integrity, authorship, copyright, bias in training data, over-reliance, and the risk that marketing language about "democratization" hides deeper problems. The paper brings these two sides together and suggests that careful course design, teacher preparation, and clear institutional guidance can help music programs deploy generative AI in a responsible way. The discussion is meant to benefit researchers in music education, educational technology and related fields.

Keywords: generative AI; higher music education; pedagogical innovation; ethics; academic integrity; personalized learning

1 Introduction

Artificial intelligence has made clear progress in music generation in recent years, transforming the creation and usage of music. The tools now include models built on generative adversarial networks, Transformer architectures, and diffusion models, which can support the diversity, structural coherence, and expressiveness of generated music. The range of application areas keeps growing, and it now covers fields such as healthcare, content creation, and education [1]. Because music education falls within this broader movement, it makes sense to closely examine what generative AI can offer music teaching and what problems it may bring.

Higher music education has certain features that make this topic worthy of dedicated attention. Music study often combines technical skill, aural ability, personal expression, and sustained practice. Generative AI tools can affect each of these areas, and they can do so in ways that support learning or in ways that hinder it. This paper reviews a set of recent studies and organizes their findings around two themes: pedagogical innovations and ethical challenges. The aim is to give a clear and grounded picture that music educators and researchers can act upon.

The paper is structured around these themes. Section 2 provides background on generative AI tools relevant to music. Section 3 describes pedagogical innovations reported in the literature. Section 4 turns to ethical challenges. Section 5

discusses how the two themes connect and offers practical directions. Section 6 gives a short conclusion.

2 Background: generative AI and music

Generative AI in music covers both symbolic music generation (e.g., musical scores and MIDI sequences) and end-to-end audio synthesis. Field surveys demonstrate that model quality and controllability have improved, and that current systems can handle symbolic data and also generate high-fidelity audio. This technical progress matters for education, as it renders classroom-oriented tools more reliable and flexible.

The reviewed literature also identifies education as one application area for these tools. AI music generation has become a way to help learners understand music theory and practical composition, and some platforms deliver interactive experiences that listen to a user's performance and provide instant feedback. These observations show that music education is already part of the generative-AI discourse, making it worthwhile to examine how such tools fit into teaching practice and what limitations they entail.

3 Pedagogical innovations

3.1 Personalized learning tools

One clear line of innovation is personalized music learning. Recent work argues that AI advances open new avenues for the next generation of music-education tools, and that building personalized, engaging learning experiences is an ongoing challenge in music education. The idea is to shape lessons around students' own musical identity, for example by drawing on students' favorite artists, genres, and songs.

Concrete tools illustrate how such concepts may be implemented. One study presents an ear-training application that leverages automatic chord recognition to generate exercises from learner-selected audio tracks, alongside an adaptive piano-method-book prototype that uses automatic music transcription to create exercises for different skill levels. Such systems can monitor students' progress and adjust the content and difficulty over time. The same study suggests these tools can widen access to high-quality music education, since students can receive tailored instruction at a fraction of the cost of private lessons. At the same time, the authors are careful to note that AI-powered music education is meant to support human teachers and is not aimed at replacing them [2].

3.2 New course designs for creative AI

A second line of innovation lies in course design, in which students learn to construct and investigate creative-AI systems. One study describes an online course centred on a pop song generator integrating three AI models: a language model for lyrics, a symbolic music model for the score, and a voice synthesis model for vocal synthesis [3]. The course uses a constructivist, learning-by-doing approach. It encourages students to explore the creative potential of each model, for instance by experimenting with prompts and by exploring the latent space of the music model.

This design yields some useful lessons for music programs. A large cohort of students took the course, and engagement was higher in the week in which students generated audible music outputs. An expert workshop validated its overall structure but emphasized the demand for a more solid creative brief and more explicit teaching on ethical and legal matters. The authors plan to add material on the ethical and legal aspects of AI-creativity in later versions. This illustrates that hands-on creative activities and ethical reflection can be integrated within one course.

3.3 Teacher and student views on generative AI

A third line of work examines how music teachers and students view generative AI, given that adoption hinges on these views. A study of pre-service music teachers examined their intention to use generative AI and the factors behind it [4]. The results indicate that performance expectancy exerts a positive effect on use, while that social influence has a large role in shaping behavioural intention, together with habit and facilitating conditions. The same study reports that perceived

risk, such as concern about information security, student privacy, and data safety, also shapes whether teachers are willing to bring these tools into the classroom. The authors suggest that higher education institutions should update their training programs and integrate technology training, so that future music teachers can gain the required skills.

Student views point in a similar direction. A survey of university students found a generally positive attitude toward generative AI; students recognized benefits such as personalized learning support, writing and brainstorming help, and research and analysis support [5]. Students also raised concerns about accuracy, privacy, ethical issues, and the effect on personal development. While the evidence above focuses only on student perspectives, a systematic review of studies in higher-education expands the scope to synthesize findings from both students and teachers [6]. It reports positive findings for both cohorts: students valued AI-enabled learning and academic support, whereas educators benefited from AI-assisted material generation, assignment checking, and lesson design that reduced their workloads. Affective responses including enjoyment and curiosity appeared among students and teachers alike. One case within this review shows that deploying an AI model for preliminary marking reduced average marking time for a poetry assignment. As the review further observes, teachers' attitudes have been investigated far less frequently than those of students, representing a notable research gap.

3.4 Lessons from related arts education

Since music falls within the broader arts, research on generative-AI applications in other artistic domains offer useful parallels. A cross-disciplinary study of arts education found that educators and students see generative AI as a helpful tool for generating ideas, while they agree that the human factor cannot be replaced [7]. Both groups in that study held the view that students ought to establish solid core-skill and knowledge foundations prior to adopting AI tools, and educators valued the practice of critically reviewing AI-generated outputs together with their students.

These points come from a study centered on visual arts, so they should be read as a related analogy rather than as direct music evidence, but they line up well with the concerns raised in the music-focused work above.

4 Ethical challenges

4.1 Creativity, authorship, and copyright

The reviewed literature raises clear ethical questions about creativity and ownership. Work on responsible AI music notes that generative AI is transforming the creative arts while it also raises ethical, societal, and legal concerns, and it names the possible displacement of human creativity, copyright issues from large training datasets, and the lack of transparency, explainability, and fairness [8]. This work grounds its analysis in an established set of guidelines for trustworthy AI, contextualizing them for generative music and defining a suite of responsible features specific to the field. It also frames ethics as a core design principle that can support creativity rather than block it.

Reviews of AI music generation add a technical view of the same problem. Copyright restrictions mean that many high-quality music datasets cannot be released, so researchers often work with limited data, and dataset bias can push models toward certain styles. These data problems connect directly to the concerns about originality and fair attribution raised in the responsible-AI work.

4.2 Bias and the limits of "democratization"

Another ethical theme concerns bias and the rhetorical language used to promote AI music tools. Work on responsible-AI music points out that current models often have a Western-centric focus in their training data, which can marginalize non-Western musical traditions. The study of personalized music tools makes a similar point, since these models are likely trained on datasets that may not represent the full diversity of global musical traditions.

A critical study of public generative-AI music systems closely examines the popular claim that these tools "democratize" music [9]. It argues that inclusivity often works as marketable language rather than a real guiding principle,

and it draws on prior research to suggest that this kind of democratization can act as a form of technologically-mediated deskilling. The study also reports that the systems tend to normalize generated outputs and diminish users' sense of creative agency, and that text-to-music interfaces push users toward genre labels, which may constrain their conception of musical composition. For music educators, this serves as a reminder to look past promotional language and to help students keep their own judgment and voice.

4.3 Academic integrity and over-reliance

Academic integrity is a shared concern across the reviewed work. The student survey found that plagiarism and the difficulty of detecting AI-generated content worried students, and that over-reliance on AI could reduce critical thinking and creativity over time. The systematic review reports similar concerns about ethical issues, plagiarism, and over-reliance that may hinder skill development, and it notes that generative AI is seen as useful yet not a substitute for the teacher. In the music-teacher study, the authors also call for more attention to ethical issues such as academic integrity, and for guidance on how to help students approach these tools with a critical, balanced attitude. In music education, where personal skill and expression are central, over-reliance is a real risk that course design needs to address.

4.4 Institutional governance

The reviewed work also points to the role of institutions. A case study of university guidance on generative AI shows that these tools bring opportunities for personalized learning and tutoring while they also challenge academic integrity, so governing responsible use has become more important [10]. The study finds that many universities have chosen guidance, which is educative and advisory in nature, flexible, and built around questions that promote critical thinking. It also reports that universities often discourage AI detection tools because of high false-positive rates, and that they focus on building AI literacy and community engagement. These findings offer music programs a model for setting local rules that fit creative work.

5 Discussion

The reviewed studies suggest that the pedagogical and ethical sides of generative AI in higher music education are closely linked. Personalized tools and creative course designs can make music learning more engaging and more inclusive, and the same tools raise questions about authorship, bias, and over-reliance. A useful way forward is to treat these two sides as parts of one design task rather than as separate problems.

Course design can carry much of this work. The pop-song generator course shows that hands-on creative practice and reflection on ethics and law can coexist within the same course, and that incorporating explicit ethical content represents a natural next step. The parallel from arts education supports a base-skills-first approach, where students build core musical knowledge and then use AI tools while acting as critical reviewers of AI outputs. This approach can lower the risk that readily-obtained results hinder genuine learning.

Teacher preparation is another key point. Since social influence, facilitating conditions, and habit shape music teachers' intention to use these tools. Programs that offer training, support, and shared practice may help teachers adopt generative AI in a thoughtful way. Attention to perceived risk, such as privacy and data safety, can make this training more convincing. Given that far fewer empirical studies focus on teachers compared with students, further research from the teachers' perspective would benefit this field.

Institutional guidance can hold the whole effort together. Guidance that is educative, flexible, and focused on AI literacy gives music departments room to set rules that fit creative assignments, and it moves the focus toward the learning process rather than only detection. Clear norms on attribution and disclosure connect this guidance to the concerns about authorship and copyright raised in the responsible-AI work. Fair access also matters, since some tools need devices and

resources that not every student possesses, which could widen educational gaps if left unaddressed.

6 Conclusion

Generative AI is becoming part of higher music education, and it brings both real opportunities and concerns. The reviewed work shows pedagogical gains through personalized tools, creative course designs, and growing acceptance among teachers and students. It also shows ethical challenges tied to creativity, authorship, copyright, bias, over-reliance, and academic integrity. The two sides move together, so music programs can gain the most by designing courses, preparing teachers, and setting institutional guidance with both considerations in view. With this balanced approach, higher music education can use generative AI in a way that supports learning and respects the values at the heart of music study.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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