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ARTIFICIAL INTELLIGENCE IN MUSIC EDUCATION

Shamakhmudova D. M. [1]

[1] National Institute of Estrada Art named after B. Zakirov,
State Conservatory of Uzbekistan

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Abstract

This article examines the possibilities of integrating artificial intelligence (AI) into the education of music students. It analyzes modern AI technologies incorporated into music education, including software for music creation, teaching music theory, analyzing musical works, and practical tools for developing performance skills. The role of AI in enhancing the quality of education and personalizing the learning process is highlighted, demonstrating its contribution to deeper musical understanding and the development of students' creative skills.

Keywords: *artificial intelligence, educational process, information technology, music students, music creation, performance practice*

In contemporary conditions, artificial intelligence has permeated various spheres of human life, becoming an integral part of them. One of the most extensive areas of its application is education, including disciplines aimed at preparing students for professions tied to creativity. AI opens new opportunities for music education, assisting music students in developing their skills, improving performance techniques, and even composing original musical pieces. This is echoed by D.Aleynikova, who notes: *"Interaction between humans and artificial intelligence is becoming an indispensable part of the modern educational process, including music education"* (Aleynikova, D. V., 2023. p. 12).

This article explores the impact of artificial intelligence on music education for students, its benefits and challenges, as well as the influence of this technological advancement on the future development of music.

Traditional methods of teaching musicians have always included individual lessons with an instructor, participation in orchestras and ensembles, and various forms of group performances. However, with the development of technologies – especially those associated with artificial intelligence – new approaches and tools have emerged, significantly enhancing the quality and efficiency of education. AI enables music students to master musical pieces faster, refine their technical skills, and even create unique compositions.

Educational technologies in music have the potential to enhance not only the academic aspect of learning but also to expand the creative potential of students. Today, leading music institutions and schools are implementing innovative methods and tools

aimed at further improving student-teacher interaction and engagement with educational materials. Within this transformation, artificial intelligence is becoming a crucial instrument.

In music education, AI can be applied in various ways. A striking example is the use of machine learning algorithms and sound processing, which serve to create programs that analyze musical works, assist in learning instruments, evaluate performances, and even compose new pieces of music. As P. Baryshnikov asserts, *"AI systems are capable of significantly expanding the possibilities of music education, providing new tools for analyzing and creating musical works"* (Baryshnikov, P. N., 2023. p. 215).

Today, some numerous programs and applications utilize artificial intelligence and serve as highly effective tools in the education of music students. These applications can analyze a musician's performance, providing feedback on technique, intonation, and accuracy. For instance, programs like Yousician and Simply Piano offer interactive lessons for various instruments, where students receive real-time instructions and tips on improving their performance. These programs leverage algorithms to accurately track notes, tempo, and technique, adapting the learning process based on the results.

AI-powered programs are capable not only of detecting performance errors but also of creating a complete musical background for practical training. For instance, a student playing a piano melody can be accompanied by the program, which adjusts to their tempo and harmonic structure, creating a duet-like interaction. In this way, students can practice and refine their skills under various conditions, developing more versatile and flexible musical abilities.

Artificial intelligence can analyze how accurately a student plays notes, their technique, dynamics, and even the emotional nuances captured in a musical piece. Based on this analysis, students receive recommendations for improving their performance mastery, interpreting the work correctly, and focusing on specific aspects of their technique that require further training.

One of the most significant advancements of AI in music education is the development of performance evaluation systems. A notable example of such innovation is the Smart Music software. This program provides tools for assessing musical precision and dynamics. Students can record their performances and upload them into the program, which then analyzes the recording, identifies mistakes, and offers recommendations for improvement. These systems evaluate performance across various parameters, such as pitch accuracy, rhythm, tempo, and sound quality. This functionality enables students to promptly identify and correct deficiencies in their performance.

Another noteworthy capability of artificial intelligence lies in its ability to analyze musical compositions and assist students in selecting repertoire tailored to their technical skills and curriculum needs. This personalized, individualized approach to music education enhances the learning experience for each student. As information technologies and data processing algorithms continue to advance, AI with more sophisticated and flexible functionalities may become an essential tool for musicians.

Moreover, AI presents a unique opportunity for music creation. As E.Belikova observes, *"Artificial intelligence has become an integral part of modern culture, including musical art, influencing both the methods of creating and perceiving music"* (Belikova, E. K., 2024. p. 61).

Contemporary AI systems can generate original musical compositions based on analyses of existing works. Algorithms such as Muse Net by Open AI and Magenta by Google are capable of creating music in various genres, including classical, jazz, and pop. By utilizing deep neural networks, these systems analyze vast amounts of musical data to produce new compositions.

Launched in April 2019, OpenAI's MuseNet can generate four-minute compositions involving ten instruments while blending styles from "Mozart to The Beatles." To achieve this, MuseNet studied a significant number of MIDI recordings. Similarly, in April 2020, OpenAI introduced Jukebox, an AI system capable of generating music across diverse genres, including instrumentals and simple vocals.

One of the promising directions in the creative process of music-making is the use of artificial intelligence to create a "dialogue"

between humans and machines. For example, AI can provide musicians with harmonic or melodic options that they can either incorporate or adapt into their compositions. This offers musicians a fresh perspective on their work and broadens their creative horizons.

Artificial intelligence opens numerous new opportunities for music students, enhancing and accelerating the learning process. Let us focus on the primary advantages of using AI in music education.

The ability to individualize the learning process for each student is one of the main benefits of artificial intelligence. AI can tailor education to the student's level of preparation, taking into account the strengths and weaknesses of their performance skills. Students can progress at their own pace, receiving feedback and recommendations specifically adapted to their individual needs. This significantly boosts students' motivation, as they begin to feel that the learning process is customized to their abilities and interests. As D.Aleynikova points out, *"The development of AI technologies opens up new opportunities for the personalization of learning and the adaptation of educational programs to the individual needs of students"* (Aleynikova, D. V., 2023. p. 14).

AI-powered programs can track students' progress, evaluate their development, and offer new tasks that help them assimilate material faster and more effectively. These programs also provide options for selecting an efficient repertoire, allowing students to refine their performance skills further.

Artificial intelligence makes music education more accessible to many individuals. Students can study anywhere and anytime through various educational programs and online courses incorporating AI. This opportunity enables people who cannot attend traditional music institutions, as well as individuals with disabilities, to engage in music and enhance their mastery. AI-driven programs can be utilized at all levels of music education – beginner, intermediate, and advanced – demonstrating their universality for different categories of learners.

Moreover, music education using AI does not require significant resources such as private tutors or specialized instruments. Students can use their available smartphones, tablets, and computers to overcome barriers to learning. Researchers O.Ivanova and A.Sokolov assert that *"The application of AI technologies in the educational process allows for the creation of more interactive and convenient approaches to learning"* (Ivanova, O. P., & Sokolov, A. G., 2020. p. 44).

Interactive applications and games powered by artificial intelligence contribute to making music education more engaging. Real-time gameplay, collaboration with programs, and instant feedback make the learning process both enjoyable and motivating. Through these programs, students can work with music in a gamified format, allowing them to overcome challenges and gain experience in a playful manner rather than through traditional methods.

Artificial intelligence can serve not only as an educational tool but also as a creative partner in music-making. With the help of AI, the potential for generating new musical ideas, processing sound data, and composing music opens up new horizons for creativity.

Today, artificial intelligence deeply penetrates many areas of human life, including music education. Its integration into the learning process for music students creates opportunities for teaching, creativity, and the enhancement of musical skills. We are witnessing a significant expansion in the capabilities available to students and educators, who can leverage innovative tools to develop technical proficiency and create new musical works.

At the same time, artificial intelligence offers students new avenues for creative self-expression. By using AI-driven programs, composers and musicians can generate fresh musical ideas, experiment with genres and styles, and work with unconventional musical structures. This paves the way for an innovative musical process, blending elements of classical music, modern technologies, and entirely novel soundscapes.

However, despite all its advantages, artificial intelligence cannot fully replace human interaction and communication in music education. The teacher, with their experience and intuitive understanding, remains an indispensable partner in the learning process. Teachers help students master performance techniques and grasp the profound emotional and cultural essence of music.

Artificial intelligence should complement, rather than replace, traditional teaching methods by fostering students' creative thinking and deepening their understanding of musical composition. This introduces an ethical dimension to the use of AI in education, particularly in music education. Addressing this issue, A.Bishkis states: *"The integration of artificial intelligence into the educational process requires profound consideration of the ethical and philosophical aspects of human-machine interaction"* (Bishkis, A., 2022. p. 36).

In conclusion, it can be stated that artificial intelligence has become a powerful and promising tool that is already transforming the landscape of music education for student musicians. The integration of AI into the process of music education creates unique opportunities for developing students' musical skills, broadens the horizons of creative self-expression, and enables interaction with music on an entirely new level.

At the same time, to achieve maximum efficiency in preparing future professional musicians, it is essential to rationally combine innovative technologies with traditional approaches, while preserving the significance of the human element in both education and creativity.

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Contact: kamolidinovamokhi@gmail.com