



## METHODOLOGY FOR DEVELOPING THE PROFESSIONAL COMPETENCE OF FUTURE MUSIC TEACHERS BASED ON GENERATIVE ARTIFICIAL INTELLIGENCE TECHNOLOGIES

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**Abstract.** The purpose of the study is to identify pedagogical conditions that facilitate the integration of the capabilities of generative artificial intelligence with the goals, content, methods, and assessment system of music education, as well as to develop practical and methodological recommendations. The study employed the methods of analyzing scientific and pedagogical literature, comparative analysis, systematization, modeling, and pedagogical design. Pedagogical appropriateness, teachers' digital-pedagogical competence, students' artificial intelligence literacy, pedagogical expertise, individualized learning, creative activity, academic integrity, a safe digital environment, and reflective assessment were identified as the main pedagogical conditions. The proposed model is aimed at developing the musical-creative, methodological, digital, and reflective-ethical competencies of future music teachers.

**Keywords:** generative artificial intelligence, music education, pedagogical conditions, digital pedagogy, music teacher, professional competence, musical creativity, individualized learning, digital content, academic integrity.

The digital transformation of higher education has significantly changed the requirements placed on future teachers. Modern educators are expected not only to possess subject-specific knowledge and methodological competence but also to understand digital technologies and apply them pedagogically, ethically, and creatively. This tendency has become particularly relevant with the rapid development of generative artificial intelligence technologies capable of producing text, images, audio, musical compositions, videos, and other forms of digital content.



In music education, the emergence of generative AI is especially significant because musical learning involves both cognitive and creative processes. Future music teachers need to understand musical theory, perform and interpret musical works, develop students' musical abilities, design educational activities, provide feedback, and encourage creative expression. Generative AI technologies can potentially support each of these areas, provided that they are integrated into the educational process according to clearly defined pedagogical objectives.

UNESCO emphasizes that artificial intelligence in education should be implemented through a human-centered approach. Miao and Cukurova, in the *AI Competency Framework for Teachers*, emphasize that teachers require competencies related to human-centered thinking, AI ethics, AI foundations, AI pedagogy, and professional learning. This position is particularly important for music teacher education because technological competence alone cannot guarantee effective pedagogical use of AI. A future music teacher must be capable of critically evaluating AI-generated musical and educational content and transforming it according to pedagogical and artistic requirements.

The digital transformation of education has created a need to update the content, methods, and tools used in music teaching. Generative artificial intelligence systems are capable of creating new content, including text, images, audio, video, musical notation, melodies, and other types of digital products based on user-generated prompts. Such tools provide new opportunities for designing music lessons, preparing educational materials, creating musical compositions, developing individualized assignments, and assessing learning outcomes. UNESCO recommends that the use of generative artificial intelligence in education should be organized based on the principles of human-centeredness, pedagogical appropriateness, data security, and age appropriateness. Before integrating these technologies into the educational process, their ethical acceptability, pedagogical value, and safety should be carefully evaluated.



The distinctive feature of generative artificial intelligence in music education is manifested not only in its ability to provide information but also in its participation in the process of creating musical products. The purpose of this study is to identify the pedagogical conditions that ensure the effective, purposeful, and pedagogically justified use of generative artificial intelligence tools in music education and to develop methodological recommendations for their implementation in the educational process.

The objectives of the study include identifying the didactic potential of generative artificial intelligence, describing the pedagogical factors influencing its use, systematizing the pedagogical conditions, developing a teacher–student–artificial intelligence collaboration model, and substantiating the requirements of academic integrity.

Generative artificial intelligence can support teachers in preparing lesson plans, creating visual materials, and developing individualized assignments. However, its recommendations should not replace teachers' professional judgment; rather, they should provide teachers with information and alternative options. In music education, text-based models such as ChatGPT can be used to explain musical concepts, develop lesson assignments, and prepare individualized feedback. Music generation systems, in turn, can create musical compositions based on textual descriptions. However, the musical-theoretical accuracy, aesthetic value, and national-cultural appropriateness of the generated product must be evaluated by a specialist.

The selection of a generative artificial intelligence tool should be determined by the specific objectives of the lesson and the expected learning outcomes. First, it is necessary to determine what students are expected to know or be able to do. Subsequently, the content of the assignment, the role of artificial intelligence, and the assessment criteria should be developed. For example, if the objective is to develop students' musical analysis competence, artificial intelligence should not be used as a tool that provides a ready-made analysis. Instead, it should serve as a source for comparing and verifying students' independent conclusions.



A music teacher needs not only technical skills but also the competence to adapt technology to pedagogical objectives in order to work effectively with generative artificial intelligence. The teacher should be able to formulate effective prompts, verify AI-generated outputs, identify musical errors, edit content, and develop appropriate assignments and assessment criteria.

Within UNESCO's AI Competency Framework for Teachers, human-centered approaches, AI ethics, the foundations of AI, AI pedagogy, and professional development are identified as important areas of competence. These competencies are developed through progression levels such as acquire, deepen, and create. Studies conducted with future music teachers indicate that training based on lesson design with the assistance of generative artificial intelligence can contribute to the development of their technological-pedagogical content knowledge. In this context, it is particularly important to use technology not merely for generating ready-made products but as an instrument within the pedagogical design process.

Students should understand not only the capabilities of artificial intelligence but also its limitations. AI literacy includes the ability to formulate appropriate prompts, critically evaluate generated outputs, identify sources, detect inaccurate information, edit musical products, and distinguish between AI-generated elements and their own authorship.

In the future, it would be appropriate to verify the effectiveness of the proposed pedagogical conditions through a pedagogical experiment involving experimental and control groups. In this process, students' initial and final performance indicators should be diagnosed according to the developed assessment criteria.

The effective use of generative artificial intelligence tools in music education is determined not by the mere availability of technology but by the pedagogical conditions created for its application. Pedagogical appropriateness, teachers' digital-pedagogical competence, students' AI literacy, pedagogical expertise, individualized learning,



creative activity, academic integrity, a safe digital environment, and reflective assessment constitute the interconnected core components of this process.

Generative artificial intelligence should not be regarded as a subject that replaces the music teacher. Rather, it should be used as a tool that supports teachers' methodological and creative activities, provides alternative solutions, and assists in the development of educational materials. Pedagogical management, musical expertise, and final decision-making should remain the responsibility of the human teacher.

The scientific novelty of the study lies in the systematization of interconnected pedagogical conditions for the use of generative artificial intelligence in music education, as well as in the development of a pedagogical model based on teacher–student–artificial intelligence collaboration and the proposal of relevant assessment criteria.

The practical significance of the study is determined by the possibility of using the proposed conditions, model, assignments, and assessment criteria in the preparation of future music teachers, the design of music lessons, professional development courses, teaching practice, and the development of methodological guidelines.

### **References**

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