

METHODOLOGICAL APPROACHES TO DEVELOPING THE PROFESSIONAL COMPETENCE OF FUTURE MUSIC TEACHERS USING 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.

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.

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The study is theoretical and methodological in nature. The methods of analyzing scientific and pedagogical sources, comparative analysis, systematization, generalization, modeling, and pedagogical design were employed. Since no specific experimental study was conducted, the article does not present statistical results or artificially generated percentage indicators.

The methodological framework of the study consists of competency-based, activity-based, learner-centered, systemic, creative, digital-pedagogical, and reflective approaches. The competency-based approach focuses on applying knowledge in professional activities; the activity-based approach emphasizes students' active participation in the process of creating musical products; and the creative approach is aimed at developing original ideas and musical solutions.

In this study, pedagogical conditions are understood as an interconnected set of organizational, didactic, methodological, technological, motivational, reflective, and ethical factors that ensure the achievement of the intended outcomes of music education.

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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.

Students should not consider an AI-generated composition as a product of their complete personal authorship. They should be able to explain which parts were generated with the assistance of artificial intelligence, which elements were personally edited, and what creative decisions they made during the process.

Generative artificial intelligence enables the development of assignments with different levels of complexity for students. For a student with a lower level of musical hearing skills, simple interval and rhythmic exercises can be developed, whereas a highly prepared student can be assigned more complex harmonic or compositional tasks. AI-based individualization does not simply mean increasing the number of assignments; rather, it refers to adapting learning tasks to the student's needs, abilities, interests, and pace of learning. Systematic studies in music education identify individualized instruction and immediate feedback as important potential benefits of AI-based tools.

According to the results of the theoretical analysis, when the identified pedagogical conditions are ensured, generative artificial intelligence can expand opportunities for individualization, immediate feedback, creative experimentation, and pedagogical design in music education. In this context, technology should not function as a system that automatically produces final results, but rather as an object of analysis, discussion, and creative transformation. The primary outcome of using AI should not be the generated audio or musical notation itself, but rather the development of students' musical thinking, methodological decision-making, critical analysis, and reflection. Otherwise, generative artificial intelligence may shift from being a tool that supports creative activity to a mechanism that limits independent thinking.

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.

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