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Artificial intelligence in music education

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Abstract: In recent years, the fast-paced progress of new technologies on a global scale demonstrates a strong impact with significant results in many fields, from education, medicine, entrepreneurship, psychology and arts to the daily organization of social interactions. Overall, artificial intelligence refers to systems that exhibit intelligent behaviors by analyzing their environment and take action - with a certain degree of autonomy - to achieve specific goals. Today, artificial intelligence presents opportunities to complement and supplement human intelligence. The field is interdisciplinary, involving substantial contributions from other related sciences: music education, cognitive psychology, theatre and performing arts, anthropology, philosophy, linguistics, mathematics, computer science. Creativity is essentially a complex process, a complex mental activity that ends in creating a certain good, it is that mental capacity to obtain the new in different forms: theoretical, scientific, technical, social; to develop original ways and solutions to solve problems and to express them in original personal forms. Modern teaching strategies increasingly encourage the formation and development of innovative intellectual skills and attitudes of students. Thus, the use of artificial intelligence applications in music education classes becomes a necessity for expressing artistic ideas, appreciating musical works and operating with elements of musical language. Under the influence of new perspectives in the teaching-learning-evaluation process, teaching staff are encouraged to use intelligent virtual platforms and multimedia systems. In this sense, the artificial intelligence applications used provide an attractive and flexible framework suitable for the transition into the digital age.

1. Introduction

Artificial intelligence (AI) is a fundamental element of making digital education work at scale. The idea that we live in a world of technology has already become normality. The school space, however, is sometimes reluctant to take on the changes in technology. The rapid evolution of new technologies generates significant changes at all levels of today's society, implicitly determining the education system to integrate these technologies as efficiently as possible in the teaching-learning-evaluation process. Based on this premise, the development of new learning theories must reflect

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the needs found at the level of society, in the time frame in which they are formulated. In the same sense, at the level of educational practice, along with the adaptation of classical theories of learning, teachers will have the responsibility of exploring contemporary concepts and strategic models, formulated in accordance with the educational requirements of the 21st century and the profile of the current student.[2]

The computer is nowadays an instrument that offers endless possibilities for exploring the art of sound. Thus, it must become a basic component in the musical education of children in general and vocational education units. The capitalization of new technologies is a desideratum of a competitive music education. However, the poor endowment of schools with devices that students use in their daily lives leads to a threat to their interest in music education classes. Lately, educational theories revolve around the educated more than around the educational process. The main function that education fulfills is contextually detected, combining all the functions listed and treated by pedagogy and aims at two basic coordinates, absolutely necessary for the current context: ensuring a repository of information to use in everyday life and achieving a state of balance with the self and with the objective world. The complexity of education has generated a series of approaches to it in relation to other sciences studying education, especially sociology and psychology.[3]

2. Artificial intelligence and modern challenges in education

The term "artificial intelligence" is used to describe devices that mimic the cognitive functions that people associate with the human mind, such as learning and problem solving. Capabilities of modern applications generally classified as AI include successful understanding of human speech, competition in strategic game systems such as chess, autonomously operating machines, intelligent routing in content delivery networks, and military simulations. Artificial intelligence can be classified into three different types of systems[4]:

- analytical artificial intelligence;
- human-inspired artificial intelligence;
- humanized artificial intelligence.

Analytical AI has only features compatible with cognitive intelligence: generating a cognitive representation of the world and using learning based on past experience to reason about future decisions. Artificial intelligence inspired by human capabilities and skills has elements of cognitive and emotional intelligence: in addition to cognitive elements, it understands people's emotions and takes them into account in

[2] Ciprian Ceobanu, Constantin Cucoș, Olimpius Istrate, Ion-Ovidiu Pânișoară (2022), *Educația Digitală* [Digital Education], Polirom, Iași, p. 188.
[3] Loredana Muntean (2013), *Noi tehnologii în educaţia muzicală* [New technologies in music education], Editura Media Musica, Cluj-Napoca.
[4] Ala Gasnaș, Angela Globa (2023), *Rolul inteligenței artificiale în educație* [Sciences of Education] 32.2, pp. 46-57.

making subsequent decisions. Humanized artificial intelligence shows the characteristics of all kinds of competencies: cognitive, emotional and social intelligence, it is capable of self-awareness, and is self-aware in interactions with others.

Today's teachers face an ever-changing horizon of expectations. To maintain a high standard of teaching, they need a complex set of professional skills, including the ability to adapt to various learning environments, including online learning. The teaching process is no longer limited to what happens in the classroom, through the classic relationship between teacher and student. Increasingly, this connection is mediated by the new information and communication technologies, which have an enormous potential, still insufficiently explored, to improve education. Information and communication technology offers a wide range of opportunities for both teachers and students to enrich their teaching and learning experiences, through virtual environments that support not only the delivery, but also the exploitation and application of knowledge.[5]

Artificial intelligence – the ability of intelligent systems to perform creative functions that were traditionally performed by humans. The notion of artificial intelligence is an interdisciplinary notion and therefore has several meanings. It is particularly highlighted by computer scientists, but it is also emphasized by its contribution to automation and robotization in various human activities, including educational activity[6].

3. Music education and the use of new computer applications

The presence of technology in music education activities is not a recent phenomenon. Inevitably, this has been part of music education since the first possibilities of recording and playing music used on a large scale and in professional and semi-professional musical environments, starting with the gramophone and reaching the computer. The computer is revolutionizing not only music in general, but also music education. Musical software found in the professional environment can be imported and adapted to the level of music education activities, by using their simplified versions. Thus, students have access to creation on the computer even if their level of musical writing-reading, instrumental interpretation or musical theory is sometimes low.

The issue of teaching means for the field of music education must be analyzed from at least two different points of view: of all the materials, devices and apparatus with the help of which the transmission and assimilation of didactic information, the

[5] Ion Albulescu, Horațiu Catalano (2021), *e-Didactica. Procesul de instruire în mediul online* [The training process in the online environment], Editura Didactica, București, pp. 43-44.

[6] Ceslav Ciobanu, Valeriu Capsîzu (2020), *Inteligența artificială – o nouă etapă în dezvoltare*, în „Problemele socioeconomice ale Republicii Moldova: reflecții, sugestii" [*Artificial intelligence – a new stage in development*, in "Socioeconomic problems of the Republic of Moldova: reflections, suggestions"], Vol. 5, pp. 37-47.

recording and evaluation of the results obtained, as well as the specific methods of music education are carried out. The novelty element is the use of ICT with all the multimedia advantages offered. A systematization, a short synthesis of these aspects is necessary. The multimedia system represents the ability of a system to communicate information through several presentation media simultaneously, such as: text, graphics, photos, animation, sound, video clips. Also, multimedia implies the notion of interactivity: the user not being a simple spectator but an active participant with the possibility to modify the course of the application according to desire and possibilities. However, there are didactic processes within music education classes that cannot use the respective applications (playing an instrument or vocal singing), but there is a software for smart devices called Real Piano, which will make students understand the piano technique, followed by individual practice on the classical instrument.

Multimedia, AI-based applications recommended for music education

1. Educational sites: websites, weblogs, portals, forums.

Examples

- http://www.emusictheory.com/
- https://musiclab.chromeexperiments.com/Experiments
- https://insidetheorchestra.org/musical-games/
- https://chat.openai.com/

2. Aiva. https://www.aiva.ai/

Aiva is an artificial intelligence system that enables music composition. It can be used to create backing tracks or even generate compositions based on certain criteria. Aiva can be integrated into music creation activities within music education classes.

3. Amper music https://aigems.net/site/amper

Amper Music uses AI to create music based on the user's preferences and needs. This app can be used in an educational context to explore different musical styles and compositional techniques.

These sites and platforms provide information, notions and concepts from the perspective of music education, the possibility of learning to play an instrument such as a piano, composing songs, rhythmic exercises, recognizing musical instruments.

Today, music technologies provide teachers with extremely useful tools in carrying out educational processes and in keeping music on the list of subjects of interest to students. Music education is rooted in hands-on activities, and digital technology provides tools for delivering experiential education centered on student development and training in the classroom. The understanding of music and the formation of musical skills depend in part on the communication and appropriation of musical contents, without excluding the transmission of information regarding the context that generated the studied creations. Music plays an important role in: training and employment, supporting volunteers and participants in personal development;

improving the image of an area; social cohesion and active citizenship; awareness of the cultural identity by the locals; improving the quality of people's lives through individual and collective creativity.

Regarding the aspect of using digital applications as a means of learning music, it is necessary that within musical activities, teachers make efforts to achieve a harmonious balance between musical activities, theoretical and technological concepts, through the appropriate and correct application of components, with the aim of stimulating the process of musical creation.

The use of new technologies in music education and the arts offers us many benefits, but there are also threats or challenges associated with this development. In this regard, we have developed a Swot Analysis to more clearly highlight the benefits and threats regarding the frequent use of digital media.

Strengths	**Shortcomings**
➢ Creative, interdisciplinary and transdisciplinary learning; ➢ Ensuring continuous and effective feedback; ➢ Developing an independent team-work style; ➢ Developing one's imagination; ➢ Integration of students with deficiencies in the educational process;	➢ Lack of up-to-date coordination of music education school textbooks with the contemporary possibilities offered; ➢ Technical support sometimes creates problems.
Threats:	**Opportunities:**
➢ The excessive use of multimedia applications may harm one's health; ➢ Inequality in access to technology ➢ The occurrence of additional costs that cannot be borne. ➢ Cyber security. ➢ Financial resources needed for the purchase of licenses. ➢ Excessive dependence on technology.	➢ Diversification and completion of educational software education in music education; ➢ Upgrading teaching support for music education; ➢ Continuous training of music education teachers. ➢ Teachers have a wide range of digital tools at their disposal to explore new ways of creative artistic expression.

Table 1 The use of AI applications within music education classes – SWOT analysis

4. Conclusions

Applications based on artificial intelligence have become an integral part of our lives, proving that technology is establishing itself as an essential element in the pre-university education system. Due to advances in artificial intelligence, there are now a growing number of educational applications based on artificial intelligence. A well-prepared teacher for the present and future should demonstrate competences both in the scientific field of music education and in the psycho-pedagogical fields, to which transversal competences are added, in order to implement a possible performance measurement within the education system. Music education is a field organically interconnected with the different types of intelligence, musical intelligence being highlighted, with innovative learning, due to the development of creative capacities developed through music, and, last but not least, it favors cross-curricular links with several school subjects[7]. The use of new applications based on artificial intelligence in music education increases the efficiency of learning and contributes to the formation of a new vision and artistic expression.

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