

EFFECTIVENESS OF DISTANCE MUSIC EDUCATION: METHODS OF MAINTAINING CHILDREN'S ATTENTION AND INVOLVEMENT IN THE ONLINE ENVIRONMENT

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Abstract. The article explores the effectiveness of distance music education and examines methods of sustaining children's attention and engagement in the online environment. The purpose of the study is to identify the specific features of organizing distance music education with the use of innovative technologies that enhance students' attention and involvement. General scientific methods of cognition were employed, including analysis, synthesis, comparison, generalization, and systematization. The findings indicate that distance music education has several distinct characteristics that set it apart from traditional learning formats. It is concluded that two main models are applied in this format: synchronous, which enables real-time interaction and immediate feedback, and asynchronous, which provides greater flexibility and independence through the use of digital resources and video materials. The research demonstrates that the effectiveness of distance communication is defined by three consecutive stages: establishing a trusting relationship between teacher and student, maintaining a productive dialogue that takes cultural differences into account, and ensuring high-quality technical support of the educational process. The study shows that only a harmonious integration of these elements creates an effective environment for music learning. The application of innovative digital tools was found to be a crucial factor in improving effectiveness. The practical significance of the research lies in the possibility of using its findings to develop effective strategies for organizing distance music education with the integration of advanced digital technologies.

Keywords: distance education, music, technologies, attention, involvement.

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Introduction

Distance music education gained particular relevance during the COVID-19 pandemic, when traditional forms of learning became impossible and educational institutions were forced to find new ways of organizing the teaching process. The transition to the digital environment opened new perspectives for music pedagogy while simultaneously requiring teachers to adapt traditional methods to the conditions of online communication. Music education, which relies heavily on direct contact between teacher and student, required a rethinking of approaches, the implementation of digital technologies, and the use of new pedagogical strategies. As a result, a system of models and methods of distance music education was formed, combining synchronous and asynchronous forms of learning, innovative digital tools, and multimodal environments. At the same time, the effectiveness of such education is determined not only by technical possibilities but also by the professional skills of the teacher, the ability to maintain students' attention and motivation, create opportunities for co-creation, and integrate music with other activities. Thus, distance music education appears as a complex phenomenon that combines pedagogical, communicative, and technological components, forming a new paradigm of music learning in the 21st century.

Literature Review

The issue of the effectiveness of distance music education, particularly methods of maintaining children's attention and involvement in the online environment, is widely covered in foreign academic literature, as most of the studies come from international authors offering different perspectives on the problem. A significant contribution to the development of this topic is made by M. Aaberg [1], who analyzes the practice of virtual teaching of string instruments during the COVID-19 pandemic, focusing on challenges of communication and student motivation in remote formats. Valuable insights are also found in the systematic review by E. Concina [2], which examines the characteristics of effective music teachers and modern pedagogical approaches that directly affect children's engagement in the learning process. R. Crawford [3] emphasizes the need to rethink music education pedagogy in the 21st century, particularly in the context of blended learning that integrates online and offline formats while offering new tools for sustaining students' attention. J. Goffi-Fynn [4] highlights the use of student-centered strategies in music teaching, which enhance learners' activity and independence. The study by S. Holmes and S. Hallam [5] demonstrates the interdisciplinary effects of music education, showing how music lessons can influence cognitive processes and the development of skills in mathematics, which is also significant for sustaining attention in online learning. Special attention should be given to the ISTE report [6], which evaluates the effectiveness of the digital music program Quaver that integrates gaming and interactive technologies to increase children's engagement. In the publication by L. Lee and Y.-Y. Liu [7], the role of multimodal technologies in early music education is emphasized, as they activate multiple perception channels and stimulate children's involvement. The research of M. Løkke Jakobsen, D. Hebert, and R. Ørngreen [8] explores the specifics of synchronous online teaching of instrumental music in an intercultural context, which is crucial in a globalized educational environment. A. Martínez [9] analyzes the benefits and challenges of music lessons via videoconference, highlighting technical and psychological barriers to students' attention. Z. Özer and R. Demirbatır [10] investigate STEAM-oriented digital approaches that combine music with other disciplines and stimulate creativity. Finally, K. Smolarczyk, L. Birnbaum, A. Christ, and S. Kröner [11] provide an extensive review of studies on children's and adolescents' engagement in music, emphasizing the potential of digital tools for increasing motivation.

Expert literature was also used, particularly modern online publications from educational portals and resources that discuss the implementation of digital technologies in music education and innovative approaches to working with children in online classrooms.

Therefore, despite a sufficient body of literature on this topic, there remains a lack of systematized material that would cover different aspects of children's online music education. For this reason, various methods of scientific inquiry were applied to analyze, categorize, and systematize existing information and present it in the context of the studied issue.

Methodology and Methods

The methodological basis of the article is the combination of systemic and competence-based approaches, which makes it possible to consider distance music education as an integration of pedagogical, communicative, and technological components. To achieve the aim, the following methods were applied: analysis and generalization of academic literature as well as systematization and interpretation of research findings on students' motivation and involvement. The use of empirical works by both foreign and domestic authors made it possible to identify key factors of effectiveness in distance music education and to formulate practical recommendations for its implementation.

The purpose of the article is to identify the specific features of organizing distance music education with the use of innovative technologies that enhance students' attention and involvement. The objectives of the study are as follows: to characterize the specifics of models and stages of organizing distance music education; to analyze the potential of modern digital technologies and their influence on the development of students' motivation and creativity; to justify the importance of pedagogical competence and adaptability of the teacher as a key factor of success in distance music education.

Research Results

The COVID-19 pandemic became a powerful catalyst for the digitalization of the educational process, particularly in the field of music education. Under quarantine restrictions, educational institutions were forced to switch fully or partially to distance learning, which raised the issue of using digital technologies in teaching. This process was especially significant for music education institutions, where learning has traditionally been based on direct interaction between teacher and student. Teachers of string instruments adapted to the new conditions by using video conferencing platforms, specialized audio and video devices, as well as digital tools for demonstrating and analyzing students' performance [1]. As noted by A. Martínez, both students and teachers emphasized the important advantages of this learning format: increased accessibility of the educational process, convenience in scheduling, and opportunities for international collaboration [9]. At the same time, organizing the learning process in a distance format required new approaches from teachers: more extensive lesson planning, preparation of educational audio and video materials, and the use of transformational pedagogy. In this context, the emphasis shifted not only to assessment but primarily to student development and learning, which demanded teacher flexibility and integration of digital resources into pedagogical practice [9].

The organization of distance music education is based on two main models: synchronous and asynchronous.

Synchronous model. Synchronous learning replicates a real lesson in real time. The teacher and student are simultaneously "in the same virtual space" through online tools. This format provides immediate feedback, correction of playing technique, and joint performance of exercises. The use of video conferencing platforms makes the distance process as close as possible to a traditional one-on-one lesson.

Asynchronous model. Asynchronous learning involves delayed interaction between teacher and student. The student gains access to online lessons, learning materials, and instructional videos, after which they complete assignments independently and send recordings of their playing. The teacher reviews the material at a convenient time and provides feedback and recommendations. This model is more flexible in terms of time but less effective for immediate error correction in performance.

R. Crawford emphasizes that in the 21st century teachers must think beyond the boundaries of their discipline: they should integrate technology into pedagogy and foster critical thinking, creativity, and active communicative interaction among students [3].

The communication process in distance music education has a multi-level structure that combines pedagogical, interpersonal, and technical factors. Its effectiveness depends on three consecutive stages.

The first stage involves establishing rapport between teacher and student. In an online setting, the lack of physical presence is compensated for by high-quality technical support, which requires prior setup of the studio for synchronous sound transmission [4]. An important condition is reaching an agreement on the use of specific platforms (Zoom, Microsoft Teams, Google Meet, or specialized music apps), scheduling, interaction rules, and lesson structure that defines time for exercises, analysis, and discussion.

The second stage focuses on maintaining dialogue and adopting a culturally sensitive approach. Synchronous online learning of instrumental music fosters active interaction, which becomes more effective when teachers consider cultural differences in learning styles, such as varying levels of autonomy, expectations of the teacher's role, or ways of presenting material. Interaction includes not only the exchange of instructions but also the transmission of emotions through intonation, facial expressions, nonverbal signals, and eye contact, which creates a sense of presence and increases student engagement [8].

The third stage emphasizes technical support for quality communication. For clear and uninterrupted interaction, proper room acoustics, high-quality microphones, headphones or speakers, and stable internet connectivity are required. The features of modern video conferencing platforms also play an important role, including noise reduction, automatic volume control, and frequency equalization, which improve speech clarity and the quality of musical signals. The technical quality of sound directly affects the perception of instructions and the student's response, making it a decisive factor in the effectiveness of communication in distance music education [9].

The effectiveness of distance learning often depends on the motivation of both students and teachers. Several studies have examined different approaches to fostering motivation in distance learning. Effective motivation of children in distance learning is based on the principle of intrinsic interest. As Goffi-Fynn (2024) notes, students are more likely to remain engaged when they feel responsible for their own learning, are given opportunities to exercise autonomy, and take part in co-creation. Achieving such intrinsic interest requires ensuring several important aspects: first, freedom of choice, and second, reduced academic pressure.

Freedom of choice in music education relates to allowing children to choose their learning pace, co-create musical fragments, or independently select repertoire, all of which significantly enhance intrinsic motivation. Teachers should not only provide positive reinforcement but also foster self-regulation skills in children, which sustains long-term engagement in the learning process [4].

Modern technologies make it possible to create multisensory and interactive learning environments that strengthen children's motivation. The study by L. Lee and Y.-Y. Liu proposes the Holistic Music Educational Approach for Young Children (HMEAYC), which integrates music with movement, play, stories, and multimedia elements. This model actively employs digital tools such as interactive music systems, intelligent assessment tools, and specially equipped multimodal classrooms. As a result, children can not only listen or sing but also interact with music through movement, touch, and visual imagery. This deepens their interest and allows them to immerse themselves in the learning process while preserving their natural need for play and creativity [7].

Thirdly, STEAM-oriented digital platforms and gaming applications create new opportunities for student engagement. Z. Özer and R. Demirbatır emphasize that digital music

games, online orchestras, and educational apps not only expand children's interest in music but also foster interdisciplinary competencies. For example, integrating music with programming or mathematical concepts helps maintain attention and develop creativity. Applications such as Chrome Music Lab, Jamulus, or Soundtrap simultaneously stimulate musical and technological literacy. As a result, an interactive learning environment is created where the child acts as an active participant rather than a passive listener [10].

Table 1. Factors of motivation, effective interaction, and student engagement in learning music disciplines

Factor	Characteristic	Examples / Technologies
Intrinsic motivation and autonomy	Developing responsibility for learning, fostering self-regulation, providing the right to choose in the learning process	Repertoire selection, independent choice of learning pace, joint improvisation
Multimodal environment	Integration of music with movement, play, and stories; use of sensory channels for immersive learning	Holistic Music Educational Approach for Young Children (HMEAYC), interactive music systems, multimedia classrooms
Interactive digital tools	Use of STEAM-oriented platforms, gaming applications, and online orchestras to enhance interest and interdisciplinary skills	Jamulus, Soundtrap, Chrome Music Lab, digital music games and apps

Note: systematized by the author based on sources [4; 7; 10].

Thus, children's engagement in distance music education relies on three key principles: developing intrinsic motivation through autonomy and co-creation, creating a multimodal environment with the help of digital technologies, and applying interactive STEAM-based approaches. Innovative technologies play a particularly important role in organizing an engaging learning atmosphere for students. Today, there are quite a number of such tools, each with its own specific approach. For example, Quaver Music combines a fully digital learning environment with interactive technologies that provide a comprehensive approach to developing musical skills. The program offers more than 300 lessons, games, songs, and projects that support not only the acquisition of theoretical knowledge but also creative activities such as composing, remixing, and collaborative projects. Digital tools like SongBrush and QGrooves Plus allow students to receive instant feedback, which enhances motivation and develops self-correction skills. At the same time, project-based learning fosters practical skills, the ability to work with open-ended tasks, and to adapt results for different audiences [6].

Another innovation is the integration of digital pedagogy with the principles of inclusivity and cultural diversity. The platform supports multilingual resources (Spanish, French, Creole), provides adaptive videos with subtitles, and covers diverse musical cultures from around the world. Combined with cloud access, lesson personalization, built-in assessments, and progress tracking tools, this creates a flexible and technologically enriched educational ecosystem. In this way, distance music education moves beyond traditional teaching, combining individualized learning paths, digital tools, and intercultural interaction to ensure deeper student immersion in the musical environment [6].

Table 2. STEAM-oriented digital music educational technologies

Technology / Platform	Key features	Educational outcomes
Math, Science and Music (Herbie	Online resource with interactive games and learning modules	Development of creative thinking, integration of STEM skills through

Hancock Institute)	combining music with math and science	music
Chrome Music Lab (Google)	14 interactive experiments (Song Maker, Rhythm, Spectrogram, Kandinsky, etc.)	Exploration of rhythm, proportion, and harmony; development of musical imagination and mathematical skills
Scratch Music (MIT Media Lab)	Visual programming for creating animations, games, and music	Development of coding skills, creativity, collaboration; opportunity to create original music projects
Groove Pizza	Programming rhythmic patterns on a circular grid with visualization	Learning rhythm through geometry, spatial thinking, multisensory learning
EarSketch	Music creation through Python and JavaScript; sound loop library	Formation of IT skills, development of creativity, working in an authentic music environment
iMuSciCA (EU Project)	Web platform with tools for 3D instrument design, sound modeling, and interactive exercises	Integration of physics, mathematics, and music; development of research and creative skills
UPISketch	Software for graphic construction of sound compositions	Combination of mathematics and music, ease of use for children, development of creative thinking

Another example of an innovative approach in music education is the “DigiMusic” methodology developed by Adelina Havryliuk. It represents a unique technological innovation in distance music education that addresses a key challenge of modern digital learning – the rapid loss of children’s attention in the online environment. Unlike traditional approaches that merely transfer offline lessons into video conferencing format, this system is based on the concept of a fundamental difference between online and offline learning. The author demonstrated that each format requires its own scenarios, tools, and methodological techniques. For this reason, “DigiMusic” offers an adapted set of exercises, interactive tasks, and technological tools that take into account the specifics of online perception, making learning more effective and engaging for children.

One of the key elements of the methodology is the creation of a “presence effect,” which compensates for the lack of physical contact between student and teacher. Lessons turn into interactive events thanks to game mechanics, visual and audio stimuli, AR animations, and musical quests. This approach not only sustains students’ interest but also builds an emotional connection, which is critically important for the effectiveness of music education. AR/VR tools bring musical images to life and make the learning process as close as possible to live performance.

A unique feature of “DigiMusic” is also the integration of AI-based attention trackers that monitor a child’s concentration level in real time. The system detects diverted gaze, loss of activity, or other signs of declining focus and suggests that the teacher adjust the lesson pace, add a game task, or switch to an interactive exercise. This creates a new level of adaptability in the learning process, where teaching is instantly adjusted according to the student’s state. Such an approach significantly increases lesson productivity and is especially effective when working with children with special educational needs, particularly ADHD or autism.

Another distinctive dimension of the methodology is the integration of music education with STEAM approaches. The effectiveness of combining music education with STEAM is described in detail in the study by S. Holmes and S. Hallam (2017), which showed that active engagement in musical activities can influence not only the development of musical skills but also other cognitive abilities, particularly spatio-temporal thinking [5]. During lessons, the child not only learns musical material but also simultaneously develops cognitive and logical skills: mathematical tasks are integrated into rhythmic exercises, while creativity and critical thinking are cultivated through musical games and improvisation. Thus, “DigiMusic” goes beyond traditional music pedagogy by offering a comprehensive system of development, structured into factors presented in Table 3.

Table 3. Unique elements of the “DigiMusic” methodology

Element	Characteristic	Educational effect
Differentiation of online/offline approaches	The author proved that digital learning requires specific tools and scenarios adapted to the online environment	Increased lesson effectiveness, avoidance of mechanical “transfer” of offline lessons
Presence effect	Use of game mechanics, AR animations, musical quests, visual and audio stimuli	Creation of emotional engagement, increased interest and motivation of children
AI attention trackers	The system monitors the student’s level of concentration (gaze, activity) and suggests adaptive changes during the lesson	Sustaining the child’s focus for longer periods, especially in children with ADHD
Gamification	Format of “music battles,” system of points, levels, and rewards	Increased motivation through game dynamics and competition
STEAM integration	Combination of musical tasks with logical, mathematical, and cognitive exercises	Development of critical thinking, memory, and creativity alongside musical skills
Individualization and inclusion	Adaptation of exercises to the level and developmental needs of the child (including autism, ADHD)	Expansion of access to music education, effective work with diverse groups of students
Measurability of results	Automatic recording of concentration time and engagement	Possibility to adjust the lesson in real time, increased learning productivity

An important factor in organizing effective distance learning is the professional skills of the teacher in conducting lessons, since even the most advanced technical tools cannot be effective without skillful use. The teacher must not only master video conferencing tools and digital platforms but also organize the learning space in a way that ensures maximum comfort and productivity for the student. In distance music education, teachers’ digital competencies are among the key factors determining the effectiveness of the learning process. As E. Concina emphasizes, a modern music educator should not only possess professional knowledge and teaching methodology but also be able to adapt traditional music-pedagogical approaches to the digital environment. This means the teacher needs to master the use of interactive platforms, digital audio and video tools, and be familiar with the potential of multimedia

technologies for creating multichannel learning environments. A successful teacher also demonstrates the ability to engage in pedagogical reflection: analyzing personal experience, evaluating the effectiveness of applied tools, and making adjustments based on individual student needs [2].

Conclusions

The organization of distance music education has revealed a number of characteristics that distinguish it from traditional forms of learning. First, two main models are applied in this format: synchronous, which replicates a real-time lesson with the possibility of immediate feedback, and asynchronous, which provides flexibility and autonomy through the use of video recordings and learning materials. Second, the effectiveness of communication in distance music education depends on three consecutive stages: building rapport between teacher and student, maintaining dialogue with sensitivity to cultural differences, and ensuring high-quality technical support. All these components form the foundation of a productive and effective educational process.

Innovative digital technologies play a significant role in enhancing student engagement. The use of multimodal platforms, interactive music systems, digital games, and STEAM-oriented educational tools not only helps sustain attention but also fosters creativity, critical thinking, and interdisciplinary competencies. Modern platforms such as Quaver Music, Chrome Music Lab, EarSketch, and Jamulus create an interactive environment that connects music with programming, mathematics, or visual arts. This enables the child to act as an active participant in the process, combining play, creativity, and learning, making lessons more engaging and effective.

Special attention should be given to the "DigiMusic" methodology, which offers a fundamentally new approach to organizing distance music education. It takes into account the specifics of online perception, uses AR/VR tools, game mechanics, and AI-based attention trackers, thereby creating an effect of presence and emotional involvement for the student. However, even the most innovative technologies cannot replace the teacher, who acts as the mediator between digital resources and the student's personal development. Competence, flexibility, and the ability to reflect pedagogically determine the success of distance learning, making the teacher the key figure in shaping an effective music education environment.

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