

Original article

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The Art of Piano Performance and Distance Technologies in the Training of Students of the People's Republic of China as a Problem of Contemporary Art Studies

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Abstract. Distance learning technologies that enable the management of music university students' learning processes by using the internet, videoconferencing, and LMS platforms are being actively introduced worldwide. This issue is particularly significant in the context of teaching students in the People's Republic of China, who have unique culturally conditioned ways of perceiving and mastering musical material. The authors present the results of a study on the methodology to embed distance learning technologies into training piano students in China, based on the active use of contemporary music and computer technologies in teaching stage piano performance. The authors examine specialized software introduced and used in Chinese piano classrooms. The paper discusses methodological approaches to organizing musical and creative events by using mobile applications, video conferencing systems, instant messengers, etc. The authors describe in detail their own methodology including: 1) synchronous lessons via video conferencing platforms using multichannel sound and a viewing angle of the keyboard and the performer's hands; 2) asynchronous work with recorded video fragments for a detailed analysis of the performance; 3) the use of specialized software (e.g., PiaScore, Simply Piano) to develop sight-reading skills; 4) elements of music information systems that ensure an effective educational process in a distance learning format; 5) the description of contemporary music and computer technologies that ensure a high-quality and effective professionally oriented educational process. The authors analyse problems that teachers may encounter when introducing innovative technologies and give recommendations for solving them. The authors conclude that it is vital to develop a reliable IT support system for music universities to overcome the significant digital divide between students and teachers. The paper may be useful to musicologists and art historians working on the development of a transdisciplinary approach to the study of musical phenomena, as well as to educators working in distance and blended learning contexts.

Keywords: art history, piano performance, piano pedagogy, distance learning technologies, People's Republic of China, Chinese piano students, music computer technologies (MCT), digitalization of education

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Искусство исполнительского мастерства на фортепиано и дистанционные технологии в процессе подготовки студентов китайской народной республики как проблема современного искусствознания

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Резюме. Дистанционные образовательные технологии, которые позволяют осуществлять управление процессом обучения студентов музыкальных вузов, используя Интернет, видеосвязь, LMS-платформ, активно внедряются во всём мире. Особую значимость эта проблема приобретает в контексте обучения студентов Китайской Народной Республики, для которых характерны свои культурно-обусловленные особенности восприятия и освоения музыкального материала. Авторы статьи излагают результаты исследования по разработке методологии включения дистанционных технологий в процесс подготовки студентов-пианистов КНР, основанной на применении современных музыкально-компьютерных технологий, активно используемых в обучении искусству исполнительского мастерства на фортепиано. Рассмотрен ряд специализированных программ, представленных и применяемых в китайской аудитории; рассмотрены методические подходы к организации музыкально-творческих мероприятий с использованием мобильных приложений, систем видео-конференц-связи, мессенджеров и др. Подробно раскрывается авторская методика, включающая: 1) синхронные занятия через платформы видеосвязи с использованием многоканального звука и углом обзора клавиатуры и рук исполнителя; 2) асинхронную работу с записанными видеофрагментами для детального анализа исполнения; 3) использование специализированного программного обеспечения (например, *PiaScore*, *Simply Piano*) для развития навыков чтения с листа; 4) элементы музыкально-информационных систем, обеспечивающие эффективный образовательный процесс обучения в дистанционном формате; 5) описание современных музыкально-компьютерных технологий, обеспечивающих качественный и эффективный профессионально-направленный образовательный процесс. Проанализированы проблемы, с которыми могут столкнуться преподаватели при внедрении инновационных технологий, и рекомендации, способствующие их решению. Был сделан вывод о необходимости создания надежной системы IT-поддержки музыкальных вузов для преодоления значимого по уровню цифрового разрыва между студентами и преподавателями. Материалы статьи могут быть полезны музыковедам и искусствоведам, занимающимся разработкой проблематики становления и развития трансдисциплинарного подхода к изучению музыкальных явлений, а также преподавателям, работающим в системе дистанционного и смешанного образования.

Ключевые слова: искусствознание, искусство исполнительского мастерства на фортепиано, фортепианная педагогика, дистанционные технологии, Китайская Народная Республика, китайские студенты-пианисты, музыкально-компьютерные технологии (МКТ), цифровизация образования

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Introduction

The current stage of societal development is characterized by the penetration of digital technologies into all fields of human activity. This is reflected in various areas of musical art and contemporary music education. The traditional model, which emphasizes individualized learning, is facing global challenges. These include the growing demand for access to high quality education, as well as the need to meet the cognitive patterns and expectations of Generation Z, who have developed a culture of clip-based thinking. In such circumstances, a redesign of the educational process is long overdue. The teaching process should be divided into synchronous (online classes) and asynchronous (independent work with recorded materials and applications), which requires the creation of new workflows. The global transition to distance learning formats, necessitated by contemporary challenges and, consequently, the specific nature of performance art training, allows, for example, for various types of testing, automating routine processes and tasks, promptly collecting analytical data, and much more. It is especially noteworthy that

for many Chinese students, raised in the tradition of hieroglyphic writing, visual information is often primary. This circumstance, in some cases, makes technologies such as detailed multi-camera filming or visualization of keystroke force in VR not just convenient but crucial for understanding new information.

Research Summary

Many researchers are studying the functionality of using contemporary information technologies in music education: instant messengers (O. N. Manapova, M. S. Podin (Manapova, Podin, 2021), E. A. Nazarbayev, Zh. K. Kulmagambetova (Nazarbayev, Kulmagambetova, 2025), I. G. Aktamov, O. V. Sambueva (Aktamov, Sambueva, 2021)), mobile applications (S. S. Arbuzov, A. A. Konovalov (Arbuzov, Konovalov, 2022), M. V. Pereverzeva (Pereverzeva, 2023)), virtual reality (M. M. Volynov, A. A. Kitov, B. S. Goryachkin (Volynov et al., 2020)), web tools (O. M. Abramova (Abramova, 2017), I. B. Gorbunova, O. L. Yasinskaya (Gorbunova et al., 2020), etc). Various difficulties associated with their use cause concerns in such musicologists and researchers as D. S. Khurmatullina (Khurmatullina, 2021), B. R. Mandel (Mandel, 2013),

V. A. Chistousov (Chistousov, 2015), N. V. Kolesnik and S. I. Boyarkin (Kolesnik, Boyarkina, 2024). Works of a number of Russian and foreign researchers ((Gorbunova, 2020; Gorbunova et al., 2020; Zhongsheng, 2025; Zhang, 2025), etc reveal problems of using contemporary distance technologies in the system of music education, as well as issues related to innovative music-related technological solutions that can be achieved using transdisciplinary and meta-subject approaches that illustrate the possibilities of contemporary music-computer technologies (MCT) used in various fields of musicology and music pedagogy. These include the development of digital musical instruments in the compositional practice and concert performance of a contemporary performing musician. The use of artificial intelligence technologies in music and music education (Baidoo, Bondzi, 2025; Ding, 2025; Abramova, 2017; Li, 2025; Mygdanis, 2025; Tatlılioğlu, 2024; Tong, 2025; Zhu, 2025) has been paid attention to by many researchers: teaching vocal art (Li, Liang, 2025); a study of innovative strategies for higher music education in the perspective of new media (Liu Lilin (Liu, 2025)); a study of the readiness for online learning of students enrolled in distance learning programs at universities in Guangzhou (Jin Yiqiang, Su Hong (Jin, Su, 2025)); a study of strategies for creating and promoting online courses using

the example of organizing distance learning at one university (in the city of Harbin; see the work of Zhao Jigang, Li Zhenyu (Zhao, Li, 2025)); a study of an innovative model of group piano lessons in an online environment using the example of piano lessons (Zhang Lijuan (Zhang, 2025)); a study of the methods of teaching online courses in piano improvised accompaniment in colleges and universities in China and Russia (Song Shuai (Song, 2021)); the use of various distance learning systems (LMS platforms) in music education (Bhuiyan M. O. (Bhuiyan, 2025); Craig B., Xu J. L. (Craig, Xu, 2024); Dominguez-Figaredo D., Gil-Jaurena I. (Domínguez-Figaredo, Gil-Jaurena, 2024), including Moodle (Si-Mohammed B., Bahlul A. (Si-Mohammed, Bahloul, 2025)); as well as the use of virtual reality systems (VR) in music and music education (Li, Liang, 2025; Mygdanis, 2025; Que, Hu, 2025; Tong, 2025; Volynov et al., 2020), including the development of specialized plugins and virtual musical instruments¹³.

The successful and fruitful collaboration of musicologists, educational researchers and specialists IT technologies of the scientific and methodological laboratory "Music and Computer Technologies" of the A. I. Herzen State Pedagogical University of Russia, significantly contributed to effective solutions to the aforementioned problems. They devised methods to develop specific

¹³ See, e.g.: Available at: <https://www.zgmzyq.cn/en/information/the-origin-of-sheng-is-legendary-the-music-it-plays-is-called-feng-ming.html> (accessed on: 19 December 2025); Available at: <https://www.zgmzyq.cn/en/operating-guide/the-reform-of-shengyin-let-this-ancient-musical->

[instrument-have-a-new-sound-in-modern-bands.html](https://www.kvraudio.com/product/individual-chinese-xun-by-kong-audio) (accessed on: 19 December 2025); Available at: <https://www.kvraudio.com/product/individual-chinese-xun-by-kong-audio> (accessed on: 18 May 25).

educational models to enable Chinese music students to study the art of performance using distance learning technologies, which is clearly reflected in the works written on innovative methodological developments, covering in detail the substantive components, main directions, and key aspects of the use of relevant music education systems¹⁴.

Methods

The following methods were used in the study:

- analysis of musicological, psychological, pedagogical, and methodological literature on the research problem,
- comparative analysis of traditional and distance learning forms in music pedagogy, study and synthesis of domestic and international experience in the application of distance technologies in music education,
- systematization of approaches to studying the characteristics of piano performance perception by Chinese music students in the context of digital transformation and the active functioning of a high-tech creative music educational environment,
- systematization of methodological approaches to teaching Chinese students in the context of the digital transformation of education,
- musical and scientific research methods conditioned by development of Music Computer Technologies (MCT) as a contemporary interdisciplinary field of

knowledge studied by musicologists and art historians, as well as specialists involved in the development of a transdisciplinary approach to the study of musical phenomena.

The following methods were used to write this paper: the analysis of psychological, pedagogical, and musicological literature on the research subject, the comparative analysis of traditional and distance learning formats, the study and synthesis of national and international experience in applying distance learning technologies to teaching piano performance, and the systematization of approaches to studying the characteristics of piano performance perception by Chinese music students in the context of the digital transformation of education.

Results and Discussion

The Use of Messengers in Learning

The advent of distance learning technologies resulted in a colossal shift in performance training and music education in general. These technologies include, for example, messengers with expanded functionality, specifically designed for organizing group outreach Interaction in communities with large numbers of participants. Primarily, they facilitate the organization of online lectures and seminars due to the option of screen sharing for presentations. According to O. N. Manapova and M. S. Podin, instructors can organize separate chats for each academic subject, where lecture

¹⁴ Available at: <https://reverb.com/en-fi/item/83244925-three-body-technology-tear-of-land-chinese-xun-virtual-instrument-download> (accessed on: 18 May 2025);

Available at: https://cdn.roland.com/assets/media/pdf/D-50_OM.pdf (accessed on: 19 December 2025).

material is discussed (Manapova, Podin, 2021, 56). Within these chats, it is easy to assign individuals responsible for specific tasks and conduct interactive surveys to gather opinions on the format of a lesson quickly or select the topic for the next project. The practice of setting up closed groups deserves special attention; this is ideal for publishing official announcements.

Another fundamental function of any messenger used in an educational context is to ensure the unimpeded flow of information. This is not limited to sending private messages; This involves creating a space (an educational information environment) where teachers can promptly publish announcements, share current schedule changes, remind students about upcoming project deadlines and exam requirements, and distribute additional educational materials such as links to research papers, lecture recordings, or useful online resources. Students, in turn, can ask clarifying questions on complex topics, request clarification on assignments, and receive prompt responses not only from the teacher but also from their more knowledgeable classmates.

The most prominent example of such a messenger is Telegram. The platform allows for the creation of group chats for up to 200,000 people, making it ideal for large educational institutions. The file transfer limit is 2 GB, which significantly exceeds competitors' capabilities. This eliminates the need for third-party file-sharing services. It also allows for the use of both programs for various educational tasks, such as sending notifications about

homework deadlines or conducting topic-specific surveys on the material covered. As noted by E. A. Nazarbayev and Zh. K. Kulmagambetova, the necessary information can be found using the instant search system through message history (Nazarbayev, Kulmagambetova, 2025, 30). Furthermore, a built-in translator eliminates language barriers.

Similar functions are available on the Russian social network *Vkontakte* (VK), which has an extensive library of video and audio materials, and *TamTam* (support for bots and the ability to organize group communications among up to 100 participants simultaneously).

However, according to I. G. Aktamov and O. V. Sambuev, *WeChat* and *QQ* are most suitable for Chinese audiences, as they offer specific functions lacking in their Western analogies: the option to create mini-forums within chats, built-in file storage with large memory capacity supporting long-term storage of materials, and integration with payment systems for organizing group book purchases (Aktamov, Sambueva, 2021, 170).

Digitalization of Music Education through Mobile Apps

Mobile apps are also actively used in musicological research. The also transform the music education process by digitizing it. According to S. S. Arbuzov and A. A. Konovalov, mobile apps used in teaching performance skills on various musical instruments can be roughly classified into several categories, each addressing specific pedagogical challenges (Arbuzov, Konovalov, 2022, 63).

The first and most popular category is software for teaching specific musical

instruments, such as *Yousician*, *Simply Piano*, *Flowkey*, and *Fret Trainer*. These programs utilize sound recognition technologies via the device's built-in microphone or MIDI connection to analyze the student's performance in real time, providing instant feedback on note accuracy, sound quality, and other key parameters. They often take the form of interactive courses with step-by-step lessons, progressing from basic exercises to the creation of complex musical compositions or musical creative projects, including video segments. They may also incorporate elements of gamification to support students' motivation to acquire knowledge.

The second fundamental trend involves the use of training apps for developing specific skills, in particular, pitch (Pereverzeva, 2023, 92). This includes multifunctional mobile apps such as *Perfect Ear*, *Complete Rhythm*, and *Tenuto*, as well as simpler platforms such as *Note Trainer* and *Rhythm Cat*, which offer a variety of exercises for identifying intervals, scales, rhythmic patterns, sight-reading, etc. The main advantage of these apps is their ability to transform routine learning into what is often seen as a boring task by many students into an engaging process, thus significantly improving the effectiveness of memorization.

A third significant area is applications that act as virtual musical instruments: GarageBand, FL Studio Mobile, Korg Gadget, BandLab, and others. As D. S. Khurmatullina notes, these can be used to learn the basics of arrangement, as well as experiment with different sounds and styles, without investing in expensive

physical equipment (Khurmatullina, 2021, 55).

The fourth area includes reference and library programs. These include digital tab collections (Ultimate Guitar, Songsterr), encyclopedias, and chord identifiers based on photographs or other graphic images, as well as sheet music archives and online libraries.

Applying Virtual Reality in Educational Practice

Virtual reality (VR) offers solutions that would be difficult or *impossible to implement in the real world*, as noted in the scientific works of M. M. Volynov, A. A. Kitov, and B. S. Goryachkin (Volynov et al., 2020, 802). For example, a VR demonstration of a teacher demonstrating correct hand positioning on the piano from any angle, including from the inside, in slow motion, while simultaneously visualizing the force exerted on the keys. The system can also project musical notation directly into the performer's field of view, eliminating the need to look at the music stand and lose contact with the instrument. The ability to record one's performance and then analyze it not only aurally but also visually, observing the movements of one's avatar from the outside, provides unprecedented opportunities for self-reflection and independent work. This approach allows for the simulation of even less-than-ideal performance conditions, such as a noisy audience or technical glitches, preparing the musician for the unpredictability of real concert situations. At the same time, the physiological manifestations of stress (tremors, increased heart rate) remain authentic, ensuring a highly reliable training experience. All this occurs in

a safe, controlled environment where errors can be analysed (Flew et al., 2025; Schilling et al., 2024; Schweighart et al., 2024; Si-Mohammed, Bahloul, 2025; Singh et al., 2025; Sun et al., 2024). For instruments such as large harps, the issue of portability is solved: an expensive and bulky instrument is always available in the virtual space in any number of copies, which is critical for educational institutions with limited budgets.

Distance learning also frequently utilizes various videoconferencing systems, such as Zoom, Skype, and Microsoft Teams, which are designed to facilitate continuous, real-time interactive communication between participants in the educational process (Abramova, 2017, 35). Each of these systems offers a unique set of features. In particular, the Zoom platform has become widespread in the academic environment due to its intuitive interface, stable operation even with low internet connection speeds, and an extensive set of tools for interactive learning. Its key features include virtual group collaboration rooms, screen annotation tools, and advanced moderation options for managing participant access rights to screen sharing, microphones, and video cameras. The system supports automatic session recording with the option to save them both to cloud storage and local devices, and provides detailed analytics on attendance and participant activity, allowing for objective assessment of student engagement.

Microsoft Teams, an integral part of the Microsoft 365 ecosystem, offers deep integration with office applications (Word,

Excel, PowerPoint, OneNote, OneDrive), creating a comprehensive collaborative learning environment. Instructors can create specialized teams for each course, organize themed channels within them, share files, co-edit documents in real time, and use a built-in scheduler to organize and plan collaborative creative activities. This program differs from similar programs in its advanced accessibility features, including automatic subtitles and real-time speech transcription, which contributes to a more inclusive educational process for students with various hearing and visual impairments (see for more details (Gorbunova et al., 2020)).

Corporate educational platforms—specialized software for organizing distance learning systems (LMS)—represent a different approach to organizing learning. For example, the *Moodle LMS* adapts to the individual requirements of educational organizations. This is achieved through the system's modular architecture and support for numerous extensions. In the context of consulting activities, there are tools for organizing thematic discussions on forums (in synchronous and asynchronous modes). *Blackboard*, in turn, offers ways to monitor student academic performance. Both platforms support mobile learning through official apps, providing access to educational materials from smartphones.

However, as B. R. Mandel notes, one of the key mistakes that occurs at the initial stage of digital transformation of the educational process is the attempt to simultaneously implement a wide range of technological solutions (Mandel, 2013, 4). This approach often leads to cognitive

overload for teachers, who are forced to master dozens of unfamiliar platforms in a short period of time. As a result, classes turn into demonstrations of the software's technical capabilities. Students (and teachers) are forced to deal with a variety of digital tools, each requiring separate registration, authorization, and memorization of a unique algorithm of actions, which distracts from the essence of the material being studied and causes digital fatigue.

A Strategy for the Phased Implementation of Innovative Technologies in the Training of Chinese Piano Students

In these circumstances, it is recommended to pursue a strategy for the phased implementation of innovative technologies in the classroom. Teachers should begin by identifying one pedagogical task that is most relevant to their subject. These include, for example, tasks related to the need to improve clarity when explaining complex material, developing teamwork skills, or automating routine knowledge assessment. Then, it is advisable to select a specific application that will achieve the desired result. These could include interactive surveys created using applications such as Socrative and Mentimeter, which test the knowledge acquired by music students throughout the semester. It is crucial to collect empirical data on the effectiveness of the chosen tool through reflective discussions and questionnaires that show the degree of student engagement in the learning process. To address the challenges posed by the use of distance learning technologies in teaching, it is necessary to

develop an educational activity plan that includes regular participation in specialized webinars on overviews of specific services as well as on methods of their pedagogical application. Selecting events organized by recognized educational platforms (e.g., Lectorium, Stepik, Coursera) is crucial, and this should be reflected in the student's technology map, as noted in the scientific works of V. A. Chistousov (Chistousov, 2015, 51).

It is also recommended to develop online communities located in specialized blogs on VKontakte and Telegram; there teachers share ready-made methodological developments, discuss emerging difficulties, and receive advisory support from colleagues.

Another problem lies in the excessive workload of teachers in the distance learning process. According to N. V. Kolesnik and S. I. Boyarkina, "they spend 43 hours a week on work tasks, which is 5 hours more than usual, and only 24 hours of work time are spent directly on teaching (the remaining time is spent on other tasks, such as planning and preparing for classes, grading assignments, working with colleagues, and professional development)" (Kolesnik, Boyarkina, 2024, 38).

To solve this problem, some tasks should be delegated. The first step is to identify students who are proficient in digital technologies used to solve a range of research problems in music science, study various musical phenomena, and use in contemporary music education. This should be done tactfully, encouraging students' active participation. A proposal was also made to establish a team

responsible for specific areas: for example, for working in Ableton Live (setup, basic technological solutions), for making presentations in Canva or Figma, and for various levels of interaction in the general Telegram/Discord chat (responsibility for the content of messages, adherence to online etiquette, etc.). This redistribution of tasks frees up the teacher's time to focus on individual work with students' creative needs. Meanwhile, technical issues are addressed by the students themselves.

A Methodology for Teaching Performance to Chinese Pianist Students Using Distance Learning

Based on the results of the analysis, a teaching method for Chinese pianist students can be proposed that consists of several components. Initially, we propose organizing synchronous lessons via videoconferencing platforms such as Zoom, with the mandatory use of a high-quality multi-channel audio transmission system (e.g., via external USB audio interfaces, condenser microphones, and closed-back headphones). We also suggest a specially developed multi-camera video surveillance system with at least three camera angles: a general view of the performer, a close-up of the keyboard with finger and hand positioning, and an additional side angle to monitor body positioning and pedal work. Detailed visualization of demonstration elements is particularly important for Chinese students, as many of them perceive information visually.

The second component of the methodology involves systematically organizing asynchronous work with pre-recorded video fragments of performances,

which are created both by the teacher (demonstration materials, study etudes, analysis of typical errors) and by the students themselves (recordings of homework assignments, rehearsals, and intermediate results of work on a musical piece). The analysis is based on the multi-level system: first, the student independently conducts a self-analysis of his/her recording using a special checklist, then the teacher provides his/her own opinion in a special video annotation program (e.g., Moises, Audacity), where comments are linked to specific bars.

The third component of the methodology involves the active use of specialized software aimed at developing specific professional skills. For example, the PiaScore app serves not only as an electronic music library but also as an interactive assistant with automatic page turning, the ability to annotate music text, synchronization with audio recordings and a metronome, and a built-in music notation recognition system via the device camera. While Simply Piano offers a gamified approach to mastering solfeggio and sight-reading through a system of gradually more complex exercises, interactive tasks, and instant feedback, it is especially important for Chinese students that the interface of these apps should be adapted to their native language and take into account the specific musical terminology adopted in the Chinese pedagogical tradition. The technological infrastructure of this method requires from students to have a minimum set of equipment: a digital piano or an acoustic piano with the ability to connect to a computer, a high-speed

internet connection of at least 50 Mbps for stable sound transmission, a multifunctional recording device (smartphone or camera with a resolution of at least 1080p), an external microphone and headphones, as well as specialized software for processing sound and video. Of great importance in the contemporary music education process in all its manifestations is the literacy and erudition of the teacher, his/her openness to the perception of new, breakthrough educational trends. On the one hand, they are determined by the development of digital educational technologies themselves, on the other hand, by new areas of research in the field of music science (such as cognitive musicology, transdisciplinary musicological research, mathematical research methods in musicology), as well as the identification of new approaches to the study of musical phenomena and their influence on the music education process (see, for example, in the work (Gorbunova, 2020)), which necessitates the development of new educational concepts, including distance music education systems and e-learning at all levels and in various educational institutions that carry out professional training of musicians.

Possibilities of Organizing Student Piano Performance Training Using Distance Learning Technologies

Our pedagogical research revealed significant variations in the piano proficiency level in music students at Chinese universities. Due to the massive expansion of university admissions, the piano was removed from the mandatory entrance exams for applicants

to creative arts courses. This has resulted in insufficient basic training for a significant portion of music students, who often focus on vocal training. This creates difficulties in teaching courses that lay the foundation for piano performance, forcing instructors to divide students into groups based on their level. Most music and pedagogical universities offer improvised accompaniment courses only in the second or third years, forming groups based on their major and minor. These courses are built on the basic levels of harmony, solfeggio, music theory, and piano instruction covered in the first two years of study. However, this study period is insufficient to master either piano technique or the practical aspects of harmony. As a result, students demonstrate weak skills in applying their knowledge in practice. Inadequate curricula and poor time management negatively affect the completion of practical assignments and, as a whole, the overall musical education of piano students in China.

The limited equipment at educational institutions presents another problem. Mass admission to creative universities has led to a shortage of teaching staff due to space and financial constraints. A lack of classroom space also reduces the effectiveness of instruction. As a result, many teachers are forced to resort to group lessons. In such circumstances, universities can optimally utilize distance learning technologies as a means of providing educational and methodological support to supplement and, where necessary, adjust the content of their curricula. Another problem is the quality of teaching materials

used in distance piano courses. These courses first appeared in Chinese conservatories in the 2010s. With the growing popularity of this program, various publications have been released. There are numerous textbooks, but their content is often duplicated, repeating previously published teaching methods and techniques for professional music disciplines, including arranging and composing music. For example, they overemphasize the theoretical aspects of harmony and texture without sufficient attention to practical exercises, or lack a consistent teaching system from simple to complex. This leads to confusion in mastering the course material. At the same time, distance learning technologies and e-learning methods continue to be actively used in music education; there is a dynamic development of their content, as well as an active search for scientifically based solutions (in musicological, pedagogical, and information technology aspects).

Associate Professor of the Piano Department He Yi released the album "Beethoven's Piano Sonatas" in 2020 and subsequently transferred exclusive distribution rights for its inclusion in distance music education systems using contemporary digital portals worldwide. During the 2020 pandemic, she actively participated in the development of online courses and recorded demonstration lessons on platforms such as Baijia Jiangdan and Future Orange Education. She organized charity broadcasts on Douyin and Bilibili, which received widespread acclaim from domestic and international educators. On June 17,

a remote piano teaching project was launched in collaboration with the Hamburg Conservatory of Music (Germany). Professors Christiane Behn and Matthias Weber conducted live lessons using Yamaha remote equipment, achieving a high level of engagement with the target audience. Vice Dean Yang Jiuhua and representatives from relevant departments also participated in the course. The progress and results of a pilot study managed to identify the specific features of the educational process for teaching piano performance to Chinese piano students using distance learning technologies. We developed a methodology for teaching piano performance using distance learning technologies for students in the People's Republic of China. We prepared the relevant teaching materials and, over a period of 2.5 years (from October 2023 to February 2026), conducted a pilot study—a multi-stage, multi-component, and multi-factorial pedagogical experiment (its ascertaining, predicting, and forming parts)—to identify the specific features of the educational process for teaching piano performance to Chinese piano students using distance learning technologies and e-learning. The formative part of the pedagogical experiment was conducted at Shanxi University (Jinzhong City, Shanxi Province, People's Republic of China) over the course of a year (two semesters in the 2024–2025 and 2025–2026 academic years). The choice of a specific higher education institution in China was dictated by the availability of a distance education department.

The total sample included 60 piano students aged 17–25, divided into two groups with identical academic performance indicators and proficiency in contemporary digital educational technologies and MCT.

During the ascertainment phase, an online survey was organized and administered among the formed groups. The multifunctional messenger WeChat was chosen as the primary technological platform for organizing and distributing the survey among the target audience. This choice was based on its widespread use throughout the People's Republic of China. I. G. Aktamov and O. V. Sambueva note that the key advantages of this social network include a high response rate, due to a familiar environment for respondents, the ability to answer questions promptly and remind them of deadlines directly, and the convenient collection of responses in a single system (Aktamov, Sambueva, 2021). A link to the questionnaire was distributed through chats connecting study participants and by sending it via private messages to potential respondents. Participants were given a specific time period to complete the survey, after which the form was closed. Beforehand, they received detailed written instructions explaining the survey's purpose, the rules for completing the questionnaire, and guarantees of confidentiality of their data.

This survey served several purposes. First, it allowed for the collection of additional qualitative and quantitative data on the participants in the pedagogical experiment. While the entrance exam objectively demonstrated their level of knowledge, the questionnaire provided

a deep understanding of their motivational sphere, which is necessary for the subsequent identification of hidden correlations. Secondly, the survey served as a pre-test.

The first question addressed the digital competencies of Chinese piano students. The results are shown in Figure 1.

The majority of respondents (45%; see Figure 1) indicated that they possess high digital skills, meaning they confidently master new specialized software, including MCT, and can solve most technical problems. Other students surveyed (30%) noted that they can use basic computer functions, but require external assistance for complex tasks.

The next question focused on the students' participation in online events (survey results are illustrated in Figure 2).

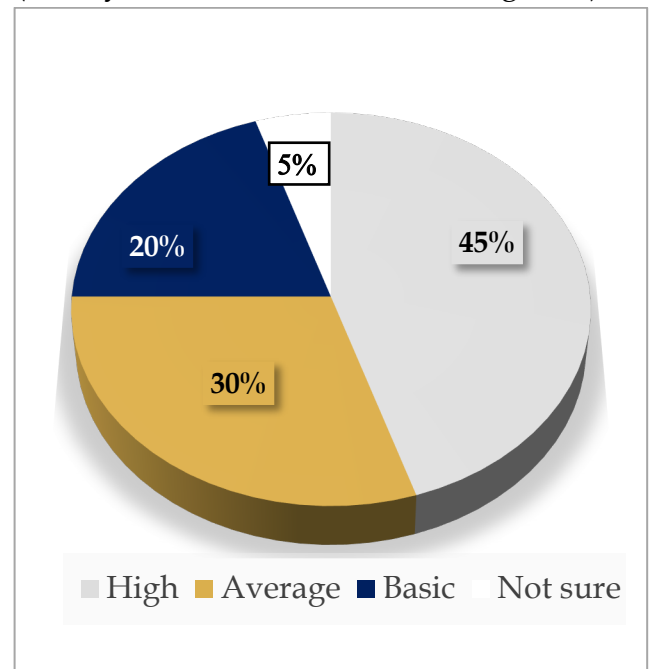


Figure 1. Respondents' responses to the question: "How do you rate your level of digital literacy in the context of using professional programs and applications?"

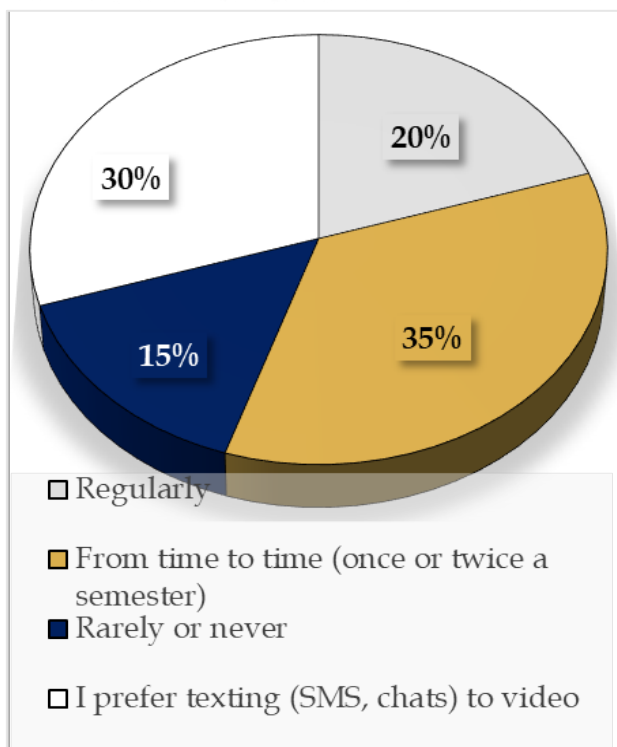


Figure 2. Respondents' responses to the question: "How often have you participated in online meetings or video conferences lasting more than 30 minutes in the past year?"

The data presented in Figure 2 shows that only 40% of respondents had had consistent experience using video conferencing before the experiment. Most students either rarely used this communication format or did not use it at all. This indicates that the integration of video technology into the educational process, particularly online consultations with the teacher, was a completely new practice that required additional learning for many individuals. It is also worth noting that a certain group of students consciously choose text-based communication over video, which must be taken into account when developing individualized learning approaches. Consequently, the low initial level of readiness for using video technology underscores the importance of subsequent advances in this area, demonstrating

the effectiveness of the pedagogical methods applied. Furthermore, based on the information provided, it is clear that most students use standard laptops or computers with built-in cameras and microphones, which provide basic readiness for remote interaction. However, this is insufficient to achieve high-quality sound recordings, which is especially important in a contemporary music education system, which must rely on the assessments of musicologists and outstanding performing musicians.

At the same time, the identified diversity of technical capabilities highlights the need to create a flexible methodological system. Such a system should ensure equal educational opportunities through differentiated instructions for working with sound (musical sound) for different levels of technical equipment.

The formative stage of our experimental study involved auditions, which were conducted remotely in accordance with assigned assignments and lessons taught by piano teachers (in some cases, alongside outstanding performers or included in the educational process). As part of this stage, students were tasked with independently recording and submitting a video recording of their performance of strictly prescribed software, which included technical exercises (e.g., Czerny Etude, Op. 139, No. 1).

A thorough analysis of the resulting video materials revealed a number of additional issues, related, for example, to the students' digital literacy that significantly affected the educational process as a whole. Weak sound quality

control manifested by hissing, distortion, and extraneous noise was observed throughout. This indicated a fundamental misunderstanding of the basic principles of audio recording, e.g. the importance of choosing the acoustic environment to minimize reverberation, the inability to manage input signal levels, leading to clipping and distortion when overloaded, and the failure to use an external microphone instead of the built-in one in a camera or laptop (Zhang Lijuan (Zhang, 2025, 103)). Another significant technical issue was the students' complete inability to set a static and methodically correct camera angle. Capturing key elements of the performing apparatus, such as the hands, forearms, and overall posture at the instrument, is known to be critical for analysis. However, this basic requirement was often not achieved, as noted in the scholarly works of Song Shuai (Song, 2021, 72). This oversight eloquently demonstrates a lack of understanding of the didactic goals of the recording itself. Students are unable to intuitively determine the optimal distance to the camera or choose the correct shooting angle, which leads to systematic errors. As a result, the camera is often positioned either too close, leading to cropping and cutting out important details such as the elbow joint or wrist position, or, conversely, too far away, making technical nuances critical for the teacher simply indistinguishable. An equally common error is placing the camera at an odd, often extreme, angle, which inevitably distorts perspective and prevents an adequate assessment of either the musician's hand position or body posture. Taken together,

all these technical shortcomings reduce the value of high-quality educational video material, both in content and artistic quality, to virtually zero, as Chen Bei and Chen Chunyan (Chen Bei, 2023; Chen Chunyan, 2022) also point out in a number of their studies.

Finally, the analysis revealed a noticeable psychological tension in the students, directly caused by the very fact of video recording and the oppressive presence of the camera. This tension was expressed in a number of external manifestations: unnatural and constrained movements, tense facial expressions, and a general increase in muscle tone throughout the body.

This physical condition directly and negatively affects the quality of sound production and the freedom of the entire performing apparatus, as any muscular stiffness makes the sound less flexible and expressive. The resulting frustration and nervousness prevent the performer from fully concentrating on artistic and purely technical tasks, forcing them to focus on secondary details and their own anxiety. Meanwhile, the ability to function in front of a camera is becoming an integral part of the professional competence of a contemporary musician.

In response to the identified challenges, a technical briefing was organized and conducted in the form of an interactive webinar on the popular Tencent Meeting platform. The webinar was divided into several sections. Specific recommendations were provided in the section on technical equipment. To ensure high-quality sound, it was recommended to use external USB microphones, such as the Blue Yeti or Rode

NT-USB, paired with HD webcams that should be positioned directly to the side of the piano, ensuring the performer's hands, forearms, and posture are captured in the frame. The software section identified the primary platform for synchronous online lessons, such as Zoom, chosen for its stability and the *original sound* feature. For asynchronous self-study, it was recommended to create shared chats in WeChat. The webinar focused on a detailed analysis of the settings, specifically demonstrating the systematic activation of the *Original Sound* mode in Zoom, which allows the participants to disable the built-in noise reduction algorithms, ensuring a pure, unprocessed piano sound. Of particular value to our pedagogical research is the detailed study of the experience gained by the staff of the Music and Computer Technologies Research Laboratory at the A. I. Herzen State Pedagogical University of Russia on the organization and details of the music education process using distance learning technologies and e-learning. For a long time the laboratory has been conducting research to identify the specifics of using distance learning technologies in the study of musical phenomena and issues related to modelling the musical creativity process. The data we obtained and the results of our original research, as well as our own teaching experience (that of one of the authors of this paper, Liu Ganfeng, and postgraduate students from the Herzen State Pedagogical University of Russia, Hou Wang, Sun Jiayue, He Yunchuan, and others) at the Music and Computer Technologies Scientific and Methodological Laboratory of Herzen

University, were used in the advanced training programs "Distance Technologies in Music Education", "Methodology for Teaching Music Subjects With Music and Computer Technologies", "Electronic Music Synthesizer", "The Art of Performance and Arrangement on a Keyboard Synthesizer", and the professional retraining program "Teaching an Electronic Keyboard Synthesizer." We used these results to develop curricula for the subjects and approaches to train students in performance-related subjects using the methods we developed. We found that the competent and targeted use of contemporary computer-based technologies plays a key role in the effectiveness of the distance learning process in the content of these programs.

It should be noted that while organizing classes with students during the formative stage of the pedagogical experiment, alongside addressing a number of art historical and technological issues, we also developed curricula for the two upcoming semesters. These curricula served as detailed learning roadmaps. These outlined technical requirements, scheduled week by week, for systematic mastery of the material. At the same time, a mandatory repertoire list was developed, including works by Russian and Western classics, as well as pieces by Chinese composers. Additionally, the plan included a strict schedule for the submission of assignments.

This was followed by relevant classes. The first semester was devoted to adapting students to the remote format. These weeks proved the most challenging due to significant technical issues, particularly

audio lags (technical problems manifested as delays, interruptions, or distortions of sound) of up to 500 milliseconds, which completely precluded the possibility of synchronized performance between teacher and student in real time, forcing a transition to an adapted *show-explain-repeat* method. As part of this process, students received specific assignments, such as practicing finger position in a technically difficult manner, and sent short video clips lasting 15–30 seconds, after which the teacher either provided detailed feedback in the form of written comments directly in the chat, or recorded a video response with a visual demonstration of the correct movement. Special attention was paid to hand positioning, that was rectified by demonstrating the correct position close-up on camera, followed by a strict requirement for the student to set the same camera angle. Therefore, instructions such as *show your hand exactly as I'm doing now* became regular teaching practice.

In parallel, group master classes were held every two weeks. For example, as part of such an activity, one student performed a pre-memorized piece (the sonata "Landscapes of Jiangnan" by Jiang Wianye), while the other students learned to express reasoned and constructive criticism. The final midterm exam in December was conducted asynchronously, requiring each student to submit a pre-recorded and rehearsed video containing a mini concert programme. The objective results of this assessment demonstrated that 80% of students successfully completed the assigned learning tasks and demonstrated consistent progress.

However, the remaining 20% showed a noticeable deterioration in technical skills, the main reason for this negative trend being the teacher's inability to correct immediately the student's actions physically.

In the second semester, the work became more advanced with the introduction of more complex concert repertoire. Simultaneously, experiments began with remote ensemble music making, where students, for example, mastered four-hand playing by recording their parts separately and then synchronizing the audio tracks in specialized programs. Individual online lessons for fine-tuning details, group master classes for developing critical thinking and artistry, as well as lectures on music literature and solfeggio, conducted via videoconference remained the main forms of work. The final stage was devoted to the final assessment, which took place in the format of an open online concert for a general audience or, at the student's discretion, as a closed recording of the exam program. Following the exam, a final student survey was conducted to assess their satisfaction with the process. Based on this analysis, final conclusions were drawn on the effectiveness of the distance learning methods used and specific methodological recommendations were developed for integrating online learning elements into the traditional music education system, taking into account both technical and pedagogical aspects.

A special focus was placed on finding correlations and opportunities for transferring experience with existing developments by scholars and educators in

this field. As a result, a number of practice-oriented solutions were identified based on the experience of training musicians, art historians, composers, and teachers of professional music disciplines in advanced training and professional retraining programs offered by the Music and Computer Technologies Scientific and Methodological Laboratory of the A. I. Herzen State Pedagogical University of Russia. Of particular value for our consideration is the use of comprehensive music education for individuals with disabilities using the capabilities of distance learning systems and contemporary MCT (see, for example, (Gorbunova et al., 2020)).

To summarize, we note that initially, students demonstrated a low level of readiness for using various IT technologies. This necessitated the introduction of specific measures: students were taught the basics of sound recording and working with specialized software and hardware. These procedures became a prerequisite for their successful adaptation to the distance learning format. Short video clips were also used to correct performance techniques.

The results of the pedagogical experiment confirm the need for the systematic use of MCT and distance technologies in contemporary music education. This integration must be carried out while maintaining the fundamental principles of piano performance and music education pedagogy. This conclusion is fully consistent with the broader view that, "experimenting with innovative methodologies and introducing advanced technological solutions into

the educational process are key factors contributing to the modernization of the education system and the enhancement of its quality" (Antonova et al., 2025, 166).

Conclusion

The development of the transdisciplinary approach to the study of musical phenomena, is actively explored in the works of musicologists, art historians, educational researchers, and specialists involved in the development of contemporary music-oriented IT applications and MCTs. These methods include those aimed at their active use in the system of contemporary professional music education as a key component.

The study found that with the active use and integration of contemporary technological tools into the educational process, focused on solving a wide range of problems and methods of remote interaction, it is possible to achieve a variety of pedagogical objectives. Thus, it was found that:

- Messengers are effective for organizing group work,
- Video conferencing systems enable synchronous interaction between teachers and students,
- Virtual reality systems offer the development of innovative, previously unexplored (and previously impossible to introduce and use) teaching methods and technologies.

The use of digital, innovative educational technologies is associated with significant challenges, such as cognitive overload for teachers and students when

attempting to simultaneously master multiple platforms, leading to *digital fatigue* and a distraction from the core of the educational material by the need to solve the technical challenges that arise and accompany this process.

Successful integration requires a strategically sound teaching methodology, beginning with a specific pedagogical task and selecting a specific tool (or set) for it. For high-quality lessons, especially in specialized subjects (e.g., piano), a minimal set of equipment is required: high-quality microphones, headphones, a multi-camera system, high-speed internet, and specialized, professionally oriented music and computer software and hardware. In this regard, the competent and targeted use of

specialized, professionally oriented hardware and software plays a key role in implementing a successful educational process using distance learning technologies. Today, this involves leveraging the capabilities of contemporary, specialized music-oriented digital tools—music computer technologies.

The teaching methodology we developed for Chinese music students specializing in performance, and especially piano students, serves as a clear example of a comprehensive approach integrating synchronous and asynchronous modes of work, essential and highly sought after in today's high-tech, creative educational environment.

CONFLICT OF INTERESTS

The authors declare no conflict of interests.

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