

The Use of Multimedia and Music Computer Technologies to Improve the Performing Activities of Students of Musical and Musical Pedagogical Universities of the People's Republic of China

Liu Ganfeng, Hou Wang, Song Xingyuan, Sun Jiayue, Irina B. Gorbunova

Abstract— The article is devoted to the main directions of the inclusion of multimedia technologies in music teaching. Digital tools, from interactive simulators and music editors to cloud services and VR environments, are considered not as a substitute for the teacher, but as support that expands his methodological capabilities. Specific examples of the organization of classes in children's art schools, colleges and individual lessons are given. Synchronous and asynchronous operation formats, gamification mechanisms, automatic feedback techniques, and immersive immersion are described. The didactic effects are analyzed: the growth of motivation, the development of independence, the expansion of the auditory horizons of students. The result is the conclusion that it is necessary to design the multimedia environment in a meaningful way, based on the pedagogical task, and not on the technological trend. In this regard, a valuable educational component of the professional activity of a musician teacher is a timely and well-grounded appeal to modern music computer technologies (MCT), digital musical instruments.

This article also discusses the use of a visualization platform for musical performance Vmus.net as an auxiliary tool for improving the expressiveness of students' playing in the piano and keyboard electronic synthesizer class. Traditional piano teaching often faces difficulties in conveying abstract concepts such as "rubato," "phrase breathing," and "dynamic vibrations." Vmus.net allows you to create curves depending on volume and tempo, making these parameters visible. Using the example of teaching Chinese piano music, a three-stage pedagogical experiment based on visualization of elements of the performance process is demonstrated, illustrating a noticeable improvement in performance results. The results show that the dynamic range of the performance has expanded significantly, a natural rubato has appeared, and the correlation of the performance curves with the reference version of the master has increased markedly. Vmus.net — an effective feedback and self-monitoring tool, suitable for learning to play the piano even when performing lyrical works.

Keywords— Cloud services, digital musical instruments, interactive learning, keyboard electronic musical synthesizer, multimedia technologies, music computer technologies (MCT), music education, People's Republic of China, music universities, performing arts, piano, simulator programs, virtual reality, visual analysis, Vmus.net.

I. INTRODUCTION

The figure has long ceased to be something exotic in music pedagogy, but the debate about how multimedia tools restructure the learning process continues unabated. Until recently, "multimedia" in the solfeggio class or in the specialty was understood by default as a PowerPoint presentation with a pair of audio inserts. Now the teacher is dealing with interactive musical scores, cloud-based sound stations, artificial intelligence-based simulators and immersive reality. From this diversity, a difficult question arises: which areas really develop a musician, and which remain only a spectacular wrapper, pedagogically insignificant. At the same time, multimedia technologies in the teaching of music theory disciplines contribute to the transition from passive learning of rules to active auditory research. Timely and meaningfully grounded use of modern music and computer technologies [1-2], digital musical instruments [3] is a kind of criterion for evaluating the effectiveness and level of professional competence of a musician teacher, and his willingness and involvement in practical activities for designing elements of professionally oriented software and hardware complexes, as well as catalogs and other various tools. broadcasts of samples of the traditional musical culture of the peoples of the world (see, for example, in [4]) determines not only the ability to conduct educational activities at a high professional level, but also often acts as an incentive and a certain guiding link in the need to develop certain components of the resource base of dynamically developing music computer technologies (MCT) themselves and new educational programs based on the direct inclusion of these technologies as a meaningful basis. new educational disciplines.

The purpose of the article is to identify key vectors of multimedia application in music education based on the analysis of available software and proven methodological techniques and illustrate them with live scenarios that can be repeated in a regular school or studio. The emphasis is on

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Liu Ganfeng. He is now with the Herzen State Pedagogical University of Russia, St. Petersburg

Hou Wang. He is now with the Herzen State Pedagogical University of Russia, St. Petersburg

Song Xingyuan. She is now with the Herzen State Pedagogical University of Russia, St. Petersburg

Sun Jiayue. She is now with the Herzen State Pedagogical University of Russia, St. Petersburg

Irina B. Gorbunova. She is now with the Herzen State Pedagogical University of Russia, St. Petersburg

specific products and techniques, rather than abstract models, so that a teacher or a student of a specialized university can immediately use what is described in the work.

Methodologically, the article combines a review of current sources with the author's reflection on his own experience in implementing multimedia systems. Five main areas are considered: interactive learning platforms and mobile applications; music editors and digital audio workstations; multimedia presentations and instructional videos; cloud collaborative services; virtual and augmented reality technologies.

In the modern process of learning the art of performing on the piano and keyboard musical synthesizer, the development of musical expression among students remains one of the most difficult tasks. Students can often reproduce the musical text correctly, but their playing is "flat and narrative." Many students play with their heads down, not paying due attention to such musical aspects as phrasing and breathing, and cannot penetrate deeply into the rich content of musical works [5, p. 58]. Traditional teaching methods mainly rely on auditory feedback and the subjective opinion of the teacher, which makes it difficult for students to understand abstract musical concepts, especially understanding rubato and dynamic vibrations.

Modern digital technologies open up new opportunities in this field. A platform for visualizing musical performance Vmus.net Developed by Yang Jiang, a professor at the Shanghai Conservatory, it can transform acoustic parameters such as volume, tempo, and rhythmic evenness into visual graphs [6]. In previous studies, the author has shown that Vmus.net It can be successfully used to analyze technical performance problems [7-8]. Thanks to multisensory perception (sight + hearing) Vmus.net Transforms abstract rubato into a tangible curve shape, allowing students to visually "see" the shape of the music, thereby better understanding and mastering phrase changes. An essential role in this process is played by the formation and development of professionally oriented music computer technologies (MCT), the adequate use of which plays an essential role in the successful work of a modern music teacher (see for more details in [1-2]). Educational systems developed on the basis of MCT, including interactive ones based on the nature of interaction with the learner and based on modern network technologies with the participation of MCT (see, for example, in the article [9]), allow using both options for learning to play on electronic keyboard musical synthesizers themselves, and "mixed" educational routes when learning on a synthesizer. precedes piano lessons (applicable in the general music education system), This is the same when teaching students to play electronic keyboard musical synthesizers at music colleges and universities during the implementation of the basic educational program and in the system of additional professional education: advanced training or professional retraining programs. We also note the possibility of including in the training of a piano student in the basic educational programs of a university, training in the art of performing arts using a keyboard musical

synthesizer both as the main special instrument in the university's music education program, and as an additional musical instrument, which is usually provided for in the basic education program of students of music and music pedagogical universities (for more information, see article [3]). The possibilities of improving the performing activities of students of music and musical pedagogical universities of the People's Republic of China in the process of learning the art of performing on the piano and keyboard musical synthesizer using modern electronic devices and computer visualization tools of the performing process are increasing. This makes it possible to train research musicians from among the most gifted students who are able, among other things, to make a significant contribution to the development of intelligent cataloging systems for the music of the peoples of the world [4]. Preserving and broadcasting the greatest centuries-old performing traditions and folklore samples of Chinese music and musical culture based on modern digital technologies is one of the greatest tasks facing modern performing musicians.

The purpose of the article is also to provide an example of a specific pedagogical case (Zhu Gongyi's piano piece *Prelude — Little stream*) show how to use Vmus.net as a tool of educational activity, as a means of implementing feedback between a student (a student of a musical or musical pedagogical university studying in the field of performing specialization) and a teacher (master) to increase the student's performing expressiveness when mastering the art of performing on the piano or keyboard electronic musical instrument in the system of higher professional education.

II. METHODS AND APPROACHES

The participant in the experiment was a second-year piano student at one of the Chinese conservatories (student S, 6 years of piano studies). The selected piece is Zhu Gongyi's piano piece *Prelude is a Small Stream*. This is a lyrical composition that requires subtle dynamic changes, flexible rubato and a "sense of fluidity" of sound [7-8].

A free online platform was used Vmus.net (version 2.0). The platform generates a volume–tempo curve: the horizontal axis is time (bars), the vertical axis is tempo (beats per minute), the volume is indicated in gray. The performance of Weng Yi (associate professor of the Shanghai Conservatory, pianist) was chosen as the master's reference version.

The experiment consisted of three stages:

1. Initial diagnosis: recording the initial performance of the student S, plotting the curve and comparing it with the master's version.

2. Pedagogical intervention (4 weeks, 8 classes): the teacher and the student jointly analyzed the graphs, set specific goals (expand the dynamic range, add rubato to certain phrases), after classes, the student independently recorded her performance and tested herself with

3. Retesting analysis: re-recording the performance, plotting the curve after the intervention, comparing curve changes.

III. RESULTS AND DISCUSSION

The graphs show a comparison of the initial volume–tempo curve of student S's performance of the piece (Fig. 1) with the reference version recorded by the master (Fig. 2).

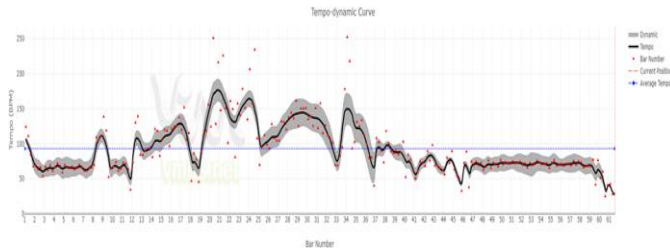


Fig. 1. The initial "volume–tempo" curve of the student S

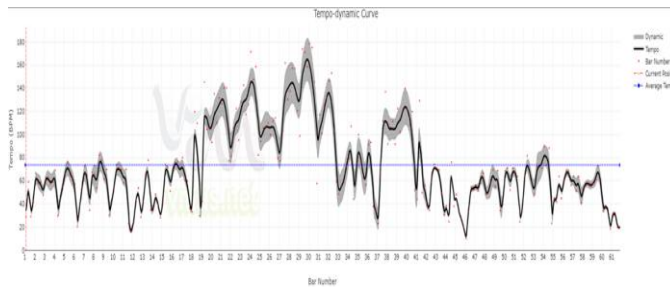


Fig. 2. The "volume–tempo" curve of the performance of the work by Master Wen Yi

Basic observations:

- judging by the gray fill, the dynamics of student S has changed slightly, the ppp-ff transitions are not highlighted;
- the tempo curve is almost straight, there is no natural deceleration at the ends of some phrases (ritenuto);
- the shape of the curve has a low correlation with the version executed by the master.

Based on the curves visualized in this way, illustrating the main performance characteristics, three priority training tasks for the student were identified.:

1. Dynamic contrast expansion: in bars 17-50, student S practiced dynamic changes from p through crescendo to sfz, ff and ppp, checking the shape of the master's curve.
2. Rubato introduction: in certain phrases (bars 11-19, 41-47), add slight deceleration and fading.
3. Synchronization of movement and sound: when performing exercises, it is necessary to accompany the game with circular movements of the brush to simulate "water ripples".

After 4 weeks, repeated testing was performed. The graphs show a comparison of the dynamics in bars 17-50: the initial curve (Fig. 3), the retest curve (Fig. 4) and the master's version (Fig. 5). The dynamic changes in student S during retesting became noticeably more pronounced compared to the initial stage. In addition, the rubato changes in bars 41-47 also became clearly noticeable.

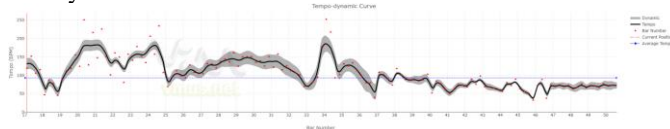


Fig. 3. The initial curve of the student S, bars 17-50

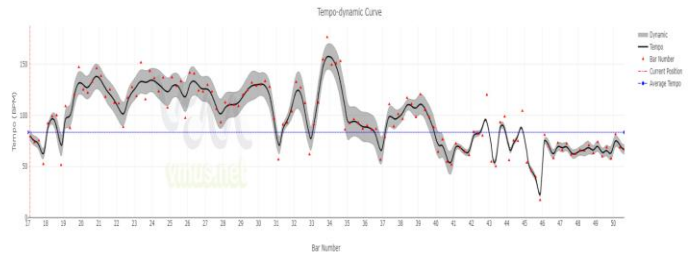


Fig. 4. Student S retesting curve, bars 17-50

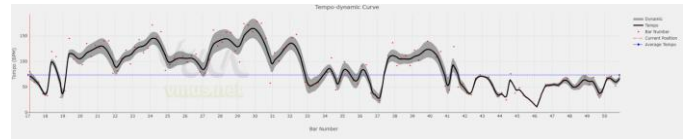


Fig. 5. The curve of master Wen Yi, bars 17-50

The graphs show a comparison of rubato in bars 11-19: the initial curve (Fig. 6), the retesting curve (Fig. 7) and the master's version (Fig. 8). Judging by the graphs, after the pedagogical intervention, the student's rubato acquired pronounced fluctuations up and down instead of an almost straight line at the beginning. Student S noted: "Now I see where the music 'breathes'. And the feeling of dynamics has become much deeper."

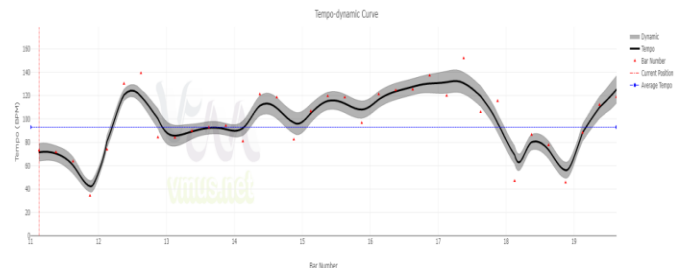


Fig. 6. The initial curve of the student S, bars 11-19

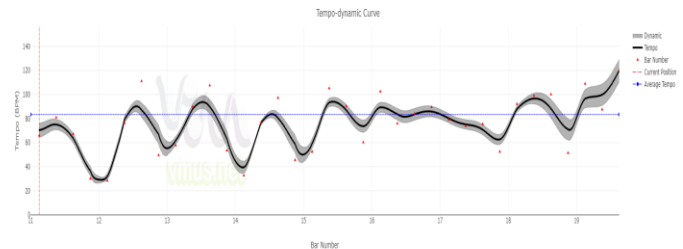


Fig. 7. Student S retesting curve, bars 11-19

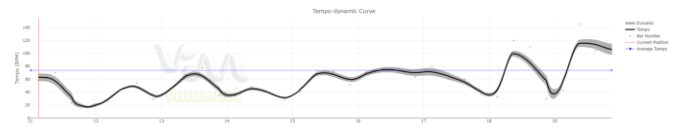


Fig. 8. Master Wen Yi curve, bars 11-19

It can be seen from the graph in Figure 7 that the values of a number of characteristics of student S's performance after repeated testing in bars 11-19, the values of a number of characteristics became much closer to the master's standard in correlation.

Correlation of tempo with the master's version of performance (Pearson correlation coefficient):

- initial performance vs master: $r = 0.31$ (weak correlation),
- retesting vs master: $r = 0.79$ (strong correlation).



Fig. 9. Comparison of the tempo values (BPM) of the original curve (marked in blue), the retest curve (red) and the version performed by the master (green) in bars 11-19

IV. THE INTERACTIVE LEARNING PLATFORMS AND MOBILE APPLICATIONS

The first thing a teacher faces today is a flurry of offers from simulators promising a sharp leap in reading from a sheet, hearing development and technique. Well-thought-out solutions include *Yousician*, *EarMaster*, *Complete Rhythm Trainer*, *Tenuto*, and *SmartMusic*. All of them are united by the logic of gamification: the student instantly sees the result, earns points, passes levels – this fuels the regularity of classes. This approach is especially valuable in times of low motivation, which are unavoidable with routine handwork or cramming intervals. "Gamification, based on the mechanics of instant feedback and visual progress, allows you to transform monotonous training tasks into an exciting educational process" – summary by Yu.M. Khokhryakova [11, p. 30].

An example is a guitar lesson at the Children's school of music using *Yousician*. The application running on the tablet analyzes the sound in real time and highlights errors on the virtual neck. The teacher gives the student a task to sort out a new invoice: First, the program guides him through a chain of micro-exercises, followed by a piece with auto accompaniment. The rest of the lesson is spent not on correcting obvious musical errors, but on artistic parameters – phrasing, articulation, and agogy. At the same time, the teacher receives a report by mail: how many hours and minutes the student spent playing the instrument at home, in which bars he lost most often. An important nuance is that "mobile applications for the development of hearing become the tool that turns episodic classes into constant auditory training, independent of the presence of a teacher" [12, p. 326]

Of course, one simulator will never appreciate the timbre nuance and will not adjust the clamp in the brush. The program

works as an auxiliary tool, freeing up a resource for meaningful musical work.

Music editors and digital audio workstations

The second line is to introduce students to the creation, editing and arrangement of music in the DAW class programs and music editors. Once upon a time, acquaintance with a set of sheet music was discovered only in high school at a music computer science course. Today, even elementary school students are able to record their own songs in *MuseScore* or *Flat.io* immediately hearing how the score sounds. For teenagers, multitrack environments are more attractive – *BandLab*, *Soundtrap*, *GarageBand*. In them, you can manipulate samples, overlay a voice, a live instrument, and experiment with built-in effects. For example, a small group of students is given the task of arranging a proposed melody in *Soundtrap*. The roles are distributed as follows: the first gathers the rhythm section, the second builds the harmonic canvas, the third records the vocal line, the fourth is responsible for mixing the panorama and automating the volume. The teacher enters the project as a co-author and sees all the edits in real time. Each participant works with their own track from any device without interfering with the others. The output is not a boring exercise, but a sounding product that can be uploaded to the cloud and immediately given to parents to listen to. Along the way, not only hearing and compositional thinking are trained, but also digital communication skills.

Wu. Ronglin emphasizes that "digital audio stations radically change the approach to instrumentation, since the composer immediately hears the timbre embodiment of the idea" [13, p. 291]. At the same time, I.M. Krasilnikov notes that "electronic creativity organically continues the academic tradition, allowing the student to combine the functions of a composer, performer and sound engineer" [14, p. 152].

Of particular interest is the music editor in solfeggio lessons. Task: type dictation in *MuseScore*. The program immediately highlights incorrect durations and heights. The teacher gets the opportunity to monitor how meaningfully the student corrects mistakes by comparing the first and final versions. An additional advantage is the automatic playback of recorded material – dictation turns from passive fixation into active auditory action.

Multimedia presentations in educational video content

In addition to simulators and workstations, the teacher constantly turns to media materials, which he himself designs or adapts. This means not just boring slides, but multi-layered interactive posters assembled in either *Genially* or *ThengLink*. Each illustration on such a poster hides an audio fragment, a video clip, or a link to an additional resource. According to Yu.B. Aliyev, "visual acuity combined with sound, word and movement turns musical practice into multi-channel perception, significantly accelerating the formation of auditory representations" [15, p. 105].

For example, in a music literature lesson, a poster about the Baroque allows you to "animate" a portrait of Bach with one click – a fragment of the *Tocatta in D minor* sounds in an authentic reading; clicking on the organ turns on a short video about the device of the instrument; the active zone above the

geographical map demonstrates the composer's movements. "Multimedia tools turn a lesson into an exciting journey, where each image is supported by an audible and visible side by side" [16] is the thesis of T.N. Diaghileva, who, summarizing the experience of working with preschoolers, comes to this statement.

Equally important is the video made by the teacher using the simplest means: screen capture, editing in *CapCut* or *DaVinci Resolve*. A video tutorial in which the teacher plays a fragment with two hands, and then shows the fingerings of each hand separately, can be sent to the student on the eve of a face-to-face meeting. In the lesson itself, it remains to check what you have learned and talk about the subtleties. This technique, in fact, implements the "inverted class" model, which is especially useful in preparing for the technical assessment. In the work of M.A. Goryunova says that "the interactive whiteboard gives the teacher the opportunity to transform the musical text with lightning speed – to change key signs, transfer bars, play fragments" [17, p. 112].

Another illustration is a vocal ensemble rehearsal. The supervisor creates a track with a soprano part and a video where the text is presented line by line, difficult jumps are marked in color. Each participant learns the part at home using recorded accompaniment, and at the general meeting the focus shifts to teamwork and sound balance. According to observations, the time of "ingestion" of the material is reduced by about 40%.

Cloud collaborative services

Cloud solutions have gradually taken a special place in music pedagogy. *Soundtrap* and *BandLab* have already been mentioned, and educational lines like *Noteflight Learn* and *Flat for Education* are being added to them, as well as a bundle of *Google Classroom* with music extensions. The main advantage is the opportunity to build hybrid learning, when some tasks are solved face-to-face, some remotely, but everything happens in a common digital field. "Cloud services in music education erase the spatial and temporal framework of the lesson and form the habit of collective creativity, where the results of each participant are integrated into a common product [17, p. 203].

As an example, we can take the organization of a children's composition competition based on *Noteflight Learn*. Students from different schools create plays directly on the platform. The jury sees the scores, leaves text and audio comments, and compares the editions. At the same time, the teacher accompanies each author with corrective remarks directly in the notation. All materials are available without downloading, administrative work is minimized, and the focus is kept on the musical material. Cloud sequencers with multi-user recording support are of interest for collective music making. The choirmaster uploads a reference recording of the soprano part, the participants at home overlay their voices, and the service automatically synchronizes the tracks. It turns out to be a virtual choir in which you can solo any part, analyzing intonation. The method, which was widely used during lockdowns, has proven its usefulness as a permanent module for self-training. But there are also disadvantages: clouds require the teacher to pre-test the connection, configure access rights and a backup offline option. In other words, technical foresight becomes a part of methodological competence.

Virtual and augmented reality

Immersive technologies are perhaps the fastest growing field. It cannot be called massive because of the cost of equipment, but individual initiatives are already yielding convincing results. *The Orchestra VR* app puts a student inside a symphony orchestra: the conductor's gesture is visible, and a spatially distributed sound is heard. For a teenager who has never been to a concert hall with a live orchestra, the impression becomes the strongest motivator. According to P.A. Michkova, "augmented reality technologies place the student in an enriched visual and acoustic environment that qualitatively deepens the perception of musical material" [18, p. 58].

Augmented reality is much more accessible because it requires only a smartphone. Programs like AR Pianist project notes and finger tips directly onto the keyboard, and recognition applications allow you to point the camera at a paper score and instantly get its digital voice acting. At solfeggio, this saves time when checking notebooks: the student scans the record, and the program highlights discrepancies. A methodical scenario with VR can be built as a lesson-journey. Let's say the class is taking the *Magic Flute*. Children put on helmets and enter the Vienna Opera Hall at the beginning of the 19th century. A virtual guide leads the tour, pays attention to the details of architecture and historical costumes, and then an aria is played. The student doesn't just listen passively – he turns his head, picking out the reactions of the audience and the orchestra. The subsequent conversation, as a rule, is emotionally colored and contains observations that cannot be deduced from a textbook.

Experiments at the intersection of AR and performance are also gaining momentum. A conservatory student wearing augmented reality glasses sees color tags above the keys with the fingerings suggested by the teacher. The algorithm analyzes the played and lights up the red zones where the clips were. So far, these are laboratory samples, but the vector is obvious: there is a movement towards a personal digital assistant working in tandem with a teacher.

To test the effectiveness of the described multimedia tools, a pedagogical experiment was conducted with the participation of 60 piano students. At the EG, classes included working in a music editor, a rhythm simulator, and a digital sound station. In the control group, the training was conducted according to the traditional methodology. The results of the final testing are shown in Figure 10.

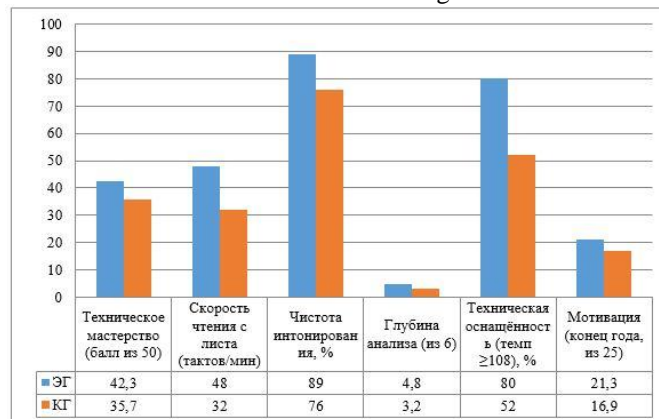


Fig. 10. Summary table of the main experimental results

V. CONCLUSION

Multimedia technologies are not a monolith. They vary in didactic weight, accessibility, and readiness for daily practice. Interactive simulators save lesson time, music editors and DAWs awaken the compositional vein, cloud services ensure the continuity of classes in a mixed mode, and VR /AR add the missing emotional depth to the perception of music. The success of any of these tools is determined by a methodically constructed scenario, where technology complements the live communication between the student and the teacher, but does not replace it. The prospects are seen in creating open libraries of such scenarios and in building up the mentors' competencies so that they can confidently design a multimedia environment for a specific task, whether it's a technical test or immersion in the aesthetics of the musical era.

Systematic organizational support can transform the disparate initiatives of single teachers into the norm of the educational process. Cataloging scripts will not solve the implementation problem by itself. We are talking about regular professional development courses, where teachers are taught not just to click on the buttons of a specific application, but to design learning events with a digital component, see the boundaries of its applicability and evaluate real-world performance. At the same time, it is important to develop the technical infrastructure of schools – stable Internet, tablet stock, licensed software – because the methodological scenario will remain on paper if there is nothing in the classroom to open the same *Soundtrap* or *Noteflight*.

What motivates a teenager can overload a younger student; instruments suitable for pop vocals are not always suitable for academic solfeggio. The age and genre differentiation of multimedia solutions deserves a separate discussion. An open library of scripts should be marked up not only by disciplines, but also by age, the level of digital literacy of students, and even by the type of musical thinking that needs to be activated. If such a library is replenished by the teaching community itself, accompanied by lively comments about failures and findings, it will turn into a self-learning environment. It is professional reflection, not technological novelty, that determines whether multimedia will become a true ally in a child's musical development or will remain just a bright splash screen on an interactive whiteboard.

The conducted preliminary and ascertaining stages of the pedagogical experiment revealed the need to adjust the educational situation related to the training of vocalists in the Chinese professional music education system.

The above results confirm that Vmus.net It is an effective additional feedback tool. In teaching the work *Little Stream*, unlike traditional pedagogy, which uses metaphors like "playing like flowing water", the visual approach gives the student a measurable guideline. The "volume-tempo" curve objectively indicates which part lacks dynamic ups and downs or rubato, forming an understanding of the term "rubato". In addition, academic motivation increases: the student clearly sees his progress. It is recommended that teachers integrate Vmus.net when working on lyrical works, starting with short phrases. You can give students homework, record the game on their own and compare their curves with the curves of the

master. However, Vmus.net It cannot completely replace auditory training; it serves only as an auxiliary pedagogical tool that enhances auditory perception.

REFERENCES

- [1] *Gorburnova I.B.* The Concept of Music Computer Pedagogical Education in Russia // International Journal of Advanced Science and Technology. 2020. T. 29. № S6. C. 600-615. eLIBRARY ID: 45510128. EDN: AVSRLP
- [2] *Gorburnova I.B., Kameris A.* Music Computer Education Concept for Teachers: Raising the Problem // International Journal of Recent Technology and Engineering. 2019. Vol. 8. No. 2 S4. Pp. 913-918. DOI: 10.35940/ijrte.B1181.0782S419 <https://doi.org/10.35940/ijrte.B1181.0782S419>
- [3] *Gorburnova I.B., Petrova N.N.* Music Computer Technologies, Supply Chain Strategy and Transformation Processes in Socio-Cultural Paradigm of Performing Art: Using Digital Button Accordion // International Journal of Supply Chain Management. 2019. Vol. 8. No. 6. Pp. 436-445. eLIBRARY ID: 43231611. EDN: LTVHRC.
- [4] *Gorburnova I.B., Alieva I.G.* On the Project of Creating an Intellectual System for Cataloging and Analyzing the Music of the Peoples of the World. Society: Philosophy, History, Culture. 2016. No. 9. pp. 105-108. eLIBRARY ID: 27552951. EDN: XEYMAV
- [5] *Fan Hesin.* Piano pedagogy // Shanghai: Shanghai Music Publishing House, 2007. 319 p.
- [6] *Jiang Jian.* The method of computer visualization analysis of acoustic parameters in the study of musical performance practice // Musical art. 2008. No. 4. Pp. 54-62. DOI:10.19359/j.cn31-1004/j.2008.04.006.
- [7] *Song Xingyuan.* A study of musical terminology and performance interpretation of Zhu Gongyi's Chinese piano piece "Little Stream" // Art and Education. 2025. No. 15(167). Pp. 110-116. EDN RYUVQJ.
- [8] *Sun Xinyuan.* How to bring to the listener the ideas expressed by the composer // "Modern musical education: creativity, science, technology 2023: Proceedings of the XXII International Scientific and Practical Conference / Under the general editorship of I. B. Gorburnova, A.V. Denisov. Moscow: International Center for Art and Education, 2024. pp. 151-158.
- [9] *Gorburnova I.B., Mikhutkina N.V.* Computer Musical Creative Work in the Russian Initial Vocational Education System. Propositos y Representaciones. 2020. Vol. 8. No. 2. C. e523. DOI: 10.20511/pyr2020.v8n2.523 <https://doi.org/10.20511/pyr2020.v8n2.523>
- [10] *Gorburnova I.B., Hinner H.* Music Computer Technologies and Interactive Network Systems of Learning Music. Proceedings of 190th the IIER International Conference. Oxford, UK, Sept.19–20, 2018. Pp. 16-21. eLIBRARY ID: 36628624. EDN: YRGCVV
- [11] *Khokhryakova Yu.M.* The possibilities of gamification of educational activities of university students. Humanitarian studies. Pedagogy and psychology. 2021. No. 5. pp. 27-37.
- [12] *Gorburnova I.B., Goncharova M.S.* Mobile technologies in teaching solfeggio: the development of musical hearing. The world of science, culture, and education. 2018. No. 5 (72). Pp. 325-329.
- [13] *Ronglin U.* A study of the influence of digital music technologies on performing arts // Education management: theory and practice. 2025. Vol. 15. No. 5-1. Pp. 289-296. <https://doi.org/10.25726/x1667-7434-3607-f>
- [14] *Krasilnikov I.M.* Electronic musical creativity in the system of art education: dissertation of the Doctor of pedagogical Sciences, Moscow, 2007. 494 p.
- [15] *Aliev Yu.B.* The desktop book of a school teacher-musician. Moscow: VLADOS, 2000. 336 p.
- [16] *Diaghileva T.N.* Actual issues of the use of multimedia technologies in music education of preschoolers. Actual problems of humanities and natural sciences. 2015. URL: <https://cyberleninka.ru/article/n/aktualnye-voprosy-ispolzovaniya-multi-mediynh-tehnologiy-v-muzykalnom-obrazovanii-doshkolnikov/viewer> (date of request: 05.05.2026).
- [17] *Goryunova M.A.* Interactive whiteboards in education. St. Petersburg: BHV-Petersburg, 2010. 336 p.
- [18] *Michkov P.A.* Augmented reality technologies in musical art and education // Musical art and education. 2023. Vol. 11. No. 2. Pp. 54-65.



Liu Ganfeng was born in Linfen, Shanxi province, People's Republic of China.

Bachelor's Degree (2017-2021): Shanxi University, The Academy of Music at the Shanxi University. Master's Degree (2021-2023): Belarusian State Academy of Music.

Currently (starting in 2023) pursuing a doctoral degree (PHD in music education under the scientific supervision of Professor Irina. B. Gorbunova at the Herzen State Pedagogical University of Russia. The topic of the dissertation work is *The current situation and development trend of piano performance distance learning technology in Normal Universities.*"

Individual awards:

Liu Ganfeng won the Grand Prix in the piano category at the V ST. PETERSBURG MUSIC COMPETITION (instrumental and vocal performances).

Liu Ganfeng won first prize in the piano category at the 3rd Moscow International Online Music Competition for Music Dreams.

Liu Ganfeng won first prize in the piano category at the 2nd Creative Vladimir Kurdi International Music Competition for Philharmonic Orchestra.

Silver Medal, Semi-Public Open Group, China Region, Royal Magnus International Piano Competition (2021).

Liu Ganfeng participates in a number of international conferences, including the annual International Research and Practical Conference *Contemporary Musical Education: Creative Work, Research, Technology* (St. Petersburg, Russia; 2023, 2024, 2025) and annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education* (Baku, Azerbaijan – St. Petersburg, Russia; 2024, 2025, 2026).

His articles have been published in various scientific journals and editions.



Hou Wang was born in Taiyuan, Shanxi Province, People's Republic of China.

He earned a bachelor's degree (2016-2018) from the Department of Music of the Yuncheng University. He obtained a master's degree (2020-2023) from the School of Arts, North University of China.

Currently (since 2023), he is pursuing a PhD in the field of music education at Herzen State Pedagogical University of Russia. His thesis topic is *Research on the Application of Modern Multimedia Technologies in Music Education.*

Hou Wang participates in a number of international conferences, including the annual International Research and Practical Conference *Contemporary Musical Education: Creative Work, Research, Technology* (St. Petersburg, Russia; 2023, 2024, 2025) and annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education* (Baku, Azerbaijan – St. Petersburg, Russia; 2024, 2025, 2026).

His articles have been published in various scientific journals and editions.



Song Xingyuan was born in Hefei City, Anhui Province, People's Republic of China.

From 2007 to 2012, she pursued her Bachelor's degree at the School of Music, Suzhou University, Anhui Province, China.

From 2014 to 2017, she studied for her Master's degree at the School of Music, Anhui University, Hefei City, Anhui Province, China.

From 2023 to the present, she has been pursuing a Doctorate in Music Education at the Herzen State Pedagogical University of Russia, under the supervision of Professor I.B. Gorbunova. Her doctoral dissertation is titled *Improving the performing activity of piano students through innovative educational practices.*

Awards:

- August 2023: Second Prize at the "Musical Dawn" International Instrumental Performance Competition, Russia.

- February 2025: First Prize at the International Music Competition *Winter Sounds* (Russia).

- February 2025: First Prize at the *Rachmaninoff International Music Competition*, Russia.

- 2025: Third place in the Pedagogy category at the 38th All-Russian Scientific Competition of the Association of Scientific Researchers, for research focusing on *Problems of Using Digital Technologies in the Process of Teaching Pianists: Implementing Online Learning to Improve Performance Skills.*

Song Xingyuan participates in a number of international conferences, including the annual International Research and Practical Conference *Contemporary Musical Education: Creative Work, Research, Technology* (St. Petersburg, Russia; 2023, 2024, 2025) and annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education* (Baku, Azerbaijan – St. Petersburg, Russia; 2024, 2025, 2026).

Her articles have been published in various scientific journals and editions.



Sun Jiayue was born in Qiqihar City, Heilongjiang Province.

She graduated from the Faculty of Vocal Education at the Shenyang Conservatory with a bachelor's degree. (2016-2020). Graduated from the Master's degree program at the Faculty of Musical Performance of the *Herzen State Pedagogical University of Russia, St. Petersburg.* (2021–2023).

Currently, she is studying at the graduate school of the *Herzen State Pedagogical University of Russia*, specializing in Music Education, (starting in 2023) pursuing a doctoral degree (PHD in music education under the scientific supervision of Professor Irina. B. Gorbunova The topic of her dissertation is *Mastering Innovative Forms of Work Involving New Educational Technologies in the Process of Training Vocal Students at a Pedagogical University.*

Song Xingyuan participates in a number of international conferences, including the annual International Research and Practical Conference *Contemporary Musical Education: Creative Work, Research, Technology* (St. Petersburg, Russia; 2025) and annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education* (Baku, Azerbaijan – St. Petersburg, Russia; 2026).

Her articles have been published in various scientific journals and editions.



Irina B. Gorbunova was born in Saint Petersburg (Leningrad), Russia.

DipMus, Special Music Higher School of the St. Petersburg State Conservatory named after N.A. Rimsky-Korsakov; BSc in Computer Science: Information Technology, Computer Science and Multimedia, Leningrad State University, Ussurisk

State Pedagogical University; MA in Education, the Herzen State Pedagogical University of Russia; PhD in Information Technology and Pedagogical Sciences, the Herzen State Pedagogical University of Russia, St. Petersburg; Doctor degree: Doctor of Pedagogical Sciences and Information Technology, the Herzen State Pedagogical University of Russia, St. Petersburg.

Dr., Full University Professor, Chief Researcher of the Education and Methods Laboratory *Music Computer Technologies* at the Herzen State Pedagogical University of Russia, St. Petersburg; hold the degree of Honorary Worker of Higher Professional Education of the Russian Federation.

Work experience; 1990 – 2010 - Associate Professor, Professor of the Department of Music and Department of Information Technology of the Herzen State Pedagogical University of Russia, St. Petersburg; 2010 - present - Full Professor of the Department of Information Technology, Institute of Computer Science and Technological Education of the Herzen State Pedagogical University of Russia, St. Petersburg; 2002 – present - Chief Researcher of the Research and Methods Laboratory *Music Computer Technologies* at the Herzen State Pedagogical University of Russia, St. Petersburg. She was on a number of business trips abroad, among them: working trips to the USA; lecturing and giving research and practice seminars in; business and working trips to the UK, Greece, Germany, Ireland (Dublin) – many times.

Prof. Dr. Gorbunova has developed first ever course in higher music

education in Russia *Music Computer Technologies*, which has been offered under the Bachelors of Arts and Sciences (BASc), which in 2004 carried out student recruitment in different regions and educational institutions of Russia and she also leads post-graduate courses *Music Computer Technologies in Education* available under the MA in Music Education, since 2006; then, under the leadership of I. B. Gorbunova, the Bachelor's degree program in *Information Technology in Music and Sound Design* (2023) and the Master's degree program in *Digital Technology in Music and Sound Design* (2022) were developed and implemented in the educational process of the Russian Federation.

Prof. Dr. Irina B. Gorbunova has more than 550 scientific publications. There are more than 15 monographs among them: *Music Computer Technologies: Historical-Theoretical, The Concept of Music Computer Pedagogical Education, Musical Instruments of the Digital Age, Voice and Computer and the Practical Aspects* and *Music Computer Technologies: The Problem of Modeling the Process of Musical Creativity*; a lot of course books: *Information Technology in Music*, vol. 1 – 4; vol. 1: *Architectonics of Musical Sound*, vol. 2: *Musical Synthesizers*, vol. 3: *Musical Computer*, vol. 4: *Music, Mathematics and Computer Science* (compiled with participation of Mikhail S. Zalivadny); *Musical Sound Engineering* and many others, as well as a variety of educational resources and programs (more than 100) developed for educational purposes, including those hosted in specialized distance education systems such as Moodle, Coursera.

Her research activities include such directions as:

MCT in professional musical education (as a means to expand creative opportunities);

MCT in general musical education (as one of the means of education);

MCT as a means of rehabilitation of people with disabilities;

MCT as the new direction in preparation of specialists of humanitarian and technological profile;

MCT in the field of digital arts;

MCT in information technology, psychoacoustics and musical acoustics;

system of training arrangements and the art of performing skills on electronic musical instruments.

Her circle of interests also includes the problems of interrelation of natural and technical sciences and humanities, as well as the possibilities of applying the results of such interrelation for the purposes of music education and upbringing.

She also takes part in working out the specialized software for computer music devices and in application of this software in pedagogical processes.

Her developments and researches also belong to the field of musical pedagogics and musicology, musical informatics, computer modeling of processes of musical creativity, timbre programming, art of performing skills and arrangement on electronic musical instruments, creative work in the field of computer music, mathematical methods in musicology.

Prof. Dr. Gorbunova is a Chairperson of the annual International Research and Practical Conference *Contemporary Musical Education: Creative Work, Research, Technology*, held since 2002; Chairperson of the annual International Research and Practical Conference *Music Computer Technologies in the System of Contemporary Education*, held since 2007; International Research Conference *Music of the 21st Century*, held since 2017; Chairperson of the annual Intra-University Scientific Congress *Higher School. Scientific Research. We are in Science: Physics.pro, Chemistry.lab, Bio&Geo.field, Math.com, IT.park*; Chairperson of the annual International Research Conference *Interdisciplinary East-West Discourse: The 21st Century. Creative Work. Research. Technology. Education*, held since 2020 (St. Petersburg, Russia – Baku, Azerbaijan); member of the organizing committees of many Russian and foreign conferences.

She is a member of Editorial Boards of International journals: *Russian Musicology*, *Music Scholarship*, *The World of Science, Culture, Education*, *Bulletin of the International Centre of Art and Education*, Electronic international scientific journal of music and sound in electronic mass media, film, Internet, and multimedia *Mediamusic*, *Music and Electronics*, *Art and Education*, *ICONI* and others.

Dr. Gorbunova is a member of the Jury of national and international competitions of musical creative works, including: *Electronic Palette* (Saint-Petersburg), *Music and Electronics* (Moscow), *Music of the 21st Century* (Moscow / Saint-Petersburg), International Festivals and Competitions *Musical Electronics and Multimedia* (Moscow / Saint-Petersburg), *Clarinet of the 21st Century* (Saint-Petersburg), *The World of Art without Borders* (Saint-Petersburg, Russia – Szeged, Hungary), *Bridge of Friendship* (Dortmund, Germany), All-Russian Competition of Electroacoustic Music *DEMO* (Saint-Petersburg).

Dr. Gorbunova is a member of the Jury of national and international competitions of musical creative works, including *Electronic Palette* (Saint-Petersburg), *Music and Electronics* (Moscow), *Music of the 21st Century* (Moscow / Saint-Petersburg), International Festivals and Competitions *Musical Electronics and Multimedia* (Moscow / St.-Petersburg), *CLARINET of the 21st Century* (St. Petersburg), *The World of Art without Borders* (Saint-Petersburg, Russia - Szeged, Hungary), *Bridge of Friendship* (Dortmund, Germany), All-Russian Competition of Electroacoustic Music *DEMO* (St. Petersburg, Russia).

Professor Dr. Gorbunova directs a number of doctoral and postdoctoral studies (more than 30) and lectures on music computer technology and information technology in music. She directs research in various fields, including: *Theory and history of culture, Musical art, Information systems and processes (in music), Theory and methodology of vocational education, Mathematical modeling in music, Numerical methods and software systems, Theory and methods of teaching and educational work (in music, computer science)*. The research results of Prof. Gorbunova has published more than 550 peer-reviewed publications, including more than 50 books and more than 300 articles in various scientific journals.

Awards and honors: 3 Gold medals of the all-Russian Exhibition Centre (former VDNKh); Silver medal of the all-Russian Exhibition Centre (former VDNKh); Diploma of the winner in the nomination «New Educational Technologies in ICT Environment» of the all-Russian creative contest of Informatization of the innovative-educational complex «Music Computer Technologies in the System of Modern Education»; Grand Prix of International Congress-exhibition «Global

Education - Education Without Borders»; Diploma of the 11th all-Russian forum «Educational environment» for the project «Digital educational resources «Music Computer Technologies in Education» in nomination of «Creative Competition of Scientific Developments, Innovative Solutions and Programs in the Field of Higher Vocational Education» and many others; Laureate of the Prize of the Government «For Outstanding Achievements in the Field of Higher and Secondary Professional Education»; Honorary Worker of Higher Professional Education of the Russian Federation

