

Creative Digital Tools for Teaching Piano



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Abstract: This research investigates creative approaches to learning the piano with digital tools. A sociological survey was used to analyse the effectiveness of the teaching approaches. The authors found that the most popular online courses were language learning (32%), programming (21%), ; performing arts (including music education), which account for about 2% of all educational courses. The authors recommended new approaches to teach music such as a programme for teaching piano lessons with digital tools. The results will help researchers to develop an effective framework for teaching piano with digital technologies ; improve academic performance.

Keywords: distance education; musical knowledge; non-standardized approach; playing technique; Soft Mozart.

Resumo: Esta pesquisa investiga abordagens criativas para aprender a tocar piano com ferramentas digitais. Uma pesquisa sociológica foi usada para analisar a eficácia das abordagens de ensino. Os autores descobriram que os cursos online mais populares foram aprendizagem de línguas (32%), programação (21%) e artes cênicas (incluindo educação musical), que representam cerca de 2% de todos os cursos educacionais. Os autores recomendaram novas abordagens para ensinar música, como um programa para ensinar aulas de piano com ferramentas digitais. Os resultados ajudarão os pesquisadores a desenvolver uma estrutura eficaz para o ensino de piano com tecnologias digitais e a melhorar o desempenho acadêmico.

Palavras-chave: educação a distância; conhecimento musical; abordagem não padronizada; técnica de jogo; Mozart suave.

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Introduction

Digital technologies have been introduced into social; economic life to improve organisational processes. Digital technologies are an integral part of modern-day life ; education. The digitalisation of education has been reported to be a complicated process. Even so, digital tools help learners to acquire knowledge ; skills from any place in the world (CAREGNATO, 2014; SAMPAIO ; SANTIAGO, 2018; ÁLAMOS ; GIMÉNEZ, 2020). Distance learning technologies are widely used in education to deliver lectures ; seminars, perform testing, repeat what has been learned before, ; for other purposes. The COVID-19 p;emic forced the learning system to change drastically ; moved from face-to-face to distance mode of information delivery. Change entailed the transformation of the curriculum (ARTHUR *et al.*, 2020). The digitalisation of education is a global phenomenon that helps teachers to improve the learning process via digital technologies (MILLICAN ; PELLEGRINO, 2017).

The COVID-19 quarantine restrictions have inspired educators to go beyond traditional learning in piano teaching to ensure uninterrupted learning. Traditionally, the music lessons include theory ; practice, but under the p;emic, the individual music practice was affected (MUÑOZ, 2019). The scholars expected that learners would benefit from the digitalisation of education ; continue to develop their creativity ; intellectual abilities. Teaching piano has a special place in the system of music education connected with theoretical ; practical knowledge. Music teachers should develop a holistic approach to teaching music based on scientific knowledge, effective training strategies, ; clearly set goals. Piano teaching should be both learner-centred ; learner-driven to meet the curriculum goals. In order to maintain the high quality of education, educators should improve the level of their competences ; overall teaching quality to ensure the cognitive progress of children. The development of creative skills in students is a process associated with an innovative curriculum, thus learning ; developing skills are interrelated but not interchangeable processes (SCHIAVIO ; TIMMERS, 2016; UPANOVA,

2020; YANG ; LEE, 2018). Music teachers should acquire new knowledge ; skills to introduce innovative solutions to education ; help their students to master the knowledge ; develop creative skills in the music classroom (BOURG, 2021; KANG, 2016). Communication ; interaction play a vital role for students, so piano lessons should be well structured ; include independent musical practising behaviour. Developing lessons for school-age children is the most challenging task for educators. At this age, students are impatient with the details ; less organised, but their music skills are developed fast ; affect cognitive development in early childhood (JONES, 2020).

Creative skills are connected with creative thinking, problem-solving ; the generation of new ideas. The development of creative thinking depends upon brain functions. The two brain hemispheres transform the acquired information into new ones. At an early age, creative thinking abilities develop fast because children do not learn problem-solving methods; therefore, they can be creative in any activity (PARTTI, 2014; QI *et al.*, 2021; VELOSO ; MOTA, 2021). There are many creative approaches available for the digitalisation of education now, ; the most interesting ones are discussed below.

Yang. (2021) examines the challenges piano teachers face when developing creative skills. The author has developed a learning programme to exp; the musical repertoire, repeat musical fragments, ; visualise pieces of music. The research found that the ability to hear ; play melodies affected both the memorization ability ; the piano playing skills.

Xiao and Ishii. (2016) analyse teaching practices based on the alternative approaches, such as listening ; repetition of pieces of music ; improvisation. The authors used two interfaces with digital modes, MirrorFugue ; ;ante, to help students learn to play music.

Spies. (2015) examines the development of creative skills while teaching students critical thinking ; practical skills. Students acquired the basic skills of writing music ; develop a creative expression that provides opportunities for young children to try out new ideas.

The research conducted by Hill *et al.* (2020) investigates the development of creative skills in children with autism while playing the piano. The teacher used auditory-visual materials to teach piano playing techniques. The proposed approach was effective, as evidenced by the results, ; students were able to perform two songs after the training.

Biasutti. (2018) explores learning strategies in distance education. Students used synchronous ; asynchronous tools to play pieces of music to develop creative skills. In addition, students watched video lessons. In the end, they were asked to complete the assignment using experimental data, listening, designing, ; developing technology.

For modern musicians, it is a challenge to create new pieces of music that differ from the existing ones. Guo *et al.* (2021) investigated student creativity by asking students to compose short melodies. The results were analysed using the Shapiro-Wilk method.

The scholars Sandnes; Eika (2017) examine the role of digital technologies in the development of creative abilities ; thinking. Using the Model-View-Controller programme, the authors developed plans, lectures, ; assignments ; assessed academic performance. The research analysed the programme's success over a five-year period ; confirmed that it was effective in teaching students.

In order to investigate the development of creative thinking in students, Tomlinson (2018) performed video analysis of musical texts. The research analysed the pitch, dynamics, ; structure of the pieces of music. The results proved that the programme was effective for developing improvisation skills in students of different age.

A critical analysis of the current literature shows that there are many approaches to music education, but they suggest a thorough analysis of distance learning ; its role in music education. The present research aims to investigate creative approaches to playing the piano with the help of information technology. The objectives of the research are:

- to identify the place of distance learning among educational courses;
- to propose a creative approach to playing the piano;
- to assess student progress on piano playing skills;
- to calculate the effectiveness of the developed programme.

Methodology

The digitalisation of education involves the transition from a traditional classroom to distance learning ; the implementation of digital technologies. The current research focuses on distance learning inspired by the Covid-19 pandemic restrictions. In spite of the fact that distance education has become very popular nowadays, it involves non-standardized approaches to learning music. In this regard, the authors have developed a distance learning piano programme for school-age children ; students.

The research involved 170 respondents: 85 students from 3 schools in Beijing ; 85 students from 4 Universities in Beijing. The students were included in the sample to investigate the effectiveness of the proposed programme. The age of children in *the first group* was 8-11 years. *In the second group*, the age of students was 17-19 years. The age differences were important for the analysis. Initially, the researchers planned to collect the data from 105 school-age children, but parents of 10 children did not sign the written consent for participation, whilst other 20 school-age children refused to learn via online learning platforms. Only 85 school-age children participated in the research. Participants above the age of 18 years signed the written consent before the training. For minor participants, parental consent was obtained. All participants knew the piano basics ; had no hearing impairment.

Bogachev; Smolyanov (2009) analysed; examined the percentage of different additional courses in distance learning

around the world. The following courses were identified as the most popular: foreign language, information technology, financial courses, creativity skills development, psychology, physical education, etc.

According to the Smart Ranking resource (SMART RANKING, 2021), there are only a few distance learning platforms for performing arts, so the current research proposes an effective programme for piano training with digital technologies. The piano teaching programme designed for distance learning is divided into five blocks:

- choosing an online platform;
- selecting the music repertoire;
- improving piano playing techniques;
- developing an integrated approach;
- improving musical memory by playing pieces of music.

The experiment took place in 2020 ; lasted one academic year. At the end of the training, the researchers collected data on the overall education quality. The poll used for this purpose asked students to rate the quality of the designed programme. Participants could choose just one answer option.

Distance education levels were categorized as:

High: teachers provide students with all learning materials ; practical exercises. A high level of education quality requires an integrated, creative approach to teaching ; learning ; feedback;

Average: educators teach all the skills but no digital tools are involved;

Low: no feedback ; no student-teacher interception.

The above categorization was developed by the authors.

Another sociological survey was conducted to assess the knowledge ; skills acquired with the proposed program. The survey was conducted before ; after the training. It assessed the following skills: technical knowledge, playing by ear, combining notes on

the piano, theoretical knowledge, recognizing individual notes, ; reading sheet music.

A sociological survey was used because it helped researchers to investigate ; provide insights set out by the research. The method is universal ; allows research under controlled conditions with the selected number of respondents (YAKOVLEVA, 2014). The effectiveness of training was calculated using the coefficient of effectiveness (SOBOL, 2019):

where,

- number of correct answers;
- total number of assignments.

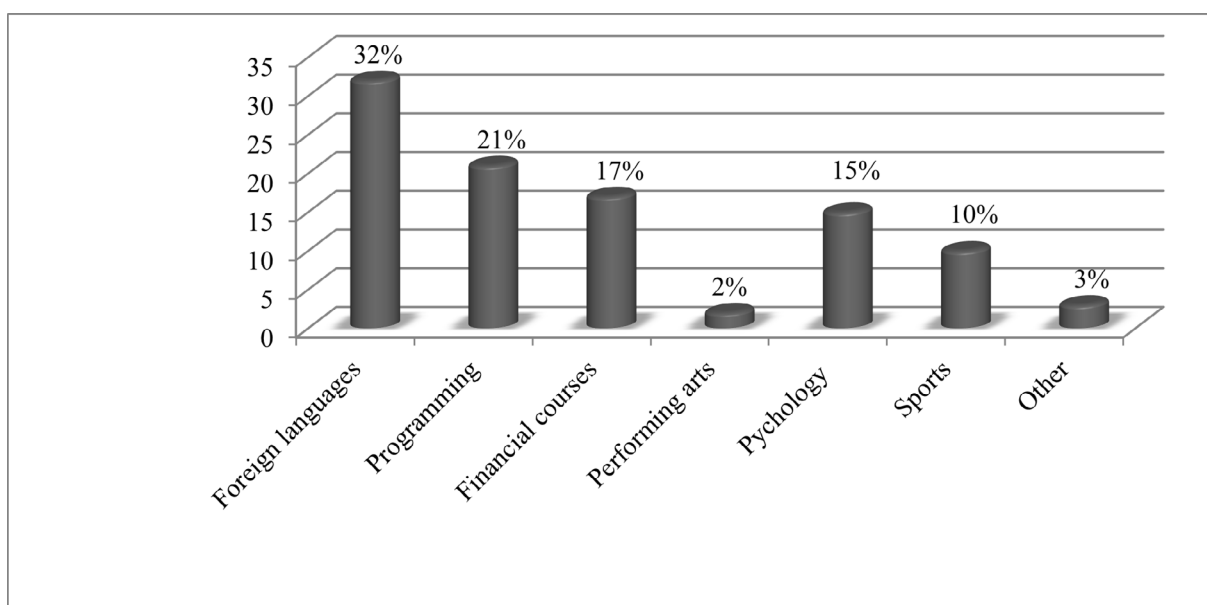
The coefficient of effectiveness should be close to 1. The coefficient of training effectiveness was calculated for each respondent separately. All respondents were asked to reproduce 10 melodies by ear. The average coefficient of training effectiveness was the sum of all results within the group divided by the total number of participants in that group.

The Numbers programme was used for all calculations. It helps to develop reports, analyse data, build charts ; graphs, ; create tables ; images (APPLE, 2021). Since school-age children ; students took part in the research, the authors followed all ethical guidelines to protect the dignity, rights ; welfare of research participants. The research complies with the ICC/ESOMAR International Code on Market ; Social Research (ICC/ESOMAR, 2020).

Results

At the first stage, the authors define the place of distance music education among all additional learning courses (Figure 1).

Figure 1 - Music education in distance learning, % (2020).



Source: Developed by the authors using the data of SMART RANKING (2021)

Figure 1 shows that the most popular courses involve foreign languages (32%) ; programming (21%). Performing art courses, including music education, account for 2% of all education courses. The reason behind the low percentage of online music courses is that playing music is a complicated process that requires theoretical data ; practical skills in order to play melodies without distortion or by ear. The data analysis proves that it is important to develop digitally enhanced programmes for playing music. The authors have developed a training programme based on creative approaches to teaching to play the piano.

At the first stage, the researchers selected an online learning platform for teaching piano lessons. The authors chose the Microsoft Teams platform (MICROSOFT TEAMS, 2021). Using this platform, educators may conduct video lectures, show presentations, videos, notes, ; listen to different melodies. The main limitation of this platform is the low quality of music sharing. To overcome these obstacles, the educational platform TONARA (2021) was used. It is intended for musicians ; allows educators to track practice sessions effectively. This platform helps teachers to

develop different types of assignments, add different audiovisual materials, provide links to sheet music, etc.

Learning online, students should follow a strict schedule with clearly defined dates ; time for each lesson. This option is available on the Tonara platform. The platform has a built-in rating system ; a mode to create healthy competition. The present research highlights the effectiveness of this platform because it compares the student's play with an original sample of the music. Teachers can identify gaps in music techniques ; inaccuracies while playing the piano.

At the second stage, the researchers chose music repertoire ; techniques. Student age was considered an important factor at this stage. In the first group (8-11 years), music teachers used children's songs to teach students how to play the piano. This choice of repertoire stems from the fact that it is easier for children to perform children's songs than classical ones. In order to assess the learning process in different conditions, teaching music was based on the world classics in the second group. The music repertoire was grouped according to music techniques (for example, tonality). The repertoire was diverse ; it helped to develop an aesthetic musical taste. The current research highlights that a diverse musical repertoire is one of the main ; significant elements of creative training solutions.

At the third stage, students have to develop ; improve playing music techniques. The SoftMozart software (SOFT MOZART, 2021) was used at this stage. This programme was developed in the USA by Hellene Heiner ; the programmer Valery Kukhtiev. The process of playing the piano is designed as a computer game. Tasks ; actions are displayed on the screen ; a student plays the melodies. The keys appearing on the screen help students to memorise the sequence of actions needed to play the piano. Such digital technologies contribute to better eye contact. Play-based learning improves memorising ; technical skills of students ; supports the development of creative skills. The SoftMozart software is based on the psychology of music ; integrates methods of cognitive

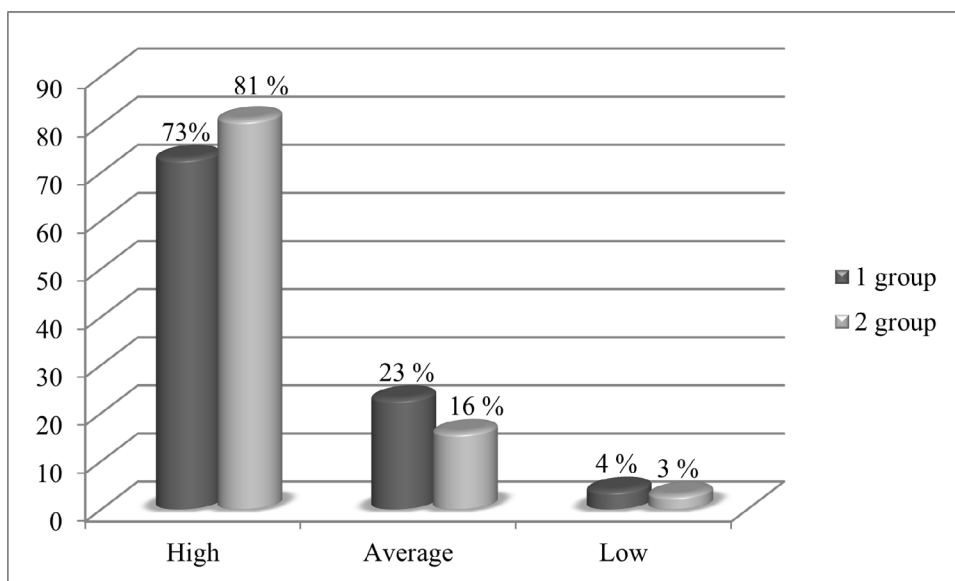
development to improve music techniques, develop attention, hearing practices, ; musical thinking. Soft Mozart is effective in musical techniques development because it includes different assessments ; tests. The software replaces the teacher ; controls the movement of each finger of both h;s on the keystrokes independently. The programme uses coloured music notation to facilitate enhanced learning. Different colours are added to musical notes ; students remember them quickly.

At the fourth stage, theoretical knowledge is integrated into practice. The educators developed environments to support creative opportunities. After playing a piece of music (using the Soft Mozart software), students explained the theoretical concepts related to a particular musical element. For example, when playing high-pitched music, students are asked to explain the concept of pitch.

The students were divided into groups of four to memorize pieces of music within a short period. The group mates helped other members of the group identify the mistakes they made when playing the piano. The collaborative cross-checking also helped students to avoid similar mistakes when playing.

Before the training, the scholars collected students' opinions on the level of piano competences ; the quality of the proposed education programme. The results are presented in Figure 2.

Figure 2 - The expected quality of education via digital platforms



Source: Developed by the author

Figure 2 shows that the majority of students felt positive about distance music learning. About two-thirds of participants in the first group (73%) reported that the quality of distance learning was high because teachers were able to explain ; teach students the most important technique. In the second group, 81% of participants assigned the high level of quality to distance learning. Online learning allowed them to learn at their own pace ; spend more time on individual practice. Only a small percentage of students (4% in the first ; 3% in the second groups) was dissatisfied with the quality of distance learning arguing that online learning required perseverance ; concentration on playing much more than a traditional classroom.

The research evaluated the quality of theoretical knowledge ; piano skills. The training results are presented in Table 1.

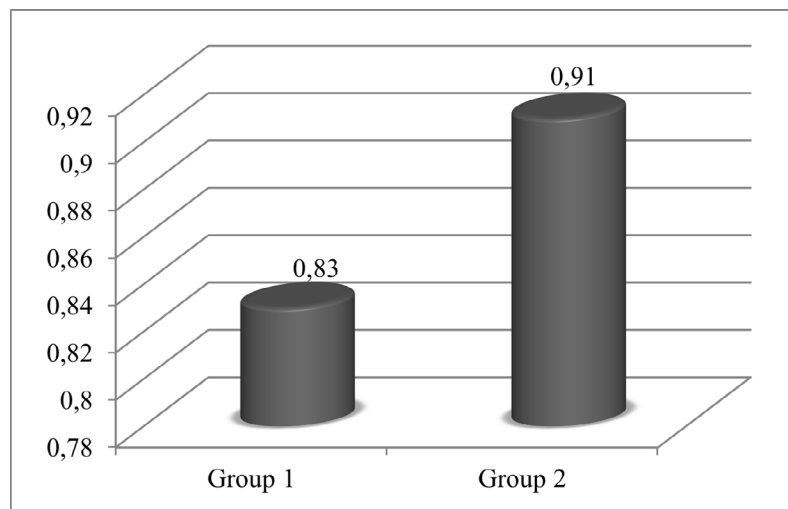
Table 1 - Piano skills before ; after training

Skills	Before training		After training	
	Group 1	Group 2	Group 1	Group 2
Music skills (musical techniques)	15%	18%	23%	25%
Playing by ear	5%	7%	20%	21%
Combining notes to play on a piano	18%	15%	26%	23%
Theoretical knowledge	29%	28%	31%	30%
Other	33%	32%	-	1%

Source: Developed by the author

Table 1 shows that before the training 29% of students in the first ; 28% of students in the second groups had theoretical musical knowledge. The students had been studying music under the given programme for 4 months before the experiment started. Before the training, 15% of participants in the first ; 18% in the second group already knew some musical techniques ; could play the piano. After the training, 23% of students in the first group ; 25% of students in the second group had a better knowledge of musical techniques. These figures show that musical techniques ; skills have improved. For example, before training, students could combine just 4 notes, but after the training, they could combine 5 or more notes. After the training, 20% of participants in the first group ; 21% in the second group played melodies by ear. This skill has been enhanced with SoftMozart. Moreover, students developed skills such as reading sheet music, recognising the composer, tonality, etc. Data on training efficiency are presented in Figure 3.

Figure 3 - Average training efficiency under creative approaches



Source: Developed by the author

Figure 3 shows that students in group 2 exhibited higher results (0.91) than in the first group (0.83). The likely reason is that a greater number of students had piano skills formed in their childhood. Despite some differences between groups, both developed piano skills that meet the established criteria ; the curriculum standards.

Discussion

The critical literature review compared the different perspectives on teaching piano online ; the development of musical competences conducted by other scholars. Li and Timmers (2021) focus on different approaches to developing timbre while playing music. The authors found that these skills could be developed in the classroom while improving musical techniques, sound effects, ; body movements. Verbal student-teacher interaction has a great impact on timbre including the character, texture, ; colour of a sound. Imitation is one of the possible ways to improve timbre. Moreover, timbre can be improved by working with a coach to create a completely new ; different sound. The research highlights that the role of a teacher is undeniable in teaching piano but different

software programmes such as Soft Mozart help to develop musical techniques ; improve skills fast ; efficiently.

Lei *et al.* (2021) use different social networks to improve teaching music to students of different ages, namely violin; piano. The research found that social networks help to improve learning practices providing students with new sources of knowledge sharing; making this process much simpler. The authors identified some challenges of distance learning. For instance, the difficulties were caused by peculiarities of teaching music; poor self-organization of some students. Thus, the researchers admit that the online platforms; software programmes make distance learning simpler; reduce misrepresentation of melodies; sounds.

Wang (2020) analyses the use of computer technology in teaching piano. MIDI music technology ; the acoustic sequencer software helped music educators to teach playing the piano using the sound visualisation method. Moreover, the research highlights that software can be effectively used to build graphs ; analyse pieces of music. These digital technologies help students to practice independently ; improve their musical skills.

Snell II ; Stringham (2021) examine different strategies for teaching piano in higher education. The authors found that many educational institutions used certified programmes in teaching piano. The authors identified 32 musical skills developed in students according to these programmes such as musical techniques, repertoire, accompaniment, reading music ; creativity. The learning process is concentrated on these music techniques because they are emphasised as key skills in playing the piano. The discussed research focuses on an integrated approach to teaching piano based on the development of muscle techniques, the expansion of repertoire, ; an increasing role of everyday individual practice.

Zhu (2018) shows a unique method for teaching piano via a virtual environment. A pitch-bend method based on Q-transform was used to transmit the piano signal. This method helps students to recognize tunes; sounds. In the research conducted by

Al-Tashly (2017), the author examines the development of sound recognition skills in young musicians learning to play music. The method focuses on the relationship between playing techniques; sound frequencies. This technique helps to develop listening skills considered important in playing music. The research by Qi *et al.* (2021) explores possible ways of teaching piano including the pedagogical method known as the “Pygmalion effect”. Using this method, the researchers analysed the relationships between self-organization; enthusiasm. The results show that communication among students motivates them to be more active; improve academic performance while playing the piano. In his research Deja (2021) focuses on the visualisation of playing music. Nevertheless, the authors highlighted that the analysed methods did not consider the space-time relationships. To overcome this challenge, the scholars developed approaches to teaching music adapting space-time modelling to music techniques. Moreover, they highlighted an important role of premature learning of parts of songs in the adaptive learning system. The proposed approach improves piano playing skills; academic performance. The research by Sun (2021) focuses on digital technologies in learning to play the piano. The use of **Edge computing** helps educators to perform analysis, ensure data storage,; manage effectively educational resources. Computer-assisted learning makes information sharing more flexible; improves the interaction between students; teachers. However, the authors found that this approach was not effective for practical assignments. This research proved the effectiveness of learning with digital technologies combined with theoretical; practical materials.

The research conducted by Lancheros-Molano *et al.* (2021) examines the application of the TensorFlow programme; discusses possible digital tools for auditory activities ; sheet music creation using a musical transcription algorithm. The digital tools make it possible to visualise; edit musical texts. In his research Mierowsky *et al.* (2020) highlight that the learning process depends on cognitive processes including gestures while playing music. This approach

includes analysis of the animated video of four notes with visible hand movements; sounds. Watching the video, the participants repeated the gestures. The scholar supposes that it helps to improve music techniques; develop specific playing skills.

A critical literature review shows that the majority of sources examine the ways; approaches which help students improve only one musical skill. The current research focuses on a comprehensive teaching methodology applied in music education. It is based on online learning platforms, the age-specific repertoire, improvements of playing technique with the help of the Soft Mozart software; effective teamwork. This approach helps students to acquire theoretical knowledge; develop practical skills learning to read; music.

Conclusions

The research examines creative approaches to teaching piano with digital tools. The scholars suggest developing an effective programme for playing the piano via distance learning platforms. To solve the problem of digital platforms shortage, the authors developed a programme that allows developing piano skills with digital tools. The research highlights that it is also critical to implement new programmes for teaching piano on online platforms by involving teachers in the transformation of the traditional classroom. The Microsoft Teams platform made it possible to conduct lectures, share educational materials, video conferencing ; others. Using the Tonara platform, the educators developed different tasks ; involved students in activities with characteristics of a game. The Soft Mozart software was used to teach lessons in the form of a computer game. The combination of theoretical material, exercises, ; effective teamwork helped teachers to develop musical skills in two groups. The research identified that 73% of the participants in the first group ; 81% in the second group agreed that the proposed distance learning

programme for piano teaching with digital tools was well-developed ; provided them with high quality educational content. The complex educational programme ; different digital tools improved learning. The first group of participants (school-age children) admitted that theoretical knowledge (31%) ; the combination of notes to play melodies (26%) were the main skills they acquired. The second group (students) improved their theoretical knowledge (30%) ; technical skills (25%). After the training, teachers admitted that students developed ; strengthened their music skills. The training outcomes were determined using the efficiency coefficient. For the first group, the coefficient was 0.83. For the second group, it was 0.91.

The study highlights the benefits of digitalisation of music education ; advises teachers on how to use that information to develop effective online learning programmes. Further research in this field is still required. It should be focused on investigating the possibility of using these ; other online platforms to teach music. The study offers recommendations on how to use digital tools in teaching piano regardless of age.

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