



The role of a teacher in modern music education: can a student learn music with the help of modernized online educational technologies without teachers?

Bing Yao¹ · Weiwei Li¹

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Abstract

Music education is aimed at the development of musical abilities, emotionality during the performance of musical compositions, and all-round development. The aim of the article is to determine the possibilities of schoolchildren obtaining musical knowledge with the help of modernized online technologies, as well as to determine the importance of a teacher in modern music education. The indicators were determined by a questionnaire, the data collection for which was done using a Likert scale. Initially, the paper identified approaches to teaching students prior to the study. The results showed that more emphasis was placed on the use of book-based theoretical materials (46%), which allowed only 21% of students to achieve a high level of knowledge. The use of information technology was common among 9% of students, which allowed 76% of students to achieve high results, which is based on acquiring knowledge in a shorter time. The authors concluded that it is necessary to provide improved stages of learning, which will expand the use of modernized technology. Work on the theoretical basics of piano playing can be implemented with the Vivace app; Flow app helps one to work on sound features; Functional Ear Trainer app is about developing rhythm and hearing; and Chordana Play app helps one to work on a piece of music. After training, by calculating the coefficient of effectiveness, it was found that students in group #1 (0.791), who mastered the skills of playing the piano according to the developed training stages and without a teacher, showed the quality of acquired knowledge lower than students in group #2 (0.853), who were trained under the direct influence of a teacher. The data obtained confirm the high quality of learning in the groups, as the educational process was built with the correct distribution of workload and providing opportunities for the development of musical skills. It is established that the students of group 1 to a greater extent developed independence (29%), and group 2 was good at the accuracy of musical tasks' sequence (28%). The practical significance of the work is based on the possibility of transforming the music learning system with the help of

Extended author information available on the last page of the article

modern technology. Prospects for the study can be based on a comparison of the quality of teaching the piano and vocal training, excluding the participation of a teacher in the learning process.

Keywords Independent learning · Information technology · Musical cultural values · Piano playing · Work on sound features

1 Introduction

Music education is a multi-step process that aims at acquiring high knowledge and skills in music that are based on the preservation of cultural heritage (Li & Zhou, 2022). The development of the music education system has influenced the exchange of teaching approaches and performance techniques between different countries (Miyazaki et al., 2018). The exchange between countries is based on economic and social aspects, which affects the improvement of education quality. Music education in China is primarily aimed at the development of creative skills, all-round development of students, and achievement of professional level of musical skills (Wan, 2022). The learning process is based on studying the characteristics of world music, its history, considering musical genres and styles, and the work of famous musicians (Ryan et al., 2022). The acquisition of musical knowledge is based on a comprehensive approach, which involves identifying the relationships between different types of creativity, which affects the development of a student's thinking (Williams & Trakarnrung, 2016). To preserve Chinese cultural characteristics, the music training system has developed at a rapid pace, which affects the high quality of instruction (Qi et al., 2021).

During music training, the emphasis is placed on traditional culture, which reflects the country's mentality and contributes to the preservation of a unique manner of performance (Li, 2022). In doing so, a student not only acquires musical knowledge, but also becomes a bearer of cultural values (Li, 2022). The modern stage of music education development is based on the development of new approaches to playing musical instruments and vocal production (Xue, 2021). The learning process is based on increasing the quality of interaction between teachers and students and the use of modern technologies, which contribute to improving musicians' knowledge quality and professionalism (Xue, 2021). Online applications exist for playing musical instruments (Yousician, Smart Pianist, etc.) as well as vocal training (Auralbook, Swiftscales, etc.). For example, the Yousician app allows one to acquire the skills to play the piano and guitar with built-in lessons by level (Nart, 2016). The acquisition of musical skills is based on warming up, learning, and mastering new material, and allowing the pace of playing to be adapted to a musician's abilities (Nart, 2016). The benefits of the Smart Pianist online program are based on the development of professional skills, which are adjusted by changing the timbre; the creation of a virtual hall, which promotes an understanding of the characteristics of sound in different concert halls (Crawford, 2017). The Auralbook app replaces a teacher in the vocal training process, as it is based on the use of various exercises affecting the warming up of the ligaments and the empowerment of the voice (Serafin et al., 2017). The Swiftscales

app has similar functionality to Auralbook and allows one to tune and develop one's voice (Waddell & Williamon, 2019).

An educator also has an important role to play in the learning process, influencing the improvement of learning process quality, which contributes to the assimilation of theoretical knowledge and practical skills (Jack & Higgins, 2019). Educators' activities may focus on the limited adoption of modern technology in instruction, which affects the quality of musical training (Hamond et al., 2020). This learning is based on achieving a professional level of musical instrument playing as a result of constant rehearsal (Thomas et al., 2021). Music instruction also takes into account the aesthetic component, which is displayed in sounds, intonations, and musical embellishments (Hamond et al., 2020). The music learning system is based on the search for imagery of compositions, which is displayed in the search and transmission of contemplative moods.

1.1 Literature review

Online music instruction occurs not only for students, but also for older people. To ensure the comfortable acquisition of musical knowledge, communication with students should be ensured; online programs should be provided; and theoretical knowledge for music writing should be provided. The use of online programs without teacher involvement can affect students' lack of motivation to learn and the emergence of technological problems. More problems arise from the lack of group rehearsals, support, and knowledge sharing (Barbeau et al., 2022). Artificial Intelligence technology facilitates music learning and can replace a teacher. This process is based on the fact that modern programs allow one to learn the necessary musical skills in the form of practical lessons. For example, while writing musical compositions, the programs include theoretical information as well as providing practical opportunities to combine notes. Further, with each level, the tasks become more complicated, which promotes initially writing short melodies, and later: complete compositions (Zheng & Dai, 2022). To teach music using modernized technology, a well-designed curriculum should be provided. This requires consideration of how to implement distance learning, what musical activities are possible in an online format, and how to ensure a communicative process. It has been found that students' creativity can be developed through online rehearsals that focus on interaction with other musicians (Schiavio et al., 2021).

The latest technology contributes to the improvement of piano playing skills as a result of their parallel use with traditional lessons. The implementation of this approach to learning should be based on the organization of group interactive lessons, which will develop the independence of students and ensure that the importance of a teacher is minimized. The use of innovative technology affects the empowerment of musicians, which can manifest itself in the process of working with musical texts, learning musical parts, and the implementation of creative tasks (Yang, 2020). The facilitation of music learning can be achieved through the use of artificial intelligence programs, as they facilitate easier perception of musical information, recognition of musical sounds, planning tasks, etc. Information technology significantly contributes to reducing the time to find the necessary information. The effectiveness of informa-

tion technology depends on its ability to recognize the quality of voice and musical sounds to show the progress of learning (Zhao et al., 2022). The combination of instructor and online learning capabilities has a positive impact on the quality of knowledge acquired. The students needed access to online pianos, computers with cameras and microphones, and Internet MIDI to enable learning with online instructors. The results identified effectiveness of the acquired skills; influenced the flexibility of learning, which manifested itself in the organization of the time frame of learning; contributed to the development of cognitive skills (Pike, 2015).

The Internet has influenced approaches to teaching vocal music. Analysis of technology has allowed determining that the existing methods are more focused on the implementation of formal (traditional) teaching. Traditional teaching is to a greater extent aimed at increasing the role of a teacher and the lack of a student's independence. To meet modern requirements for music education, a student's vocal abilities should be analyzed using modern technology. It is also necessary to broaden the artistic horizons that contribute to the understanding of the images embedded in a piece of music. Modern technology contributes to the reduction of time for learning, which is manifested in an easier search for information (Tang, 2022). The *Werktreue* program can be used to reinforce the practical skills of classical music playing. The *Werktreue* program promotes emotional piano playing as a result of repeating the precise interpretation of the melodies presented. The functionality of the program is based on the development of students' technical abilities as well as the emotional interpretation of the compositions (Navon, 2020). As a result of the literature review, it was determined that the interaction between a teacher and the use of computer technology allows for better perception of musical information and the development of practical skills.

1.2 Mission statement

The improvement of music education in China is based on the integration of foreign teaching approaches. The integration is multidimensional, which affects the transformation of the teaching system during the playing of musical instruments, vocal training, learning the skills of music band management, etc. However, to improve the learning process, information technology can be used to replace a teacher partially or completely in the learning process. For the acquisition of musical skills in China, the national traditions, which reflect the uniqueness of musical culture, should be taken into account. The system of music education should be aimed at developing the creative potential of a student, based on the skills of creativity. Based on the peculiarities of the teaching system, the aim of the work is to investigate the possibility of obtaining musical skills of students as a result of modernized online technologies without the role of a teacher, as well as to determine its importance in the learning process.

The study objectives are based on:

- identifying the approaches that were involved in teaching students prior to the study,
- development of learning stages that will allow one to develop the skills of playing the piano without the participation of a teacher,

- determination of learning quality among two groups of students who studied under the control of a teacher and without teacher's participation,
- determination of the skills that were acquired during music instruction, using the coefficient of intensive values.

2 Methodology

2.1 Research design

The first study level was based on the identification of approaches to student learning that were undertaken prior to the start of the study. The approaches were divided into the following categories:

- emphasis on a teacher's control,
- emphasis on independent learning,
- application of information technology,
- emphasis on book-based theoretical materials.

The indicators were determined by a questionnaire, the data collection for which was done using a Likert scale. Electronic questionnaires were used to collect data, which included the approach to learning, and the percentage of modern technology that was used in the work. Answers had to be submitted by mail within 24 h. The distribution of students' scores on prior learning was obtained from students' journal extracts.

The second study level was based on the development of learning stages for music education. Piano playing has been chosen as the basis of training because it is quite common in China and contributes to the preservation of national musical traditions. There are also a sufficient number of online programs for learning to play the piano. To determine the most effective computer programs, their functionality and features were analyzed. During the selection of online applications, the possibility of testing skills and knowledge was also taken into account. The phases of the training included:

- I. Work on the theoretical basics of playing the piano.
- II. Work on sound peculiarities:
 - studying changes in pitch of notes.
 - studying the peculiarities of the combination of sounds.
- III. Working on the development of rhythm and hearing.
- IV. Working on a piece of music:
 - identifying difficult elements to play.
 - tonal studies.
 - performance of compositions.

– ability to make changes in composition.

V. Ability to accompany the vocalist's voice.

To implement the training, an introductory lesson was held among students to learn the technique of using the online applications that were involved in the training (Vivace, Flow, Functional Ear Trainer, Chordana Play). The study was conducted over a period of 8 months, from March 2021 to November 2021. The third study level was based on determining the quality of learning among students in two groups (in group #1 learning took place without teacher influence, in group #2 under the influence of a teacher). To determine the quality of skills obtained, the efficiency coefficient was calculated.

$$EC = \frac{(n_p + n_i) \times k_t}{m_{max}} \quad (1)$$

n_p – points received in the process of training,

n_i – scores for independent study,

k_t – the coefficient of time spent (0.5 - students completed the tasks on time; 0.1 - students completed the tasks with a significant delay)

m_{max} – the maximum number of points that could be obtained (in this study it is 5).

The calculation of the efficiency coefficient is high if the indicator is between 0.650 and 0.9; medium: 0.4 to 0.6; low: less than 0.4. At this stage, the students' opinions on the developed approach to teaching were calculated, which was based on the use of the coefficient of effectiveness. The data from the students were obtained based on the questionnaire according to the first level. The students' scores ranged from 1 to 5, which allowed revealing the average performance. Comparison of results between groups was determined based on statistical measures using the Mann-Whitney test.

$$U = n_1 \times n_2 + \frac{n_x \times (n_x + 1)}{2} - T_x \quad (2)$$

n_1 and n_2 – values of the first and second groups,

n_x – number of indicators to calculate

T_x – tabular value

The correlation of indicators is observed as a result of the calculated data lower than the tabulated data (Liu & Shao, 2022).

Skills were also identified at this level that were developed in the two groups of instruction. Skills were identified by teachers by calculating an intensity coefficient (Yuting et al., 2022). They were also presented as percentages.

$$I = \frac{g}{M} \quad (3)$$

g – task performance rating,

M – benchmark of performance.

High efficiency is observed if the coefficient is from 0.8 to 1.0; average efficiency: from 0.6 to 0.79; low efficiency: less than 0.59.

2.2 Sample

The work involved 128 students from four music schools in Beijing, who studied in the experimental group within the optional classes. For the organization of the study, students of the second and third grade of music school were involved. The limitations of the sample of schoolchildren were set to determine the teaching approaches that had previously been used. The authors planned to involve 130 schoolchildren, but 2 people did not meet the sampling criteria. For the study, the students were divided into two groups of 64, which allowed achieving necessary results. Pupils of Group 1 were taught according to the developed stages to achieve the skills of playing the piano without the direct participation of a teacher. For pupils of group 2 the training was conducted according to the developed training stages, but under the control of a teacher. Signing voluntary consent to participate in the study was carried out under the supervision of parents.

2.3 Statistical processing

Experimental data were processed using Microsoft Excel. The program allowed grouping data, carrying out calculations, and constructing graphic and tabular material affecting study visualization.

2.4 Ethical issues

Ethical issues were respected in the study, which allowed for the involvement of schoolchildren in the experiment. In this regard, prior to the start of the study, the students were told their rights and responsibilities in the presence of their parents, thus avoiding any conflicts of interest (Committee on Publication Ethics, 2021).

2.5 Research limitations

Limitations of the study are related to the presentation of the learning stages for piano playing with the introduction of modern technology without the participation of a teacher, excluding a comparative analysis of learning effectiveness without the influence of a teacher. Further research will involve comparative analysis.

3 Results

Understanding the specifics of conducting music lessons was based on the study of previously used approaches to teaching schoolchildren. The first study stage is necessary to develop further teaching approaches (Table 1).

Table 1 Approaches to teaching students before the start of the study

Approach to teaching	Percentage of schoolchildren	Percentage of modern technologies that were used in the work	Points received		
			High	Medium	Low
Emphasis on teacher supervision	34%	21%	41%	54%	5%
Emphasis on self-study	11%	23%	19%	77%	4%
Emphasis on information technology	9%	81%	76%	23%	1%
Emphasis on book-based theoretical materials	46%	3%	21%	64%	15%

Before the start of the study, 46% of students used book-based theoretical materials, which provided that only 3% of all classes used modern technology (computer applications, programs to play tunes, etc.). The use of book-based theoretical materials influenced the fact that 21% of students received high scores and 64% received average scores, because the learning process was based on memorizing theoretical material in blocks, followed by practical exercises. Teaching materials were not adapted to modern musical requirements, the repertoire did not affect the interest of students in learning.

For 34% of pupils during the acquisition of musical knowledge, the emphasis was on teacher control, which involved playing musical compositions and interpreting theoretical material. The presented approach to the work allowed 41% of the students to get high scores for the semester of study, which is associated with the support of teachers, but the lack of independent preparation of students.

An emphasis on independent learning was provided for 11% of students, which involved prior study of the learning material and its discussion in the classroom. At the same time, 23% of the total percentage of classes were conducted using modern technology, which involved the use of presentations and computer programs for practical lessons. However, teacher support was not significant, which influenced high scores among only 19% of the students.

Information technology instruction was prevalent among 9% of students, which was reflected in high scores among 76% of students. The learning process helped to motivate students, which influenced the development of musical skills. The use of computer-based music software influenced the learning of music skills in a shorter time frame.

Analysis of the previous training format revealed that the most effective training is the use of modern information technology, but an important role is also played by a teacher. The authors have developed stages of music education using modernized interactive technology, excluding the role of a teacher, to determine the quality of students' learning and development of their independence (Fig. 1).

- I. Work on the theoretical basics of playing the piano was the base of acquiring musical knowledge. The learning process was based on learning the basics of piano playing, proper body positioning, and studying approaches to the analysis of musical compositions. During the training the emphasis was placed on the study of composers' works and the basic musical techniques that were used to write compositions, which is necessary for further piano playing. The study of

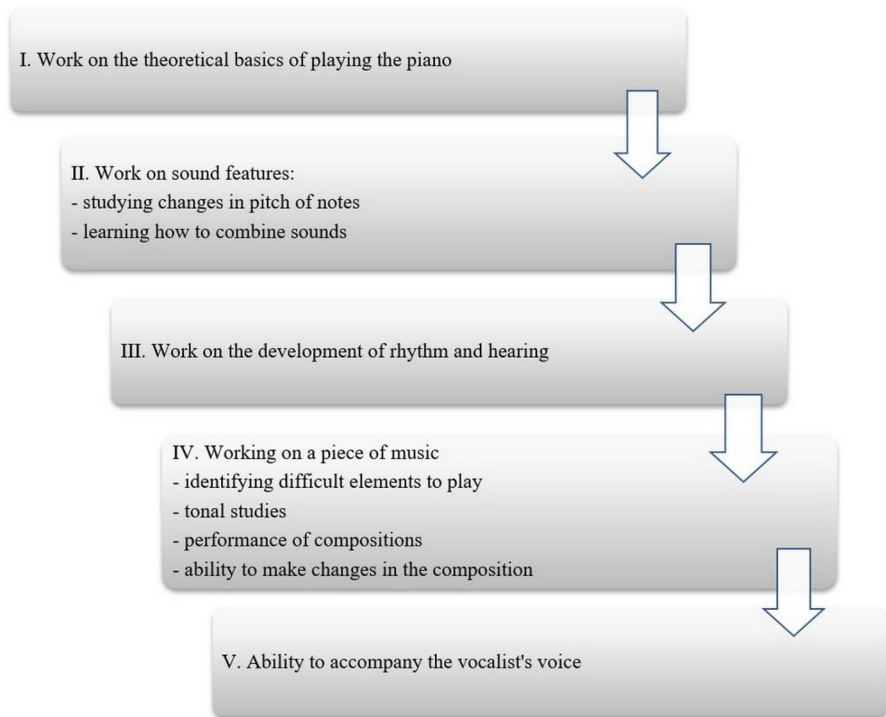


Fig. 1 Stages of music instruction using modernized interactive technologies

theoretical material was supported by practical skills, so theoretical knowledge was developed throughout the course. The Vivace app was suggested as a modernized online technology. The app is based on the use of methodical instructions in illustrative form; it is also aimed at learning notes and understanding pitch and duration of notes. The app includes a variety of test tasks, which are aimed at checking the knowledge. For the second group of students who studied with a teacher, there was a logical sequence in the study of tasks. Insufficient level of theoretical knowledge implied repetition of the material, which was coordinated by a teacher.

- II. Work on sound features was based on the study of changes in the pitch of notes and the features of the combination of sounds. The approach is based on the understanding of the nuances of combining the sounds, the ability to harmonize them with each other. This stage contributes to the development of piano playing technique and develops skills of fluency, dexterity, and clarity. It develops skills for further opportunities to express individual creativity. The study of fine and coarse techniques has contributed to this. Fine technique is based on repeating five notes in one musical position without considering melodic embellishments and scales. Coarse technique includes octaves, chords, and leaps. Coarse technique is aimed at learning deepening skills and developing flexibility, plasticity, and fluidity of movement. Work on sound features also involves the study of musical strokes (non legato, legato, staccato), which contribute to the variation of

the sound duration. The Flow app aims to develop the skills presented and allows one to develop piano skills from simple to more advanced. Checking one's performance skills is based on a built-in progress bar. The second group of students learned the sound features of piano playing not only through the Flow app, but also as a result of accompaniment and performance presentation by a teacher.

- III. Work on rhythm and hearing development promotes the acquisition of skills that affect the reproduction of sounds. The development of rhythm and musical hearing affects the clarity of intonation and accuracy of playback. Rhythm affects the transmission of moods, which affects a listener's perception of songs. The accuracy of the combination of sounds depends on the development of one's hearing. While working on the development of one's ear, one's playing skills will improve, allowing one to play tunes more professionally and improve one's playing of an individual phrase. The development of rhythm and hearing is important during accompaniment of vocal performances because it allows the pianist to adapt the melody to the voice of the performer. The Functional Ear Trainer app was suggested to provide independent work, which is aimed at perceiving melodies by ear and playing them back. This approach will facilitate the recognition of tones, rhythms, and melodic intervals, which affects the ability to understand songs. The second group also used the Functional Ear Trainer, but under the supervision of a teacher.
- IV. Work on a piece of music builds on previously learned skills and includes identifying difficult elements to play back, examining tonality, performing compositions, and the possibility of making changes to the composition. Identification of difficult elements for playback is based on studying the features of a particular composition, understanding the level of difficulty of playback, studying the possibility of performance, and determining the degree of training required. Rehearsals for compositions are important because they affect the quality of the final performance. A separate item in the work on a piece of music is the ability to make changes to the composition. This item displays the skill level of the pianists and affects the ability to transform the tunes. The Chordana Play application is aimed at studying compositions and allows one to identify errors in performance. Students in the second group were also aided in learning the compositions by their teachers, who monitored changes in the composition and pointed out inaccurate and false play.
- V. The skill of accompaniment to a vocalist's voice was the final stage of learning because it promoted the development of professional skills. The accompaniment was done with the help of audio and video recordings, which were provided from the YouTube platform. The students of the second group accompanied the future vocalists directly, which allowed determining possible changes in the voice during the repeated performance of the composition.

Based on the developed approaches to learning, the work carried out a comparative analysis of training quality of the two groups of students. Group 1 studied piano playing in accordance with the presented items without the coordination of a teacher (a teacher was as an observer). Group 2 studied piano technique based on the presented stages; the process was coordinated directly by a teacher (Table 2).

Table 2 Effectiveness of teaching students in accordance with the developed learning stages

Group number	Calculation of the efficiency factor	Student assessment
Group 1	0.791	4.8
Group 2	0.853	4.6
Comparison of indicators using Mann-Whitney test	0.861	

Table 3 Developed skills of schoolchildren

Developed skills	Calculation of the coefficient of intensive values		Percentage of students	
	Group 1	Group 2	Group 1	Group 2
Independence	0.96	0.71	29%	21%
Accuracy of execution of musical tasks' sequence	0.73	0.93	19%	28%
Harmonicity of changes in the composition	0.92	0.86	27%	25%
Polyphony of sound	0.81	0.79	25%	26%

The results showed that group 2 (0.853), which was engaged with a teacher, got insignificant but higher results in the process of acquiring the skills of playing the piano. However, the effectiveness of learning without a teacher in group 1 (0.791) was also high. The high skills obtained are related to the correct distribution of the workload and the possibility of learning with the help of interactive applications, which promote consolidation of theoretical knowledge based on the performance of practical actions. Assessment of pupils of group 1 (4.8) regarding the developed approaches to learning is higher than that of pupils of group 2 (4.6), which is connected with the possibility of independent planning of lessons. The paper also determined which skills were developed in the two study groups. The results were presented as a percentage, as well as by calculating the coefficient of intensive values (Table 3).

Among the students of group 1 the skills of independent work (29%), which implied the study of educational materials, both theoretical and practical, were developed to a greater extent. The students of group 2 (28%) developed to a greater extent the ability to perform the sequence of musical assignments accurately. Students of group 2 with the help of the teacher studied their capabilities and the emphasis was on the correct sequence of actions and accurate repertoire. The results show that modern technology helps to ensure the learning process and acquisition of necessary knowledge by students. However, a teacher's role is essential in the educational process because it helps to control the individual abilities of the students and influences the correctness of the interpretation. A teacher contributes to the coordination of students' posture, which has an impact on the correctness of the performance.

4 Discussion

Computer and multimedia music instruction is an innovative way to get more instructional information using networked platforms. Modern technology contributes to reducing the role of a teacher and influences the development of students' independence. Note editors affect the study of musical notation (which facilitates solfeggio lessons) and contribute to the development of general musical literacy. Skill development is associated with the ability to use practical lessons that are not limited by time constraints (Dai, 2017). Modern technology promotes the development of vocal skills in the process of working with gifted children. The development of children's musical skills is achieved through the use of approaches that influence children's interest and their self-expression as a result of the development of different musical abilities. The results showed that collective activities, such as choral singing, have an impact on their musical expression. The role of a teacher is of great importance for the achievement of high results. High results are achieved as a result of conducting concert activities, finding an individual approach to each student. The role of a teacher is that they systematically analyze the level of knowledge and abilities of students (which affects the variability of the acquired knowledge), as well as contribute to students' adaptation. Implementation of online learning is primarily needed during contingencies (e.g., the COVID-19) to ensure continuity of musical knowledge. Online learning should be based on the processes of adopting, implementing, and adapting the curriculum. However, the online learning process should provide positive emotions that will stimulate students to acquire musical knowledge. Therefore, the role of a teacher is indispensable, and the use of information technology without the influence of a teacher cannot provide the necessary level of musical knowledge (Li et al., 2022). In the study presented by the author, however, the emphasis is on the application of approaches to teaching piano with the help of computer technology, which contributes to learning without the involvement of a teacher.

Modern music technologies can be aimed at the realization of musical knowledge. Functionality is related to the possibility of using them to view educational materials, listen to music, and use them as a personal assistant to search for information. Computer technology facilitates learning because it focuses on multifaceted functionality (Hutahaean et al., 2022). The use of information technology contributes to the development of musical skills and positive emotions of students. This is achieved as a result of the fact that electronic resources contribute to the activation of musical thinking and the development of creative skills. Despite the advantage of electronic technology, modern multimedia technology is not widespread enough in junior high school (Liu, 2022). Motivation is an important factor in the learning process because it affects the ability to improve academic knowledge. The Open SoundS program is a virtual studio that promotes the projection of musical knowledge and influences the approaches of creating one's own musical compositions. The program is updated to meet new requirements, which affects the needs of students (Michele, 2018). The individualized information technology-based curriculum promotes competent knowledge. The effectiveness of this approach was confirmed based on the experimental group, as students with average and high knowledge significantly developed musical competence. Musical competence is related to listening, vocal and instrumental

expression, and development of musical language (Hernández-Bravo et al., 2016). In the same author's study, it was found that innovative technology contributes not only to the development of musical skills, but also affects the independence, the exact sequence of tasks, the harmony of changes in the songs, and develops skills of polyphonic sound.

The Improved Neu MF matrix model was used to develop independent piano skills. The training system is based on the use of a recommendation for online lessons. This approach to learning improves the efficiency of the educational process and influences the acquisition of musical skills (Huang & Ding, 2022). Listening skills can be developed through the use of the Listen By Looking app, which is based on the use of a game format during instruction. Classes are based on the reading of notes and repetition of musical compositions. Repetition of different songs affects the rhythm and musicality (Pitteri et al., 2019).

Analysis of scientific papers allowed determining that most articles are aimed at the development of new interactive applications or the use of existing ones for the development of musical skills. Combining them to develop new training programs that will eliminate the role of a teacher is presented rather limited. In the main study presented, however, the focus is on the development of learning stages, which can be carried out with or without teachers. The effectiveness of training with modern technologies was confirmed in the study.

5 Conclusions

The paper analyzed the approaches that were used to develop piano skills prior to the study. The results showed that the use of exclusively book materials was characteristic of 46% of the students, the emphasis on a teacher's work was 34%, but high levels of proficiency were obtained only among 21% and 41% of the students, respectively. These results are associated with a lack of modern approaches to teaching, which affects the motivation of students in acquiring high knowledge. The use of computer technology in the learning process influenced the interest of students, which allowed 76% to get high scores. However, the process of learning with the use of information technology was characteristic only for 9% of pupils.

Based on the results obtained, in the course of the study the learning stages to play the piano were developed, which were focused on the use of information technology:

- work on the theoretical basics of playing the piano: included the use of the application Vivace,
- work on sound features included the use of the Flow app,
- work on rhythm and hearing development included using the Functional Ear Trainer app,
- work on musical composition included the use of the Chordana Play app,
- the ability to accompany the vocalist's voice was based on the use of audio and video recordings.

During training, it was taken into account that group 1 learns piano playing without the influence of a teacher; group 2 is supervised by a teacher. Based on the data presented, it was found that the quality of learning in group 2 (0.853) is higher than in group 1 (0.791), but the indicators are at a high level. Pupils found that learning to play the piano without teacher control has a greater efficiency (4.8), which is based on the independent ability to distribute training time. Pupils of group 1 confirm that the control of a teacher contributes to more discipline. In the process of the study it was found that the students of group 1 had a greater degree of independence (29%) and the ability to harmoniously change the compositions (27%), as based on the development of logical thinking. Students of group 2 (28%) developed the accuracy of the sequence of musical assignments under the direct influence of a teacher.

The practical significance of the work lies in the possibility of improving the teaching of music, namely piano playing, with the help of information technology. Prospects for the study can be associated with a parallel piano training among younger students, high school students, and college students to determine the quality of interactive learning with the minimization of a teacher's role.

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Data Availability Data will be available on request.

Declarations

Conflict of interest Authors declare that they have no conflict of interests.

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Authors and Affiliations

Bing Yao¹ · Weiwei Li¹

✉ Bing Yao
bingyao8256@gmail.com

¹ School of Music and Dance, Xingtai University, Xingtai City, Hebei Province, China