Idealogy Journal, Vol. 8, No. 2, 2023, pp. 257-266
DOI: https://doi.org/10.24191/idealogy.v8i2.432
Section: Original Article

The Application of Intelligent Piano Teaching in College Education

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Received: 18 May 2023, 18 May 2023, Accepted: Published: 1 September 2023

ABSTRACT

With the advent of the age of artificial intelligence, intelligent music education is also developing rapidly. The intelligent piano is an intelligent product that combines conventional piano technology with the latest computer network technology, which indicates that piano learning technology has entered the age of intelligence. The purpose of this study is to explore the advantages of intelligent pianos, verify the effectiveness of intelligent pianos for piano skill improvement, and to investigate how to use intelligent pianos in combination with the intelligent features they offer for piano teaching to college students. Using a quasi-experimental research design, this paper provides a quantitative analysis by comparing the learning of two groups of students in different teaching, and pointed out the difference in performance between the two groups of students. The strengths and significance of intelligent piano teaching are further discussed with some recommendations for future studies.

Keywords: *Intelligent piano, Intelligent function, College education, Quasi-experiment*

1. INTRODUCTION

Group piano lessons have been introduced into Chinese university music education programs since 1993 (Li, 1995). This instructional program is still implemented in today's curriculum, which includes a variety of musical activities such as piano piece playing, piano playing and singing, and four-handed playing, and the continued existence of college piano group lessons demonstrates the importance of piano education for college students (Zhang, 2016). However, studies in recent years have found that college students have low learning efficiency in piano classes, and students are unable to master piano skills in piano lessons to the extent that there is a loss of interest in learning, and there are even cases of giving up learning piano midway (Hu, 2020). After discovering this problem, the author found that teaching with intelligent pianos could serve as an intervention for this problem. In previous studies, intelligent pianos have been found to improve college students' learning efficiency and performance in piano classes, and interest in learning. However, previous studies have generally had a short research process, too few participants, and no control group for data comparison. Therefore, in this study, by using intelligent pianos in college piano classes, we designed the actual teaching process using the experimental group of intelligent pianos and the control group using conventional pianos, and finally determined the effectiveness of intelligent pianos in improving college students' piano proficiency by comparing post-test scores.

2. DEFINITIONS OF INTELLIGENT PIANO

2.1 The connotation of emotional design

The word "intelligence" has two basic meanings in the Modern Chinese Dictionary: first, it refers to wisdom and talent, and second, it refers to intelligence. In the New Chinese-English Dictionary, intelligence is explained as: intelligence; understanding; talent; wisdom. The word "intelligence" is given the meaning of intelligent manufacturing in modern society, such as intelligent phones and intelligent TVs, where "intelligence" usually refers to an integrated intelligent manufacturing system composed of intelligent machines and human experts (Qiang, 2018). In 1983, MIDI was introduced, a revolutionary industry-standard protocol that enabled intercommunication between digital instruments. 1991, the digital piano was equipped with all 88 keys and a true mallet response, with a mallet-only structure without reeds, providing a natural touch like that of a conventional piano. In 1992, digital pianos were equipped with built-in memory and a large database of music available for use. In 2002, the digital pianos manufactured by Roland incorporated the advanced Digi-Score technology, which allowed the electronic score to be displayed on the LCD and to interact with the player, at which point the characteristics of the digital piano took on the shape of an intelligent piano (Qiang, 2018).

The intelligent piano contains the characteristics of intelligence while retaining the basic musical instrument properties of the piano. The definition can be expressed as follows: the intelligent piano is the latest piano form based on the conventional piano by attaching new computer and Internet technologies, and intelligent piano is a high-tech product that uses the mechanical principle of conventional piano and the cross-border integration of Internet information technology, automation control technology, and artificial intelligence analysis technology. Compared with conventional pianos and digital pianos, the "intelligence" of the intelligent piano is reflected in the implementation of teaching functions through the connection with the Internet and the use of related teaching apps. The use of piano-related entertainment apps can guide the user experience with gamified learning. Intelligent pianos can meet diverse needs including playing, teaching, recording, transposing, etc. (Chen, 2017)."The so-called properties of a musical instrument are to maintain its inherent articulation principles. If all the inherent articulation principles of a certain instrument are changed, it is practically eliminating this instrument. If the development of a certain instrument goes beyond the properties of the original instrument, then a new kind of instrument will be formed. In this sense, although the intelligent piano has new intelligent characteristics, its core components have not changed, and the playing principle is still played through mechanical vibration and resonance of the speaker, which still has the properties of a piano instrument (Liu, 2018).

From these arguments, it can be seen that the intelligent piano is still a piano because it does not change the conventional piano's articulation principle, but has certain differences from the conventional piano, which are mainly reflected in the application of advanced intelligent technology on the conventional piano to further strengthen the practicality of the piano and broaden the functions of the conventional piano in learning, playing, and using (Tu, 2018). Therefore, the intelligent piano is the intelligence of the conventional piano, which is the expanded application of modern technology on the conventional piano, adding some subsidiary performance without substantial changes in the basic performance, so it not only retains the basic entertainment, educational and aesthetic functions of the conventional piano, but also draws closer to the consumers with the advanced intelligent technology (Wang, 2018).

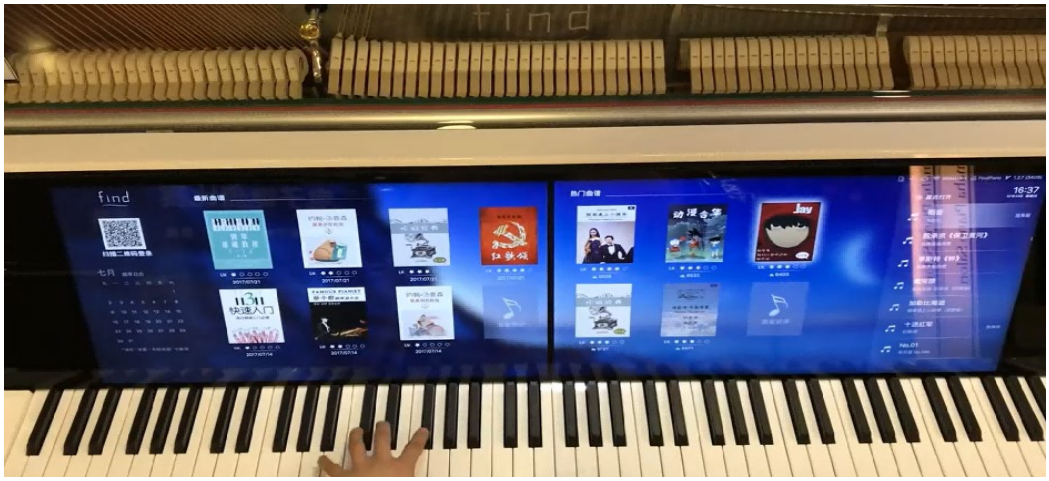

Figure 1 Appearance of Intelligent Piano

2.2 Functions of intelligent piano

2.2.1 Intelligent piano score

In conventional piano teaching, teaching materials are essential, and it is usually necessary to purchase at least dozens of textbooks for piano lessons from beginner to advanced level, and students usually need to bring several different textbooks to a piano lesson. In the process of playing piano, the player has to be distracted from turning the score manually or hiring a helper to turn the score, which is very inconvenient. In an intelligent piano, all the piano scores from the past and present can be stored in the form of electronic scores in the built-in computer of the piano only, which can be searched by searching. The score can be read out directly on a 4k ultra-high-definition display, with a full HD pentatonic score on large screen size. When you play, the score is displayed on the screen on the music stand. Some models of intelligent pianos can automatically turn the pages according to the player's progress. On the intelligent sheet music, the player can also adjust the size and color needs of the notes, tempo marks, intensity marks and other symbols as he or she likes. For example, students can't easily recognize conventional sheet music because the scale of the paper version of the score is too small for children to distinguish the notes on the pentatonic scale, so on the intelligent score, students can adjust the size and scale of the score according to their requirements. In the performance. The notation of the intensity of the process can be according to their preferences, for example: "ff" "sf" and other strong notation, marked with red, once the player sees the red notation, he will quickly distinguish it as strong playing; "PP ", "MP" and other weak notations are marked with green, and once the player sees the green notation, it will play the weak note. Other notations such as "presto", "legato", etc. can be marked individually.

2.2.2 Intelligent accompaniment mode

The intelligent practice mode is also a feature of some intelligent pianos, first of all, it has an automatic error correction system, which allows the intelligent piano to analyze the audio information of the player's real playing in the tone recognition module. In addition, the system of the intelligent piano can accurately evaluate all aspects of the student's performance, including pitch, rhythm, speed, completeness, expressiveness and technical level, and has a light-following mode, which can detect every note played by the player, and the next light will be lit only when the right note is played. The wrong notes are indicated by red marks and the correct notes are indicated by green marks.

2.2.3 Playback, recording and video functions

Most piano players play as the main body and use their ears to listen to their melodies while playing. However, in the process of playing, because the player's attention is mostly focused on playing and

technical processing, it is difficult to divide the energy to feel the acoustics of their playing. It is hard enough to distinguish the wrong notes during the performance, not to mention. It is difficult to feel the contrast between strength and weakness, speed and slowness. Therefore, the playback and recording function of the intelligent piano can be a good solution to this problem. The teacher can choose to play back the video and recording function after the student's finish playing a piece, so that they can listen to their playing repeatedly and point out the problems, which will have a more intuitive teaching effect.

2.2.4 Music game function

To further stimulate students' interest in learning piano in the era of the internet, the designer of the intelligent piano software has added the link of breakthrough games, which can make most of the students learn piano in a relaxed and pleasant learning atmosphere. For example, the "waterfall" game, in which students can freely choose the tracks to play, allows most students to learn the music easily and quickly by practicing in the piano "game" according to the prompts of the led indicator. For example, there are intelligent pianos that introduce the course through animation, linking each lesson with an animated story, and combining the game with the learning of music theory, with four different ways of practicing: stop, slow, rhythm, and playing, and some of them also design the "karaoke piano" way of learning, which is equivalent to the "rhythm master" and "rhythm master". Some of them have also designed "Karaoke Piano", which is the equivalent of "Rhythm Master" and "Strictly Come Dancing", where students can choose the tracks on the intelligent piano or connect to the mobile app to load the tracks they need. The music games greatly stimulate students' interest in learning and make piano learning less boring.

2.2.5 Music competition function

The software of the intelligent piano system has a scoring function for playing, so the teacher can use the scoring function to turn the classroom into a small piano playing arena when organizing students' instant practice in the classroom. In the process of continuous practice and competition, students' attention and motivation are fully mobilized, which improves the efficiency of students' instant practice in class. Group PK can be used to drive students' learning motivation by competing. In addition, the intelligent piano can communicate and learn from other intelligent pianos through an online connection. Learners can upload their works to the online communication platform, and all players can rank, learn, review and complete.

2.2.6 Internet remote function

Since the outbreak of the new crown epidemic in 2020, the isolated environment among people has further contributed to the normalization of online education. As a result, all music majors are actively reforming their offline, old-fashioned teaching models, and various music theory courses and one-on-one performance courses are being explored methodically, except for courses that require multiple people to perform together, which cannot be successfully taught online, as is the case with conventional piano art instruction courses. As a result of the combination of conventional pianos and high technology, the Intelligent Piano has not only recorded and playback functions for piano art instruction courses, but also a very complete "distance learning system" that allows piano art instruction courses to practice the important educational innovation of "Internet + Education". The "Internet + Education" is an important educational innovation. This distance learning technology allows for the sharing of educational resources worldwide, not only allowing the Piano Arts Instruction Program to join the ranks of online instruction, but also providing a diverse and open future for the program in the long term. For example, with online distance master classes and concerts, students have the privilege of performing, interacting and learning with different piano instructors remotely online, learning from each other and even performing concerts with recorded Versions performed by artist-level pianists, without the barriers of space.

3. MATERIAL AND METHODS

3.1 Location

The study will be conducted at a university in Henan Province, China. The university institute is located within the city. There are two piano rooms, one equipped with 15 conventional electric pianos and one with 15 intelligent pianos of a certain brand. The study was also conducted with the permission of the college.

3.2 Participants

The study will be conducted at a university in Henan Province, China. The university institute is located within the city. There are two piano rooms, one equipped with 15 conventional electric pianos and one with 15 intelligent pianos of a certain brand. The study was also conducted with the permission of the college.

3.3 Research Design

In this study, participants were randomly divided into an experimental group and a control group, with 15 participants in each group. Respondents in the control group were taught music using a conventional piano, and the experimental group was taught using the intelligent piano. The teaching process is shown in Table 1. The study was conducted for 6 weeks, and the students were asked to learn pentatonic music, rhythm, and to play Mozart-Banjo dances with both hands. The weekly lessons were 2 hours long and the teaching process focused only on the exam piece Bagpipe Dances. No additional instruction will be given by the instructor outside of class time. During this time, students will be assigned the same amount of practice time.

Table 1 Teaching research process

Week	Experiment Group	Control Group	Similarities of teaching traits
1	Learning Staff	Learning Staff	Identical
2	Rhythm and singing	Rhythm and singing	Identical
3	Play a piece with one hand	Play a piece with one hand	Identical
4	Playing with both hands	Playing with both hands	Identical
5	Playing with expression terms	Playing with expression terms	Identical
6	Student independent practice	Student independent practice	Identical

At the end of the 6th week, students from both groups are arranged to take an exam, the exam piece is Mozart's Bagpipe Dances. The scoring criteria for the exams were the "Rules for Music Examinations in Chinese Higher Teacher Training Colleges". The scoring experts were two associate professors in piano who would score the students in four areas: rhythm, fingering, standard tempo, and repertoire completeness, with 25 points for each item, for a total of 100 points. After the scoring is completed, all score sheets are collected, and the two groups' scores are compared and analyzed.

Table 2 Scores of the Experimental Group

NO	Name	Rhythm	Standard Tempo	Correct Fingering	Piece Completion	Post-Test Scores
1	Li	25	99	20	25	90
2	Xue	20	20	20	20	80
3	Zhou	18	20	15	15	68
4	Zhang	25	23	25	25	98
5	Zhang	10	20	20	10	60
6	Xiao	20	25	5	15	65
7	Wamg	25	25	25	25	100
8	Yan	23	20	22	20	85
9	Zhang	20	20	20	20	80
10	Pan	25	19	18	25	87
11	Cui	15	15	25	25	80
12	Su	25	20	25	25	95
13	Liu	20	16	25	25	86
14	Chang	25	24	20	20	89
15	Liu	22	24	20	8	74

Table 3 Scores of the Control Group

No	Name	Rhythm	Standard Tempo	Correct Fingering	Piece Completion	Post-Test Scores
1	Zhang	20	20	15	22	77
2	Yang	25	15	15	15	65
3	Chen	15	12	10	15	52
4	Du	20	20	20	20	80
5	Yao	16	15	18	20	69
6	Li	15	25	14	15	69
7	Pei	20	15	11	10	56
8	Luo	20	15	22	22	79
9	Xiao	15	25	20	10	70
10	Li	12	10	15	11	48
11	Zhou	15	20	15	15	65
12	Xu	20	15	17	17	69
13	Bai	20	12	25	10	67
14	QV	20	25	22	25	92
15	Chen	10	15	12	11	48

After getting the scores of the two groups, the average of the scores obtained by the students was calculated, and according to the calculation results, Table 4 was obtained. According to the results of the data, it was found that the final post-test average scores of the students in the experimental group were higher than those of the students in the control group. In Table 5, we can find by the four data results in Rhythm, Standard Tempo, Correct Fingering, and Piece Completion, the experimental group of students who used the intelligent piano had higher scores than the control group of students who used the conventional piano.

Table 4 Average Score

No.	Experiment Group	Control Group
Rhythm	21.2	17.5
Standard Tempo	20.7	17.1
Correct Fingering	20.3	16.7
Piece Completion	19	15.9
Post-Test Scores	82.5	67.1

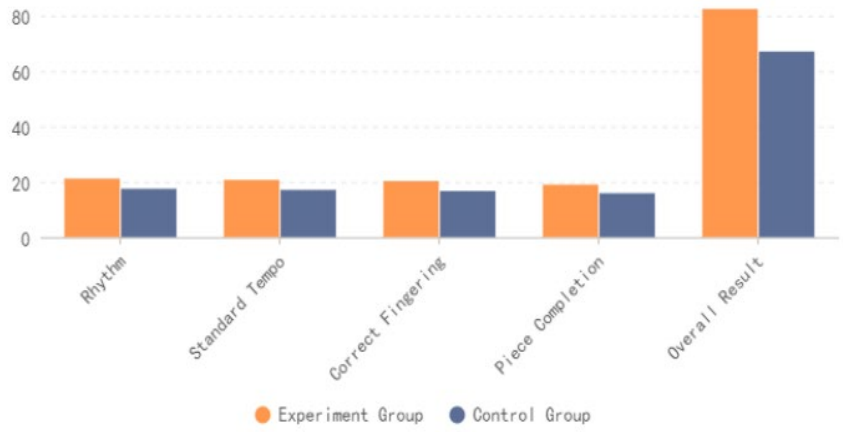

Figure 2 Individual Score Comparison

By using the intelligent piano to teach piano to college students, as shown in Figure 2, the researcher believes that the students will have a better understanding of piano performance and a new understanding of how to teach in an intelligent context nowadays, after having great space and opportunity to further improve their piano and become increasingly proficient in using the special features of the intelligent piano.

Figure 3 Teaching Process of Intelligent Piano

Researchers found that by using intelligent piano instruction, students' interest in learning piano lessons was also significantly enhanced (Qiang, 2018). It was found that intelligent piano learning has helped a lot in the development of intellectual and non-intellectual factors as well as musical creativity and memory, and there is a significant improvement in the music learning process (Zhang, 2019).Wan found that through intelligent piano teaching, not only did students improve their learning efficiency, but also teachers changed their teaching concepts, teachers kept up with the development of technology in the teaching process, gained an in-depth understanding of the new teaching models, and also improved teachers' teaching abilities (Wan, 2019). The combination of intelligent piano playing, and games allows students to learn the piano together in a game. This not only improves the efficiency of learning piano, but also stimulates students' enthusiasm for learning piano and allows them to learn and understand music theory better (Chen, 2020). Applying the intelligent piano to the university classroom, using the modernized features of the intelligent piano not only improves teaching efficiency, but also develops students' communication and teamwork skills through the interaction between teachers, students, and peers (Zheng, 2021). Researcher Wu found in his intelligent piano teaching practice that

not only college students can operate the intelligent piano proficiently, but also beginners, adults, and elderly people can play music in a natural and relaxed state (Wu, 2021). In the context of the pandemic, researchers have also found that the "Internet + distance education" function of the intelligent piano allows the university classroom and the off-campus classroom to integrate and conduct online remote master classes and concerts, allowing students to perform, communicate, and learn with more experts, scholars, and classmates remotely, broadening the classroom diversified teaching modes (Chou, 2022).

4. CONCLUSION

In the context of artificial intelligence, the intelligent piano, as a product of artificial intelligence development, responds to the development trend that the artistic expression of the piano is more and more closely integrated with modern high technology, and the impact of intelligent devices on education is becoming more and more profound. The combination of intelligent piano and university piano teaching has changed the way of teaching and learning in university piano education, which is based on the existing functions of the intelligent piano, combined with the characteristics of university piano teaching, and the experimental design. The experiment shows that the use of the "Intelligent Piano" function module in the university piano teaching mode has more advantages and effectiveness than the conventional piano teaching mode. After investigation and research, teachers and students believe that the intelligent piano teaching format has a positive effect on the popularization of music, the development of musical literacy, piano skills, and the enhancement of learning interest. Through the author's teaching practice, students can play music in a natural and relaxed state, develop finger independence, be able to create simple melodies, master legato techniques, train hand coordination, master double notes and chords, train finger runs, and be able to play combinations of legato and skip notes. Thus, we find that the novelty of this study is that the intelligent piano improves the piano skills of college students more effectively than the conventional piano. We hope that future researchers can apply the intelligent piano, or more intelligent instruments, to other classrooms to explore a more intelligent music teaching classroom.

ACKNOWLEDGMENT

No acknowledgement to anyone.

FUNDING

The researcher received no financial support for the research, authorship or publication of this article.

AUTHOR CONTRIBUTIONS

Liu Chang contribute to this research, including data collection, analysis, writing etc. In addition, Dr Md Jais Ismail instruct me to do this research.

CONFLICT OF INTEREST

Liu Chang declared no potential conflicts of interest with respect to the research, authorship, or publication of this article.

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