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The Integration of Information Technology into Vocal Education for Music Teacher Training Students in Colleges and Universities

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Abstract

Background and Aim: In the field of vocal music education, the rapid development of Internet technology allocates vocal music education resources reasonably and efficiently, and the integration of information technology and vocal music education has become an important way of teaching contemporary vocal music. The main purpose of this study is to determine whether teaching vocal music in colleges and universities with information technology methods can improve students' academic performance.

Materials and Methods: The subjects of this study were 90 sophomore and junior vocal music students, of which 30 students were in the control group and 60 were in the experimental group. Considering pre-existing differences in singing ability, a pre-test was administered to all students who took the test. After 8 weeks, a post-test was administered to all students who took the test.

Results: The results show that integration learning through We Sing and MOOC can significantly improve student performance in all four domains, namely pitch, rhythm, affective, **and** musical creativity. Compared with traditional learning methods, blended learning methods can provide students with more flexible learning methods and environments to help students achieve higher scores in the course.

Conclusion: According to the relevant research data, this study draws on and adopts new educational teaching concepts and new teaching results, the method used the quasi-experimental comparison of students' performance on the pre-test and post-test scores, in the process of data collection and analysis, it can be seen that the students' various achievements have obvious and significant improvement, and by the main content of the study and the plan, in turn, on the students' singing pitch, rhythm, affective and musical creativity to detect, get the corresponding data show that this experimental research is of a certain degree of validity.

Keywords: Information technology; Vocal education; Musical creativity

Introduction

With the aid of information technology, the teaching of vocal lessons can be more widely understood by the public. Information technology has revolutionized the development of education in the context of vocal music teaching, this means a variety of different styles, schools, and cultural expressions. In addition, students are trained to think critically and creatively and to explore innovative methods of teaching vocal music in their teaching. In the teaching of vocal music, the combination of theoretical knowledge and practical teaching is the most important and effective way to realize teaching and learning (Adileh, 2012).

The application of network resources in vocal education has gradually become an important research topic in the development of contemporary music education in China. The reasonable integration

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of information technology and vocal music education has also improved the quality and efficiency of the development of vocal music education in China to a certain extent (Carvallo et al.,2013).

It solved some problems existing in the traditional teaching mode and has an obvious promotion effect on the development of vocal music education in colleges and teacher training colleges (Alekseenko & Rakich, 2020). With the application of information technology, music teaching can be more diversified and convenient, and students can better develop and improve their vocal skills (Tunjera, 2019).

Since the 21st century, the development of Internet electronic information technology has been particularly rapid. As society is rapidly entering the information age, big data on the Internet occupies an important position in people's lives and social civilization (Zhou & Gong, 2020).

The main purpose of this investigation is to do a quasi-experiment on the teaching method after incorporating technology, to compare the learning effects and performance of the experimental group and the control group, and to discover an effective method and approach that can better facilitate the teaching and learning of vocal music. “In the conventional teaching of vocal music, the teacher not only has to do the demonstration of singing and playing the piano but also has to narrate, if technology is used, it can free up the hands to concentrate on the students and can analyze and demonstrate the singing”

In the age of technological information technology nowadays, in this sense, letting music teacher trainees learn and master solid teaching competence to adapt to the task of being the teachers of tomorrow in preaching and teaching, this is the development of information technology that needs to be adjusted accordingly to the teaching activities of the current music teacher education in colleges and universities (Bowman, 2022).

The research tool is performance testing. Vocal singing consists of four main areas of song singing: pitch, rhythm, affective, and musical creativity, exploring the level of students' singing after using the technology We Sing and MOOC applications. The researchers have conducted eight weeks of blended learning methodology for the vocal singing course totaling 20 hours of learning activities. This included 8 hours of face-to-face learning (Karaoke for All) and 12 hours of self-directed learning (University MOOC). Pre- and post-tests were administered to a sample of students before and after using the technology. The pretests and posttests assessed students' pitch, rhythm, emotional expression, and musical creativity concerning the sung repertoire. A score of 25 (out of 100) was given for each variable based on the student's actual performance.

Research Objectives

1. To explore the before-and-after differences in these aspects of students' intonation, rhythm, affective, and musical creativity after utilizing information technology.

2. To explore the effects of incorporating information technology on these aspects of students' pitch, rhythm, affective, and musical creativity as compared to traditionally taught students.

Literature review

In the literature review, the two technologies used are expounds respectively We Sing and MOOC. The theoretical framework of this paper is identified as constructivism theory, cognitivism theory, and theory related to variables.

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We Sing

The rise of We Sing software, met many singers to become a "singer", with the dream of singing star chorus, for singing enthusiasts to open the door of convenience. With the development of the later stage, all kinds of network vocal classrooms came into being. Vocal lessons should not be confined to traditional teaching but should be open to new things to better promote the development of teaching (Shu, 2023).

We Sing software is loved by singing enthusiasts, and its reasonable application in vocal teaching can not only improve students' learning motivation, and promote students' interaction and sharing after singing but also encourage students to master more singing skills and thus improve their singing level. Therefore, it is necessary to apply the We Sing software in the teaching of singing (Chen et al., 2023).

MOOC

Openness means that the barriers are lowered, or even no barriers and the classroom door is always open for practically anyone (Wang et al., 2011, October).

MOOCs made waves in the United States and quickly became popular all over the world, such as China, Japan, the United Kingdom, Australia, Brazil, Africa, India, and other countries and regions. Given the different development forms of MOOC and the current situation of MOOC in these regions, a few researchers have launched studies to make comparative arguments for the global development of catechism. The year 2012 can be considered as a demarcation point in the development of MOOC. (Juslin, 2013).

More online learning trailblazers have made a lot of efforts, but there was still no breaking through the original teaching model until David Wiley began to share the course attempts, efforts to practice the classroom open, to promote the openness of education, fairness, MOOC into the development of the fast lane, called MOOC field "the first to eat crabs! ".

Its large-scale connotation is also very easy to understand, that is, in the classroom, the number of people learning zero limit, that is to say, as long as the learner is willing, then the classroom can accommodate an unlimited number of people; and in the Internet to carry out this kind of course teaching, which is also catechism initially pursued by the goal of the education of the sharing is the essential connotation of the MOOC.

Theoretical Framework

Constructivist

The constructivist theory believes that learning results from learners' meaning construction based on their own experience with the help of teachers and other learners in certain situations. A deep approach to collaborative learning requires teachers and students to become co-learners who improve their musical understanding through interaction with and reflection on the music-making process (Bednar et al.,1992).

A constructivist approach requires teachers to consider how to achieve greater democracy in the classroom by moving away from a teacher-centered approach and encouraging students to lead the decision-making process (Scott, 2006).

Transformative learning processes (TLP) were “building Gemütlichkeit”, “grappling with difficult material,” “emotional intensity”, and “course structures.” We constructed a model to illustrate our findings, depicting how the categories interact and influence one another (Salvador et al, 2020).

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Constructivism originated from Piaget's preliminary theory on students' cognitive development. He argues that learning in a constructivist framework is not a product of passive transmission as a process of active construction, in which learners construct their knowledge based on previous knowledge and experience (Salvador et al, 2020).

Cognitivism

Art's cognitive value resides primarily in its capacity to promote certain cognitive and perceptual virtues, for example, the capacity to attend to detail, grasp meaning, look beyond surfaces, and contemplate an object selflessly. As one philosopher puts it, 'making sense of a painting by Kitaj requires open-mindedness, so it requires a closed-minded person to become more open-minded', and this would seem to be a noteworthy cognitive accomplishment (Geringer et al., 2007).

Those who prefer to learn through concrete experience can be given opportunities to work with peers and get peer feedback, with the instructor functioning less as an authority and more as a helper or coach. Learners who rely on reflective observation and see the instructor as an abstract conceptualization can be given opportunities to research a model or theory. Learners who prefer active experimentation can take part in activities that emphasize applying information to real life (Gibson, 2008).

Cognitivism education theory emphasizes the learning process rather than the learning outcomes themselves. Learning is more about the interaction of people with their environment, and is continuous throughout their lives, which creates changes in knowledge or behavior (Ovcharenko et al., 2020).

Theories Related to the Variables

Pitch

Pitch is the frequency at which a sound is perceived and is a fundamental aspect of music and sound perception. Pitch allows us to recognize high and low notes in music, and is essential for composing melodies, harmonies, and chords. Key concepts of pitch include Frequency, the number of times a sound wave vibrates or cycles per second. Higher rates produce higher pitches, while lower rates produce lower pitches. Frequency is measured in hertz (Hz) (Ponsatí, et al., 2016).

Musical context plays a very important role in tone perception and performance. For example, musicians of all three levels sing in decreasing intervals, with the average interval being more "in-tune" than the rising interval this difference was statistically significant (Nápoles et al.,2019). College music majors equal interval pitch deviation judgment significant differences as a function of the stimulus Timbre (such as trumpet, violin, or voice) (Hu et al., 2022).

Rhythm

Musical rhythm is the rhythmic pattern of beats and accents in a piece of music. It is the organized duration and sequence of accents that create the sense of time and pulsation in music. Rhythm is the basic element of music that gives it style, energy, and a sense of movement (Zhang & Hu, 2023).

Rhythm is an important common feature of music and language. Represents the event of an organization sound learning a time scale and the rules of the strong and the weak continuous (clap, tempo, and rhythm) (Faure-Carvallo, et al., 2022).

Affective

A prerequisite for the development of a satisfactory theory of musical emotion is to have a full understanding of the underlying phenomena that need to be explained: what emotions are contained in

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music to awaken the listener? Although this question may appear simple, the reality is that it is such a thickening. Throughout history, there have been two distinct methods of describing the emotions aroused by works of art (including music), which can be termed "aesthetic emotions".

Musical performances contain emotional sound cues, such as changes in rhythm, it is time, rhythm, vocal intensity, intonation, vocalization, timbre, dynamics, and even silence to convey emotions such as joy, awe, sadness, fear, and anger (Johnson, 2020).

Musical creativity

Creativity in music making is a composite concept combining "music making" and "music creativity", and music creativity is a subcategory of creativity. Musical creativity is a subcategory of creativity (Coulson & Burke, 2013).

A renowned researcher of musical creativity defines thinking in creative music as "the engagement of the mind in an active, structured process" aimed at sound to create some new product for the creator. Creative thinking is a dynamic alternating process of convergence and divergence, progressing gradually over time, supported by certain skills (innate and acquired). And all of which, under certain conditions, result in a final product" (Bauer, 2020).

Research Framework

The research tool is performance testing. Vocal singing consists of four main areas of song singing: pitch, rhythm, affective, and musical creativity, exploring the level of students' singing after using the technology We Sing and MOOC applications.

The researchers have conducted eight weeks of blended learning methodology for the vocal singing course totaling 20 hours of learning activities. This included 8 hours of face-to-face learning (Karaoke for All) and 12 hours of self-directed learning (University Mooc). Pre- and post-tests were administered to a sample of students before and after using the technology. The pre-tests and post-tests assessed students' pitch, rhythm, emotional expression, and musical creativity concerning the sung repertoire. A score of 25 (out of 100) was given for each variable based on the student's actual performance.

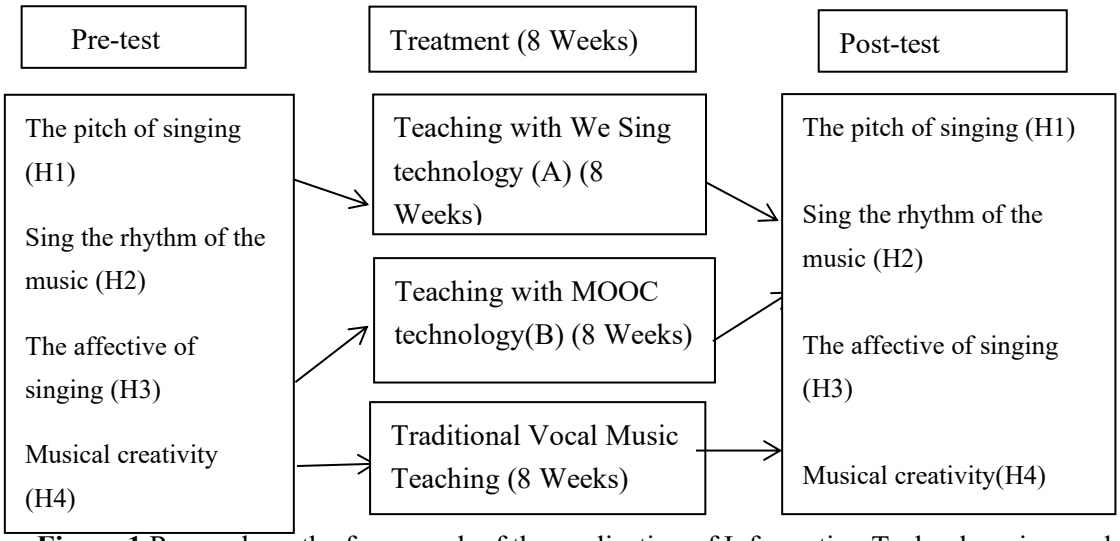

Figure 1 Research on the framework of the application of Information Technology in vocal music teaching.

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Figure 1 above illustrates the conceptual framework. The students' intonation, rhythm, affective, and musical creativity are tested in advance. Then, one group uses the We Sing technology, one group uses the MOOC technology, and the other group uses the traditional teaching. Grades were obtained from the three groups of students' pitch, rhythm, affective, and musical creativity performances.

Research Hypothesis

$H_0$1 There are no significant differences in singing pitch between the three groups of students after the integration of technology.

Ha1 There are significant differences in singing pitch between the three groups of students after the integration of technology.

$H_0$2 There are no significant differences in singing rhythm between the three groups of students after the integration of technology.

Ha2 There are significant differences in singing rhythm between the three groups of students after the integration of technology.

$H_0$3 There are no significant differences in singing effectiveness between the three groups of students after the integration of technology.

Ha3 There are significant differences in singing effectiveness between the three groups of students after the integration of technology.

$H_0$4 There are no significant differences in singing musical creativity between the three groups of students after the integration of technology.

Ha4 There are significant differences in singing musical creativity between the three groups of students after the integration of technology.

Methodology

Research Design

This study utilized a quantitative research methodology, and a quasi-experimental research design was used in the study. We Sing and a MOOC was integrated into a blended learning classroom in the vocal music instruction of this study to improve the singing of voice students in the program. Participants were divided into two experimental groups and one control group in a quasi-experimental study using quantitative research methods to experiment and test the academic performance of the program's students in all aspects of the school curriculum.

After eight weeks of the experiment, the singing scores of two control groups and one group of traditional students were compared. The singing scores of the members of each experimental group were evaluated according to the Scoring Standard for Vocal Music Professional Examination of Henan Institute of Science and Technology.

The performance scores in each of the four areas of pitch, rhythm, affective, and musical creativity were quantitatively analyzed, and conclusions were drawn by comparing the results.

Population and Sample

The object of this study is college students in China, and the specific research object is the sophomore and junior students in the direction of vocal music majors in the School of Music of Henan Institute of Science and Technology.

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The research sample of this study was composed of the sophomore and junior students of this program. The research sample consists of 90 students drawn from two grades as described above. Who scored above 80 points in every final exam. This is because these students have a great advantage in terms of voice condition, comprehension, acuity of thinking, and motivation toward learning.

Demographic Information

The participants in this study were 90 students from the music department of the School of Music and Dance, Henan University of Science and Technology. Among them, there were 21 females and males, accounting for 23.33%, and 69 females, accounting for 76.67%. There were 21 females and males, accounting for 23.33%, 49 females and females, accounting for 54.44%, and 20 females and males, accounting for 22.23%. There are two grades, sophomore and junior. There are 41 sophomore students, accounting for 45.56%, and 40 junior students, accounting for 54.44%. 90 students, assigning 30 of them to the control group and 60 of them equally to the two experimental groups. Considering the pre-existing differences in singing ability, a pre-test was administered to all the students who were tested. 8 weeks later, a post-test was administered to all the students who were tested.

Table 1 Demographic Information

Variable	Category	Frequency	Percentage
Gender	Male	21	23.33%
	Female	69	76.67%
	Total	90	100%
Age	18	21	23.33%
	19	49	54.44%
	20	20	22.23%
	Total	90	100%
Year of Study	Year 2	41	45.56%
	Year 3	49	54.44%
	Total	90	100%

Hypothesis Testing

In this subsection, the aim is to evaluate the hypotheses of the four variables that constitute student achievement and test them using an independent sample t-test. Hypotheses Ha1 to Ha4 were tested to find differences in performance between IT-based learning and traditional learning styles.

Table 2 Independent Samples T-Test

	Statistic	df	p	Mean	SE
Pitch	8.66	88	<.001	4.12	0.475
Rhythm	8.37	88	<.001	4.27	0.510
Affective	8.06	88	<.001	3.98	0.494
Music Creativity	10.1	88	<.001	4.53	0.477

After data testing and analysis, the t-test shows that there are significant differences in all relevant variables in the application of information technology to vocal music teaching.

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There were significant differences in the four aspects of pitch, rhythm, affective, and music creativity, indicating that the learning style after blending information technology had a significant impact on student performance. The summary in Table 2 confirms the null hypothesis, highlighting that the impact of the information technology blended learning style on student achievement is statistically significant.

Result

Data from the study results showed that the treatment group outperformed the control group in terms of pitch, rhythm, affective, and musical creativity. These results further proved that the hybrid information technology teaching method was effective in improving students' academic performance in all areas and had certain advantages over the traditional offline face-to-face teaching method.

Table 3 Group Descriptive

	Group	N	Mean	Median	SD	SE
Pitch	Control	30	81.3	80	5.36	0.269
	Treatment-We sing	30	88.3	88	4.57	0.254
	Treatment-Mooc	30	88.4	85	5.21	0.221
Rhythm	Control	30	83.1	83	5.02	0.273
	Treatment-We sing	30	88.9	88	4.26	0.252
	Treatment-Mooc	30	84.8	84.5	4.97	0.335
Affective	Control	30	82.5	82	5.69	0.356
	Treatment-We sing	30	86	86	4.83	0.2
	Treatment-Mooc	30	88.6	88.5	4	0.317
Music Creativity	Control	30	82	80.3	6.55	0.316
	Treatment-We sing	30	86.9	86	4.49	0.196
	Treatment-Mooc	30	88.8	89	3.88	0.287

Conclusion

As the information age develops, information technology has taken root in modern lives, and so must teaching and learning. The emergence of information technology has had a profound impact on information technology. The deep integration of information technology and music teaching is worth exploring. With the help of information technology, subject teaching has been ushered into an informatization environment. The curriculum is vivid and interesting and enhances students' memory and sensibility. The continuous teaching process not only reflects the dominant position of teaching students but also allows the teacher to play a leading role.

This investigation is based on some relevant research materials, using new educational and teaching concepts and new teaching results, using the quasi-experimental approach to compare the impact of students' performance in the pre-test and post-test, in the process of data collection and analysis, it can be seen that there is a clear and significant increase in the performance of the students in all the variables, in line with the main content of the study and the program, based on the analysis of the specific data obtained to illustrate that this quasi-experimental pilot study has some validity.

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From the results of the whole hypothesis testing, each hypothesis is valid and proves that the experiment is more significant. Students are eager to improve their academic performance and learning ability, and these technological studies can help them to improve their learning ability as well as their academic performance.

Table 4 Data Summarization

	Group	N	Mean	Median	SD	SE
Pitch	Control	30	81.3	80	5.36	0.269
	Treatment-We sing	30	88.3	88	4.57	0.254
	Treatment-Mooc	30	88.4	85	5.21	0.221
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	Treatment-Mooc	30	88.6	88．5	4	0.317
Music Creativity	Control	30	82	80.3	6.55	0.316
	Treatment-We sing	30	86.9	86	4.49	0.196
	Treatment-Mooc	30	88.8	89	3.88	0.287
Total Score	Control	30	81.9	81.5	5	0.185
	Treatment-We sing	30	87.1	86.5	3.95	0.117
	Treatment-Mooc	30	86.3	85	3.95	0.815

The assisted teaching integrated with technology can promote most students who lack self-confidence, their own voice conditions and musical expression are not good enough. In a sense, it is a breakthrough in the teaching reform in the vocal singing class. In this way, we can cross the limitation of time and space, break the boundary between vocal rookies and singers, improve students' interest in learning, and stimulate their enthusiasm for learning, confidence, and self-expression. As college teachers in the new era, we should keep pace with The Times, pay attention to the cultivation of good voices, and write a new chapter for the teaching reform of cultivating high-quality and talented vocal-singing students in colleges and universities.

Discussion

According to the quasi-experimental results, it is proposed that the teaching of integrating technology can improve the vocal singing ability of music students. The results are consistent with another research by (Hong Xiao). Among them, the research shows that the integration of technology into vocal music teaching provides students with favorable learning tools and improves their learning experience, which can be used creatively not only in the classroom but also in the main extracurricular exercises. Information outside the classroom can be learned from the Internet and online learning. In addition, in classroom teaching, teachers can let students use creative thinking to play and imagine (Gupta, et al. 2018). Pointed out that using visual feedback singing software can improve the accuracy of pronunciation of different songs and help students learn how to improve their singing.

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According to the study, students must first understand the usefulness and practicality of the two technologies. Students believe that technology can make it easier for them to learn new with new information and increase their interest in practicing, so that learning is autonomous and active, and learning methodology will be easy, and they are eager to delve deeper into the technology to work with the effective methodology way of learning.

Suggestion and Recommendation

The research results show that teaching with technology can improve students' singing ability and performance. However, based on the results, future research can explore more new technology development and research specifically for the course of vocal singing. For example, in We Sing, more accurate detection of singing voice intonation and melody can be added. If it can be added to correct the intonation rhythm will be better, in the final system score for the intonation rhythm should be more accurate; In addition, in MOOC, more relevant materials can be added to the analysis and research of vocals music works, to expand the more comprehensive vocal music and music literacy of vocal music students in colleges and universities.

From usefulness to the increase of interest is the third most influential factor influence. According to the study, students must first understand the usefulness and practicality of the two technologies. Students believe that technology can make it easier for them to learn new with new information and increase their interest in practicing, so that learning is autonomous and active, and learning methodology will be easy, and they are eager to delve deeper into the technology to work with the effective methodology way of learning.

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