Exploration of Innovative Approaches in Applying Information Technology to Vocal Music Teaching in University

Jingping Yi, Yali Zhang[*]

College of Art, Hainan Tropical Ocean University, Sanya 572022, Hainan, China

*Corresponding author: Yali Zhang, zhangyl@hntou.edu.cn

Abstract: With the rapid development of information technology and the advancement of educational modernization, the teaching mode of vocal music in colleges and universities is undergoing a new transformation, which complies with the trend of digital age and brings new challenges. This paper explores the specific implementation path of artificial intelligence technology, virtual reality technology, big data technology and intelligent interaction technology in vocal music teaching in colleges and universities, aiming to inject new vitality into the traditional teaching mode and improve teaching quality and efficiency.

Keywords: Information technology; Teaching reform; Colleges and universities; Vocal music teaching; Innovative approaches

1. Introduction

With the continuous rapid development of modern information technology, information technology has been integrated into various fields, including university vocal music teaching. The innovative application of information technology in vocal music teaching has brought new opportunities and challenges to university vocal music education, gradually promoting the transformation and development of university education. By constructing an auxiliary vocal music teaching system in university vocal music courses, and integrating innovative methods such as virtual reality technology, big data technology, and intelligent interaction technology into the comprehensive practical teaching of vocal music, these teaching systems have effectively enhanced students' learning interest and exploration spirit, and also made up for the shortcomings of traditional vocal music teaching [1]. Specific implementation is carried out from aspects such as teaching digital resources, innovative design of teaching models and methods, teaching evaluation and feedback. In the professional teaching links of vocal music training and work performance interpretation, there is no limitation of space, and a relevant resource management platform is established to provide innovative ideas for teaching. Through

the promotion of the information technology platform, teachers implement individualized teaching based on students' characteristics, cultivate students' autonomy and innovation consciousness, enhance efficient and smooth interaction between teachers and students, and help improve teaching outcomes, thereby achieving the reform of teaching methods and the innovation of talent cultivation models [2].

2. The current situation of the application of information technology in vocal music teaching

At present, in the context of the continuous development of information technology, college vocal music teaching has also seized new opportunities in line with the trend of the new media era. The promotion of information technology has broken the "master-apprentice system" model of traditional college vocal music teaching and further innovated and reformed it. Of course, the integration of information technology with vocal music teaching has provided more abundant teaching resources, and there are also potential challenges in actual teaching. Currently, some colleges are attempting to initiate teaching innovation driven by information technology. By analyzing a large number of vocal music works and using AI technology to assist students in deeply understanding the connotations and singing styles of the works, and attempting to simulate diverse singing sound effects, the aim is to enhance students' musical perception ability and singing skills. The degree of students' autonomous learning of vocal music works and participation in simulated singing on relevant music learning platforms, the precise analysis of AI technology accurately understands students' musical interests and hobbies, real-time intelligent analysis of singing techniques and provides evaluations and feedback, and provides reasonable and targeted suggestions. Teachers adjust teaching methods and strategies promptly based on the analysis given by AI, achieving personalized teaching. The implementation of these information technologies in the process of college vocal music teaching is still in its initial stage. Further in-depth research is needed to continuously improve it. In the future, a large amount of practice is required to further deepen the research and refine the analysis, injecting new strength into the innovative development of college vocal music teaching and providing solid support for talent cultivation [3].

3. The innovative construction of information technology in college vocal music teaching

3.1. The innovative construction of an artificial intelligence-assisted vocal music teaching system

With the continuous advancement of artificial intelligence, some vocal recognition, synthesis and analysis technologies have become increasingly mature. The rational application of AI technology helps students master vocal skills more accurately. The AI-assisted vocal teaching system has a profound significance in improving teaching efficiency and quality. In the construction of a vocal skill assessment system, this system automatically analyzes aspects such as the singing pitch, timbre, speed, rhythm, and emotional expression of learners, and provides timely feedback. Teachers can formulate corresponding learning plans based on students' learning situations and combine AI feedback to make adjustments. They can also record and review the learning outcomes through AI lines, and based on students' vocal singing level and needs, intelligently generate characteristic teaching plans to effectively enhance teaching effectiveness.

3.2. The innovative construction of virtual reality technology in vocal music teaching

Virtual Reality (VR) technology has created an immersive learning environment for vocal music teaching. Through multi-sensory experiences and interactive feelings, students can immerse themselves in the virtual scene, which is one of the innovative ways of information-based vocal music teaching at present. The experience of the virtual scene makes vocal music teaching more diverse and can better promote interaction and communication between teachers and students. At the same time, by using VR space, students can fully experience different singing forms, enabling them to break through the limitations of time and space and achieve virtual environment interaction, obtaining different forms of experience [4].

3.3. The innovative construction of big data technology in vocal music teaching

The application of big data technology in vocal music teaching is an important way to enhance teaching effectiveness. By integrating data collection, analysis, visualization and other technologies with vocal music teaching, this new optimization method makes the teaching more vivid and interesting. Specifically, it is reflected in the following two aspects: On one hand, a corresponding vocal music teaching big data platform is constructed, which is responsible for collecting various learning data of vocal music students. On the other hand, a vocal music learning behavior analysis system is constructed, which deeply analyzes the duration and methods of students' singing practice, evaluates the effect of their singing practice; it conducts precise analysis of students' learning data, and teachers give targeted learning suggestions based on the system feedback of the learning behavior analysis data. This self-study auxiliary tool can directly record the learning progress and trajectory, providing a basis for teachers to formulate teaching plans precisely, thereby achieving personalized teaching.

3.4. The innovative construction of intelligent interaction technology in vocal music teaching

The intelligent interaction technology applies advanced concepts to create a virtual vocal teaching environment, thereby breaking the limitations of time and space and enabling effective interaction between teachers and students, among students, as well as between students and the virtual environment. This allows high-quality digital resources to be widely utilized. Through the remote teaching platform, students can have real-time video interaction learning with professional teachers; they can showcase their learning results through online video singing, and vocal teachers can provide online teaching guidance through on-site video teaching or live classes, explaining specific singing techniques and vocal theory knowledge to students, and promptly answering their questions and solving their problems on the intelligent interaction platform. At the same time, the intelligent interaction technology further prompts students to explore collaborative methods, such as independently establishing vocal learning groups on the platform, jointly discussing the bottlenecks of vocal learning, sharing learning experiences, and engaging in interactive communication. Teachers encourage students to organize online individual performances, group chorus activities, and cooperative concerts on the intelligent interaction platform to stimulate students' enthusiasm and creativity and promote personalized teaching.

4. The implementation path of informatized vocal music teaching

4.1. Digital integration and sharing of teaching resources

The digital integration and sharing of teaching resources is an important project in the field of information-based vocal music teaching. By breaking through the problems of scattered resources and limited dissemination in traditional vocal music teaching, and conducting digital integration and efficient sharing based on traditional

teaching resources, a relevant resource management platform is established to provide innovative ideas for teaching. The establishment of the core database of vocal music teaching resources includes vocal theory, sample audio or video recordings, accompaniment, and excellent online teaching courses, and unified integration standards are set for them. In university, vocal music teaching, layered teaching can be carried out based on digital teaching resources, combined with the school's characteristic resources, such as some original materials, courseware, and excellent works, which are only available for internal teachers and students to use. Permissions and application management are set, and some teaching resources are only available for teachers for teaching purposes. Moreover, between sister universities, a sharing system can be initiated, and a master teacher classroom resource can be established to achieve cross-regional mutual learning and communication, or it can be based on professional education platforms to be open to society to meet the learning needs of music enthusiasts. During the implementation of classroom teaching, teachers can directly use platform resources to assist teaching, such as comparing and analyzing different versions of the same work's singing videos, studying singing techniques such as breathing, timbre, and resonance, and providing timely guidance to students. Students can conduct targeted training based on the teaching guidance on the platform and provide prompt feedback to the teachers.

4.2. Virtual reality vocal training scenario

The innovative application of virtual reality technology in vocal music teaching is a new direction with unlimited possibilities. It can fully assist teachers in completing more guiding tasks, update teaching methods, and greatly improve teaching quality. In the vocal music teaching environment created by VR, through professional sensors and head-mounted displays to simulate real atmospheres, multi-sensory experiences such as visual and auditory, for example, a teacher creates a performance stage placement space, and the singer begins their vocal music performance after reading the introduction information; creating a virtual piano or band accompaniment, immersive singing in specific types of music spaces, during the relaxed and bold singing process, the teacher carefully observes and provides feedback. Using virtual reality technology to restore the stage environment of opera scenes and create realistic stage effects. Singers can truly feel the charm of the characters in the scene, making it possible to combine vocal music teaching with virtual reality technological innovation. In opera duet teaching, different style stage effects and virtual duet teams can be created for remote rehearsal cloud cooperation to improve the flexibility of duet performances. In addition, vocal music teachers can also be virtual, creating a virtual teacher in the scene, experiencing the diversity of teaching forms naturally and freely singing. The teaching space created by virtual reality technology is highly realistic and diverse in scenarios, effectively enhancing students' musical perception ability [5].

4.3. Innovative design of teaching models and methods

Exploring the innovation of teaching models and methods is the core project of information-based vocal music teaching. We can utilize big data technology to enhance the integration with vocal music teaching, establish a blended teaching model, and innovate teaching design.

Establish a corresponding vocal music teaching data platform to facilitate students' use of the digital platform for pre-learning mode. Collect vocal music courses related to singing, and at the same time, combine AI auxiliary tools to conduct trial practice on vocal skills. The platform should be set up to collect students' practice data, such as students' vocalization (parameters like pitch accuracy, rhythm, breath control, resonance, etc.), practice duration, classroom interaction, and changes in singing during different learning stages etc.

Teachers can use the background data analysis to implement targeted teaching strategies and provide precise technical guidance to students. For example, analyzing the audio data of a student singing a vocal piece can accurately identify specific problems such as "pitch deviation in certain vocal ranges" or "inaccurate rhythm," and during the teaching process, analyzing the data can help find suitable learning methods for students of different levels.

Through the promotion of the information technology platform, teachers implement individualized teaching by tailoring education to students' needs. With the assistance of some AI technologies and the continuous advancement of online intelligent platforms, the combination of student-student interaction and teacher-student interaction is achieved. A vocal music group is established on the intelligent interaction platform, with a group leader assigned. Teachers divide students into different groups based on different stages, and different groups analyze different problems. Specific problems are analyzed specifically. The innovation of teaching methods has transformed vocal music teaching from abstract to visual. Through digital teaching resources or multimedia tools, the composition of three-dimensional graphics of the vocal organs can be observed; it is possible to attempt to convert intangible sounds into intuitive visual signals to help students understand abstract vocal music techniques, such as the application of spectral analysis software, real-time observation of students' sound wave trajectories, comparison of the amplitude of sound wave vibrations when breathing is correct or incorrect, and experiencing the correct vocalization method from a physical perspective. With the assistance of AI software for teaching, precise correction and timely feedback are provided, and teaching strategies are adjusted. In the teaching process, AI software is used to analyze abstract dimensions, such as the emotional expression when students perform vocal music works. AI, based on data such as the strength, speed, and emotions of the sound, provides singing suggestions and references, and in the vocal music performance teaching process, virtual reality technology is used to switch between different scenes, enabling students to shift from passive participation to active participation. These innovative teaching designs have achieved a high degree of integration of "technology" and "art" [6].

4.4. Innovation of teaching evaluation and feedback mechanism

The innovation of teaching evaluation and feedback mechanisms is an important part of information-based vocal music teaching. Comprehensive, scientific, and diverse teaching evaluation and feedback are conducive to improving the effectiveness of vocal music teaching and are more conducive to achieving the efficiency and practicality of teaching. By using intelligent interaction technology to construct a multi-dimensional vocal music teaching evaluation system, focusing on the evaluation of teaching objectives, the evaluation of students' abilities, and the evaluation of comprehensive qualities. For example, intelligent interaction technology can intelligently assess and analyze the learning outcomes of vocal music classes, using analysis tools to analyze aspects such as the accuracy of singing, rhythm, breath control, and emotional expression, real-time data interaction, and timely evaluation and feedback. Teachers can promptly conduct quantitative assessment of individual feedback data, specifically identify problems and solve them, and for difficult vocal music problems, establish an electronic learning archive to record the learning trajectory, analyze the learning records, and solve the fundamental problems step by step. The system also evaluates whether the teaching methods and strategies of teachers are effective, providing corresponding references for teachers to improve their teaching. Intelligent interaction technology, based on objective and scientific teaching evaluation and feedback, recommends relevant teaching resources and strategies for teachers, adjusts teaching methods, improves teaching quality, and helps the development and innovation of vocal music teaching.

4.5. Improvement of teachers' and students' information literacy

The improvement of information literacy has significantly facilitated the transformation of national education towards digitalization. In college vocal music teaching, the construction of smart classrooms to enhance intelligent-assisted learning, and the application of artificial intelligence technology to empower vocal music teaching and optimize the curriculum teaching system, all require teachers and students to further learn information technology skills, strengthen relevant training, and avoid operational errors when using intelligent teaching tools. Specific approaches include holding regular digital vocal music training and lectures, organizing training on the operation of multimedia classrooms, recording studios, etc., strengthening technical guidance on the use of vocal music teaching-related platforms, allowing teachers and students to better experience and understand the functional characteristics and intelligent applications. At the same time, an online platform for participating in vocal music information activities can be established, using platforms such as video channels, official accounts, and Douyin for promotion and publicity, promoting efficient experiences of vocal music information applications and enhancing teaching effectiveness. College vocal music teachers can develop diverse vocal music digital courses, fully utilize high-quality resources, particularly focusing on emerging intelligent technologies such as Doubao and DeepSeek to enrich course design, forming open and shared course resources, presenting the results of information-based teaching through online and offline methods, further cultivating teachers' and students' awareness of information technology, and achieving diversified teaching.

5. Conclusion

In the field of vocal music teaching in universities, the exploration of innovative paths for university vocal music teaching through information technology has brought about new changes and developments to university vocal music education. With the continuous advancement of information technology, by integrating emerging technologies such as artificial intelligence, virtual reality, and big data into teaching, vocal music teaching is gradually transforming into an information-based teaching model, highlighting its advantages. Information technology empowering vocal music teaching breaks the limitations of time and space, providing students with effective learning experiences, greatly enhancing their learning interest, and helping vocal music teachers efficiently develop relevant teaching methods and strategies, achieving personalized teaching. Under the support of information technology, various aspects such as the digital integration and sharing of teaching resources, the innovative design of teaching models and methods, the innovation of teaching evaluation and feedback mechanisms, and the improvement of teachers' and students' information capabilities are advanced, constructing a multi-level and all-round implementation path to ensure the effective implementation and long-term planning of information-based vocal music teaching. In the future, the deep integration of information technology and vocal music teaching will provide new impetus for the innovative development of vocal music teaching, and help it develop digitally, intelligently, and innovatively.

Funding

Disclosure statement

The author declares no conflict of interest.

References

[1] Gao K, He T, 2023, Five-Dimensional Innovation of Vocal Music Teaching Enabled by Information Technology. Grand View (Forum), (6): 132–134.

[2] Fan X, 2024, The Transformation Path of Digitalization Enabling College Vocal Music Teaching. Journal of Yuzhang Normal University, 39(6): 90–94 + 116.

[3] Wu Y, 2020, Exploration of Vocal Music Teaching Reform in the Information Age. The Artist, (12): 126–127.

[4] Xia L, 2025, The Application and Exploration of Virtual Reality Technology in College Music Teaching. Journal of Jilin Agricultural Science and Technology College, 34(3): 117–120.

[5] Zhou X, Xu P, 2024, The Challenges and Strategies of Virtual Reality Technology Application in Music Teaching. Extreme Eye, 52(06): 81–85.

[6] Yang Z, 2023, The Path of Integrating New Media Technology into the Reform of College Vocal Music Teaching. Art Sea, (5): 81–83.