Cloud Platform Assists Construction of Ecological Environment for Vocal Music Teaching in Colleges and Universities from Sustainable Perspective

Xinlei Liu[*]

College of Physical Education & Sports Science, Hengyang Normal University, Hengyang, Hunan 421000, China

[*]*corresponding author*

Abstract: The environment of vocal music education has long been a dissonant factor. Some vocal music education institutions are outdated and backward, vocal music education is relatively isolated, the extracurricular artistic practice activities of teachers and students are insufficient, the improvement of the overall quality of teachers is not effective, and the lack of communication between schools has affected the quality of vocal music education. It is significant to analyze and solve the above questions as soon as possible to establish a harmonious ecological environment for vocal music classes. This paper used the cloud platform to assist the vocal music teaching in schools, and conducted study on the ecological environment construction of vocal music teaching. This paper first discussed the means and purpose of the music teaching ecological environment construction, then introduced the cloud education platform, and described the application of the cloud education platform in vocal music teaching in detail. The experimental part compared cloud platform education with traditional education, and studied the feasibility of the method. The experimental results manifested that, compared with the traditional vocal music teaching method, the teaching quality evaluation satisfaction of the cloud platform vocal music teaching method was increased by 23.9%. The students' singing ability, practical competence and scientific study competence have all improved, indicating that the cloud platform teaching can facilitate the construction of the ecological environment of vocal music teaching in schools, and can better promote the sustainable development of vocal music teaching in schools.

1. Introduction

The quality of vocal music education is closely concerned to the harmony of the educational environment. Relevant schools should actively enhance the construction of harmonious science

classrooms, scientific projects and scientific research, carry out related activities, and optimize resources and personnel in all aspects. This can furnish a powerful, reliable and firm guarantee for the establishment of a harmonious vocal music classroom ecological environment.

There are many researches on the teaching ecological environment. Liu X used big data technology to establish an intelligent teaching ecological environment [1]. Jingzhong L I conducted research on the ecological environment of computer teaching in TCM colleges through the analysis of virtualization technology [2]. Zhu Y C analyzed the ecological environment of college English teaching in the era of big data [3]. Wang F thought about the ecology of college English teaching under information technology [4]. Chen Y L constructed a sustainable mechanical CAD extracurricular practice teaching ecosystem from the perspective of ecology [5]. Although there are many researches in the field of teaching ecological environment, few scholars have conducted research on the ecological environment of vocal music teaching in colleges and universities.

Cloud platforms are often used in the field of teaching. Liu X used embedded systems and cloud platforms to build a distance music teaching classroom [6]. Sun Y used the cloud platform to reform the teaching of accounting information system practice courses [7]. On the basis of the cloud platform, Ye L built a new system of chemical engineering principles and experimental teaching based on "one platform, three clients" [8]. Wang B introduced the cloud platform teaching mode in the teaching of literary psychology [9]. Wenlong D U deeply investigated the current situation of cloud platform teaching in higher vocational colleges and proposes corresponding solutions to improve the teaching effect [10]. Although cloud platform teaching has been widely used, the application of cloud platform in college vocal music teaching still needs to be studied.

This paper applied the cloud platform to investigate the ecological environment construction of vocal music teaching in colleges and universities. This paper firstly introduced the methods and results of the construction of the ecological environment of vocal music teaching in colleges and universities, and then introduced the cloud education platform, including the definition, characteristics, impact on education and teaching of cloud education, and the advantages of cloud education platform model in college vocal music teaching. Finally, the application of cloud education platform in vocal music teaching in colleges and universities was introduced, including the application before class, during class and after class. The experimental part compared the teaching results of traditional teaching and cloud platform teaching to confirm the effectiveness of cloud platform teaching in ecological construction.

2. Construction of Ecological Environment for Vocal Music Teaching in Colleges and Universities

(1) Strengthen the construction of modern vocal music teaching facilities

The classroom needs of the 21st century must evolve with the times. Modern classrooms are the main guarantee for the realization of a harmonious ecological environment in vocal music classes. The modernization of teaching methods is impossible, and the harmonious ecological environment of vocal music classes is also impossible. Schools should strengthen the construction of teaching equipment according to the special circumstances of students' learning and extracurricular practice, and according to the different needs of ordinary vocal music teaching, group teaching, and classroom private teaching, and play the role of special classrooms and special equipment [11]. For example, teachers can utilize digital tools and the powerful multi-track recording capabilities of computers to enhance classroom learning and create a variety of audiovisual materials for students to learn after class to enhance their learning.

(2) Accelerate the development of multi-channel vocal music course resources

For the technical, artistic, and academic aspects of the vocal program to be verifiable and

evidence-based, schools must actively develop and meaningfully utilize the school's diverse educational resources. For example, the Graduate School of Vocal Education must procure musical scores, magazines, and audiovisual materials to prepare teachers for teaching, learning, and research. At the same time, the school should promote the establishment of a school library, through the preparation of paper materials, the establishment of an electronic data network verification system, allowing teachers and students to easily retrieve various materials, as well as providing off-campus learning resources and improving the quality of vocal music courses.

(3) Promoting the rationalization of vocal music-related curriculum reform

The vocalization process is not isolated, but forms a holistic, networked process ecosystem with other processes, which must be coordinated, holistic, and harmonious. Schools need to make necessary reforms to the courses related to vocal music, such as expanding elective courses (Chinese music art history, foreign music art history, Chinese and foreign music and opera art examinations, etc.). It also consolidates professional courses and strengthens professional connection (such as comprehensive vocal music courses). Through this series of streamlined voice curriculum reforms, the quality of education would be improved and students' cultural heritage, creativity and singing skills would be expanded [12].

(4) Carry out multi-channel vocal music course art practice

In order for students to figure out practical questions and enhance their grades, hands-on exercises are carried out in multiple manners. Vocal practice should be actively developed outside the classroom, and teachers must actively guide the practice. Schools must incorporate this task into teachers' workloads and offer indispensable support and guarantees with appropriate equipment, resources, and facilities.

(5) Establish an interactive vocal music course research organization

Voice training is an organic combination of technology, art and science. Teachers and research departments should focus on enhancing academic study, set up acoustic research institutions, and hearten students to take part in research activities. Teachers and students should interact more, create an inclusive academic atmosphere, conduct in-depth academic discussions, and conduct more extensive academic research. The research content, extent and perspective of the research team should be as diverse as possible, such as vocal technique, vocal analysis, vocal performance culture, the relationship between "learning" and "teaching", and the genres of foreign vocal music. It can also broaden its horizons by researching local vocal topics for many related topics. Through a sequence of study activities, some issues are studied in more depth after class.

(6) Conduct all-round vocal music teacher quality training

Excellent vocal music teachers play a central role in creating a harmonious ecological environment for vocal music practice. While vocal teachers continue to learn, reflect and change, schools must also actively reassure, support and provide comprehensive, high-quality teacher training, such as:

1) A "please come in" strategy can be used. Famous singers and vocal music teachers can be invited to the academy for consultation on a regular basis, so that teachers can continuously update their educational concepts, transform their teaching concepts, and enhance their professional level.

2) The "going out" strategy can be adopted. Teachers can be arranged to actively study in the vocal music department of a national first-class music school to understand the current situation, education and research of the national vocal music industry. It provides teachers with high-quality concert and opera performances, and constantly collects fresh practical materials for teaching reference.

Through "inviting in" and "going out", teachers' humanistic, artistic and professional qualities have been greatly improved, and they can continue to provide strength and persistence, which can further develop classroom vocal music in a harmonious ecological environment [13].

3. Specific Analysis of Cloud Education Platform

(1) Definition of cloud education

Cloud education in a broad sense generally refers to educational concepts, educational concepts and teaching methods based on digital platforms. There are several differences between cloud education and e-learning. Online education is mainly based on professional online teaching, and the learning goals are mostly personal, one-sided, and autonomous. Synchronized learning through the network can be said to be the foundation of cloud education. As an extension of traditional teaching methods, cloud education can better meet the needs of students and is of great help to learning and reforming traditional teaching methods [14].

In a narrow sense, cloud education refers to an online education information service platform based on cloud technology, which is mainly composed of four parts, as shown in Figure 1.
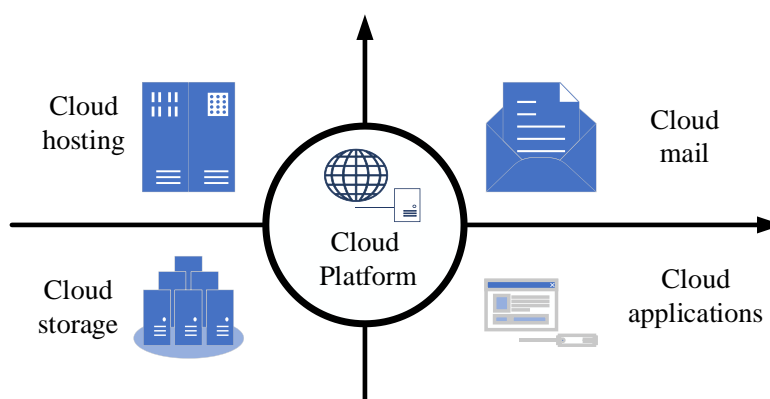

Figure 1. Cloud education composition

Cloud hosting mainly provides shared hosting services for education, and cloud storage provides file services such as documents for educational users. Cloud mailboxes provide schools with enterprise-level personalized email services, and cloud applications provide schools with educational resource services. Compared with the traditional educational informatization concept, it is a new educational informatization model integrating education, learning, interaction and entertainment.

(2) Characteristics of cloud education

The characteristics of cloud education and traditional education are compared, as shown in Table 1.

According to the trend of education reform, the cloud education model has broader development space and development advantages than traditional education, and has unique advantages, which are mainly reflected in the following four points [15]:

1) Set strict permissions and privacy

This is an important feature of cloud education platforms. When downloading data, users can freely set access rights. In addition, from the perspective of personal information, no one other than the user can see the user's information, so the user's personal information is greatly protected.

2) Simple and easy to generate website

Cloud education platform provides a simpler website creation system. Users can customize pages according to their preferences and create personalized websites.

3) High storage capacity, sharing resource information

Cloud Education has a large-capacity memory, which can store all user information without loss. The large storage capacity makes it a huge resource information repository, and learning resource

information can be used between schools. It can promote equality of learning resources and educational equity across regions.

4) Fast update, low client device

Cloud Education has a team dedicated to R&D that develops and updates software over time and updates automatically. Schools do not need to create many programs to receive state-of-the-art services. Cloud education does not require very advanced client devices, and users can enjoy the services provided by cloud education through mobile phones and computers.

Table 1. Comparison of the characteristics of cloud education and traditional education

Project	Traditional education	Cloud Education
Educational philosophy	Elite education, Collective improvement	Sharing education, Personal customization
Teaching mode	Chalk blackboard teaching, students' ears and notes	Online teaching, Audio-visual integration for students
Teaching content	Textbook knowledge, Textbook system	Etextbooks, online courses, instructional videos
Teachers	Certain age stage authority recognized by the professionals of a certain geographical area	Educators worldwide with expertise
Students	Legal school age learners	Everyone who loves to learn
Learning content	Paper textbooks, Curriculum independent system	E-learning courses, Open learning content
Learning mode	Classroom teaching, practice	Online learning, instruction
School efficiency	Uniform and efficient	Independent, depending on the individual
Teaching effectiveness	Facilitate systematic knowledge learning	Good for intellectual innovation, large human circle, focus on innovation

(3) The impact of cloud education on education and teaching

For students, cloud education provides students with richer autonomous learning resources and a better learning environment. Students can choose the time, place and various teaching methods according to their needs to achieve the desired learning effect. In addition, students can design their own programs according to their own learning environment, making classroom learning more efficient [16].

For teachers, cloud education provides a more personalized learning support platform. The role of teachers in the cloud education platform model has changed from active teaching to guidance. Teachers become facilitators by guiding students to create diverse and personalized lessons through various group activities on the cloud platform. Teachers can create a score database through the online evaluation system, grade students anytime and anywhere, keep abreast of students' learning, formulate meaningful lesson plans, and hold nationwide classroom discussions and learning exchanges anytime, anywhere.

Cloud education saves resources and increases efficiency by implementing resource sharing in the classroom. The cloud platform itself is a huge resource pool for students, parents, teachers, educational institutions and others to use. By organically linking different regions and regions, more inclusive communication channels can be created and an overall learning ecology can be formed, as
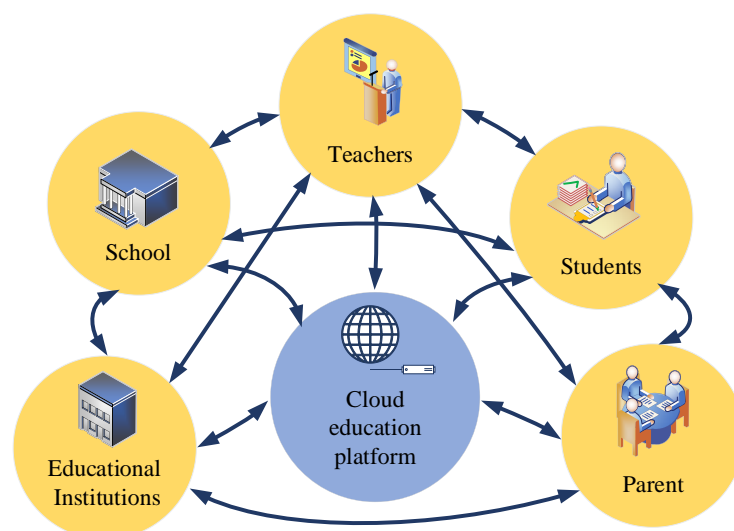
shown in Figure 2.

Figure 2. Cloud education platform ecosystem map

(4) Advantages of cloud education platform model in vocal music teaching in colleges and universities

1) Make the subject of teaching more clear

In a traditional college music class, the professor is the protagonist and the student is the audience. The teaching activities under the cloud education platform model have subverted the roles of teachers and students in the traditional education model, and the roles of teachers and students have also changed. The basic knowledge that students need to master before class can be obtained online, instead of having to teach them face-to-face. Students become the main body of classroom activities, and teachers are the guides.

It should be noted that the learning of the cloud learning platform has the characteristics of autonomous learning, and students are not bound by teachers and are not limited to classroom activities. In this uncertain time and space, teachers monitor student learning, set learning goals, and assess learning impact. The successful achievement of lesson plans and learning objectives can be ensured by ensuring that students are consciously, independently and consciously engaged in learning.

2) Create a new form of teaching organization

The teaching mode of traditional classroom and cloud education classroom is shown in Figure 3.

Figure 3(a) is the teaching mode of the traditional classroom, and Figure 3(b) is the teaching mode of the cloud education classroom.

Traditional classroom activities mainly include three parts: students review new knowledge before class, teachers impart knowledge in class, and students do homework after class. In the learning mode of cloud education platform, students mainly learn basic knowledge before class through this platform. In the classroom, teachers usually do homework in the form of group discussions, special projects, and solving complex problems. At the end of class, teachers and students work together to complete homework. Compared with the existing activities, this learning activity changes the time-space structure, creates a new type of class organization, and realizes the time-space flip of the class.
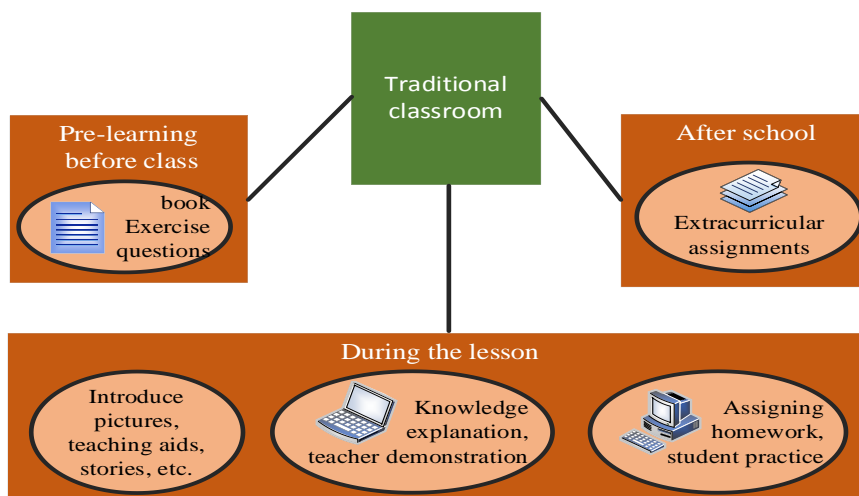
(a) Teaching mode of traditional classroom
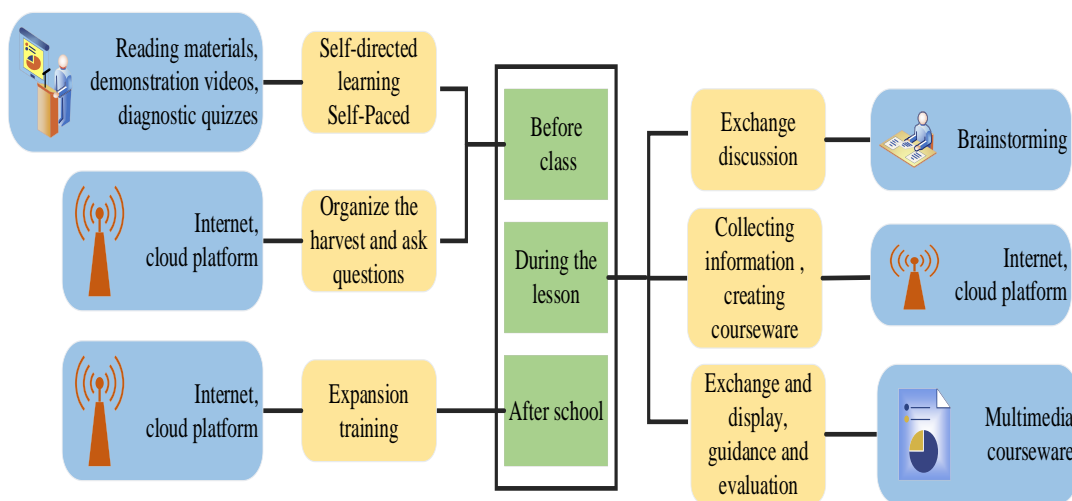
(b) Teaching mode of cloud education classroom

Figure 3. Teaching mode of the classroom

The chaos of time and space in learning brought by the cloud education platform is difficult to achieve in the traditional learning environment. Because it provides interactive and personalized learning, and the teaching model of "Learn first, expand later, ask questions in class", spread the online-offline teaching method for students and update the learning organization.

3) More rational use of teaching resources

In the learning activities of the cloud education platform model, the use of learning resources is a more reasonable production method and form. The learning resources on the cloud education platform can be divided into three categories: course study materials, teaching videos and demonstration animations. On the cloud education platform, resources in teaching activities mainly appear in the form of fragmentation of knowledge and time. Usually, the 45-minute content is divided into several small knowledge points, and then the tutorial is set to about 15 minutes to make it easier for students to understand. The knowledge score of each segment is presented as a small topic in the video. This format allows students to learn easily and without burden, meeting individual and diverse learning needs and promoting ubiquitous learning.

4) Expand the mode of interpersonal communication and interaction

In educational activities, cloud education platforms not only provide students with rich learning resources, but also engage students in wider interpersonal relationships, enabling them to use a variety of teaching methods. The cloud education platform allows many people to ask and answer complex questions online, it would improve the communication between students and peers and with other unfamiliar students, and expand the scope and vision of communication. At the same time, online questioning, commenting and answering are realized in different places through real-time communication, extending interpersonal communication by providing students with a large amount of relevant educational information. This model strengthens the collaboration between teachers and students and between students and students in the learning process, allowing them to receive information from different sources in the process of communication and share knowledge together [17].

4. Application of Cloud Education Platform in College Vocal Music Teaching

(1) Use before class

The material of the course has a lot of creative background and performance videos related to the repertoire studied, so the scope of learning is very wide, requiring the presentation of sounds, images, music score examples and a large number of documents, and the materials are rich in variety and complex in content. In the traditional classroom model, teachers spend a lot of time telling stories. In the classroom mode of the cloud education platform, teachers can integrate their course content into the cloud platform before class. It allows students to learn new knowledge, conduct self-study and research, which determines the importance of cloud education platform application model in vocal music education [18].

1) Pre-class study task list

When creating to-do lists, people allow students to clearly define the problems they need to understand and the skills they need to master. Relevant audio is available for students to learn on their own, summarizing the key features of audio. It allows students to understand the main points of self-study before class, which improves the effect of pre-class learning.

2) Fragmentation of teaching content

Using the cloud education platform, the teaching content of the course is structured in the way of knowledge fragmentation and time fragmentation, and the teaching material is generally about 15 minutes. For example, the 45-minute course content is broken down into blocks of knowledge in the form of small topics for students to explore and learn on their own. The difficulty is inserted into the part that students understand, so that students do not feel bored, and the key points and difficulties are emphasized, and the learning effect is obvious. During the learning process, students can chat online if they do not understand, or they can bring it to the classroom for discussion.

3) Related extracurricular videos

In addition to presenting the lecture content as a special topic, the cloud education platform can also integrate interesting videos and audios related to the lecture content into the cloud platform. By knowing this knowledge before class, teachers can accurately explain the key points and difficulties in classroom teaching, which not only saves the time of teachers' classroom demonstration, but also improves classroom efficiency.

(2) Application in class

1) Test the mastery of pre-class knowledge learning

This part is mainly to test the students' mastery of the basic knowledge they learn online before class. Teachers help students recall the basic learning content of this lesson, test students' abilities by asking questions, and master and improve students' understanding of basic knowledge. Through

students' responses, teachers have a better understanding of students' mastery of knowledge points to help them move on to the next stage of learning.

2) Group collaborative discussion

Students discuss learning in collaborative groups and work together to complete one or more learning tasks. When the teachers summarizes the vocal technique in class, they show the students a video, ask the students some questions, and then invite each group to discuss. Teachers can use the cloud education platform to remotely play videos of music works online, allowing students to identify performance locations, songs, and instrument usage. In this way, teachers can motivate students and activate boring lessons. By leveraging remote network connections, it broadens students' horizons and inspires students to participate in these courses.

3) Assign new learning tasks

This part is designed to consolidate and improve the lesson and learn the knowledge in the next lesson, and it is closely related to the pre-class activities. Since learning tasks vary in complexity, care must be taken when assigning tasks to students. For the learned knowledge points, the difficulty of the task can be increased, and for the newly learned knowledge points, basic tasks should be arranged [19].

(3) Use after class

1) Complete the coursework

Using the cloud education platform, students complete new learning activities assigned by teachers online. A virtuous cycle can be created between classroom and extracurricular activities, reversing the inability of teachers to stay in touch with and interact with students in traditional extracurricular activities. The homework assigned by the teacher to the students in the classroom would be published on the cloud education platform. Students answer these questions through self-diagnosis and after-school learning, and submit their own thoughts, opinions and answers, and teachers would provide students with satisfactory answers in the form of online question and answer [20].

2) Teaching reflection

Through pre-class self-study and learning reinforcement, students reflect and summarize what they have learned, gaps and areas that still need to be explored. In the class, if in doubt, students communicate with relevant teachers through the learning platform to fill in the gaps, and use the learning materials uploaded by teachers to the exchange platform to continue their learning and improve their learning level and skills.

Teachers reflect on the entire lesson through four steps: reviewing the class, identifying successes and weaknesses, analyzing causes and finding coping strategies. Teachers think about each link in the course, find out the defects of each link, analyze the reasons, and finally find the strategy to solve the problem. Through after-school reflection, teachers can closely connect all aspects of vocal music education in the cloud education platform to optimize the learning process. It can provide guidance and proper preparation for subsequent educational activities, stimulate teachers' enthusiasm and creativity in teaching activities, and successfully design effective classrooms.

At the end of the course, the cloud education platform facilitates face-to-face learning, effectively supporting students in learning and consolidating knowledge. At the same time, teachers use classroom analysis to identify problems and countermeasures, monitor classroom tracking, and ensure smooth classroom learning.

3) Extracurricular activities

Teachers can use the cloud platform to organize practical activities, such as online vocal performances, vocal music lectures, etc., as well as conduct online academic activities, organize students to conduct academic discussions, and increase students' practical ability and scientific

research ability.

## 5. College Vocal Music Teaching Experiment

The sophomore music students from 3 colleges and universities were divided into group A and group B for half-year vocal music teaching. Among them, there are 32 students in school group 1A and group B, 29 students in school group 2A and B group, and 35 students in school group 3A and B group. Group A adopts the cloud platform vocal music teaching method, and Group B adopts the traditional vocal music teaching method. After the teaching is over, the teacher would grade the students' abilities, and the two groups of students' ability scoring results would be compared, and the students would also evaluate the teaching quality.

(1) Evaluation of teaching quality

The evaluation is divided into four levels: very satisfied, satisfied, average, and dissatisfied. The evaluation results of the two groups of students in the three colleges and universities on the quality of vocal music teaching are shown in Figure 4.
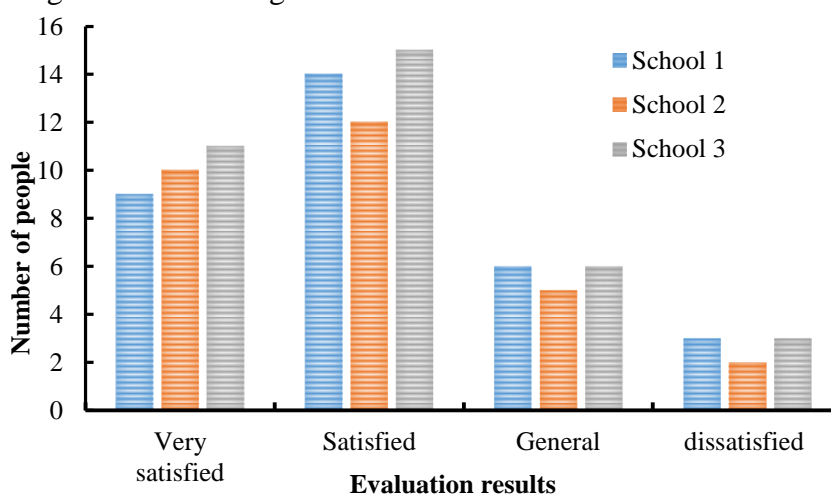
(a) Group A teaching satisfaction
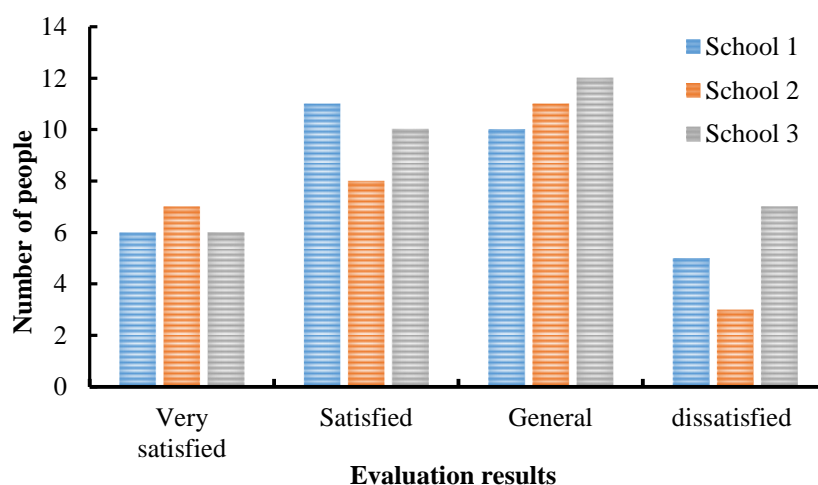
(b) Group B teaching satisfaction

Figure 4. Evaluation results of the quality of vocal music teaching

Figure 4(a) shows the evaluation results of students in group A on the quality of vocal music teaching, and Figure 4(b) shows the evaluation results of students in group B on the quality of vocal music teaching.

For group A students, it can be seen that the number of people who rated as very satisfied and satisfied is much higher than the number of people who rated as average and dissatisfied. Among them, a total of 30 people were rated as very satisfied, 41 were rated as satisfied, and 17 were rated as average. A total of 8 people were dissatisfied, and the overall satisfaction rate was 73.9%, indicating that group A has a higher overall satisfaction with the cloud platform vocal music teaching.

For group B students, those rated as Satisfactory and Fair accounted for the majority of those who rated them. Among them, 19 people rated as very satisfied, 29 rated as satisfied, 33 rated as average, and 15 rated as dissatisfied. The overall satisfaction is 50%, indicating that the students in group B are generally satisfied with the traditional vocal music teaching method.

Compared with the traditional vocal music teaching method, the evaluation satisfaction of the cloud platform vocal music teaching method has increased by 23.9%, indicating that the cloud platform vocal music teaching mode can better meet the students' learning needs and increase students' interest in learning.

(2) Students' singing ability

After the teaching, the evaluation results of the singing ability of the two groups of students in the three colleges and universities are shown in Figure 5.
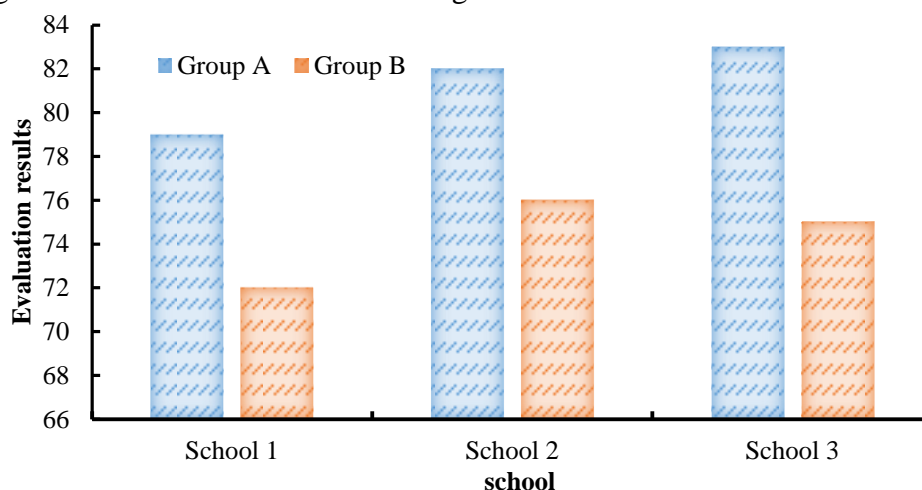

Figure 5. Performance ability evaluation results

It can be seen from the data that the overall singing ability of the students in group A is relatively high, and the evaluation results of the singing ability of the students in group A of the three schools are 79, 82, and 83 respectively. The evaluation results of the students' singing ability in group B were 72, 76, and 75, respectively. It shows that compared with traditional vocal music teaching methods, cloud platform vocal music teaching can better train students in vocal music singing, improve teaching efficiency, and improve students' vocal music singing level.

(3) Students' practical experience

After the teaching, the practical experience evaluation results of the two groups of students in the three colleges and universities are shown in Figure 6.
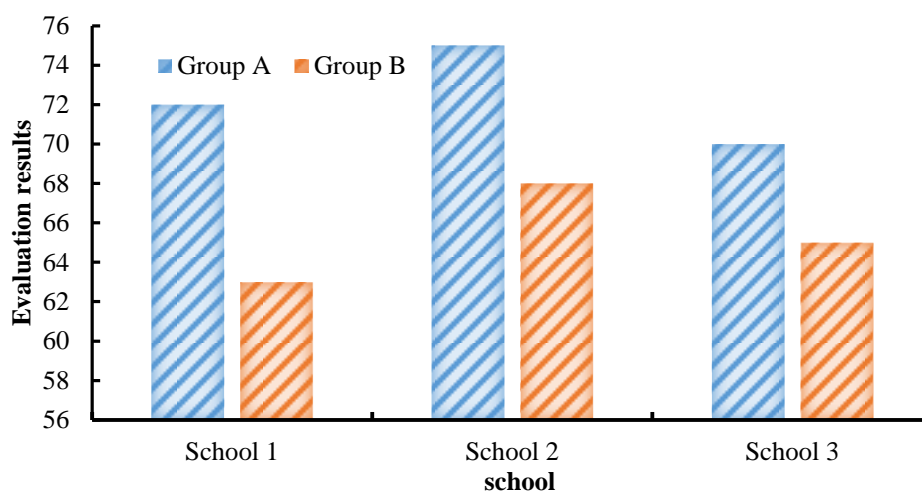
Figure 6. Practical experience evaluation results

It can be seen from the data that the overall practical experience of students in group A is higher than that of students in group B, and the practical experience evaluation results of students in group A of the three schools are all above 70 points. The evaluation results of students' practical experience in group B are between 60 and 70, indicating that the cloud platform vocal music teaching can better improve students' practical experience. Cloud platform teaching can organize more practical activities online, so that students can participate in practical exercises in various ways and gain more practical experience.

(4) Students' scientific research ability

After the teaching, the evaluation results of the scientific research ability of the two groups of students in the three universities are shown in Figure 7.
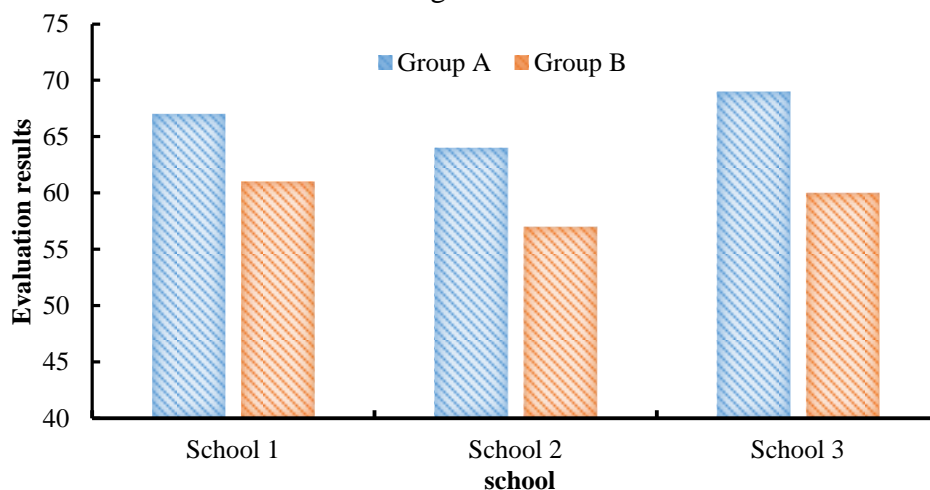

Figure 7. Results of scientific research capacity evaluation

It can be seen from the data that the overall scientific research ability of students in group A is higher than that of students in group B, and the evaluation results of students in group A are higher than those in group B. The evaluation results of scientific research ability of students in group A of the three schools are 67, 64, and 69, respectively, and the evaluation results of students in group B are 61, 57, and 60, respectively. The cloud platform can organize students to conduct online discussions, conduct in-depth academic discussions, carry out extensive academic activities, and comprehensively create an academic atmosphere.

6. Conclusion

This paper uses the cloud platform for college vocal music teaching, and studies the ecological environment construction of college vocal music teaching. This paper analyzes the method and purpose of the construction of the ecological environment of college vocal music teaching, discusses the characteristics and advantages of the cloud education platform, and describes the application of the cloud education platform in college vocal music teaching in detail. The experimental part compares the traditional teaching method with the cloud platform teaching method. The research results show that the student satisfaction of cloud platform teaching is higher, and the students have better singing, practical and scientific research ability. It shows that the cloud platform can promote and promote the ecological environment construction of vocal music teaching in colleges and universities, and make vocal music teaching continue to develop sustainably.

Funding

This article is not supported by any foundation.

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

References

[1] Liu X. Construction of Intelligent Teaching Ecological Environment of ESP Driven by Big Data. The Guide of Science & Education. (2019) 27(9): 7-8.

[2] Jingzhong Li. Research on the ecological environment of computer teaching in traditional Chinese medicine colleges and universities based on virtualization. China Medical Herald. (2018) 15(13): 135-138.

[3] Zhu Y C. Analysis of the ecological environment of college English teaching in the era of big data. Heilongjiang Science. (2017) 8(3): 31-32.

[4] Wang F. Reflection on the Adaptability in College English Teaching Ecological Niche under the Information Technology. Journal of Heilongjiang College of Education. (2018) 37(3): 132-134.

[5] Chen Y L. Construction of mechanical CAD practical teaching ecological system in application-oriented undergraduate course. Laboratory Science. (2017) 20(1): 154-157.

[6] Liu X, Yang C. Remote Music Teaching Classroom Based on Embedded System and Cloud Platform. Microprocessors and Microsystems. (2021) 82(4): 103844.1-103844.6. https://doi.org/10.1016/j.micpro.2021.103844

[7] Sun Y. Research on the practice teaching reform of accounting information system based on cloud platform. Laboratory Science. (2017) 20(3): 81-83.

[8] Ye L. Study on Blended Teaching in Principles of Chemical Engineering Based on Cloud Platform. IOP Conference Series: Earth and Environmental Science. (2021) 693(1): 12-27. https://doi.org/10.1088/1755-1315/693/1/012027

[9] Wang B. Research on Cloud Platform Teaching Mode--Take Literary Psychology as an example. Journal of Contemporary Educational Research. (2020) 4(10): 40-53. https://doi.org/10.26689/jcer.v4i10.1565

[10] Wenlong Du. Investigation and Analysis on Cloud Platform Teaching Status in Higher Vocational Colleges. Journal of Changzhou College of Information Technology. (2019) 57(6): 11823-11834.

[11] Sudu L. Design and Application of Vocal Music Teaching Management System. Mathematical Problems in Engineering. (2022) 2022(7): 1-8. https://doi.org/10.1155/2022/5023333

[12] Li F. Model research on the development and transformation of college english teaching paradigm under the ecological environment of education. Revista de la Facultad de Ingenieria. (2017) 32(5): 322-326.

[13] Gong X. Research on Discrete Dynamic System Modeling of Vocal Performance Teaching Platform Based on Big Data Environment. Discrete Dynamics in Nature and Society. (2017) 11(2): 206-217.

[14] Fu L. Discussion on the Differences between Theory and Practice in Vocal Music Teaching. Region - Educational Research and Reviews. (2021) 3(1): 6-9. https://doi.org/10.32629/rerr.v3i1.215

[15] Yang L. The Teaching Design and Application of Vocal Music Education in Normal University. International Journal of Applied Environmental Sciences. (2019) 8(12): 1569-1579.

[16] Fu L. Research on the Reform and Innovation of Vocal Music Teaching in Colleges. Region - Educational Research and Reviews. (2020) 2(4): 37-40. https://doi.org/10.32629/rerr.v2i4.202

[17] Youjun Dai. Research on the Vocal Music Teaching Model Based on Computer Platform. Science & Technology Information. (2018) 27(9)10-16.

[18] Chi X. Study on vocal music teaching innovation mode based on computer simulation and voice spectrogram analysis. Revista de la Facultad de Ingenieria. (2017) 32(6): 400-406.

[19] Jing Y. Vocal music teaching mode based on a computer platform. Agro Food Industry Hi Tech. (2017) 28(1): 2200-2204.

[20] Sun J. Research on resource allocation of vocal music teaching system based on mobile edge computing. Computer Communications. (2020) 160(2): 342-350. https://doi.org/10.1016/j.comcom.2020.05.016