



A Case Study on the Application of Information Technology in Rural Music Education

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DOI: 10.32629/asc.v5i3.2448

Abstract: In recent years, the application of information technology in the field of education has received considerable attention, especially in music education, where its potential is increasingly evident. This study explores the application of information technology in rural music education through a case study of a volunteer teacher teaching music in a rural school in China. Using qualitative research methods, including classroom observations and semi-structured interviews with the teacher and students, the study analyzes the practical application of information technology in music education. The results show that by integrating multidisciplinary teaching methods and using interactive games and information technology, rural students not only developed a strong interest in learning music but also improved their singing skills and emotional expression abilities. These methods enabled students to better grasp musical knowledge. This study provides valuable insights for educators and demonstrates the significant potential of information technology in rural music education in China. The research indicates that even in resource-limited rural areas, the successful application of information technology in music classes is feasible. As information technology continues to develop, educators should continue to explore and innovate, providing students with richer and more effective educational resources to enhance educational quality and promote the comprehensive development of students.

Keywords: music education, information technology, rural music teaching, aesthetic education assistance

1. Introduction

In recent years, the application of information technology in education has garnered extensive attention and research (Szymkowiak et al., 2021). With 5G technology now broadly available in rural China, most rural school classrooms are equipped with computers and other information technology devices. Numerous studies have shown that information technology can effectively enhance teaching quality and students' interest in learning. In music education, the application of information technology not only enriches teaching content but also makes abstract concepts more concrete and vivid, enhancing students' understanding and memory (Jiang & Cheong, 2024). However, traditional teaching methods in rural China face numerous challenges (Deng, 2021). Rural music teachers have limited use of information technology, and most students lack systematic music education. In response, many Chinese colleges have established one-to-one assistance projects for rural areas, sending college student volunteers to teach in rural schools to improve local education levels. These college volunteers also bring a wealth of information technology to the classroom, creating new classroom dynamics. Despite the growing number of college student volunteers teaching in rural schools, there is little research on their actual music classrooms. This study uses the case of a college student volunteer teaching singing emotion classes in a rural school in China to explore the application of information technology in music teaching. The findings of this study provide new ideas and methods for music teachers to improve and enhance music education in similar contexts.

2. Literature Review

The application of information technology in education has been thoroughly validated. Dahdouh et al. (2020) point out that information technology can help teachers better impart knowledge and improve teaching efficiency through multimedia, interactive platforms, and big data analysis. Wu et al. (2024) emphasize that the application of information technology not only enriches teaching content but also makes abstract concepts concrete and vivid, enhancing students' understanding and memory.

In music education, the application of information technology is mainly reflected in multimedia teaching, real-time feedback, and big data analysis. Camlin and Lisboa (2021) show that multimedia teaching can make music teaching content livelier and more interesting, stimulating students' interest in learning. Real-time feedback helps students quickly identify and correct mistakes, improving learning efficiency (Hooda et al., 2022). Additionally, the application of big data analysis

technology makes data collection and analysis in the teaching process more convenient and scientific, providing strong support for personalized teaching (Habib et al., 2021).

Rural music education faces many challenges due to resource shortages and insufficient teacher strength. However, the introduction of information technology provides new solutions to these problems. Li et al. (2020) note that the application of information technology can compensate for the lack of educational resources in rural areas and improve teaching quality. Jiang and Cheong (2024) find that the application of information technology in rural music education can stimulate students' interest in learning and enhance their musical literacy and comprehensive abilities.

In conclusion, the application of information technology in the field of education has achieved remarkable results, especially in the field of music education and rural education. Information technology provides new opportunities for rural music education. Therefore, this study aims to explore the ways in which information technology can be used in rural music education by exploring the use of information technology in rural music education. The questions of this study are: how well do teachers use information technology in rural music classrooms? What are the current difficulties encountered in the teaching of information technology in rural classrooms?

3. Research Methods

Creswell and Poht (2016) suggest that to deeply understand teachers, teaching, and context, research should focus on teachers' practices and the factors influencing their level of technology integration in synchronous online teaching. Therefore, this study uses qualitative research methods, including interviews and classroom observations, to deeply explore the application and effects of information technology in rural music education. The study adopts typical case sampling (Robinson, 2014). The researcher invited teacher Jiang (a pseudonym) to participate in the case study; she has received high recommendations and evaluations among volunteer groups. As a nearly graduated student with professional music teacher qualifications, Jiang has been teaching in rural areas for one year and has been rated as the most innovative and tech-savvy music teacher by local students. The study also includes 15 students as research subjects. Data collected were analyzed using grounded theory to reveal the impact of information technology on rural music education (Strauss & Corbin, 1994). The study followed appropriate ethical procedures and obtained consent.

3.1 Interviews

The primary data for this research is derived from in-depth interviews with JIANG, a seasoned music teacher, and 15 of her students. All interviews will be recorded and subsequently transcribed into text for analysis.

The interviews will focus on two main areas:

- (1) exploring the use and effectiveness of information technology tools in JIANG's music teaching.
- (2) Analyzing how teacher JIANG utilizes interactive games and multimedia to stimulate student interest in learning.

To ensure the systematic collection and reliability of the data, a detailed interview protocol has been established. Initially, the selection of interview participants includes teacher JIANG and 15 students from various grades and learning backgrounds to ensure representativeness. A comprehensive interview guide, comprising open-ended questions designed to elicit detailed responses, has been prepared. Prior to the interviews, Teacher JIANG and the students will be informed about the research objectives, interview process, and scheduling. Their consent for participation and recording will be obtained.

The interviews will commence with an introduction to the research background, objectives, and procedures to ensure that participants are well-informed and comfortable with the process. The interviews will then proceed according to the prepared guide, focusing on the two main research areas. Interviewers will prompt participants to provide in-depth responses and follow-up questions will be posed to delve deeper into the topics. Throughout the interviews, audio recordings will be made to ensure that no critical information is missed. Post-interview, the recordings will be transcribed verbatim and meticulously reviewed for accuracy. The transcribed data will then be systematically analyzed to extract key themes and insights relevant to the research questions. Initial findings will be shared with teacher JIANG and her students for feedback and verification, and if necessary, additional follow-up interviews will be conducted. This thorough and structured approach aims to ensure that the data collected is robust and provides a solid foundation for the research.

3.2 Classroom Observations

In addition to interviews, this study also used classroom observation methods to record teacher Jiang's teaching process and students' reactions. Observations included Jiang's teaching methods, classroom interactions, specific applications of information technology, and their impact on students' learning outcomes.

3.3 Data Analysis Methods

This study used grounded theory to analyze interview and observation data. Grounded theory is a systematic qualitative research method that reveals patterns and relationships in the data through coding (Strauss & Corbin, 1998). In the data analysis process, we first performed preliminary coding of the interview and observation records, replaced student names with code numbers, and then classified and compared the codes to form a theoretical framework (Chen, 1999) that explains the role and effect of information technology in rural music education.

4. Research Results

This study interviewed teacher Jiang and 15 students. During the interviews, all of them mentioned the importance of information technology in their classes, which enhanced their music aesthetics. Information technology has enabled students to learn in a more personalised and diverse way, but there is still a gap with the use of information technology in the city. Teacher Jiang is a college student majoring in music. She teaches in a rural school with relatively limited resources, and most students lack systematic music education and show little interest in music classes. However, Jiang continuously innovated her teaching methods and actively explored the integration of information technology and music teaching, opening a door to the world of music for her students.

4.1 Integration of Information Technology in Teaching Practice

Observations show that teacher Jiang's use of pre-made PowerPoint courseware in every lesson and her integration of multiple subjects with information technology have significantly improved rural students' musical literacy and interest in learning. Her lessons include not only traditional vocal theory, but also performance and ancient languages through information technology, which she believes can help students understand and master music in a more comprehensive way. For example, when teaching 'Singing Emotions', teacher Jiang played a short video to show an animation of the principles of vocalisation, so that students could intuitively understand the control of singing emotions. (ST7) One student commented, "By watching the video, I understood the emotional changes in the song better, and when I actually sang, I would imagine the structure of my body and try to control it" (ST1). Another student, ST4, agreed with this view, saying that this modern, visual way of teaching was more interesting and easier to understand than the original music teacher's teaching. This approach was recognised by several students, with ST13 commenting that the teacher's videos and animations helped with singing by enabling a more visual understanding of mood changes. Student ST3 also recognised this approach, saying that the teacher had enabled students to go beyond book knowledge through information technology, but had improved their overall musical literacy.

Informative mini-games also became a way of integrating information technology in teaching practice that was repeatedly mentioned by students. Teacher Jiang made the classroom more interesting and lively through a variety of informative and interactive games. These mini-games not only enhanced the students' sense of participation, but also helped them to better grasp the music knowledge. For example, one student mentioned in the interview, "Teacher Jiang often asked us to listen to computer music to guess what ethnicity or musical instrument the game was about, and through this kind of game, we not only remembered a lot of music knowledge, but also cultivated an interest in music." (ST6) Another student said, "In teacher Jiang's class, we would learn the sounds of different musical instruments through a music puzzle game, with prizes for correctly spelling them out, which gave me a deeper understanding of the sounds of each instrument." (ST10) Another student mentioned, "I learnt how to keep the rhythm through a computer screen displaying the rhythm and we played a clapping game, which was much more fun than just explaining it." (ST2) These interactive mini-games not only added fun to the classroom, but also helped students learn and master music knowledge in a relaxing and enjoyable atmosphere. The design of these games not only takes into account the teaching content, but also fully mobilises students' enthusiasm and initiative, so that they can learn while entertaining and entertain while learning. Overall, the introduction of informative mini-games injected new vigour into teacher Jiang's music classroom and enabled students to improve their musical literacy and learning interest in interaction and games.

In theoretical explanations, teacher Jiang uses a variety of innovative teaching methods to make abstract musical concepts more visual and easy to understand. For example, she uses images and tables to visualise the abstract concept of 'melodic line', helping students to better grasp the details of musical structure. She also collects a large number of waveform samples and uses big data analysis techniques to scientifically describe the patterns of sound intensity. These methods not only make the abstract concepts more concrete, but also enable students to have a deeper understanding of the knowledge points. Teacher Jiang also uses professional audio software on her mobile phone to analyse the students' singing on the spot and provide instant feedback. This method not only improves the efficiency of classroom teaching, but also enhances stu-

dents' ability to correct mistakes. In the classroom, teacher Jiang analyses the students' singing through the audio software, identifies the strengths and weaknesses, and helps the students to improve. For example, one student gave feedback, "I like the music teacher's class, the teacher will show us images and it's fun." (Student 1) Another student mentioned, "The teacher's immediate feedback allowed me to correct my mistakes in time and I felt that I improved quickly." (Student 11) Another student said, "The teacher analyses the big data to find out the problems in our singing and gives us targeted instructions, which is helpful to our progress".(Student 13)

Teacher JIANG used 3D sound technology to design a meditation experience session, allowing students to deeply feel the charm of music through meditation. This innovative teaching method not only enhanced students' interest in learning, but also deepened their understanding and emotional experience of music. The students responded positively, with one student saying, "The teacher comes from a big city and brings a way of teaching that we have never seen before." (Student 2) Another student shared a similar experience, "Through the 3D sound meditation experience, we felt the emotions of the music more deeply, which helped us sing." (Student 14) In addition, during the observation, Teacher JIANG set up interactive sessions such as improvisation and choreography exercises, which greatly enhanced students' participation and competitiveness. For example, in the improvisation and choreography exercises, the students showed great creativity and teamwork skills, which stimulated their enthusiasm for learning.

Through these information technology teaching tools, Teacher Jiang's class not only improved students' musical literacy but also stimulated their interest and enthusiasm for learning. This demonstrates that the effective use of information technology plays a positive role in promoting rural music education and opens up new possibilities for the all-round development of students.

4.2 Difficulties encountered with information technology in rural classrooms

In rural education, even though classrooms may be equipped with networks and multimedia devices, the practical use of information technology still faces several significant challenges.

Firstly, inadequate network infrastructure is a significant issue. Network coverage and speed in rural areas are typically inferior to those in urban areas, resulting in slow or unstable connections when teachers and students attempt to access online educational resources. Teacher Jiang noted, "We often encounter slow internet speeds, and sometimes we cannot load teaching videos or engage in online interactions promptly." This problem directly impacts the real-time transmission of teaching content and the effective utilization of learning resources, thereby limiting the efficacy of information technology applications in education. To compensate for the lack of personalized teaching in the classroom, Teacher Jiang has adopted the strategy of pre-downloading classroom videos and materials and storing them on a USB flash drive to address the issue of unstable network connections.

Secondly, the usage and maintenance of equipment present practical challenges. Although classrooms are equipped with modern multimedia devices, rural schools often lack a professional technical support team. Consequently, if equipment malfunctions or issues arise, repairs may take a considerable amount of time, affecting the continuity and efficiency of teaching. One student reported, "The equipment often breaks down, and sometimes it takes a long time to fix, which directly impacts our learning progress." Such equipment issues not only increase the workload for teachers but may also reduce students' interest in and acceptance of technological education.

Additionally, teachers' technical skills and training are critical limiting factors for the integration of information technology in rural education. Teachers in rural areas generally face issues such as outdated technical knowledge and limited training opportunities. Teacher Jiang noted, "There are very few young teachers here. The older teachers cannot use information technology equipment, and most teachers stick to traditional teaching methods, which is particularly prominent in rural schools." The lack of adequate technical support and training means that teachers may not fully utilize modern equipment and resources, thus limiting the effectiveness and innovation of information technology in teaching.

In summary, although investments in equipment and technological resources in rural education have increased, significant challenges related to networks, equipment, and teacher capabilities remain in practice. In the future, it will be essential to improve the quality and reliability of facilities and equipment while enhancing technical training and support for teachers to promote the effective application and development of information technology in rural education.

5. Discussion

The integration of information technology has brought significant changes and improvements to rural music education. Through the case study of Teacher Jiang, it is evident that the use of information technology can effectively address the challenges of traditional rural music education, enhancing students' interest and engagement in learning music. Teacher Jiang's interdisciplinary teaching methods, combined with advanced information technology, provide rural students with

new opportunities for musical growth.

Firstly, the use of multimedia and interactive tools has significantly improved students' learning experiences. Fang (2021) found that multimedia teaching makes music theory more vivid, thereby increasing students' interest and effectiveness in learning. Through multimedia means such as videos, animations, and images, students can understand and master complex musical concepts and techniques more intuitively. This interactive and visual learning approach not only makes abstract music theory more concrete and understandable but also enhances students' emotional investment and depth of understanding in music.

Secondly, the introduction of interactive games through information technology activities has significantly increased student engagement and enthusiasm for learning. Deeva et al. (2021) showed that real-time feedback and interactive teaching can help students quickly identify and correct learning mistakes, thereby improving learning efficiency (Wu et al., 2024). Through various interactive games and live music activities, students actively participate in a relaxed and enjoyable atmosphere, enhancing their understanding and skills in musical expression and aesthetics. This teaching approach not only boosts learning motivation but also fosters students' teamwork abilities and creativity, laying a solid foundation for their overall development.

However, this study also reveals some practical challenges faced by information technology in rural education. These challenges include inadequate network infrastructure, difficulties in equipment usage and maintenance, and insufficient technical skills and training for teachers. These factors limit the widespread application of information technology in actual teaching, requiring further improvements in policy support and technical assistance to promote comprehensive information technology application in rural education.

In summary, this study provides empirical support for the integration of educational technology through an in-depth analysis of the application of information technology in rural music education. It also offers valuable theoretical insights and practical suggestions for the future development and implementation of information technology in rural education. The findings of this study provide valuable insights for educators and policymakers, demonstrating that even in resource-limited rural areas, the successful application of information technology in music education is feasible and beneficial.

6. Conclusion

Based on this case study, various strategies have significantly enhanced rural students' interest in learning and their overall abilities. These strategies include interdisciplinary integration, diversified teaching methods, information-based teaching modules, and the extension of traditional teaching time and space (LaFever, 2008). Even in rural areas, as long as there are information technology resources available, combining multiple disciplines, using interactive games, multimedia-assisted teaching, and professional audio software can help students comprehensively master musical knowledge, improve singing techniques, and enhance emotional expression. The application of information technology makes abstract musical concepts more concrete and visual, allowing students to understand and grasp knowledge points more intuitively. Immediate feedback and big data analysis help students correct errors promptly and make faster progress. This teaching model not only provides valuable insights for educators in similar environments but also demonstrates the beneficial application of information technology in rural education.

However, information technology in rural areas still faces challenges of instability. Future educators need to continue exploring innovations to provide richer and more effective educational resources, thereby improving education quality and achieving comprehensive student development. To verify whether these strategies are suitable for a broader range of rural schools, future research could further explore the application of information technology in rural music classrooms using quantitative methods.

In future research, the sample coverage could be expanded to include rural schools with diverse geographical and economic conditions to validate the educational effects of information technology in different contexts. Additionally, in-depth studies on the specific impacts of individualized technical training and support for teachers on teaching implementation could enhance teachers' abilities and confidence in applying information technology. As information technology continues to advance, educators should keep exploring innovative teaching methods to provide students with rich and effective educational resources, improving the quality of rural music education and promoting comprehensive student development.

By analyzing a case study, this article reveals the potential and challenges of information technology in rural music education. The findings provide practical references for other rural educators while emphasizing that through innovation and technology integration, significant improvements in educational outcomes can be achieved even with limited resources. Future research should continue to focus on and address the application issues of information technology in rural education to ensure its feasibility and effectiveness in different contexts.

Acknowledgments

Funding: This article is one of the research outcomes of Guangdong Philosophy and Social Science Foundation 2022 “The 14th Five-Year Plan” project (Project Number: GD22XYS19).

References

- [1] Camlin, D. A., & Lisboa, T. (2021). The digital ‘turn’ in music education. *Music Education Research*, 23(2), 129-138.
- [2] Chen, x. (1999). Grounded theory: its train of thought and methods. *Educational Research and Experiment*(4), 58-63.
- [3] Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and research design: Choosing among five approaches*. Sage publications.
- [4] Dahdouh, K., Dakkak, A., Oughdir, L., & Ibriz, A. (2020). Improving online education using big data technologies. *The role of technology in education*, 15.
- [5] Deng, X. (2021). A study on the strategy of improving the quality of music lessons at teaching points through “Networked Joint Schools” [Southwest University].
- [6] Habib, M. N., Jamal, W., Khalil, U., & Khan, Z. (2021). Transforming universities in interactive digital platform: case of city university of science and information technology. *Education and Information Technologies*, 26, 517-541.
- [7] Hooda, M., Rana, C., Dahiya, O., Rizwan, A., & Hossain, M. S. (2022). Artificial intelligence for assessment and feedback to enhance student success in higher education. *Mathematical Problems in Engineering*, 2022(1), 5215722.
- [8] Jiang, H., & Cheong, K. W. (2024). Developing teaching strategies for rural school pupils’ concentration in the distance music classroom. *Education and Information Technologies*, 29(5), 5903-5920.
- [9] LaFever, K. S. (2008). *Interdisciplinary teacher education: Reform in the global age* [Miami University].
- [10] Li, J., Shi, Z., & Xue, E. (2020). The problems, needs and strategies of rural teacher development at deep poverty areas in China: Rural schooling stakeholder perspectives. *International Journal of Educational Research*, 99, 101496.
- [11] Robinson, O. C. (2014). Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative research in psychology*, 11(1), 25-41.
- [12] Strauss, A., & Corbin, J. (1994). *Grounded theory methodology: An overview*.
- [13] Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques*.
- [14] Szymkowiak, A., Melović, B., Dabić, M., Jeganathan, K., & Kundi, G. S. (2021). Information technology and Gen Z: The role of teachers, the internet, and technology in the education of young people. *Technology in Society*, 65, 101565.
- [15] Wu, J., Jiang, H., Long, L., & Zhang, X. (2024). Effects of AR mathematical picture books on primary school students’ geometric thinking, cognitive load and flow experience. *Education and Information Technologies*, 1-26.