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Innovation of Music Education Model Supported by Information Technology

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Abstract

With the rapid development of information technology and intelligent tools in education, university music education faces the dual demands of personalized instruction and innovative classroom models. However, traditional music teaching methods have limitations in resource utilization, learning feedback, and creative guidance, such as difficulty in personalized content delivery, limited classroom interaction, and subjective evaluation of student works. To address this issue, this paper introduces network technology, micro-courses, and artificial intelligence-assisted teaching. Through the integration of multimedia resources, real-time learning data analysis, and the application of AI composition and intelligent evaluation systems, it achieves refined management and personalized guidance for student music learning. In the experiment, students' learning interest, creative ability, classroom participation, and musical knowledge mastery are significantly improved. The average interest score of students in experimental group A (micro-courses + online resources) is 4.5 points, an increase of approximately 1 point compared to the control group. This indicates that micro-courses combined with rich online resources can effectively stimulate students' learning interest, make them more actively engaged in class, and significantly enhance their exploratory learning of musical knowledge and skills. The results indicate that the integration of information technology and artificial intelligence can effectively optimize university music education models and provide practical reference for personalized, interactive, and refined teaching.

Keywords

Innovation in Music Education Models; Information Technology; Micro-Courses; Artificial Intelligence; Online Resources

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1. Introduction

With the rapid development of information technology and the continuous innovation of higher education models, music education is undergoing a transformation from traditional classrooms to digital and intelligent teaching. Traditional university music courses are mostly general courses, focusing on music appreciation, performance, and basic practice. These courses fail to meet students' individual learning needs. Classroom interaction is limited, and creative guidance and learning feedback are not timely, which hinders the improvement of students' artistic literacy and creative ability. Furthermore, with the increasing diversity of college students' musical foundations, traditional education models are unable to cater to the development of each student. There is an urgent need to explore more flexible, precise, and personalized teaching methods.

Against this backdrop, information technology, particularly online resources, micro-courses, and artificial intelligence (AI), offers new development paths for music education in universities. Micro-courses and online resources can enrich teaching content, enable personalized learning delivery, and enhance student autonomy and classroom interaction. AI-assisted instruction can intelligently analyze and provide feedback on student creations, optimizing the teaching process and evaluation system, and promoting learning efficiency and creative ability. The integration of technology and education not only enables innovative classroom teaching models but also ensures the comprehensive development of students' artistic literacy and creativity.

Against this backdrop, this paper aims to explore innovative models for music education in universities supported by information technology. This paper constructs a comprehensive approach combining "micro-courses + online resources + AI-assisted instruction" and, through empirical research, evaluates its impact on students' musical knowledge, creative ability, learning interest, and classroom engagement. The findings can provide a theoretical basis and practical reference for reforming university music education models and promoting the application and development of information technology in arts education.

2. Related Work

In recent years, with the continuous evolution of educational concepts and the widespread application of technology, the field of music education has shown a diversified development trend. Drawing on a variety of domestic and international research, the following review systematically examines core issues, innovative practices, technological applications, and teaching strategies in music education, providing a reference for understanding the current development characteristics and future directions of music education.

Yang and Welch summarized the main characteristics of Chinese music education from 116 core studies based on a literature review of 3,257 high-impact Chinese journal articles from 2007 to 2019. The results showed that educational reform, aesthetic education, traditional music, and cultural identity are the most prominent issues; government funding, policy guidance, curriculum implementation, and teaching innovation are generally regarded as ways to improve educational problems[1]. Olvera-Fernández et al. explored teaching innovation and subversion in music education through a systematic literature review and analyzed practices at different educational levels and contexts. The results showed that changes in the four elements of learning objectives and contexts, teacher-student relationships, and learner roles would bring about subversion and help promote a more flexible, open, and interdisciplinary curriculum system[2]. Rexhepi et al. found through statistics, modeling, empirical summary, experiments, and theoretical analysis that digital technology can improve learning efficiency and accessibility, help students master knowledge, stimulate interest, enhance creativity, and promote collaborative learning[3]. Fernández-Barros et al. reviewed the literature on peer tutoring in music education from 1980 to 2021 and analyzed 51 studies. The results show that peer tutoring plays a positive role in music education at all stages and in all forms, and can promote mutual assistance, guidance, and feedback among students. However, the research also has limitations[4]. Ouyang evaluated the effect of introducing digital software in music education on academic performance and sight-singing and ear-training attendance. Through tests and t-tests, it is found that the average score of the experimental group is significantly higher than that of the control group, and

the mastery level is better[5]. Uludag and Satir explored the impact of music education content supported by mobile technology on the basic music theory learning of middle school students. Sixth-grade students in Turkey participated in the experiment. The experimental group studied for 8 weeks using applications such as NoteWorks, Rhythm Cat, GarageBand, and Kids Piano, while the control group used traditional teaching. The results showed that the music theory scores of the experimental group improved significantly[6]. Bauman-Field explored classroom management strategies in music education and their compatibility with the TIPE method, and proposed a definition of "trauma-informed classroom management". The study pointed out that teachers should avoid triggering trauma reactions while supporting students' recovery, and provided corresponding inspiration for the field of music education[7]. Fredriksson et al. conducted a meta-analysis of 14 qualitative studies to explore how teachers support students' music learning. The results showed that teaching framework, learner perspective, scaffolding strategies, and music reproduction are key factors[8]. Coppes and Berkers found through interviews with 12 course leaders that: the definition of popular music is not unified, and the curriculum is often based on British and American small classics, local music or jazz; the status of popular music majors in classical colleges is still unstable; curriculum design balances between skill orientation, art orientation and market orientation, and is subject to institutional environment[9]. Liu et al. reviewed the research on music education supported by mobile technology from 2008 to 2019, analyzing the application areas, research questions, samples, methods, equipment, and learning strategies. The results showed that the number of studies increased, focusing on learner perception, tablets are most commonly used, and guided, project-based, and inquiry-based learning are widely used[10]. Anderson tracked curriculum development in England, where the government has verified the policy-driven approach. It explored the learning plans designed by British music teachers as a summary of music learning in key stage 3. He explored the impact of music education policy on classroom practice and presented a proposed model that captures this interaction[11]. Bennett analyzed 31 teachers through constructivist grounded theory and found that cultural responsibility includes 13 aspects, such as interactivity, student-led, creativity, diversity, interdisciplinarity, and multimodality. The study showed that the level of cultural responsibility of teachers depends on their teaching methods, goals, and beliefs, and whether these aspects reflect various dimensions, thus affecting students' music experience and cultural understanding[12]. Although existing research has made some progress in innovative practices and technological applications in music education, there are still bottlenecks such as the disconnection between theory and practice, insufficient external validity, and limited research on applicability to different educational contexts and student groups.

3. Method

3.1. Innovative Opportunities Facing College Music Education in the "Micro Era"

3.1.1. Implement Innovative Education Methods Based on Individual Needs

Music is an aesthetic art form, and its performance is determined by the participant's aesthetic awareness, talent, and cultivation. Furthermore, due to the varying musical backgrounds of university students, they have highly individualized needs when participating in music courses. In traditional universities, music courses are mostly general education courses, with relatively simple music appreciation, performance, and practical activities. Given the diversity among students in musical literacy, vocal quality, and emotional attitudes, traditional music instruction struggles to accommodate every student and provide targeted artistic guidance, resulting in inadequate development of students' artistic abilities.

In the micro-media environment, the effective interaction between various media technologies, online platforms, and social software provides new means for the development of music education. First, it must describe student learning behaviors. Leveraging monitoring, sensors, and big data technologies, it can timely analyze and understand changes in students' attitudes, emotions, and behaviors during the teaching process. This understanding, in turn, helps people understand the underlying drivers of these behaviors, enabling music instruction to accurately grasp and track student learning progress. Based on generated reports, it can proactively identify student needs and deliver personalized learning

content to meet their individual learning needs.

Secondly, it promotes in-depth communication between teachers and students. Music teaching, centered on aesthetics, is a process centered on creativity and generative characteristics. Answering students' questions can flexibly adjust teaching content and provide new opportunities for music teaching reform.

3.1.2. Transformation Method: Actively Utilize Network Resources

The internet is a vast resource library, boasting enormous scale and rapid updates. Music teachers can use the internet as a repository for music teaching materials and actively draw on the vast amount of high-quality information available online, such as music resources from the National Digital Resource Library, electronic libraries from other schools, renowned music education websites, and major music video sites, to enrich their music classrooms.

Compared to print textbooks, online music course resources offer richer content and a wider variety of formats, helping students acquire more musical knowledge and skills. Furthermore, the constant flow of updated information sparks a greater interest in music. With this wealth of music resources, students' learning interest is heightened, their motivation is positive, and their learning efficiency is significantly improved.

3.1.3. Analysis of Micro-Course Models in University Music Education

Teachers are key participants in the classroom and play a central role in both traditional and online music classes. With the development of the internet, new technologies, theories, and teaching models are emerging, requiring teachers to continuously learn and master relevant skills. These new teaching models place new demands on music teachers. Therefore, integrating micro-courses with traditional instruction can strengthen teacher development and ensure that teachers fully master teaching concepts and skills at a technical level. Furthermore, teachers should actively promote micro-courses and explore their educational value.

Integrate online technology into traditional music classrooms, building an integrated online teaching system that combines both hardware and software. Schools should provide funding, hardware, and software support to build a micro-course network system, and implement rational planning and management at the system level to improve course technology. Public solicitations can be used to gather excellent resources, new technologies, and teaching concepts, and integrate them into the university's music education resource system. Schools should not only increase funding and equipment investment, but also improve the curriculum development process and classroom format from a systemic perspective to ensure the formality, integration, and integration of micro-classrooms.

3.2. Optimizing teachers' information technology teaching strategies

Teachers' information technology teaching strategies should be further optimized. On this basis, this study proposes a network-based teaching method, which is to design highly interactive and attractive course content in a network environment and realize the effective combination of teaching methods and information technology through student data feedback.

(1) Strengthening Teachers' Information Technology Training

In the network environment, teachers' information technology level is an important guarantee for achieving innovation in teaching models. Therefore, it is very necessary to carry out systematic information technology training for online music education.

(2) Strengthening Teachers' Teaching Methods

Teachers should have a certain understanding of the multimedia tools, video recording, and editing software required for online education so that they can flexibly use various tools in the classroom and improve the expressiveness and interactivity of the course. Educational institutions can provide a series of training to enable teachers to fully master the various tools of the online teaching platform and effectively utilize teaching resources.

(3) Master the Functions of Online Education Platforms

We need to further understand the functions of online education platforms, master functions

such as live broadcasting, interaction, and discussion, and enhance teacher-student interaction. By building a teacher learning community, teachers can exchange educational experiences online, share interactive teaching strategies, and improve the effectiveness of educational interaction.

(4) Technology and Equipment Training

Teachers should be trained in technology and equipment. Schools should provide technical support to help teachers become familiar with the operation of audio-visual equipment and avoid technical problems. The training content includes equipment selection and debugging, and network environment optimization to ensure that teachers can use audio and video equipment smoothly in the classroom and ensure the normal operation of online teaching.

3.3. Artificial Intelligence Empowers Music Education in Colleges and Universities

(1) Intelligent Writing Assistant

Artificial intelligence technology can not only simulate the musical style of music composers, but also provide strong technical support for music creation. Using advanced creative technology tools, students can set different style parameters according to their preferences. Artificial intelligence technology can automatically generate music that meets the user's requirements and assist in composition. Whether it is melody, rhythm, or harmony, AI technology can create more possibilities for music.

(2) Accurate Evaluation and Feedback

Artificial intelligence technology can objectively and accurately evaluate students and provide effective feedback. Through this method, teachers can quickly and conveniently collect and analyze students' learning materials and process them effectively. Timely learning feedback is a convenient process evaluation method that can help teachers continuously adjust teaching strategies and improve evaluation systems.

(3) Building a Smart Classroom

Smart classrooms utilize advanced technologies such as VR, AR, and AI to create immersive, experiential learning spaces. In such classrooms, students can experience the world as if they are there, gaining a more direct understanding of profound concepts and knowledge, thereby stimulating their interest in learning and their spirit of inquiry.

4. Results and Discussion

4.1. Experimental Subjects

College music students (divided into music majors and non-music majors)

Recommended sample size: 60–100 students, randomly assigned to experimental and control groups.

4.2. Experimental Grouping

Technology Application of Group-Based Teaching Models

Control Group (Traditional Classroom): Traditional textbooks, no online resources

Experimental Group A (Micro-Course + Online Resources): Micro-Course teaching with enriched online resources

Experimental Group B (Micro-Course + Online Resources + AI Assistance): AI composition tools, intelligent evaluation system, and immersive smart classroom

The number and combination of groups can be adjusted based on resource availability.

4.3. Experimental Procedure

Pre-test Phase

All students received a music foundation test (knowledge test + short composition).

Questionnaire survey of student learning interests and attitudes.

Intervention Phase (6–8 weeks).

Control Group: Traditional classroom instruction.

Experimental Group A: Micro-lectures + online resources.

Experimental Group B: Micro-lectures+online resources+AI-assisted (composition/evaluation/smart

classroom).

Data Collection

Student engagement (number of interactions, assignment submissions) is recorded weekly.

Teachers graded the work and collected AI-generated feedback.

Students completed periodic questionnaires, providing feedback on their learning experiences and changes in their interests.

Post-test phase: Musical knowledge test + creative ability assessment. Questionnaire on learning interests and attitudes.

Pre-test and post-test results are compared to analyze differences between groups.

4.4. Data Analysis

This study evaluates the effectiveness of university music education models using four key indicators: musical knowledge and creative ability (pre- and post-tests, with a maximum score of 100), learning interest (Likert-scale questionnaire), classroom engagement (number of interactions/assignment completion rate), and a comparison of teaching models (control group, experimental group A, and experimental group B). These indicators can directly reflect students' performance in knowledge acquisition, creative ability, learning motivation, and classroom engagement, providing a quantitative basis for analyzing the effectiveness of information technology and artificial intelligence in improving music education.

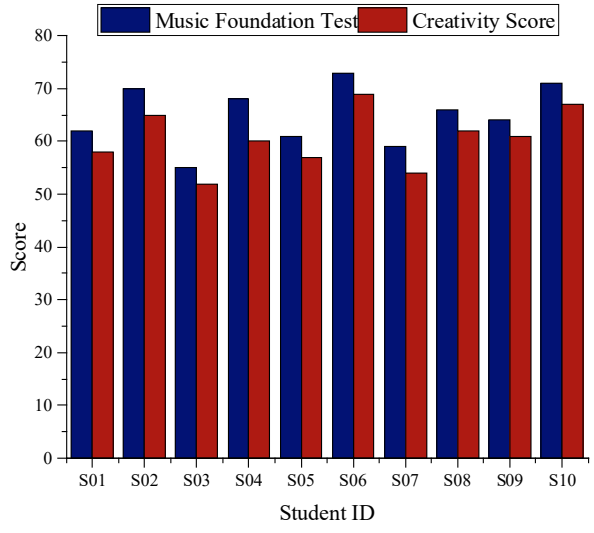

Figure 1. Pre-test Scores on Music Knowledge and Creative Ability (Maximum 100 Points)

The pre-test scores shown in **Figure 1** reveal significant differences among college students in their music foundation and creative ability scores. Music foundation scores range from 55 to 69, with a mean of 61.0 and a standard deviation of approximately 5.6. This indicates that students' overall musical knowledge and creative abilities are above average, but with significant individual variation. The highest-scoring student (S06) scores over 68 on both the music foundation and creative ability tests, demonstrating strong theoretical and practical skills. The lowest-scoring student (S03) scores below 55 on both measures, reflecting a weak foundation and insufficient creative experience. This discrepancy provides a basis for subsequent experimental grouping. Students can be randomly or balancedly assigned to control and experimental groups to ensure balanced pre-test performance, thereby enhancing the reliability of the experimental results.

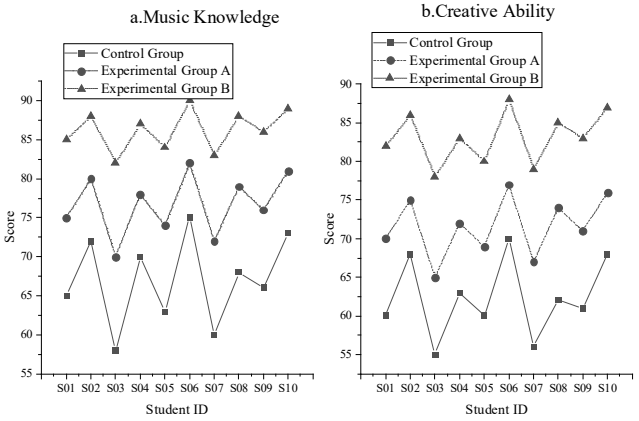

Figure 2. Post-Test Scores on Music Knowledge and Creative Ability (Maximum 100 Points)

The format is "Music Knowledge/Creative Ability."

The average scores of students in Experimental Group A (micro-courses + online resources) are significantly higher than those in the control group. Their scores on the music foundation test and creative ability increased to approximately 77.5 and 71.2, respectively, representing an average improvement of approximately 16%-18% (as shown in **Figures 2a and 2b**). This result demonstrates that the micro-course combined with rich online resources effectively stimulates student interest and enhances class participation, leading to significant improvements in their mastery of music knowledge and creative ability. The average scores of students in

Experimental Group B (micro-courses + online resources + AI-assisted instruction) further improve, reaching approximately 87.1 and 83.1, respectively, representing an increase of approximately 30% compared to the control group and approximately 10%-12% compared to Experimental Group A. This demonstrates that the introduction of AI-assisted instruction (AI composition and intelligent evaluation systems) can provide personalized feedback and creative guidance, significantly improving students' mastery of theoretical knowledge and the creation of musical works.

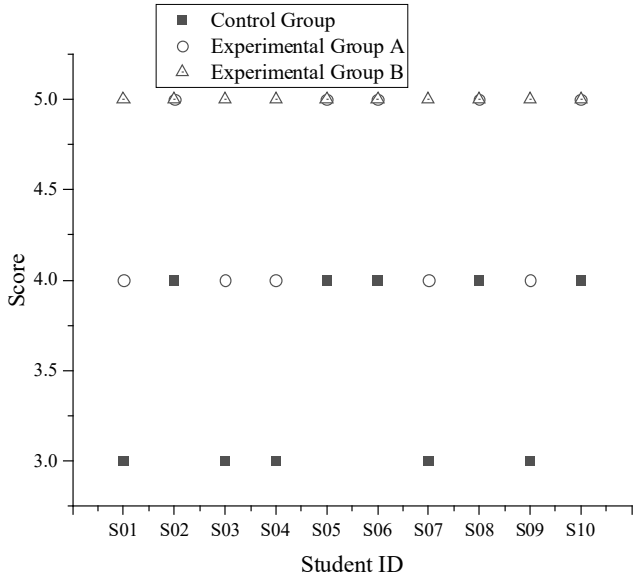

Figure 3. Learning Interest Questionnaire (5-Point Likert Scale, 1 = Very Low, 5 = Very High)

The average interest score for students in the control group is 3.5, indicating that under the traditional classroom model, students' learning interest is moderate, with limited class participation and initiative. The average interest score for students in Experimental Group A (micro-courses + online resources) is 4.5, approximately 1 point higher than the control group. This demonstrates that micro-courses combined with rich online resources effectively stimulate students' learning interest, enabling them to engage more actively in class and significantly strengthening their exploratory learning of musical knowledge and skills. The average interest score for students in Experimental Group B (micro-courses + online resources + AI-assisted instruction) is 5, reaching the maximum score, demonstrating that information technology and AI-assisted instruction can further enhance student learning motivation. AI composition, intelligent evaluation, and immersive smart classrooms provide students with personalized feedback and immediate guidance, significantly improving their active participation and engagement, as shown in **Figure 3**.

Table 1. Class Participation (Number Of Interactions/ Assignment Completion Rate%)

Student ID	Control Group		
S01	5 / 80	8 / 90	12 / 100
S02	6 / 85	9 / 92	13 / 100
S03	4 / 75	7 / 88	11 / 98
S04	5 / 80	8 / 90	12 / 100
S05	5 / 82	8 / 91	12 / 99
S06	6 / 86	9 / 93	14 / 100
S07	4 / 78	7 / 89	11 / 98
S08	5 / 81	8 / 90	12 / 100
S09	5 / 80	8 / 90	12 / 100
S10	6 / 84	9 / 92	13 / 100

The format is "number of interactions/assignment completion rate (%)."

Experimental Group A (micro-course + online resources) demonstrates significant advantages. Post-test results show an average improvement of approximately 16%-18% in students' music knowledge and creative ability, with an average learning interest score of 4.5. Classroom interactions and homework completion rates increase to approximately 8 times per week and 91%, respectively. These results demonstrate that micro-courses combined with rich online resources can effectively meet students' personalized learning needs, stimulate class participation and learning interest, and promote the improvement of music knowledge and creative ability. Even more remarkable is the performance of Experimental Group B (micro-course + online resources + AI assistance). Post-test scores reach an average of approximately 87 (music knowledge) and 83 (creative ability), respectively. Learning interest scores reach a perfect score of 5. Classroom interactions and homework completion rates increase to 12 times per week and nearly

100%, respectively. The introduction of AI-assisted instruction, such as intelligent composition, personalized feedback, and immersive smart classrooms, provides students with real-time guidance and creative support, significantly improving their music knowledge and creative ability while also significantly increasing their learning initiative and class participation. Compared with experimental group A, experimental group B further improved by about 10%-12% in all indicators, indicating that the intervention of artificial intelligence can further optimize teaching effects (as shown in **Table 1**).

5. Conclusion

This paper, focusing on university music education, explores the value of information technology in innovative teaching models. By integrating micro-courses, online resources, and artificial intelligence-assisted instruction into the classroom, a comprehensive model of "micro-courses + online resources + AI-assisted instruction" is constructed. The effectiveness of different teaching models is empirically analyzed through pre- and post-tests, a learning interest questionnaire, and a classroom engagement experiment. The experimental results show that compared with traditional classroom teaching, micro-courses and online resources significantly improve students' musical knowledge, creative ability, and learning interest. Furthermore, the addition of AI-assisted instruction further enhances students' creative accuracy, classroom interaction, and homework completion rates, validating the important role of information technology and AI in personalized, interactive, and refined instruction. The study shows a positive correlation between the degree of technological intervention and student learning outcomes, highlighting the core value of information technology and AI in innovative university music education. However, this study has limitations, such as a limited sample size, a short research period, and incomplete implementation details of the AI-assisted system. Future work could expand the sample size, extend the experimental period, and further optimize the AI teaching module to further validate and promote this innovative teaching model and enhance the sustainable development and broad application of university music education.

Disclosure statement

The author declares no conflict of interest.

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