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Innovative Pathways and Practical Exploration of Artificial Intelligence-Enabled General Music Courses at Medical Universities from the Perspective of "New Medical Science"

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ABSTRACT: Driven by digital technologies such as artificial intelligence (AI) and big data, higher education is undergoing digital transformation, while aesthetic education is evolving toward greater intelligence, digitalization, and integration. In medical universities, aesthetic education serves a dual purpose: cultivating aesthetic appreciation and shaping medical humanities and professional ethics. It is therefore an essential component of medical talent development in the new era. However, general music courses at medical universities continue to face a range of challenges, including outdated content, limited classroom interaction, monotonous assessment methods, and insufficient integration with medical disciplines. These shortcomings make it difficult for such courses to meet the requirements of contemporary medical education. Guided by the principle of "revitalizing music through intelligence and cultivating medicine through beauty," this study examines the application of AI to general music courses at medical universities. Drawing on curriculum reform practices at Henan Medical University, it systematically explores the theoretical rationale, practical challenges, and implementation pathways. The study indicates that AI can comprehensively reshape course res[1]ources, classroom interaction, learning assessment, and teaching management, thereby promoting the coordinated development of medical students' aesthetic competence, humanistic qualities, and professional commitment.

KEYWORDS: Artificial Intelligence; Digital Aesthetic Education; General Music Courses; Higher Education Curriculum Reform; Medical Humanities

I. INTRODUCTION

The 20th National Congress of the Communist Party of China outlined an ambitious blueprint for the high-quality development of education in the new era. It identified accelerating the development of China into a leading country in education and improving the quality of independent talent cultivation as central strategic priorities, thereby providing direction and fundamental guidance for educational endeavors in the new era.

Located in the Central Plains, Henan Medical University benefits from rich local cultural resources, including intangible cultural heritage music in Xinxiang, traditional music and dance of the Yellow River Basin, and folk vocal traditions along the Wei River. These resources provide a distinctive cultural foundation for music education. Nevertheless, owing to the institutional orientation of medical universities and shortcomings in their aesthetic education systems, music education at the university has long faced three characteristic challenges.

First, there is a content-related challenge: an emphasis on technique at the expense of culture. Existing music courses te[This paper is supported by the 2026 Xinxiang Federation of Social Sciences Research Project entitled "Research on the Construction of an Innovative Mechanism and Optimization Pathways for AI-Enabled General Music Courses in Medical Universities" (Grant No. SKL-2026-0293).]nd to focus on basic skills such as instrumental performance, resulting in a relatively narrow scope of instruction. Students may acquire basic practical skills but often have limited understanding of the traditional cultural meanings embodied in instrument design, musical systems, and melodies. They also have insufficient exposure to such areas as the arrangement and

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creation of traditional music, the restoration of folk instruments, and the transmission of intangible musical heritage. Consequently, university music education risks becoming homogeneous skills training and losing its cultural and educational core. Second, there is a transmission-related challenge: an emphasis on practice at the expense of cultural inheritance. Music education is often narrowly understood as the improvement of instrumental performance and music appreciation, while the systematic transmission of traditional musical culture is neglected. The transmission of traditional folk music and local vocal traditions rooted in Xinxiang has become fragmented in university classrooms. Students lack comprehensive knowledge of traditional musical practices and regional folk customs, as well as immersive learning experiences. As a result, the educational potential of local musical heritage remains underutilized.

Third, there is an integration-related challenge: an emphasis on art at the expense of the humanities. Music-based aesthetic education is insufficiently connected with medical talent development and is not deeply integrated into the distinctive educational mission of medical disciplines. The potential of music for healing, emotional regulation, humanistic empathy, and personal cultivation has not been fully explored. Consequently, music education does not adequately address the needs of medical students in developing professional competence, a sense of vocation, and humanistic depth, and its fundamental role in fostering virtue through education remains under-realized.

Medicine and aesthetics share common roots and are mutually permeable [1]. Medical humanities constitute "an interdisciplinary field that seeks to understand human health and illness in order to create knowledgeable and sensitive healthcare providers, patients, and family caregivers" [2].

In higher medical education, a central task of the development of "new medical science" is to cultivate high-quality medical professionals with interdisciplinary capabilities. This requires the deep integration of medical education with the humanities and the arts. The aim is to ensure that medical students possess not only excellent clinical skills but also profound humanistic values and aesthetic literacy, thereby meeting public expectations for high-quality healthcare in the new era [3]. Against the backdrop of Healthy China and ongoing healthcare reform, medical students are expected not only to demonstrate clinical expertise but also to uphold firm ideals and cultivate rich inner lives. In addition to treating illness and saving lives, they bear responsibility for disseminating health knowledge to society. These expectations place higher demands on talent development in medical universities [4].

Compared with comprehensive universities, medical universities have distinctive professional and humanistic characteristics in their talent development missions. Their disciplinary curricula tend to prioritize biomedical knowledge, clinical skills, and scientific theories. The intensive pace of study and substantial academic pressure mean that many medical students spend long periods in highly rational, rigorous, and structured learning environments. This may reinforce fixed patterns of linear thinking while leaving limited opportunities for emotional perception and expression. General music education can help address this humanistic gap in professional medical education and offer unique educational benefits. As an art of emotion, music uses melody, rhythm, harmony, and other artistic languages to provide students with opportunities for emotional expression and inner nourishment. Immersive musical experiences, diverse cultural learning, and sustained emotional engagement with music can enrich students' sensibilities, relieve academic stress, and cultivate aesthetic interests. More importantly, they can help students perceive emotions, understand human warmth, and develop reverence for life, thereby fostering empathy, emotional understanding, and an awareness of care for life. Collective musical activities, such as choral singing and ensemble performance, can also strengthen teamwork, communication, and mutual understanding, laying a solid foundation for effective doctor–patient communication and collaboration within medical teams.

II. REVIEW OF DOMESTIC AND INTERNATIONAL RESEARCH AND THEORETICAL FOUNDATIONS

Against the backdrop of digital technologies becoming deeply embedded in social development, AI is reshaping the educational ecosystem at an unprecedented pace. The digital transformation of education is changing not only how knowledge is produced and disseminated but also the form of teaching, shifting it from "one-way transmission" toward "multidirectional interaction." In this process, aesthetic education, as an important component of fostering virtue through education in higher education, is undergoing a structural transformation from the cultivation of artistic skills to the coordinated development of aesthetic competence and humanistic qualities.

Aesthetic education in medical universities has a particularly distinctive value orientation. It is generally delivered through classroom teaching and aims to promote the coordinated development of students' physical and mental well-being through collaborative engagement between teachers and students, with aesthetic education offered across the university [5]. In practice, however, some medical universities continue to prioritize science over the humanities and technical skills over aesthetic

development, resulting in inadequate growth in students' humanistic qualities and professional emotions. In recent years, policy documents such as the Opinions on Comprehensively Implementing the School Aesthetic Education Infiltration Initiative have called for deeper integration of information technology and aesthetic education, as well as the development of digital aesthetic education resources. In this context, exploring AI-enabled approaches to general music courses is not only an inevitable trend in educational technology but also an important opportunity for reforming medical humanities education.

Research in China on "digital aesthetic education" and "AI plus education" has become increasingly extensive. Existing studies mainly address three areas: the application of digital technologies in music education, reform of university aesthetic education systems, and the cultivation of medical humanistic qualities. Many scholars have explored practical applications such as AI-assisted composition, intelligent accompaniment, and the development of online music teaching platforms, demonstrating the potential of digital technologies to transform traditional music classrooms. Overall, domestic research has established a preliminary theoretical and practical foundation, but notable limitations remain. Much of the literature focuses on individual technological applications and lacks a systematic theoretical framework. Research specifically addressing the digital reform of general music courses at medical universities remains scarce, and systematic discussion of the underlying logic, operational mechanisms, and implementation pathways for integrating AI, music-based aesthetic education, and medical humanities is still insufficient.

International medical humanities education has gradually matured alongside the reform movement associated with the third generation of medical education. It is characterized by the early incorporation of humanistic assessment, close integration with clinical practice, and links with medical licensing examinations [2]. Research and practice in the digitalization of music education began earlier in many other countries and have developed more extensively. Considerable progress has been made in applying AI to music education, particularly in AI-generated music, intelligent analysis of learning data, and immersive musical experiences using virtual reality. Meanwhile, international medical education places strong emphasis on humanistic development and commonly incorporates music therapy, arts-based therapy, and other forms of aesthetic education into medical training. These approaches use the arts to support medical students' psychological adjustment and empathy in doctor–patient relationships. Such established models and educational experience offer valuable reference points for integrating digital aesthetic education with medical humanities in Chinese medical universities.

III. AN IN-DEPTH ANALYSIS OF PRACTICAL CHALLENGES IN GENERAL MUSIC COURSES AT MEDICAL UNIVERSITIES

An examination of the overall state of general music education at medical universities, together with the teaching practices of medical universities, reveals prominent problems in course content, teaching methods, assessment mechanisms, technological integration, and the translation of educational values. These problems make it difficult for general music courses to meet the requirements of medical talent development in the new era and the development of digital aesthetic education. In terms of course content, existing materials are often outdated and relatively fixed. Courses continue to focus primarily on the appreciation of Chinese and Western classical music and explanations of basic music theory. Their content has not been updated sufficiently over time and lacks material relevant to contemporary developments, medical students' learning needs, and their future professional development. In particular, there is insufficient integration with core medical themes such as clinical contexts, life education, professional ethics, and doctor–patient communication. This leaves music-based aesthetic education disconnected from professional medical education and deprives courses of distinctive characteristics. In terms of teaching methods, many medical universities continue to rely on a single traditional model consisting of teacher lectures, audio playback, and explanations of musical works. Classroom teaching is dominated by one-way knowledge delivery, with students listening and learning passively. Immersive and participatory activities—such as music creation, artistic experience, interactive inquiry, and practical application—are often lacking. Consequently, classroom activities can become monotonous, and students' motivation and participation remain relatively low.

At the assessment level, current evaluation mechanisms for aesthetic education are characterized by static and narrow approaches. Course assessment still relies heavily on traditional summative methods, including final examinations, course papers, and attendance records, with an emphasis on students' mastery of theoretical knowledge. Such methods overlook the experiential and developmental nature of aesthetic education and cannot accurately measure changes in students' aesthetic experiences, abilities, emotional growth, or humanistic qualities during the learning process. They therefore fail to reflect the actual educational outcomes of courses or use assessment results to drive teaching improvement. In terms of technological integration, digital reform in music courses at many medical universities remains superficial. Multimedia equipment is mainly used to play audio and video or display teaching materials, while advanced technologies such as AI and big data have not been meaningfully incorporated into the full teaching process before, during, and after class. Intelligent teaching tools and digital resources remain underused, and the

educational advantages of technology are not fully realized. In terms of translating educational values into practice, general music courses often remain at the level of basic aesthetic appreciation. They have not effectively translated artistic appreciation into professional qualities. The emotional education, life education, and empathy-building potential of music-based aesthetic education have not been deeply connected with the cultivation of medical professionalism, humanistic care, and respect for life. As a result, these courses have limited impact on shaping medical students' professional identities, and the core educational value of aesthetic education is difficult to realize.

IV. PRACTICAL PATHWAYS FOR AI-ENABLED GENERAL MUSIC COURSES

Building on the trend toward the digital transformation of education, the existing challenges facing general music courses at medical universities, and the core objectives of medical talent development, this study also draws on the curriculum reform experience of Henan Medical University. It proposes optimizing the implementation of AI-enabled general music courses across five dimensions: resource development, classroom reconstruction, teaching models, assessment systems, and faculty development. The goal is to establish a distinctive aesthetic education system characterized by "technology empowerment, experiential learning, and the integration of medicine and the arts," thereby putting into practice the educational principle of "revitalizing music through intelligence and cultivating medicine through beauty."

With regard to the development of digital resources, AI can be used to establish a dedicated intelligent music resource repository for medical universities. Musical works can be classified in detail and annotated according to their emotional characteristics and educational significance. Particular attention should be paid to collecting and organizing thematic musical resources related to medical humanities, life education, psychological healing, and doctor–patient communication, so that musical resources can be accurately connected with medical education scenarios. AI can also support automatic resource updates and personalized recommendations, creating a dynamic, specialized, and distinctive digital aesthetic education resource system. When preparing lessons, music teachers can use generative AI to develop teaching designs for different works, including learning objectives, key and difficult points, teaching procedures, and assessment plans [6].

With regard to the reconstruction of intelligent classrooms, AI-based interactive teaching systems can be introduced to move beyond the traditional one-way lecture model. Before class, AI voice assistants and intelligent preview platforms can provide short lessons on basic music theory and music appreciation tasks. Students can ask questions through voice interaction and receive real-time AI responses, lowering barriers to learning. During class, interactive AI music tools can support activities such as part-based choral practice, rhythm games, and melodic adaptation. Virtual reality and augmented reality technologies can be used to create virtual concert halls and music-based therapeutic scenarios, allowing students to experience the connections between music and medical contexts in an immersive way. After class, AI music-teaching applications can assign personalized practice tasks. When students upload singing, instrumental performances, or original compositions, AI can provide immediate feedback on pitch and rhythm and generate targeted suggestions for improvement. At Henan Medical University, the reconstruction of intelligent classrooms and the adoption of project-based teaching have transformed the previously monotonous traditional classroom. Students' attention and active participation have increased significantly, replacing earlier patterns of passive listening and minimal engagement. The widespread use of AI composition tools has also stimulated medical students' interest in music creation and artistic exploration. Rather than limiting themselves to passive appreciation, students can now create simple musical works based on their reflections on medical studies, strengthening their artistic practice and creative aesthetic abilities.

With regard to the development of assessment systems, the limitations of traditional static summative assessment should be overcome by establishing a multidimensional model that integrates "process-oriented, developmental, and data-informed" evaluation and reflects the characteristics of digital aesthetic education and medical training. Big data can be used to automatically collect process-related information, including classroom participation, online learning, interactive feedback, and creative work. These data can be considered alongside students' developing aesthetic insights, humanistic reflections, and professional understanding to evaluate their progress in aesthetic competence, artistic literacy, and humanistic qualities. This approach enables comprehensive, dynamic, and evidence-informed teaching assessment. With regard to faculty development, regular professional training in teachers' digital literacy should be provided, focusing on the application of AI music tools, digital instructional design, the development of integrated medicine-and-arts courses, and the operation of intelligent classrooms. Such training can strengthen aesthetic education teachers' ability to apply digital technologies and teach across disciplines, building a highly qualified faculty capable of supporting digital reform. At Henan Medical University, the establishment of a multidimensional assessment system and regular faculty training have helped standardize intelligent teaching procedures and improve teachers' digital teaching capabilities. These measures have supported the sustained and standardized implementation of AI-enabled music

curriculum reform. Through systematic instruction, medical students have gradually developed an understanding of the relationship between musical art and medical disciplines, strengthening their capacity to integrate medicine and the arts and to connect musical learning with medical contexts.

V. CONCLUSIONS

Against the backdrop of the digital transformation of education, AI is reshaping the development of aesthetic education in higher education across multiple dimensions, including teaching models, resource systems, assessment mechanisms, and educational philosophies. It is opening up new pathways for innovation in university aesthetic education in the new era. In the context of contemporary medical education reform, general music courses at medical universities must move beyond the constraints of traditional teaching and actively explore approaches that integrate medicine and the arts, promoting the deep integration of AI, music-based aesthetic education, and medical humanities. Accordingly, stronger connections between the theory and practice of aesthetic education should be established. In medical university teaching in particular, further exploration is needed into incorporating aesthetic principles into clinical skills training and patient communication, thereby creating an aesthetic education model that involves all medical students throughout their educational experience [7].

Looking ahead, medical universities should continue to deepen practical reform in digital aesthetic education, advance the development of intelligent aesthetic education resource platforms, and improve the supporting systems for technology, institutional governance, and security. These efforts will gradually establish a comprehensive and sustainable ecosystem of intelligent and humanistic aesthetic education. Through the deep integration of technology and the humanities, and the mutual empowerment of arts education and medical education, general music courses at medical universities can be transformed from traditional knowledge-transmission courses into courses focused on cultivating competencies and shaping professional character. In this way, aesthetic education can provide robust support for the development of Healthy China and the cultivation of high-quality medical professionals in the new era.

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