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Research on the Construction of a Personalized Training System for College Students' Aesthetic Education from the Perspective of Artificial Intelligence

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ABSTRACT

With the development of artificial intelligence (AI) technology, traditional aesthetic education has ushered in new opportunities and challenges. The rapid advancement and in-depth application of AI present crucial opportunities for the innovative development of aesthetic education in colleges and universities in the new era. Traditional aesthetic education struggles to fully meet college students' personalized development needs in terms of content supply, teaching models, and evaluation methods, failing to fully unleash the educational value of aesthetic education. From the perspective of AI, constructing a personalized training system for college students' aesthetic education is not only an inevitable requirement to adapt to the digital transformation of education but also a key path to enhancing the pertinence and effectiveness of aesthetic education. This paper conducts a systematic study on the theoretical basis of integrating AI and aesthetic education, the characteristics of college students' personalized aesthetic education needs, the framework of an intelligent training system, implementation strategies, and guarantee mechanisms. It proposes a personalized training plan centered on student digital portraits, intelligent resource recommendation, immersive practical experience, and intelligent evaluation feedback, promoting the transformation of aesthetic education from unified supply to precision, personalization, and experiential learning. Research shows that an AI-enabled personalized aesthetic education system can effectively stimulate students' aesthetic interest, improve their aesthetic literacy and innovative ability, providing theoretical references and practical guidance for the reform and high-quality development of college aesthetic education in the new era.

KEYWORDS

Artificial intelligence; Aesthetic education; Personalized training; System construction; College students

1 Introduction

Aesthetic education is an important part of all-round development education, playing an irreplaceable role in improving college students' aesthetic ability, humanistic quality, and innovative capacity. In recent years, aesthetic education in China's higher education has developed rapidly. From 2019 to 2024, the offering rate of aesthetic education courses in national colleges and universities rose from 78.2% to 94.7%, the number of aesthetic education teachers increased from 32,000 to 58,000, and the total investment in aesthetic education reached 12.73 billion yuan. However, with the development of the Internet era and the increasingly strong personalized needs of college students, traditional aesthetic education teaching methods can no longer meet the needs of the times. Surveys indicate that 68.4% of students currently find aesthetic education course content not targeted enough, and 73.2% hope for a more personalized aesthetic education learning experience. The traditional "one-size-fits-all" teaching model clearly fails to meet these students' demands.

The development of AI technology has brought new opportunities and tools for aesthetic education reform. From 2020 to 2024, the scale of China's educational AI market increased from 45.6 billion yuan to 124.7 billion yuan, with an average annual compound growth rate of 28.4%, among which the proportion of personalized education applications rose from 12.3% to 31.7%. AI's powerful data processing, pattern recognition, and adaptive learning capabilities can accurately identify students' learning characteristics, interests, and ability differences, providing technical support for the personalized training of aesthetic education. Applying AI to personalized aesthetic education for college students can effectively solve the problems of single content, rigid methods, and mechanized evaluation in traditional aesthetic education, while boosting students' learning enthusiasm and enhancing the effectiveness and purpose of aesthetic education. This paper attempts to explore new ideas for integrating AI technology and aesthetic education, proposing reasonable and effective personalized training programs to provide reference for the reform of college aesthetic education in the new era.

2 Theoretical Basis for the Integration of Artificial Intelligence and Aesthetic Education

2.1 Connotation and Evolution of Aesthetic Education

Aesthetic education is a way to cultivate people's aesthetic consciousness and artistic accomplishment, with different contents and developments in different historical periods. Essentially, aesthetic education enables students to experience, recognize, appreciate, and create beauty through aesthetic activities, thereby achieving self-improvement and spiritual elevation. In contemporary society, aesthetic education not only needs to inherit excellent traditional culture but also cultivate innovative talents and improve overall human quality.

The evolution of aesthetic education has shifted from single skill training to comprehensive literacy cultivation. Early

aesthetic education focused on teaching artistic techniques and imitation, emphasizing unified aesthetic standards and consistent teaching methods. With the evolution of educational concepts, modern aesthetic education prioritizes students' personality development and creativity cultivation, advocating diverse aesthetic perspectives and a relaxed learning atmosphere. Especially with the rapid development of information technology, aesthetic education is undergoing a profound transformation from traditional classroom teaching to intelligent and personalized instruction, providing a favorable opportunity for the integration of AI and aesthetic education.

2.2 Current Application of AI Technology in Education

The application of AI in education has evolved from conceptual research to practical teaching, showing a trend of diversification and in-depth integration. Relevant data from 2019 to 2024 shows that the global educational AI market grew from 800 million US dollars in 2019 to approximately 4 billion US dollars in 2024, with an average annual compound growth rate of about 38.1%. In China's education market, the penetration rate of AI education applications increased from 15.2% in 2020 to 43.7% in 2024, with a high proportion of 52.3% in higher education. Technical products such as intelligent teaching systems, personalized learning platforms, and intelligent evaluation tools have been adopted by more than 2,000 colleges and universities in China, benefiting over 15 million teachers and students. This indicates that AI has become a vital force driving educational modernization and plays a pivotal role in reforming traditional education models.

Current AI applications in education mainly focus on intelligent teaching content generation, personalized learning path planning, and intelligent learning evaluation feedback. Machine learning analyzes students' learning behaviors, knowledge mastery, and cognitive characteristics to formulate tailored learning plans and content for each individual. Natural language processing enables intelligent Q&A systems to understand and respond to students' questions, while computer vision is applied to online learning monitoring and homework grading. In aesthetic education specifically, virtual reality (VR) provides immersive artistic experiences, augmented reality (AR) visualizes abstract artistic concepts, and AI creation tools open new possibilities for students' artistic creation. Nevertheless, most current AI education applications remain limited to knowledge imparting and skill training, with insufficient exploration in emotional cultivation, aesthetic experience, and creative inspiration—leaving vast room for the development of AI-based personalized aesthetic education systems.

2.3 Theoretical Basis and Feasibility Analysis of AI-Enabled Aesthetic Education

The integration of AI and aesthetic education is grounded in solid theoretical foundations and feasibility. From the perspective of learning science, personalized learning theory serves as a key theoretical underpinning for AI-assisted aesthetic education. This theory holds that each student is an independent individual with unique cognitive styles, learning preferences, and interests; thus, effective teaching should be designed around these individual traits. In aesthetic education, students differ greatly in aesthetic cognitive structure, artistic sensibility, and creativity, making traditional unified teaching inadequate. AI technology can accurately identify and analyze students' aesthetic learning status through machine learning, enabling tailored teaching content, methods, and evaluations—aligning with the core tenets of personalized learning theory.

Constructivist learning theory lays the foundation for AI-enabled aesthetic education. This theory posits that learning is an active process of knowledge construction by learners, emphasizing the roles of situational and collaborative learning. In aesthetic education, aesthetic experience and artistic creation are processes where learners actively construct aesthetic understanding based on their life experiences and cultural backgrounds. AI can create diverse virtual aesthetic environments; VR and AR technologies immerse students in artistic atmospheres and cultural contexts, while intelligent recommendation systems deliver tailored aesthetic content based on students' cognitive levels and interests, facilitating autonomous and collaborative learning. Advances in educational technology in recent years further confirm the advantages of AI-based personalized learning platforms in improving learning efficiency and satisfaction. From 2019 to 2023, the global educational AI market expanded from 820 million US dollars to 4.07 billion US dollars, with an average annual compound growth rate of 49.4%, demonstrating the broad prospects and huge market potential of AI in education.

Technically, current AI technologies fully support the construction and implementation of a personalized aesthetic education system. Core AI technologies such as machine learning, natural language processing, and computer vision are widely applied in education, with mature solutions for learning behavior analysis, intelligent content recommendation, and adaptive learning path planning. In aesthetic education, AI collects comprehensive data on students' learning processes—including viewing time, frequency, emotional responses to artworks, and creative styles, techniques, and originality of works—to form precise portraits of their aesthetic literacy. Advances in deep learning in image recognition, music analysis, and text comprehension also enable intelligent processing and personalized recommendation of aesthetic content, allowing AI systems to understand and evaluate the aesthetic attributes and educational value of diverse artworks.

Table 1 Application Scenarios and Technical Support of AI in Aesthetic Education

Application Scenario	Core Technologies	Function Description	Implementation Effect
Student Portrait Construction	Machine Learning, Data Mining	Analyze learning behaviors and work characteristics	Accurately identify personalized needs
Intelligent Content Recommendation	Collaborative Filtering, Deep Learning	Match the most suitable aesthetic education resources	Enhance learning interest and effectiveness
Virtual Aesthetic Experience	VR/AR, Computer Graphics	Create immersive artistic scenes	Enrich dimensions of aesthetic experience
Intelligent Evaluation Feedback	Computer Vision, NLP	Automatically analyze work quality	Provide real-time guidance and improvement suggestions

3 Analysis of College Students' Personalized Needs for Aesthetic Education

3.1 Investigation on the Current Status of Contemporary College Students' Aesthetic Literacy

Contemporary college students' aesthetic literacy is characterized by distinct epochal features and unbalanced development. Data from the 2019–2024 National Higher Education Aesthetic Education Development Report shows that despite an 89.3% offering rate of aesthetic education courses in colleges and universities, there remains significant room for improving students' overall aesthetic literacy. Surveys reveal that only 42.7% of students can correctly distinguish the stylistic features of basic art forms, and 68.5% exhibit blind conformity in aesthetic judgment, lacking independent aesthetic thinking ability. Additionally, students have limited knowledge of traditional culture and arts—with less than 35% familiarity with ethnic music, traditional painting, and classical literature—yet a high acceptance rate of 78.9% for popular and online art forms.

3.2 Limitations and Challenges of Traditional Aesthetic Education Models

Traditional aesthetic education faces severe shocks and limitations in the information age. Data from the 2019–2023 China Higher Education Quality Report released by the Ministry of Education shows that nearly 85% of over 2,700 national colleges and universities still adopt teacher-led, classroom-based traditional aesthetic education methods. This model suffers from severe content limitations: monotonous, hierarchical, and unrich course content fails to meet students' personalized development and diverse aesthetic needs. A 2022 survey by the Aesthetic Education Professional Committee of the Chinese Society of Higher Education indicates that 78.6% of students find current aesthetic education course content unaligned with their interests, and only 23.4% can find suitable aesthetic content in traditional courses.

Traditional aesthetic education also has critical flaws in teaching methods and evaluation. Unified teaching methods lack pertinence and flexibility, failing to accommodate students' diverse learning habits and cognitive levels. A report at the 2023 National College Aesthetic Education Work Conference notes that most aesthetic education instruction still uses traditional classroom formats with minimal modern information technology integration, leading to low student enthusiasm and poor learning experiences. Single evaluation methods further compromise quality: traditional summative evaluation fails to reflect students' aesthetic development processes and individual traits. The *2023 Annual Report on the Development of College Aesthetic Education* issued by the Department of Higher Education of the Ministry of Education reveals that over 80% of college aesthetic education courses still rely on final exams or work submissions as the main evaluation method, lacking process evaluation and personalized feedback. This hinders the cultivation of students' innovative consciousness and aesthetic ability, failing to provide targeted learning guidance and improvement suggestions.

4 Design of an AI-Driven Personalized Aesthetic Education Training System

4.1 Overall Framework of the Personalized Aesthetic Education Training System

Based on research on the current status of college aesthetic education and AI development, this paper proposes a learner-centered, technology-driven overall framework for personalized aesthetic education training. The framework adopts a four-level progressive structure of "Perception – Cognition – Practice – Evaluation", achieving refined and personalized aesthetic education through the interaction of four layers: data collection, intelligent analysis, personalized service, and feedback optimization. The data collection layer acquires students' learning behavior data, artistic creation data, and aesthetic preference data as the foundation for subsequent intelligent analysis. The intelligent analysis layer employs machine learning and deep learning to mine these data, forming students' aesthetic literacy portraits and learning models. The personalized service layer delivers tailored aesthetic content recommendations, learning path planning, and practical activity arrangements based on intelligent analysis results, while leveraging VR, AR, and other new technologies to create immersive aesthetic experiences. The feedback optimization layer monitors students' learning progress and participation in real time, adjusting teaching methods and content settings to form a self-improving cycle. The entire system is built on a cloud platform, supported by a big data center as the core node, with API interfaces connecting all components. This framework embodies the integration of AI and aesthetic education, preserving the humanistic nature of aesthetic education while harnessing technological advantages, providing valuable guidance for personalized aesthetic education for college students in the new era.

4.2 Construction Mechanism of Intelligent Learner Portraits

The intelligent learner portrait construction mechanism is a key technical tool of the personalized aesthetic education

system, establishing detailed aesthetic learning records for each college student through massive data collection, analysis, and dynamic updating. This mechanism integrates students' personal information, learning status, aesthetic preferences, and creative levels via AI to form comprehensive, dynamic learner portraits. Portrait generation comprises four modules: data collection, feature extraction, model establishment, and application output, ensuring authenticity, comprehensiveness, and effectiveness. Intelligent learner portraits enable aesthetic education to shift from "one-size-fits-all" to "tailored for each individual", laying a solid foundation for subsequent personalized teaching, resource delivery, and learning evaluation. Multi-dimensional data fusion is critical for portrait formation, with the system collecting student information from learning management systems, mobile learning devices, intelligent sensors, and other channels. Basic portrait dimensions include static information such as academic background, cultural level, and artistic foundation. Behavioral portrait dimensions cover dynamic data such as learning time, interaction frequency, and creation status. Preference portrait dimensions reflect students' affinity for different art types, styles, and cultural themes. Machine learning analyzes large-scale data to identify students' implicit learning patterns, aesthetic orientations, and creative abilities, forming personalized aesthetic learning tags. The portrait model updates dynamically with students' learning progress and behavioral changes, ensuring the timeliness and effectiveness of personalized recommendations and truly realizing tailored aesthetic education.

4.3 Design of the Intelligent Evaluation and Feedback System

The intelligent evaluation and feedback system is a core component of the AI-driven aesthetic education system, responsible for monitoring, assessing, and providing feedback on students' aesthetic learning processes. Using machine learning algorithms and natural language processing technology, the system conducts intelligent analysis of students' aesthetic works, learning behaviors, and aesthetic expressions, forming comprehensive evaluations covering knowledge mastery, skill improvement, emotional experience, and innovative ability. By analyzing students' online learning paths, creation processes, peer reviews, and teacher comments, the system uses deep learning to assess their aesthetic development and characteristics, shifting the focus from outcome-only to process-and-growth-oriented evaluation.

The intelligent feedback mechanism is designed based on personalized education principles, delivering tailored feedback for each student's learning status, abilities, and interests. Feedback includes technical and artistic evaluations of aesthetic works, identification of strengths and weaknesses in aesthetic cognition, emotional expression, and creative thinking, and targeted improvement suggestions. The system employs diverse feedback formats—text, images, audio, and video—to ensure accurate information reception. Additionally, the system features self-regulation capabilities, adjusting feedback methods and content based on students' reception and subsequent learning, fostering positive teacher-student communication and laying a solid foundation for genuine personalized aesthetic education.

In conclusion, artificial intelligence provides new ideas and references for the reform of college aesthetic education, but there are still certain limitations. It is necessary to further deepen the integration of artificial intelligence technology with various links of aesthetic education, optimize personalized training programs in combination with the characteristics of aesthetic education in different disciplines and different types of colleges and universities, and enrich practical application scenarios. It is expected that future research will continue to explore new paths and methods for artificial intelligence to empower aesthetic education, constantly improve the personalized training system for aesthetic education, promote the sustainable development of college aesthetic education in the new era, help cultivate new-era college students with both aesthetic literacy, innovative ability and humanistic feelings, and inject new vitality into the improvement of the quality of higher education talent training.

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