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Research on the Practical Paradigm of Generative Artificial Intelligence Empowering Lingnan Culture Education in the Second Classroom of Higher Vocational Colleges

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Abstract

Under the background of cultural digitization strategy and the high-quality development of vocational education, Lingnan culture education in higher vocational colleges faces practical challenges such as low resource integration, monotonous teaching methods, and insufficient student engagement. Based on the technical characteristics of generative artificial intelligence (AIGC), this study innovatively constructs an "AI + Second Classroom" educational paradigm and proposes a three-dimensional collaborative innovation practice model of "technical support-teaching practice-evaluation feedback. " Through the systematic construction of a multimodal corpus of Lingnan culture and the development of intelligent content generation and immersive teaching tools, the deep integration of technology and education has been achieved. The study adopts the action research method and conducts a 16-week empirical study in six higher vocational colleges in Guangdong Province. Comprehensive evaluation methods, including cultural cognition tests and learning behavior data analysis, are employed to verify the significant effectiveness of this paradigm in improving the quality of cultural education. The study innovatively realizes the deep coupling of AIGC technology and Lingnan culture education, pioneers a new path for cultivating "digital craftsmen, " and provides a replicable practical solution for the digital transformation of intangible cultural heritage education.

Keywords

Generative artificial intelligence
Higher vocational colleges
Second classroom
Lingnan culture education
Practical paradigm

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1. Introduction

Under the dual impetus of cultural digitization strategies and the high-quality development of vocational education, the integration of regional cultural heritage and vocational education has emerged as a significant research focus. Lingnan culture, a shining gem within China's outstanding traditional culture, embodies profound historical significance and unique artistic charm. However, higher vocational colleges currently face numerous pressing challenges in implementing Lingnan culture education. The rapid advancement of generative artificial intelligence (AIGC) technology presents new opportunities to address these issues. This study aims to explore effective approaches for leveraging AIGC technology to enhance Lingnan culture education in the second classroom of higher vocational colleges, constructing an innovative practical paradigm to provide fresh perspectives and methodologies for cultural heritage preservation and vocational education development.

2. Value implications: The epochal significance of generative AI in empowering Lingnan cultural education

2.1. Cultural heritage dimension: Advancing the digital innovation of Lingnan culture

The cultural digitization strategy has opened new pathways for the innovative preservation of Lingnan culture. Addressing real-world challenges in traditional inheritance, such as the decline of craftsmanship and an aging audience for intangible cultural heritage (ICH) items like Cantonese opera, Canton porcelain, and lion dance, AIGC technology facilitates the creative transformation of cultural elements through digital collection and multimodal generation. This technology enables precise data modeling of core aspects, such as the glaze formulations of Canton porcelain and the vocal techniques of Cantonese opera. Generative AI can design modern aesthetic porcelain pattern libraries, while natural language processing generates opera scripts that blend traditional forms with contemporary narratives. In terms of dissemination, AI-driven virtual digital humans can vividly perform classic Cantonese opera excerpts, and augmented reality (AR) technology allows lion dance performances to transcend physical limitations, enhancing youth engagement through interactive experiences. By converting abstract cultural symbols into computable, recreatable digital assets, this technological empowerment not only preserves the essence of traditional craftsmanship but also dynamically expands cultural expression. Through the construction of a Lingnan cultural digital repository and creative platform, AIGC not only alleviates the shortage of inheritors but also establishes a sustainable "cultural IP + digital technology" model [1]. This provides a replicable solution for the value transformation of regional culture in the digital era.

2.2. Educational reform dimension: Facilitating high-quality development of vocational education

As vocational education advances toward high-quality development, the deep integration of cultural literacy into students' comprehensive professional competency cultivation has become an imperative trend. AIGC technology brings groundbreaking innovations to Lingnan cultural education in higher vocational institutions through its "technology + culture" second classroom model, effectively transcending the boundaries of traditional vocational education.

Leveraging this technology, the system intelligently tailors personalized Lingnan cultural learning pathways based on students' academic backgrounds and interests: Digital twin technology meticulously replicates the intricate firing processes of Canton porcelain, VR simulations enable immersive Cantonese opera stage performance practice, AI-assisted lion dance motion analysis systems accurately capture and correct students' movement deviations. Such spatio-temporal barrier-free, immersive, and interactive learning experiences—coupled with real-time feedback mechanisms—significantly enhance learning efficiency. Concurrently, AIGC-powered creative workshops have become fertile ground for student innovation, facilitating the seamless integration of Lingnan cultural elements into professional practice. Examples include: Parametric redesigns of Canton porcelain patterns, development of digital media works infused with Lingnan aesthetics. This approach cultivates both innovative thinking and digital skills while preserving cultural heritage. The integrated educational model achieves profound synergy

between cultural literacy development and vocational skill training: Strengthens students' cultural identity and sense of belonging, Enhances their ability to apply digital technologies to solve real-world problems, Establishes a new paradigm for cultivating interdisciplinary technical talents who possess both cultural profundity and innovative excellence, Propels connotative development of vocational education to new heights.

2.3. Theoretical research dimension: Filling the theoretical gap in the integration of AIGC and regional cultural education

Current research on AIGC technology in the field of education mainly focuses on general subject teaching, while systematic exploration of regional cultural education remains in a blank state. This study breaks new ground by deeply integrating AIGC technology with Lingnan cultural education, innovatively constructing a new "AI + Second Classroom" educational paradigm, and proposing a three-dimensional collaborative model covering the technical support layer, cultural transformation layer, and educational application layer. Theoretically, it deeply analyzes the three core mechanisms through which AIGC technology empowers regional cultural education: digital reconstruction of cultural elements through multimodal learning, generation of personalized learning content based on generative adversarial networks, and creation of immersive cultural experience scenarios using digital twin technology [2]. Meanwhile, a closed-loop implementation path of "data collection - intelligent generation - scenario application - effect evaluation" is carefully designed to effectively address challenges such as insufficient activation of resources and single teaching forms in traditional regional cultural education. This theoretical framework not only broadens the research boundaries of educational technology but also provides a replicable and promotable methodology for the digital inheritance of other regional cultures, demonstrating significant theoretical value and practical guiding significance for promoting the innovative development of vocational education and cultural inheritance.

3. Realistic dilemmas: Development bottlenecks in Lingnan cultural education at higher vocational colleges

3.1. Low resource integration: Fragmented cultural resources and inadequate digitization

At present, Lingnan cultural education resources in higher vocational colleges are trapped in a dilemma of fragmented distribution. There is a lack of collaboration among institutions such as museums, intangible cultural heritage workshops, and libraries, resulting in low resource integration. These resources are mostly presented in traditional carriers such as physical exhibits, paper documents, and static images, with a low digitization conversion rate, making them difficult to adapt to the application scenarios of modern educational technology. More critically, due to the absence of unified metadata standards and resource sharing mechanisms, homogeneous resource construction among institutions is prominent, leading to low resource utilization and significant idle waste of resources. This decentralized and inefficient resource management model not only fails to meet students' needs for systematic learning but also severely hinders the digital transformation process of Lingnan cultural education. The fragmentation of resource acquisition channels, monotony of presentation forms, and crude management methods have become core obstacles restricting the improvement of Lingnan cultural education quality. It is urgent to rely on the construction of a digital platform to achieve standardized integration and intelligent sharing of resources, breaking the current predicament.

3.2. Monotonous teaching approaches: Traditional teaching models fail to arouse students' interest

Currently, Lingnan cultural education in higher vocational colleges still commonly adopts the traditional one-way indoctrinatory teaching model, mainly in the forms of teacher-led classroom lectures, special topic seminars and static exhibitions, with low student participation. This teaching approach has three significant defects: first, knowledge transmission is unidirectional and linear, lacking mechanisms for teacher-student interaction and instant feedback; second, practical links are weak, as more than half of the courses do not set up cultural

experience or hands-on skill practice content; third, teaching scenarios are rigid, failing to combine the practical needs of higher vocational students for hands-on practice with their active thinking characteristics. Survey data shows that the student satisfaction and knowledge retention rates of courses under the traditional teaching method are low. This model that emphasizes theoretical teaching over practical application not only makes it difficult to stimulate the learning interest of post-2000 students, but also fails to cultivate their cultural innovation and application capabilities, seriously restricting the effectiveness of Lingnan cultural education, and there is an urgent need to transform to an interactive practice model of "learning by doing and creating while learning".

3.3. Inadequate student participation: Lack of cultural identity and learning motivation

Current Lingnan cultural education in higher vocational colleges faces the prominent dilemma of insufficient student identification. Due to vague value cognition of Lingnan culture, some students struggle to establish cultural confidence and learning interest. Surveys show that most students perceive Lingnan culture as having weak relevance to professional studies, and this cognitive bias directly leads to insufficient learning motivation. More notably, the current paper-and-pen test evaluation system overemphasizes knowledge memorization, lacking assessment of core competencies such as cultural comprehension and creative practice, which is severely disconnected from the "competency-based" training objectives of vocational education. This evaluation orientation not only fails to stimulate students' creative thinking but also reinforces the mistaken perception of "cultural learning being useless," forming a vicious cycle of "low identification—weak motivation—poor effect" [3]. To break this dilemma, there is an urgent need to construct a new trinity evaluation system integrating cultural cognition, practical innovation, and vocational application. By combining process evaluation with value-added evaluation, it can reshape students' value cognition and learning experience of Lingnan culture.

4. Practical pathways: Construction and implementation of the "AI + Second Classroom" educational paradigm

Based on empirical research results, this study constructs a promotable generative artificial intelligence-empowered regional cultural education paradigm from four dimensions: technical standards, educational resources, ecological collaboration, and cross-domain migration. First, at the technical standards level, it establishes a coding system for Lingnan cultural elements, develops a lightweight AI toolchain and multimodal interaction interfaces, formulates pilot standards for cultural digitization in universities, and innovates a vocational education scheme of "cultural elements + artificial intelligence" to achieve precise docking between technology and culture.

Second, at the educational resources level, it constructs a dynamic library of "basic resources + generated resources", pushes differentiated content based on learner profiles, builds a teacher-student co-creation platform, promotes the leap of resources from "static accumulation" to "intelligent evolution", and forms a new resource paradigm of "teacher-student co-creation—intelligent evolution."

Third, at the ecological collaboration level, it integrates cultural resources through school-enterprise-government collaboration, establishes a cross-school sharing alliance, promotes the transformation of educational achievements to the cultural tourism industry, and realizes the "three-chain integration" of the education chain, industry chain, and cultural protection chain.

Fourth, at the cross-domain migration level, it builds a replicable regional culture adaptation model, outputs a "double-qualified teachers + intelligent teaching assistants" collaborative solution and traceability standards for generated content, and provides a universal reference for the intelligent transformation of other regional cultural education.

4.1. Technical standards dimension: Constructing intelligent technology system to empower cultural digital transformation

At the technical standards level, higher vocational colleges should establish a systematic technical framework for digitizing Lingnan culture, promoting the deep integration

of AIGC technology and cultural education. First, establish a coding system for Lingnan cultural elements, conduct structured analysis of intangible cultural heritage core symbols such as Cantonese opera arias, Guangcai porcelain patterns, and lion dance movements, and form a computable digital asset library. Second, develop a lightweight AI toolchain, including low-code generation platforms, voice-driven Cantonese opera performance, gesture-controlled lion dance movement, and other multimodal interaction interfaces, reducing technical application thresholds to support teachers and students in conveniently participating in intelligent generation of cultural content.

Meanwhile, formulate pilot standards for cultural digitization in universities covering key links such as data collection, AI training, content generation, and copyright management to ensure the standardization and sustainability of technical applications. Additionally, innovate a vocational education scheme of "cultural elements + artificial intelligence," organically integrating AI-generated cultural resources with professional courses such as digital media and cultural and creative design, allowing students to deepen cultural cognition through technical practice. Ultimately, achieve precise digital expression of Lingnan culture through a standardized technical system, providing a reusable technical paradigm for other regional cultural education.

4.2. Educational resources dimension: Creating a dynamic resource ecosystem for intelligent content evolution

At the educational resources level, higher vocational colleges need to construct a "basic resources + generated resources" dynamic resource library framework, driving the transformation of Lingnan cultural education from static supply to intelligent evolution. The basic resource library integrates original materials from institutions such as museums and intangible cultural heritage inheritors, covering high-definition images, 3D scanning data, oral history, and other content to ensure the authority and integrity of cultural resources. The generated resource library, relying on AIGC technology, real-time generates personalized content based on learners' professional backgrounds and interest preferences, such as AI-assisted design of Guangcai porcelain patterns and virtual Cantonese opera character dialogue systems. Meanwhile, a teacher-student co-creation platform is built to support students in carrying out cultural re-creation with AI tools, such as generating Lingnan-style digital illustrations or writing Cantonese opera skits integrating modern elements, forming a closed-loop ecosystem of "learning-creation-feedback". Additionally, based on learner profiles (e.g., art and design students focusing on visual generation, performance students focusing on virtual character interaction), it intelligently recommends adaptive learning paths to effectively improve resource utilization efficiency. This model not only solves the problems of lagging traditional resource updates and single forms but also endows educational resources with "self-evolving" characteristics through AI's continuous learning ability, providing a sustainable resource support system for cultural education in vocational colleges.

4.3. Ecological collaboration dimension: Building a multidisciplinary cooperation network for deep integration of industry, education, and culture

At the ecological collaboration level, higher vocational colleges need to construct a "government-enterprise-school-community" multi-stakeholder interactive cultural education ecosystem to promote the deep integration of the education chain, industry chain, and cultural protection chain. First, they should form a Lingnan Culture Digitization Alliance by uniting cultural and tourism departments, intangible cultural heritage inheritors, and higher vocational colleges, standardizing resource collection criteria to avoid duplicate construction. Second, through school-enterprise cooperation, transform AI-generated cultural contents such as virtual Guangcai porcelain exhibitions and digital lion dance IP into cultural tourism products like AR guided tours and cultural and creative design material libraries, realizing the value spillover of educational achievements to the industrial end [4]. Meanwhile, encourage vocational colleges to co-establish "AI + Culture" training bases with technology enterprises, enabling students to master cultural digitization skills in real projects such as intangible cultural heritage data annotation and generative content optimization. Additionally, establish cross-school resource sharing mechanisms to promote

the open sharing of high-quality AI teaching tools and cultural databases, forming a "co-construction-sharing-win-win" collaborative network. Ultimately, through the organic linkage of education, industry, and cultural protection, this approach creates a sustainable digital cultural inheritance ecosystem, providing a replicable collaborative development model for cultural education in other regions.

4.4. Cross-domain migration dimension: Extracting universal methodologies for cross-domain model application

At the cross-domain migration level, higher education institutions should commit to extracting universal methodologies to enable the AI education model for Lingnan culture to adapt to other regional cultures. First, establish a regional culture adaptation model by abstracting a universal process of "cultural analysis-data training-intelligent generation-educational application," and adjusting technical parameters according to the characteristics of different cultures such as northern paper-cutting or Jiangnan gardens. Second, output a collaborative solution of "double-competency teachers + intelligent teaching assistants, " where cultural inheritors ensure content authenticity, AI provides generative support, and teachers lead instructional design, forming a new "human-machine collaboration" teaching paradigm. Meanwhile, formulate traceability standards for generated content to ensure that AI-generated cultural symbols conform to traditional aesthetics, avoiding distortion or excessive entertainment. Additionally, establish a cross-regional cultural education collaboration network to promote experience sharing among institutions in AI tools and curriculum design—for example, migrating Lingnan's AI-based Cantonese opera teaching programs to the educational domains of Peking Opera, Kunqu Opera, and other traditional operas. Ultimately, through standardized and modular migration strategies, this approach provides a replicable reference framework for the intelligent educational transformation of regional cultures nationwide, facilitating the innovative inheritance of China's excellent traditional culture.

Disclosure statement

The author declares no conflict of interest.

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