An Analysis of the Aesthetic Education Mechanisms of Technology-Empowered Intangible Cultural Heritage Documentaries

Xiaoyang Qiao
Herzen International Art College, Shandong Normal University, Jinan 250014, Shandong, China

Abstract: Against the backdrop of the digital and intelligent era, technological empowerment has injected new momentum into the image production and dissemination mechanisms of intangible cultural heritage (ICH) documentaries, enabling them to gradually become an important medium for the protection and transmission of ICH. While adhering to the principle of authenticity, the aesthetic education function of ICH documentaries has become increasingly prominent, and their modes of expression and dissemination have exhibited diversified characteristics of media convergence and cross-community circulation. Focusing on the concrete means through which digital and intelligent technologies empower ICH documentaries, this paper systematically analyzes innovations in audiovisual language, narrative logic, and dissemination pathways. It then explores in depth the multidimensional values manifested by ICH documentaries at the level of aesthetic education, including the shaping of cultural identity, the cultivation of aesthetic competence, and the stimulation of public participation. Finally, the paper reflects on the limitations and challenges present in current research and offers an outlook on future development trends of ICH documentaries in terms of technological integration, cultural expression, and dissemination effectiveness.
***Keywords*:** technological empowerment; intangible cultural heritage documentaries; aesthetic education

1. Practical Approaches to Aesthetic Education in Technology-Empowered ICH Documentaries

To fully reveal the aesthetic educational value of ICH documentaries, it is necessary to explore their intrinsic educational significance in depth and, through the innovative transformation and application of digital and intelligent technologies, present this value to audiences in a more vivid and intuitive manner. By means of high-definition image capture, the application of virtual reality technologies, and the construction of interactive learning platforms, audiences can be guided to traverse time and space and personally experience the sophistication of ancient crafts and the depth of cultural transmission. This integration of technology and art not only preserves and disseminates ICH culture but also stimulates people's perception of beauty and respect for traditional culture. In this process, ICH documentaries are no longer merely instruments of documentation; rather, they become living educational tools that guide new generations of viewers to discover, learn, and cherish valuable cultural heritage that might otherwise be forgotten.

1.1 Augmented Reality Technology: Achieving the Integration of the Virtual and the Real and the Scenario-Based Dissemination of Intangible Cultural Heritage

Augmented reality (hereafter referred to as AR technology) is a new technology that collects, simulates, and integrates physical information from the real and virtual worlds, and re-projects the integrated information onto reality, thereby enriching the granularity of sensory perception for participants and enabling sensory experiences that transcend reality[1]. The unique appeal of AR technology lies in its role as a medium endowed with digital "magic," capable of ingeniously embedding virtual ICH-related content into the tangible reality within our reach. In recent years, AR technology has become widely used in museums, science centers, and certain historical sites. Its application effectively presents objects that are difficult to display in their original physical forms, enriching both the content and modes of exhibition. Moreover, AR technology facilitates the integration of resources in diverse forms, offering visitors a more comprehensive and immersive viewing experience.

The "Ten Thousand Years of Zhejiang" AR project launched by the Zhejiang Provincial Museum is an intelligent guided-tour service jointly developed with the technology company Rokid. Utilizing the spatial computing capabilities of AR glasses, SLAM real-time positioning technology, and 6DoF interaction technology, the project accurately reconstructs historical scenes — such as Spring and Autumn period sword-forging workshops and the Lanting Gathering — within the physical exhibition space. This allows audiences to seemingly "enter" historical settings, interact with ICH projects, and achieve a transformation and upgrading from static exhibition viewing to dynamic immersive experience.

AR technology functions like an invisible cultural guide, subtly integrating ICH into everyday life in a light and engaging manner. It breaks down the barriers between tradition and modernity, revitalizing ancient crafts through the interweaving of smartphone lenses and real-world environments, and transforming aesthetic education into a natural and delight-filled lived experience.

1.2 Artificial Intelligence Technologies: Immersive Interaction between AI and Intangible Cultural Heritage

At present, the modes of safeguarding and transmitting intangible cultural heritage (ICH) are undergoing a profound transformation toward intelligence. Crucially, AI technologies are no longer applied merely as auxiliary tools; rather, they are beginning to construct new digital–intelligent cognitive domains, engaging in multi-layered and immersive interactions with humans and with ICH itself.

"AI Shu Brocade", jointly produced by Sichuan Radio and Television and Daochuan Media under the guidance of the Sichuan Provincial Department of Culture and Tourism, is China's first AI documentary on intangible cultural heritage and cultural tourism. Using a Shu brocade panda as the narrative thread, the film presents the historical development of Shu brocade from the Ancient Shu period to the Han and Tang dynasties through dialogues between an elderly craftsman and a child. The production team collected over 200 ancient and contemporary Shu brocade patterns to construct a localized large-model database. By leveraging multimodal AI technologies, the team precisely calibrated AI's expressive capacity within the domain of Shu brocade, enabling the visuals, music, and voice-over to be entirely generated through AIGC. This approach achieves a digital reconstruction of historical contexts and offers an innovative paradigm for empowering ICH culture, showcasing a compelling integration of traditional aesthetics and cutting-edge technology.

AI-based ICH documentaries, empowered by technology, enhance content appeal and elevate audience engagement, allowing ancient crafts to acquire renewed vitality. In terms of creation, AI technologies lower the technical threshold of ICH visual production and support integrative experimentation. For instance, combining the melodic structures of Dong ethnic grand songs with the patterns of Zhuang brocade can generate new scenes that blend traditional charm with contemporary aesthetics — an approach that has sparked strong interest among younger audiences. In dissemination, intelligent recommendation algorithms can accurately deliver ICH content according to user preferences, while formats such as short videos and live streaming align well with contemporary audiences' fragmented viewing habits, enabling ICH to transcend its conventional circles. Notably, young creators are actively employing AI visual effects and digital modeling to reconfigure ICH expression through novel cross-disciplinary narratives — such as parkour combined with iron flower performances, or mechanized Nuo dances — thereby aligning ICH with the aesthetics of the networked era and effectively capturing and retaining audience attention.

1.3 Virtual Reality Technology: Constructing Interactive Aesthetic Education Scenarios for Intangible Cultural Heritage

Virtual reality technology (hereafter referred to as VR) is a form of immersive, real-scene VR based on panoramic imagery and constitutes a core component of VR systems. Panoramic technology employs computational methods to stitch together one or more sets of 360-degree photographs captured in loops by cameras, enabling fully interactive viewing and thereby restoring and displaying real-world scenes[2]. The central advantage of VR lies in its ability to construct highly realistic and interactive three-dimensional dynamic environments, thus creating deeply immersive experiential spaces for the dissemination of ICH. In the field of ICH documentaries, VR applications have evolved from early-stage 360-degree panoramic recording to systematic contextual reconstruction that integrates computer graphics, high-precision 3D modeling, and motion capture technologies. Through head-mounted displays, audiences can virtually "enter" the sites where ICH practices are performed and witness the complete process of creation — from raw materials to finished works. Such comprehensive immersive environments transform viewers from passive spectators into active participants in cultural practice, substantially enhancing the immediacy of aesthetic perception and the embodied sense of engagement.

By integrating multi-channel sensory stimuli — including visual, auditory, and even tactile inputs — VR technology advances ICH aesthetic education from surface-level cognitive understanding to deeper emotional resonance, significantly enhancing experiential depth and immersion. A representative example is Journey in Search of Ancient Texts, a VR-based ancient-text revitalization project jointly developed by ByteDance Public Welfare, the First Historical Archives of China, the Dunhuang Academy, and the National Library of China. Relying on 6DoF interaction and 3D reconstruction technologies, the project centers on the "Four Major Discoveries of Chinese Ancient Documents in the Early Twentieth Century" — oracle bones from Yin Ruins, Han bamboo slips from Juyan, Dunhuang manuscripts, and Ming–Qing archives — to construct immersive historical scenarios. With VR equipment, users can freely navigate these spaces, directly interact with virtual

artifacts, and even participate in historical tasks such as frontier beacon signaling or astronomical observation, thereby deepening their understanding of ICH through highly autonomous interaction.

Applying VR technology to ICH documentaries fundamentally reshapes the mechanisms of aesthetic education by constructing multisensory immersive cultural contexts and opening personalized learning pathways. In doing so, ICH is revitalized within digital spatiotemporal frameworks, achieving a form of renewed presence. VR provides audiences with aesthetic access that transcends physical limitations and opens new channels for cultural cognition, establishing itself as an indispensable component of contemporary ICH aesthetic education systems.

2. The Plural Aesthetic-Educational Values of Technology-Empowered Intangible Cultural Heritage Documentaries

Aesthetic education, or education through aesthetics, aims fundamentally at cultivating well-rounded individuals[3]. Through aesthetic activities, it enhances aesthetic competence, refines sensibilities, inspires intellectual growth, and promotes the holistic development of personality. The aesthetic-educational value of intangible cultural heritage (ICH) documentaries derives from the aesthetic qualities inherent in ICH as a form of living culture — qualities that are deeply embedded in specific historical contexts, community life, and ethical frameworks. Digital and intelligent technologies amplify and interpret this composite form of beauty across multiple dimensions, enabling its precise transmission into diverse educational settings.

2.1 Media Characteristics: From Viewing to Experiencing — Technology-Driven Reshaping of the Perceptual Dimensions of ICH Aesthetic Education

In the digital–intelligent era, the media characteristics of ICH documentaries have undergone a fundamental transformation, shifting from passive viewing toward interactive, immersive experiential modes. This transition is largely enabled by the integrated application of digital technologies, which create immersive aesthetic environments and enhance the educational value of aesthetics. Such environments strengthen audiences' intuitive perception of the artistic qualities of ICH projects, allowing forms of heritage that are difficult to access directly — due to factors such as the aging of inheritors or geographical constraints — to be vividly preserved and widely disseminated. As media characteristics evolve, ICH documentaries are no longer merely audiovisual records; they become interactive works that both accomplish the urgent task of safeguarding endangered heritage and realize its revitalized transmission, providing abundant, authentic, and reliable resources for in-depth exploration.

Compared with current VR, AR, and MR technologies, extended reality (XR) places greater emphasis on the integration of virtual and real worlds and on narrowing the distance between humans, information, and experience. XR technologies are characterized by contextual awareness, sensory immersion, natural interaction, and the ability to edit reality. Their application in education demonstrates human-centeredness, intelligence, interactivity, ecological integration, and generativity[4]. Impression: Mazu is China's first immersive interactive performance centered on Mazu culture. Taking Mazu's life experiences as its narrative thread, the production employs XR technologies, parallel-stage concepts, and digitally controlled mist screens to creatively express the Mazu spirit of "moral integrity, benevolence, and universal compassion." By successfully constructing a parallel illusionary stage through digital technologies, the project breaks traditional boundaries between performers and audiences, while integrating ICH elements such as Putian opera and Shiyin Bayue music. It vividly conveys the core of the Mazu spirit. This innovative practice not only integrates ICH transmission with contemporary expressive forms but also serves as a vital vehicle for fostering cultural identity, representing a paradigmatic example of technology-empowered ICH documentaries.

The immersive media environments constructed through digital and intelligent technologies elevate ICH documentaries to a higher level, enabling audiences to fully mobilize their senses to perceive and deeply comprehend the profound aesthetic meanings embedded in ICH, thereby concretely realizing the value of aesthetic education.

2.2 Dissemination Characteristics: Integrating Aesthetic Education into Everyday Life

In the digital–intelligent era, ICH documentaries have transcended the temporal and spatial constraints of traditional media. Leveraging diversified dissemination channels, they transform aesthetic education from relatively centralized educational activities into an omnipresent everyday condition, achieving comprehensive permeation in both breadth and depth.

The integration of multiple dissemination channels constructs ubiquitous aesthetic fields. ICH documentaries are no longer confined to scheduled television programs; instead, they are disseminated through short-video platforms such as Douyin and Kuaishou, as well as digital museums and other channels. This enables ICH content to enter various everyday contexts, including commuting, leisure, and work breaks, thereby diversifying the temporal and spatial dimensions of aes-

thetic education.

User profiling technologies based on big data allow for precise analysis of individual aesthetic preferences. Such personalized dissemination strategies enable accurate targeting in aesthetic education, significantly enhancing its relevance and effectiveness. By ensuring a high degree of alignment between content and audience, these approaches more effectively cultivate aesthetic competence.

Through the construction of diversified dissemination channels, digital and intelligent technologies render the transmission of ICH documentaries ubiquitous. They propel aesthetic education beyond the confines of classrooms and textbooks, transforming it into an everyday practice that can occur anytime and anywhere, exerting subtle yet profound influence and promoting holistic human development on a broader scale.

2.3 Cultural Communication: Inspiring National Pride and Strengthening Cultural Identity

As an important vehicle of cultural communication, intangible cultural heritage (ICH) documentaries, in the digital era, enhance audiences' sense of cultural identity and awaken deep-seated national pride through skillful narration and diversified dissemination pathways. ICH can be regarded as the genetic code of national culture, carrying the historical memory, value systems, and aesthetic sensibilities of specific communities. Through vivid audiovisual storytelling, ICH documentaries transform cultural practices that are geographically dispersed and relatively abstract into concrete, perceptible narratives, enabling audiences to naturally establish connections with their own cultural roots.

This effect is particularly evident among younger generations. When forms of ICH such as local paper-cutting, dragon dances, and regional operas from their hometowns are presented in well-produced, contemporary documentary formats and receive wide recognition on domestic and international platforms, this can substantially alleviate the sense of cultural alienation that may arise amid rapid modernization, thereby fostering a strong sense of identification. The pride that emerges from such cultural identification becomes a crucial emotional foundation for aesthetic education to achieve its higher-level goal of promoting the holistic development of personality.

In the realm of international communication, digital ICH documentaries characterized by globally legible audiovisual language have become a striking calling card for telling China's stories well. What they present to the world is not merely technical craftsmanship, but more importantly, the spirit of artisanship embedded within these practices. When the comprehensive beauty of Chinese culture gains recognition from the international community, this form of cross-cultural feedback can, in turn, reinforce domestic audiences' pride in their own culture. Consequently, the cultural communication function of ICH documentaries elevates their aesthetic-educational value beyond individual aesthetic cultivation to a strategic level of fostering a sense of national community and strengthening cultural confidence.

3. Challenges and Reflections on the Development of Aesthetic Education through Technology-Empowered ICH Documentaries

3.1 Challenges in the Educational Domain: The Lack of Systematic Teaching Frameworks and the Difficulty of Evaluating Aesthetic Outcomes

At present, the most critical challenge in integrating digitally empowered ICH documentaries into school-based aesthetic education lies in the absence of a comprehensive and systematic pedagogical framework. Although numerous related practices exist, most remain at the level of technological display and have yet to form mature models that are closely aligned with curricular objectives, instructional activities, and students' developmental stages. Assessing the educational effectiveness of ICH documentaries in aesthetic education is inherently difficult, as improvements in aesthetic literacy and the strengthening of cultural identity are internalized and long-term processes that cannot be readily quantified through conventional examinations. In the absence of effective evaluation tools, it becomes difficult to assess teaching outcomes or to ground instructional improvement in empirical evidence. Addressing these issues requires collaborative efforts among educational researchers, frontline teachers, and technology developers, beginning with top-level design to formulate systematic integration strategies centered on aesthetic education goals and student development.

Given these challenges, effective evaluation should shift toward a multidimensional and process-oriented comprehensive system. Particular attention should be paid to students' development of core competencies in aesthetic perception, cultural understanding, creative practice, and artistic expression. At present, various regions across the country are actively exploring related initiatives, such as establishing arts competency assessment databases through information technology or implementing evaluation practices under the banner of "Internet + Aesthetic Education." In the future, with the continued advancement of educational evaluation reform and digital technologies, more scientific and human-centered assessment

models are expected to emerge. These models will more fully demonstrate the aesthetic-educational value of digitally empowered ICH documentaries and, in turn, guide creation and practice, forming a virtuous cycle.

3.2 Technological Challenges: The Risk of Superficial Cultural Representation and the Erosion of Authenticity

While technology brings immense possibilities to the creation of ICH documentaries, it also introduces significant challenges. During production, an excessive emphasis on visual spectacle may lead to a shift in creative focus, reducing ICH documentaries to showcases of technology and thereby neglecting their cultural connotations and spiritual values. Although digital technologies can construct grand historical scenes, without careful attention to detail and internal logic, such spectacles may become distractions. When audiences are captivated by the magnificence of virtual environments, the core content of ICH projects — such as distinctive production techniques — may be overshadowed. A successful digitally empowered ICH documentary should not merely astonish viewers with technological prowess; rather, it should immerse them deeply in cultural meaning, fostering a more profound understanding of ICH and eliciting strong emotional resonance.

The "hyper-realistic" environments created by digital technologies also pose new challenges to authenticity in ICH documentaries. For instance, to enhance visual appeal, a documentary may attempt to use AI technology to reconstruct a ritual dance that has long been lost. Yet on what basis is such a reconstruction made? Is it grounded in scholarly inference or artistic imagination? If this distinction is not clearly articulated, audiences may easily mistake it for historical fact, resulting in a new form of distortion. To address these challenges, creators must adhere to a culture-centered stance. In applying technology, the fundamental principle should be to deepen — rather than dilute — the cultural substance of ICH. This requires creative teams to be not only technological experts, but also cultural researchers and interpreters, and ideally to establish mechanisms for joint discussion and co-creation with ICH inheritors and domain scholars.

4. Conclusion

Driven by digital and intelligent technologies, intangible cultural heritage (ICH) documentaries have successfully transformed from traditional recording media into dynamic digital gene banks. Through the application of technologies such as augmented reality (AR) and virtual reality (VR)–based interaction, they not only preserve the procedural knowledge of traditional techniques but also reconstruct the broader cultural ecology in which these practices are embedded. In doing so, ICH documentaries accomplish both the task of salvage documentation and the goal of living transmission. Moreover, by adopting modernized and internationalized narrative strategies, they have become emotional bridges linking individuals with national culture, effectively contributing to the construction of cultural identity and the cultivation of national pride. In addition, supported by intelligent recommendation systems and diversified dissemination channels, the aesthetics of ICH have been integrated into everyday life, evolving into ubiquitous resources for aesthetic education. Looking ahead, it is essential to establish a coordinated framework that takes culture as its foundation, technology as its support, and education as its orientation. Such a framework will promote the transformation of ICH documentaries from display-oriented tools into systematic carriers of aesthetic education, thereby injecting sustained vitality into the creative development of traditional culture.

References

[1] Wang Shi, Liu Xinyi. Research on AR Technology–Empowered Narrative Exhibition of Cultural Connotations at Large-Scale Heritage Sites [J]. The Border Economy and Culture, 2026, (02): 78–82.

[2] Cai Ziling, Yang Lin, Liu Dan, et al. Application of Digital Virtual Human Technology in VR Panoramic Roaming [J]. Computer Programming Skills and Maintenance, 2026, (01): 150–152.

[3] Du Wei. Three Meanings of Aesthetic Education [J]. Literature and Art Studies, 2016, (11): 9–21.

[4] Chu Leyang, Chen Weidong, Tan Yue, et al. Reshaping Experience: Extended Reality (XR) Technology and Prospects for Its Educational Applications — Also on the Direction of "Integration of Education and New Technologies" [J]. Journal of Distance Education, 2019, 37(01): 17–31.