

Research on the Cross-Regional Sharing Mechanism and Implementation Path of High-Quality Resources for Rural Intangible Cultural Heritage Aesthetic Education Empowered by Digital Technology

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Abstract: Rural intangible cultural heritage (ICH) aesthetic education is a core carrier for inheriting the excellent traditional Chinese culture and advancing the vitalization of rural aesthetic education. However, the uneven distribution of high-quality resources and poor cross-regional circulation have become the key bottlenecks restricting its development. With the characteristics of breaking temporal and spatial boundaries, precise adaptation and efficient dissemination, digital technology provides a revolutionary solution for the cross-regional sharing of rural ICH aesthetic education resources. Based on the practical application of digital and intelligent technologies and cases of cross-regional cooperation, this paper systematically analyzes the practical dilemmas of resource sharing for rural ICH aesthetic education, constructs a trinity sharing mechanism of "technical support - subject coordination - value transformation", and proposes four implementation paths including digital resource development, cross-regional platform construction, collaborative education implementation and evaluation feedback optimization. It provides theoretical reference and practical guidance for promoting the balanced allocation of high-quality rural ICH aesthetic education resources and achieving the dual goals of cultural inheritance and aesthetic education quality improvement.

Keywords: Digital Empowerment; Rural Intangible Cultural Heritage Aesthetic Education; Cross-Regional Sharing; Resource Mechanism; Implementation Path

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With the in-depth penetration of digital and intelligent technologies in the field of cultural inheritance, digital transformation has become a core engine for breaking resource circulation barriers and realizing cross-regional sharing. Practices such as the Dunhuang "Digital Scripture Cave" and the Zhejiang-Guizhou "Cloud-based ICH Resource Library" have fully proven that digital technology can drive ICH aesthetic education resources from "solid-state protection" to "dynamic sharing" and from "one-way output" to "two-way empowerment". Against this backdrop, how to build a scientific and efficient digital sharing mechanism, explore feasible implementation paths, enable high-quality rural ICH aesthetic education resources to cross geographical barriers and benefit more rural teachers and students has become an important urgent issue for the vitalization of rural aesthetic education in the new era. From the perspective of the integration of digital technology and aesthetic education practice, combined with typical cases of cross-regional cooperation, this paper focuses on the construction of sharing mechanisms and path optimization, and provides a systematic solution to break the resource dilemma of rural ICH aesthetic education.

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1. Practical Dilemmas of Cross-Regional Sharing of High-Quality Rural ICH Aesthetic Education Resources and the Value of Digital Empowerment

1.1 Practical Dilemmas of Cross-Regional Sharing of High-Quality Rural ICH Aesthetic Education Resources

The cross-regional sharing of high-quality rural ICH aesthetic education resources faces multiple structural obstacles, which first manifest in the regional imbalance of resource distribution and morphological constraints. China's ICH resources are mostly concentrated in specific regions, such as tie-dyeing techniques in the Jiangnan region, ethnic singing and dancing in the southwest, and traditional handicrafts in the northwest. These resources exist in physical forms and are difficult to flow across regions due to geographical restrictions. Rural areas generally lack effective channels for resource integration and dissemination, resulting in high-quality resources being "hidden in the boudoir and unknown to the world". Secondly, technical shortcomings and lack of standards in resource transformation increase the difficulty of sharing. Rural ICH is mostly inherited through oral instruction and hands-on practice, and digital transformation requires professional technical support and standardized norms. However, rural areas are short of technical talents and transformation funds, a large number of ICH skills have not formed standardized digital resources, and the resource formats and presentation forms in different regions are incompatible, making it difficult to achieve cross-platform sharing. Furthermore, insufficient coordination and lack of motivation in the sharing mechanism restrict practical effects. Current cross-regional sharing is mostly fragmented and short-term cooperation, lacking a stable subject coordination mechanism. There are cooperation barriers among universities, research institutions, cultural venues, rural schools and other subjects, leading to a disconnect between resource supply and the actual needs of rural areas. "Blood transfusion-type" sharing is difficult to form a sustainable "hematopoietic" capacity. Finally, the lack of an evaluation system and poor feedback affect the quality of sharing. Cross-regional sharing lacks targeted evaluation criteria and scientific monitoring of core indicators such as resource adaptability, teaching effectiveness and cultural inheritance, resulting in a formalistic resource sharing that is difficult to truly serve the dual goals of improving rural aesthetic education and inheriting ICH.

1.2 Core Value of Digital Empowerment for Cross-Regional Sharing of Rural ICH Aesthetic Education Resources

The innovative application of digital technology provides key support for solving the above dilemmas, and its core value is reflected in three dimensions. First, breaking temporal and spatial restrictions to achieve efficient resource circulation. Technologies such as VR/AR and 3D modeling can transform rural ICH skills into digital resources, such as the panoramic VR performance of the Guangxi Tianqin art and digital teaching videos of Miao batik, enabling high-quality resources in remote areas to break geographical barriers, realize real-time cross-regional sharing through cloud platforms, and allow teachers and students in different regions to experience the beauty of ICH immersively. Second, optimizing resource supply and improving the accuracy of adaptation. Big data and intelligent algorithms can accurately capture the aesthetic education needs of different rural areas, and through a "learning demand blueprint" - style precise matching, combine high-quality resources with the teaching objectives, students' interests and regional culture of rural schools to achieve "personalized" resource push and solve the problem of disconnect between resource supply and actual needs. Third, activating inheritance vitality and building a collaborative ecosystem. Digital platforms can integrate the professional strengths of universities, research institutions and ICH inheritors to form a cross-regional cooperation community. For example, Zhejiang and Guizhou have established more than 280 learning communities and carried out more than 1,500 cross-regional activities through the model of "cloud-based co-learning and offline mutual visits", promoting the transformation of high-quality resources from one-way output to two-way co-creation, which not only empowers rural aesthetic education but also injects modern vitality into ICH inheritance. Fourth, reducing sharing costs and achieving sustainable development. Once digital resources are built, they can be reused infinitely, and the application of blockchain technology can realize resource right confirmation and orderly sharing. For example, the "Digital Dunhuang · Open Material Library" has opened more than 6,500 high-definition resources to the world, which not

only reduces the cost for rural areas to obtain high-quality resources but also builds a positive cycle of "resource co-construction - sharing - co-creation".

2. Construction of a Cross-Regional Sharing Mechanism for High-Quality Rural ICH Aesthetic Education Resources Empowered by Digital Technology

2.1 Technical Support Mechanism: Building a Digital Resource Transformation and Dissemination System

The technical support mechanism is the basic guarantee for cross-regional sharing, and its core lies in establishing a standardized digital transformation and efficient dissemination system for ICH aesthetic education resources. At the resource transformation level, a technical path of "high-precision collection + multi-modal presentation" should be adopted. Combined with 3D scanning, motion capture, speech recognition and other technologies, all-round digital recording of ICH skill processes, inheritors' oral narratives and cultural connotations should be carried out. For example, the "ICH Digital Twin Platform" developed by Tsinghua University has realized the full-process digital reconstruction of shadow puppetry, Kunqu opera and other ICH projects with a recognition accuracy of 96.8%. At the same time, unified resource digital standards should be formulated to standardize resource formats, metadata tags, presentation forms, etc., to ensure the interconnection of resources in different regions and types. For example, the "Cloud-based ICH Resource Library" jointly built by Zhejiang and Guizhou has unified curriculum standards and resource norms, realizing the cross-regional sharing of more than 3,200 high-quality lesson examples. At the dissemination level, a three-dimensional communication network of "cloud platform + mobile terminal" should be built, 5G technology should be used to realize high-speed transmission of high-definition resources, and VR/AR devices should provide an immersive experience, enabling rural teachers and students to easily obtain high-quality resources. For example, the Dunhuang Academy's "Digital Scripture Cave" project allows users to "personally" unfold millennium-old scriptures with the help of VR devices, realizing a cross-temporal and spatial cultural dialogue.

2.2 Subject Coordination Mechanism: Forming a Cross-Regional Diversified Co-construction and Sharing Community

The subject coordination mechanism is the core driving force for sustainable sharing. It is necessary to integrate multiple subjects such as the government, universities, research institutions, rural schools, ICH inheritors and enterprises to build a cooperation community of "multi-party participation, shared responsibilities and benefit sharing". Universities and research institutions give play to their technical and talent advantages and undertake tasks such as digital resource development, technical support and teacher training. For example, the "ICH Inheritor Motion Semantic Analysis System" developed by the Zhejiang University team provides core technical support for the digitalization of ICH skills; as the main body of resource reception and application, rural schools feed back resource optimization suggestions according to teaching needs and participate in resource co-creation; ICH inheritors give play to their professional advantages, serve as resource development consultants and online instructors, and ensure the authenticity and professionalism of resources; enterprises participate in sharing through technical sponsorship, market transformation and other methods. For example, the Nantong tie-dye intelligent robot production line has realized the large-scale transformation of traditional skills and provided industrial support for shared resources; the government plays a coordinating role, builds a cross-regional cooperation platform, and promotes resource docking and experience exchange between different regions.

2.3 Value Transformation Mechanism: Achieving the Dual Goals of Aesthetic Education Quality Improvement and Cultural Inheritance

The value transformation mechanism is the core goal of the sharing mechanism, aiming to promote the transformation of digital resources from "accessibility" to "effectiveness" and realize the dual values of aesthetic education quality improvement and cultural inheritance. At the level of aesthetic education quality improvement, a transformation path of "resource input - teaching application - literacy improvement" should be established. The

digitally shared resources across regions should be integrated into rural aesthetic education courses, and through the method of "cloud-based co-learning and offline practice", students' cultural comprehension, creative practical ability and aesthetic perception ability should be cultivated. For example, students from Zhejiang and Guizhou have created more than 120,000 ICH works through cross-regional cooperation, and more than 360 of them have been selected into national exhibitions, which fully reflects the aesthetic education value of shared resources. At the level of cultural inheritance, a transformation path of "resource sharing - innovative practice - dynamic inheritance" should be constructed, encouraging rural teachers and students to carry out innovative practice combined with local culture on the basis of absorbing high-quality cross-regional resources. For example, students from Danzhai created lantern works by integrating Hangzhou Qiantang paper-cutting with Miao batik patterns, which not only inherited ICH skills but also endowed them with modern connotations.

3.Implementation Paths for Cross-Regional Sharing of High-Quality Rural ICH Aesthetic Education Resources Empowered by Digital Technology

3.1 Promote the Digital Development and Standardization of ICH Aesthetic Education Resources

First, carry out a general survey and screening of rural ICH aesthetic education resources, focus on ICH projects with aesthetic education value and inheritance potential, establish a cross-regional list of ICH aesthetic education resources, and clarify the priority of digital development. Second, adopt a development strategy of "hierarchical classification + localized adaptation". For skill-based ICH (such as tie-dyeing and pottery), focus on the digitalization of process visualization and hands-on teaching; for performance-based ICH (such as ethnic singing and dancing, opera), focus on the digitalization of panoramic performance and interactive experience; for folk custom-based ICH (such as traditional festivals and folk stories), focus on the digitalization of cultural connotation interpretation and situational presentation. At the same time, combined with the actual rural teaching situation, develop lightweight and fragmented micro-course resources to adapt to the teaching scenarios of rural schools and the learning characteristics of students. Third, formulate unified digital resource standards, including data collection accuracy, resource format, metadata specifications, teaching application guidelines, etc., to ensure the compatibility and practicality of resources. For example, establish a digital standard system for ICH aesthetic education resources with reference to the relevant technical specifications of the national cultural big data system. Finally, establish a dynamic resource update mechanism, regularly update digital resources according to the development of ICH inheritance and changes in rural aesthetic education needs, incorporate new technical innovations, cultural interpretations and teaching cases, and maintain the timeliness and vitality of resources.

3.2 Build a Cross-Regional Digital Sharing Platform and Precise Docking Channels

Build an integrated digital sharing platform for rural ICH aesthetic education, integrate functions such as resource display, retrieval, download, interactive communication and teaching application, and realize "one-stop" resource services. The platform should have precise retrieval and intelligent recommendation functions, and recommend suitable high-quality resources through algorithms based on tags such as the regional characteristics, teaching grades and curriculum needs of rural schools. For example, build an intelligent recommendation system of "learning demand blueprint + resource matching" to enable rural teachers to quickly find the required resources. Establish cross-regional resource docking channels and implement a "one-to-one" or "many-to-one" regional pairing model. For example, developed eastern regions establish long-term cooperation with rural areas in the central and western regions, and carry out targeted resource delivery, joint teaching and research, and online teaching support activities through the platform. Open a resource demand feedback channel, allowing rural schools, teachers and students to submit resource demand suggestions through the platform, forming a closed loop of "demand - supply - optimization".

3.3 Implement the Project of Cross-Regional Collaborative Education and Teacher Capacity Improvement

With the digital platform as the link, build a "cross-regional learning community", organize rural schools to

carry out "cloud-based co-learning" activities with high-quality urban schools and ICH inheritance bases. For example, set up cross-regional student ICH creation groups, and jointly complete creation projects through video conferences and online collaboration tools. The "learning partner map" model of Zhejiang and Guizhou can be used for reference, promoting the cross-regional growth of students through more than 280 cross-regional learning communities. Carry out a combination of online and offline teacher training, with experts and backbone teachers from universities and high-quality urban schools as training instructors, provide training content such as teaching case sharing, digital resource application guidance and teaching design discussion through the platform, and improve the digital resource application ability and cross-regional cooperation ability of rural aesthetic education teachers. For example, Zhejiang and Guizhou organize Zhejiang-style famous teachers and Guizhou teachers to form co-learning tribes every year, and improve teachers' professional level through joint teaching and research. Invite ICH inheritors to carry out online teaching guidance through the platform, regularly hold live lectures on ICH skills and online workshops to make up for the professional shortcomings of rural aesthetic education teachers. Establish a cross-regional teaching and research cooperation mechanism, carry out regular teaching and research activities through the platform, share experience in the application of digital resources, jointly solve problems encountered in teaching practice, and form a positive cycle of "resource sharing - joint teaching and research - capacity co-improvement".

3.4 Establish a Scientific Evaluation Feedback and Continuous Optimization System

Construct a "four-dimensional integrated" evaluation index system, conduct a comprehensive evaluation from four dimensions: resource quality, sharing efficiency, application effect and inheritance value. Resource quality indicators include digital accuracy, cultural authenticity and teaching adaptability; sharing efficiency indicators include resource access volume, cross-regional transmission speed and user satisfaction; application effect indicators include the improvement of students' aesthetic literacy, mastery of ICH skills and innovative practical achievements; inheritance value indicators include the effectiveness of dynamic ICH inheritance and the improvement of cultural identity. Adopt an evaluation method combining "process evaluation + result evaluation", record the process data of resource application through the digital platform, such as resource usage frequency, teaching application scenarios and student interactive feedback, and conduct a comprehensive evaluation combined with phased teaching results and ICH creation works. Establish an evaluation result feedback and resource optimization mechanism, and timely adjust the content of digital resources, the functions of the sharing platform and the mode of collaborative education according to the evaluation results. For example, optimize the resource presentation form and teaching guidance plan for the problem of poor resource application effect; upgrade the platform technology and transmission network for the problem of low sharing efficiency. Encourage users to participate in the evaluation, set up an evaluation entrance through the platform, and invite rural teachers, students and ICH inheritors to score and leave messages on shared resources and platform services, forming an evaluation pattern with the joint participation of multiple evaluation subjects.

4. Conclusion

Digital empowerment provides an unprecedented opportunity for the cross-regional sharing of high-quality rural ICH aesthetic education resources, breaking the temporal and spatial barriers of traditional resource circulation and building a diversified and collaborative sharing ecosystem. The trinity sharing mechanism of "technical support - subject coordination - value transformation" and the four implementation paths of digital resource development, cross-regional platform construction, collaborative education implementation and evaluation feedback optimization constructed in this paper provide a systematic solution for promoting the balanced allocation of high-quality rural ICH aesthetic education resources. Practice has proved that digital technology can not only enable rural teachers and students to easily obtain high-quality aesthetic education resources, but also activate the modern vitality of ICH inheritance, realizing the dual goals of aesthetic education quality improvement and cultural inheritance.

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