

RESEARCH ON THE IMPLEMENTATION OF CANTONESE GRAY SCULPTURE ARCHITECTURAL DECORATIVE SCULPTURES IN PRIMARY SCHOOL CURRICULUM: BASED ON THE DUAL PERSPECTIVES OF CULTURAL INHERITANCE AND EDUCATIONAL INNOVATION*

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Received 23 August 2025; Revised 27 August 2025; Accepted 29 August 2025

Abstract

This study aimed to explore the feasibility, effectiveness, and conservation benefits of systematically integrating the national intangible cultural heritage of Cantonese gray-plastic architectural decorative sculpture (hereafter referred to as “gray sculpture”) into the primary school curriculum. The study employed a mixed-method approach, combining literature analysis, questionnaires, in-depth interviews, and classroom observations. A one-year follow-up study was conducted among 425 students, 35 teachers, and 12 intangible cultural heritage inheritors and cultural experts from three pilot primary schools in Guangzhou.

Citation:



* Zhang Rufang, Jantana Khochprasert, Poradee Panthupakorn and Chusak Suvimolstien. (2025). Research On The Implementation Of Cantonese Gray Sculpture Architectural Decorative Sculptures In Primary School Curriculum: Based On The Dual Perspectives Of Cultural Inheritance And Educational Innovation.

Journal of Interdisciplinary Social Development, 3(5), 865-884.;

DOI: <https://doi.org/10.>

Website: <https://so12.tci-thaijo.org/index.php/JISDIADP/>

This study was analyzed using SPSS 26.0 and NVivo 12. Results showed that a model combining project-based learning (PBL) with “intangible cultural heritage inheritors in the classroom” was the most effective, significantly enhancing students’ understanding of gray sculpture, their cultural identity, and their willingness to inherit it. This study innovatively constructed a gray sculpture “Double Helix • Four Dimensions” campus inheritance model, with “cultural inheritance” and “educational innovation” as the core of the double helix, and “course content, teaching practice, support system, and evaluation feedback” as the four basic dimensions, providing a systematic, replicable and evaluable theoretical model and practical framework for the dynamic inheritance of intangible cultural heritage on campus.

Keywords: Gray sculpture, primary school curriculum, project-based learning

Introduction

Gray sculpture, a unique architectural decorative art form of the Cantonese region, was listed in the second batch of the National Intangible Cultural Heritage List in 2008. Using lime as its primary material, supplemented with straw, brown sugar, and glutinous rice, it is intricately crafted into various figures, flowers, birds, and animals on buildings. This art form not only possesses exceptional artistic value but also carries the historical memories, philosophical ideas, and folk beliefs of the Cantonese people. However, amidst modernization and urbanization, traditional architecture is declining. The inheritors of the core techniques of gray sculpture are aging, and successors are scarce. This precious cultural treasure faces a crisis of extinction: the art will be lost with the passing of the artist.

Integrating intangible cultural heritage into the education system to address the inheritance crisis has become a global educational strategy and practical exploration. For example, in Japan, primary and secondary schools

generally carry out the “shokunin in schools” activity, inviting traditional craft maintainers to enter the classroom for long-term teaching, deeply integrating the inheritance of skills with the school’s art, history and comprehensive learning time courses, and forming an institutionalized “regional education” model (Murakami, K., 2018). In the UK, “Heritage Schools” programme provides teachers with training, resources and support, encouraging them to incorporate local history and architectural heritage into the curriculum, cultivating students’ sense of local identity and historical continuity (Historic England, 2020). Influenced by the “Slow School” movement, Italy emphasizes local artistic heritage as the core of project-based learning, allowing students to understand the contemporary value of traditional culture through exploration, imitation and re-creation. These international cases show that successful heritage education is not only about imparting skills, but also about building a sustainable ecosystem that connects schools, communities and inheritors.

School education, particularly basic education, as the primary platform for cultural transmission and reproduction, plays a crucial role in the protection and inheritance of intangible cultural heritage. Integrating intangible cultural heritage into primary school curricula is not only a positive response to national policies such as the “Opinions on Implementing the Project for the Inheritance and Development of China’s Excellent Traditional Culture” (State Council of the People’s Republic of China, 2017), but also a key measure for shifting cultural heritage from a “blood transfusion” approach to preservation to a “blood-making” approach. Primary school is a crucial period for the formation of students’ cultural awareness, aesthetic tastes, and identity. Promoting local intangible cultural heritage education during this period plays a crucial role in “planting seeds.”

Objectives

1. Develop and validate a set of gray sculpture curriculum content and teaching models suitable for primary school.
2. Evaluate the impact of the curriculum implementation on students' cultural cognition, attitudes and behavioral intentions.
3. Explore the ripple effects of curriculum implementation on teachers, schools, and communities.
4. Evaluate the long-term sustainability of the educational effectiveness and cultural influence of the curriculum model after the project cycle, that is, provide empirical evidence for the endogenous development of heritage education in the campus ecosystem.
5. Construct a theoretical model of “intangible cultural heritage campus inheritance” to provide a reference for similar studies.

Literature Review

1. Wang, S. S. (2022) proposed that "intangible cultural heritage entering campus" is an effective form of living inheritance, but the article lacks systematic curriculum design, long-term empirical data support and discussion of deep educational mechanisms. The UNESCO (2003) Convention for the Safeguarding of the Intangible Cultural Heritage clearly states that "education" is the core measure to ensure the vitality of intangible cultural heritage.
2. Contemporary art education emphasizes going beyond simple skill training and shifting towards “visual culture education” and “cultural understanding” (Yin, S. C., 2015). PBL is a student-centered teaching method that guides students to explore and learn through real projects through driving questions. It has been proven to effectively improve learning motivation, collaboration skills and higher-order thinking (Thomas, J. W., 2000).

3. Through case studies, Fukuoka, S. (2020) explored how Japanese elementary schools integrate local traditional crafts into subjects such as social studies, science, and art, forming interdisciplinary project-based learning and effectively enhancing students' identification with and willingness to inherit local culture. MEXT (2017) explains from a policy perspective why Japanese elementary schools are able to carry out intangible cultural heritage education in a systematic and high-quality manner. CHA & NIHC (2018) systematically developed an intangible cultural heritage education model suitable for primary and secondary schools, which specifically includes curriculum cases, teaching models and effect evaluation. Park, J.-H. (2019) studied the intangible cultural heritage education in Korean primary and secondary schools and proposed that the core of the education is to bring “human cultural heritage” into the classroom and practice experience, so as to effectively promote cultural inheritance and students’ sense of identity.

Methodology

Study design

This study employed an exploratory sequential mixed methods design. First, qualitative research was used to initially construct a curriculum framework. Then, quantitative experimental research was used to test the curriculum's effectiveness. Finally, qualitative interviews were used to further interpret and supplement the quantitative findings.

Sample acquisition and sample size determination

Using a purposive sampling method, we selected three primary schools in different areas of Guangzhou with different art education foundations as pilot schools. The research subjects included: (1) Student sample: Students from grades 3 to 6. The experimental group (n=225) participated in the complete gray sculpture course, while the control group (n=200) did not participate in the gray

sculpture course. Cluster sampling was used, with natural classes as the unit. (2) Teacher sample: teachers of art, Chinese, and comprehensive practical activities courses and school administrators participating in the experimental schools (n=35). (3) Expert sample: Gray sculpture inheritors (n=2), university folklore and art education researchers (n=5), and district teaching and research staff (n=5).

The sample size was calculated based on the effect size of Cohen, J. (1988).

Research tools

(1) Primary School Students' Cognition and Attitude Scale towards Gray Sculpture: compiled by the researchers, including three dimensions: "Basic Knowledge Cognition" (10 questions), "Aesthetic Value Perception" (8 questions), and "Willingness for Cultural Heritage" (6 questions), using a 5-point Likert scale.

To ensure the scientificity and effectiveness of the research tools, this study conducted rigorous validity testing:

1) Content Validity: The scale items were assessed for relevance to their dimensions, semantic clarity, and appropriateness. The Content Validity Index (CVI) was used for quantitative evaluation. The calculated scale-level Content Validity Index (S-CVI) was 0.92, and the Content Validity Index (I-CVI) for each item ranged from 0.86 to 1.00, indicating that the scale has good content validity.

2) Construct Validity: An exploratory factor analysis (EFA) was conducted on the pretest data from the control group (n=200) before the formal administration of the test. The results showed that: The KMO sampling suitability measure was 0.89, and the Bartlett sphericity test χ^2 value was 2536.72 ($p < 0.001$), indicating that the data were suitable for factor analysis; Principal component analysis (PCA) with varimax rotation was used to extract three common factors with eigenvalues greater than 1, with a cumulative variance explanation rate of 67.8%; The loading values of each item on its factor range from 0.52 to 0.81, and there is no cross-factor loading phenomenon (cross loading

is less than 0.40). The factor structure is clear and fully consistent with the three dimensions of the theoretical conception.

3) Reliability test: The overall Cronbach's α coefficient of the scale is 0.91, and the α coefficients of each dimension are 0.84, 0.87, and 0.83, respectively, indicating that the scale has extremely high internal consistency reliability.

(2) Semi-structured interview outline: designed for teachers and experts respectively, covering the challenges, gains, suggestions and views on the effectiveness of curriculum implementation.

(3) Classroom Observation Record Sheet: used to record students' learning engagement, group collaboration, creative performance, and other behaviors.

(4) Evaluation of student works: Evaluate students' clay sculpture works from three dimensions: "technical fit", "cultural connotation" and "creative expression".

Data collection and analysis

(1) Quantitative research data: Measurement tables were administered to the experimental group and the control group before the course (pretest) and after the course (posttest). SPSS 26.0 was used for data analysis, including descriptive statistics, reliability and validity tests, independent sample t-tests, and analysis of covariance (ANCOVA).

(2) Qualitative research data: Interviews with teachers and experts were conducted and their texts were transcribed. Student reflection diaries and teacher lesson plans were collected. NVivo 12 was used to conduct thematic analysis and draw conclusions.

(3) Data integration: Quantitative research results and qualitative research results complement and explain each other to answer the research questions.

Results

Quantitative comparison of students' cognition, attitudes, and willingness before and after course implementation

As shown in Table 1, the covariance analysis (with "pretest score" as the covariate) shows that after controlling for pretest differences, the experimental group's posttest scores were significantly higher than those of the control group. This indicates that the implementation of the gray sculpture course has effectively improved students' cultural cognition, aesthetic appreciation, and willingness to actively pass on knowledge.

Table 1 ANCOVA analysis results of post-test scores of the experimental group and the control group (M±SD)

Dimensions	Group	Pretest(M±SD)	Posttest(M±SD)	Adjusted posttest mean	F-number	P-number
Basic knowledge cognition	experimental group	2.45±0.68	4.12±0.51	4.10	285.73	<0.001
	control group	2.51±0.72	2.68±0.70	2.70		
Aesthetic value perception	experimental group	3.10±0.75	4.35±0.48	4.33	198.45	<0.001
	control group	3.08±0.80	3.20±0.78	3.22		
Willingness to inherit culture	experimental group	3.25±0.85	4.20±0.60	4.18	156.89	<0.001
	control group	3.30±0.82	3.38±0.81	3.40		

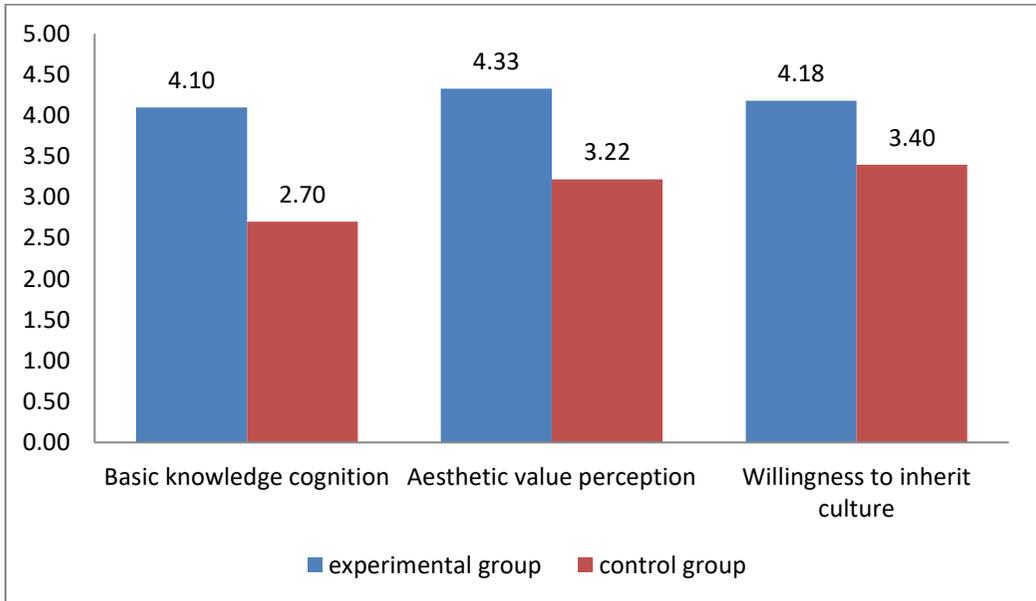


Figure 1 ANCOVA analysis results of post-test scores of the experimental group and the control group

The effectiveness of different teaching models

Within the experimental group, the effects of the three models of “pure theoretical teaching”, “simple manual experience” and “project-based learning (PBL) + inheritor guidance” were further compared. As shown in Table 2, the class that adopted the PBL model was significantly better than the other two models in post-test gains in all dimensions.

Table 2 Comparison of students' gain scores in each dimension after testing under different teaching modes

Evaluation dimensions	Pure theoretical teaching(n=75)	Simple manual experience(n=75)	Project-based learning (PBL) +inheritor guidance(n=75)	F-number	P-number

Basic knowledge cognition	1.25 ± 0.42 ^a	1.48 ± 0.38 ^b	1.72 ± 0.35 ^c	28.731	<0.001
Aesthetic value perception	1.05 ± 0.51 ^a	1.32 ± 0.45 ^b	1.58 ± 0.40 ^c	22.145	<0.001
Willingness to inherit culture	0.85 ± 0.48 ^a	1.10 ± 0.52 ^b	1.42 ± 0.49 ^c	18.932	<0.001
Understanding of cultural connotations	0.92 ± 0.46 ^a	1.18 ± 0.43 ^b	1.50 ± 0.41 ^c	25.867	<0.001
Emotional connection and identification	0.78 ± 0.50 ^a	1.05 ± 0.47 ^b	1.38 ± 0.44 ^c	21.094	<0.001
Willingness to apply innovation	0.65 ± 0.55 ^a	0.95 ± 0.51 ^b	1.30 ± 0.48 ^c	19.576	<0.001

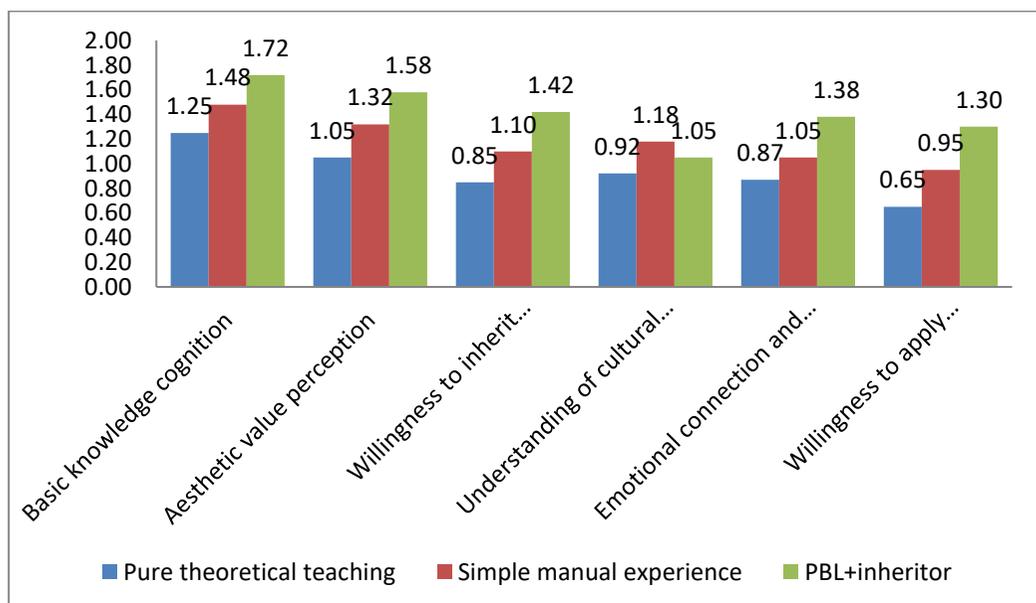


Figure 2 Comparison of students' gain scores in each dimension after testing under different teaching modes

Key findings from the qualitative research

Thematic analysis of the interview and observation data revealed the following core themes: (1) “Revitalized” inheritance: The inheritors said that seeing the children’s imaginative works broke the stereotype of “inheritance means imitation of the ancients” and injected new vitality into the gray sculpture technique. (2) Teacher growth: Teachers have experienced a transformation from “strangeness and fear” to “confidence and leadership”. The process of preparing lessons together with inheritors has become a valuable professional development opportunity, giving birth to a group of “intangible cultural heritage seed teachers”. (3) Interdisciplinary links: Gray sculpture course naturally connects multiple disciplines such as art (modeling), language (stories and legends), science (material chemical reactions), mathematics (proportion and symmetry) and comprehensive practice (field investigation), becoming an effective entry point for the integration of school-based curriculum. (4) Collaboration between home, school and community: The course inspires students’ enthusiasm to visit ancient buildings around them, and through activities such as “Home-School gray sculpture Workshop” and “Community Achievement Exhibition”, cultural learning is extended from the classroom to the family and community, forming a good collaborative education atmosphere.

Discussion

The study found that a successful intangible cultural heritage curriculum goes far beyond simply imparting knowledge, building a diverse and interactive “cultural ecosystem.”

(1) The research results are highly consistent with constructivist learning theory (Bruner, J. S., 1966) and situated learning theory (Lave, J. & Wenger, E.,

1991). The PBL model is most effective because it creates opportunities for students to engage in “legitimate marginal participation,” enabling them to construct knowledge and deepen their understanding through active exploration, social interaction, and artistic creation in a context close to real cultural practice (like a “little apprentice”). This is consistent with the conclusion of many past studies that emphasize that intangible cultural heritage education should focus on “experience” and “practicality” (Wang, X. M., 2020), but this study further reveals the superiority of the "project-based" complete practice process over “fragmented experience”.

(2) This study reveals the inherent connections among the research variables: the effective implementation of the curriculum (independent variable) not only directly affects students’ cultural outcomes (dependent variable), but also produces an amplifying effect by influencing teacher effectiveness and the home-school-community environment (mediating variables). The deep participation of inheritors is a key catalyst. They are not only the transmitters of skills, but also the “physical carriers” of culture. Their presence greatly enhances the cultural authenticity and appeal of the course. At the same time, the role of teachers has changed from passive executors to active curriculum developers and cultural guides, and their professional growth is the core guarantee for the continued in-depth development of the curriculum. The positive feedback from families and the community creates a supportive cultural identity environment for students and consolidates their learning outcomes.

(3) These factors interact with each other and jointly promote the transformation of intangible cultural heritage from “specimens in museums” to “living culture in campus life”, achieving the ultimate goal of protection and inheritance.

Although this study has verified its effectiveness in a pilot setting, if we expect this model to be promoted on a large scale and operate sustainably, we still need to face up to the practical obstacles and potential risks it faces.

(1) Curriculum integration and time competition are core challenges: The current primary school curriculum is already highly saturated, with immense pressure on class time in core subjects. As a newly added component, intangible cultural heritage courses can easily be seen as an “extra burden” rather than a “necessary supplement.” If the knowledge of gray sculpture cannot be effectively integrated into existing subjects (such as art, science, and comprehensive practical activities), or if stable school-based curriculum hours cannot be obtained, its survival space will be very limited, and it will easily be shelved or reduced to a formal “one-time activity” due to time constraints.

(2) Sustainability of funds and resources poses significant risks: The success of this research depends largely on project-based resource investment, including the teaching hours of inheritors, the purchase of special materials, and the expenses of off-campus practical activities. Without stable external funding or regular school budgeting, these programs will be difficult to sustain. Once the initial project funding is exhausted, the program is likely to fall into the predicament of “the staff leave and the policy is closed.”

Therefore, future promotion work needs to build a systematic support environment: The education department needs to introduce supporting policies to incorporate the effectiveness of intangible cultural heritage inheritance into the school evaluation system; school administrators need to carry out scientific curriculum planning and resource allocation; and the society needs to explore diversified funding channels. Only in this way can the inheritance of intangible cultural heritage on campus be transformed from a “praiseworthy innovation” to a “sustainable norm.”

New knowledge

This study originally proposed a comprehensive model for the inheritance of intangible cultural heritage on campus. The model takes “cultural inheritance”

and “educational innovation” as its two core lines. Like the double helix structure of DNA, they are intertwined and support each other, jointly driving the upward development of the system.

Double Helix:

(1) Cultural inheritance chain: Emphasis on the authentic protection and dynamic inheritance of intangible cultural heritage genes (skills, aesthetics, and spirit).

(2) Educational innovation chain: Emphasizes student-centeredness and stimulates learning interest and creativity through modern educational concepts, teaching methods and evaluation methods.

Four dimensions (the stable fulcrum of the model): Course content dimension, teaching practice dimension, support system dimension, and evaluation feedback dimension.

The model shows that successful intangible cultural heritage inheritance on campus is not the implementation of a single course, but the result of the dynamic balance and coordinated evolution of the “double helix” supported by the “four dimensions”. The ultimate goal is to cultivate a future generation with both cultural heritage and innovative spirit.

Recommendation

Research conclusions

(1) In terms of feasibility, this study verified the effectiveness of the “Double Helix • Four Dimensions” model and provided a replicable practical framework for the development of intangible cultural heritage school-based curriculum. The successful implementation of the gray sculpture course proves that the key to introducing intangible cultural heritage projects into primary school classrooms lies in finding a balance between cultural inheritance and educational innovation. This means building a complete ecosystem that includes

curriculum content, teaching practices, support systems, and evaluation feedback, with “inheritor-teacher collaboration” and “project-based learning” as the core driving forces. This model clearly defines the roles and functions of each participating entity, solves the core issues of “what to teach, how to teach, who will teach, and how to evaluate”, and has strong promotion value.

(2) In terms of effectiveness, the course significantly improved students’ comprehensive cultural literacy and achieved a deep transformation from knowledge acceptance to emotional identification and then to behavioral intention. Quantitative and qualitative data consistently show that the course not only enables students to master the basic knowledge and aesthetic skills of gray sculpture, but also deeply promotes their understanding of the connotation of local culture and stimulates their cultural pride and sense of belonging. More importantly, the study observed students’ clear and positive desire for inheritance and innovation, which indicates that intangible cultural heritage education has gone beyond the short “experience” stage and truly achieved the long-term effect of “sowing seeds” and “nurturing” future inheritance subjects and cultural audiences.

(3) In terms of radiation effect, the implementation of the curriculum has generated multiple added values beyond the individual students and promoted the construction of a cultural ecology of collaborative education. This study confirms that the implementation of intangible cultural heritage courses is a win-win process: for students, it is an improvement in cultural literacy; for teachers, it is an opportunity for professional development to cooperate with inheritors in lesson preparation and mutual learning, giving birth to “intangible cultural heritage seed teachers”; for schools, it is an important opportunity to create distinctive school-based courses and build campus cultural brands; for inheritors, it is a valuable channel for skills to enter life, obtain feedback and inspiration, and break the “inheritance dilemma”; for the community and culture, through

the “home-school-community” linkage, the field of cultural protection is extended from the classroom to the family and public space, enhancing the cultural cohesion of the community.

Ultimately, this study demonstrates the crucial role of primary school as the starting point for the “living inheritance” of intangible cultural heritage.

(4) In terms of sustainable development, the “Double Helix • Four Dimensions” model preliminarily verified in this study provides a theoretical framework and implementation path for its long-term practice, but its ultimate effectiveness still requires a long period of testing. The success of a course lies not only in the quantifiable and visible results within the project cycle, but also in whether it can stimulate endogenous development within the campus cultural ecosystem after the project ends. Future long-term follow-up studies need to further assess: whether students have transformed from cultural learners to active communicators and practitioners; Whether teachers have internalized the role from “teachers” to “transmitters” and have the ability to independently develop and iterate courses; whether the school has solidified it from a “featured project” to a “cultural system” and provided continuous budget and institutional guarantees. This study has laid a solid foundation for this evaluation. Its ultimate goal is to provide a solid empirical basis and implementation path for the fundamental proposition of “how intangible cultural heritage education can transform from an externally promoted high-quality project into an inherent and organic cultural character of a school.”

Research limitations and reflections

This study obtained insightful findings through rigorous methodological design, but it still has certain limitations.

(1) Limitations of sample representativeness: The samples for this study were drawn from three primary schools in Guangzhou. Although differences in school location and educational background were taken into account to enhance sample diversity, the results still primarily reflect practices in the core areas of

Cantonese culture. There are differences in economic development levels, cultural policy support and school resources in different regions of China. Therefore, the applicability and effectiveness of the “Double Helix • Four Dimensions” model constructed in this study in other regions, especially in schools outside the original cultural environment of intangible cultural heritage projects, still need to be further verified.

(2) Insufficient verification of long-term effects:

The data collection period for this study was one-year. Although it was able to effectively observe the immediate and medium-term changes in students' cognition, attitudes, and intentions, it was unable to track the course's lasting impact on students' long-term cultural identity and their role as potential inheritors. The “living inheritance” of intangible cultural heritage is a long process of internalization, and the durability of its educational effects still needs to be tested through longer-term longitudinal research.

Based on the above limitations, we propose the following future research directions in order to improve relevant research.

Recommendations for future research

(1) Cross-regional comparative research: A comparative study of the educational models of similar intangible cultural heritage projects in different regions (such as different cities in the Guangdong-Hong Kong-Macao Greater Bay Area , and even in northern and southern China) can be conducted to explore the impact of regional cultural differences on the effectiveness of curriculum implementation.

(2) Longitudinal Tracking Study: Future research can track students who participate in this course for 3-5 years or even longer. Through regular return visits, follow-up questionnaires, in-depth interviews, etc., we examine the stability and development trajectory of their cultural identity and inheritance willingness,

evaluate the durability of the effects of intangible cultural heritage education, and how it interacts with the growth of individual students.

(3) In-depth exploration of digital empowerment: Develop AR/VR immersive teaching platforms to break through time and space limitations; Using generative AI to build creative assistance tools to inspire students' innovative thinking; Build an educational big data platform, scientifically evaluate the long-term effectiveness of digital tools, and promote the intelligent and personalized development of intangible cultural heritage education.

suggestion

(1) Suggestions for education policymakers: Special guidance and incentive policies should be issued, intangible cultural heritage inheritance should be incorporated into the school evaluation system, and special funds should be set up to support the “Intangible Cultural Heritage Inheritor Residency Program” and teacher training.

(2) Suggestions for schools and education administrators: Based on local resources, they should elevate the inheritance of intangible cultural heritage to the level of the school's distinctive development strategy, actively develop school-based curriculum, and provide institutional and time guarantees for interdisciplinary teaching and “dual-teacher classrooms.”

(3) Suggestions for frontline teachers: They should take the initiative to improve their cultural literacy and project-based curriculum design capabilities, actively communicate and cooperate with inheritors, and become a “transit station” and “catalyst” for cultural inheritance.

(4) Suggestions for layered promotion: 1) At the domestic level, it is recommended that the Guangdong-Hong Kong-Macao Greater Bay Area take the lead in establishing a curriculum alliance to create a regional model and realize resource sharing. Nationwide, “methodological transfer” is advocated, and schools across the country are encouraged to learn from the “PBL + inheritor” model. At the same time, it is called for the inclusion of intangible cultural

heritage inheritance results into the school evaluation system and the provision of special funding support. 2) Internationally, the gray sculpture course can be modularized and incorporated into Confucius Institutes and Sino-foreign cultural exchange programs as a distinctive business card to showcase China's educational philosophy and cultural confidence. We also export China's experience in “intangible cultural heritage education” to international organizations such as UNESCO and actively participate in the formulation of international standards. Through systematic promotion from near to far and from inside to outside, the results can benefit more people.

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