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From "A Grain of Rice in Baodun" to "Ten Thousand Acres of Smart Farmland": Integrating Tianfu Agricultural Culture into Research-Based Learning for Primary and Secondary Education

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Abstract: Tianfu agricultural culture, as a core representation of agrarian civilization in the upper reaches of the Yangtze River, embodies rich historical heritage, including the origins of rice cultivation in Baodun, the hydraulic engineering wisdom of Dujiangyan, and the ecological settlement patterns of Linpan in western Sichuan. Against the backdrop of the rapid development of research-based learning, the organic integration of Tianfu agricultural culture into research-based learning practices for primary and secondary school students not only facilitates the dynamic transmission of China's fine traditional culture but also represents an innovative pathway for fulfilling the fundamental educational task of fostering virtue through education. Building upon a systematic review of the core connotations and educational value of Tianfu agricultural culture, this study, in conjunction with the current development status and representative cases of research-based learning in Sichuan Province, examines the logic and mechanisms underpinning their integration from three dimensions: curriculum design, theoretical framework, and practical pathways. In response to existing challenges — such as underdeveloped curriculum systems, insufficiently trained teaching staff, and a lack of endogenous motivation within practice bases—this paper proposes a series of strategic recommendations. These include constructing a tiered and progressive curriculum system characterized by integrative approaches, cultivating a professionalized teaching workforce, developing regionally distinctive research-based learning brands, and strengthening collaborative educational mechanisms among schools, families, and communities.

Keywords: Tianfu agricultural culture, primary and secondary school students, research-based learning, cultural integration, curriculum design

1. Introduction

The Bashu region, renowned for its natural richness and cultural vitality, has long been celebrated as the "Land of Abundance," with a profound and enduring cultural lineage. In March 2026, Sichuan Province released 116 high-quality research-based learning routes for primary and secondary school students, organized around four major themes—red heritage, humanities, nature, and science and technology—to promote the high-quality development of research-based learning (Publicity Department of the CPC Sichuan Provincial Committee & Sichuan Provincial Department of Education, 2026). Among these, the humanities-themed routes focus on cultural treasures such as ancient Shu civilization, historical landmarks, and intangible cultural heritage, within which Tianfu agricultural culture constitutes a core component (Sichuan Provincial Department of Education, 2026).

Meanwhile, in 2025, Chengdu issued the Notice on Further Strengthening the Management of Research-Based Study Tours in Primary and Secondary Schools, explicitly requiring schools to align such activities with the fundamental educational goal of fostering virtue through education. Schools are encouraged to design study tours centered on themes such as traditional culture, while avoiding destinations lacking educational value. These policy developments indicate a significant shift in research-based learning—from "learning through travel" toward a more substantive and

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value-oriented form of learning (Chengdu Municipal Education Bureau et al., 2025).

Does Tianfu agricultural culture serve as a high-quality carrier for research-based learning? The answer can be traced back to the first grain of rice sown by the Baodun ancestors approximately 4,500 years ago. From carbonized rice remains at the Baodun site to the Dujiangyan irrigation system, from the Linpan settlements of western Sichuan to today's vision of a "Tianfu Granary," Tianfu agricultural culture embodies the spiritual ethos of the Chinese nation, including traditions such as integrating farming and scholarship and adhering to harmony with nature. However, a key challenge remains: how to effectively "activate" this cultural resource within research-based learning for primary and secondary students—transforming it from static display to immersive experience, and from knowledge transmission to competence development.

This paper aims to explore the pathways for integrating Tianfu agricultural culture into research-based learning for primary and secondary education. It conducts analysis from three perspectives—cultural value excavation, theoretical framework construction, and innovation in practical models—with the goal of providing both theoretical insights and practical references for the high-quality development of regional research-based learning.

2. Connotations, Characteristics, and Educational Value of Tianfu Agricultural Culture

2.1 Historical foundations: the origins of Baodun rice civilization

The origins of Tianfu agricultural culture can be traced back to the Baodun culture, dating approximately 4,500 years ago. In 1995, the ancient Baodun city site was discovered and, through radiocarbon dating, identified as a settlement from this period. Crucially, archaeologists unearthed carbonized rice remains and soil layers containing high densities of rice phytoliths beneath the site, providing clear evidence that the Baodun people had already engaged in large-scale rice cultivation. This marked the foundation of agrarian civilization in the upper Yangtze River region.

This single grain of rice from 4,500 years ago not only initiated the development of ancient Shu civilization but also signaled the transition of the region into a rice-based subsistence system. The agricultural system of the Baodun culture laid the material foundation for the flourishing of subsequent civilizations, such as Sanxingdui and Jinsha, and heralded the emergence of urban civilization in the Chengdu Plain.

2.2 Hydraulic wisdom: the ecological philosophy of Dujiangyan

If the Baodun culture represents the "seed" of Tianfu agriculture, the Dujiangyan irrigation system can be seen as nourishing its "roots." Following its construction by Li Bing, the Shu region truly became the "Land of Abundance." Dujiangyan exemplifies an ecological engineering marvel, operating without dams while enabling automatic water diversion and sediment discharge (Huang, 2021).

Its governing principles—adapting to natural conditions and leveraging natural forces—embody profound philosophical ideas such as harmony between humanity and nature. These concepts continue to hold significant educational value today. For instance, the China Agricultural Civilization Museum features a dedicated exhibition hall showcasing the hydraulic wisdom of Dujiangyan through sand-table simulations and biomimetic water-flow models, vividly illustrating an engineering system that has functioned effectively for millennia (Red Star News, 2022).

2.3 Spatial form: the cultural imagery of Linpan settlements in western Sichuan

Tianfu agricultural culture is not only reflected in modes of production but also embodied in distinctive spatial forms. In the plains and hilly regions of Sichuan, agricultural and sideline economies developed alongside dispersed settlement patterns, where households were established across scattered fertile lands. This gave rise to the Linpan landscape, characterized by the organic integration of forests, water systems, dwellings, and farmland (Huang, 2021).

This pattern of dispersed rural habitation reflects cultural traits such as optimism, inclusiveness, and adherence to natural principles. Over successive historical periods, waves of migration transformed Sichuan into a culturally diverse society, fostering the integration of agricultural production and commercial exchange while enhancing cultural inclusivity. The Linpan tradition of combining farming with scholarly pursuits resonates strongly with contemporary educational emphases on labor education and life-oriented learning.

2.4 Educational value: from historical heritage to educational resource

From the perspective of research-based learning, the educational value of Tianfu agricultural culture can be understood across at least three dimensions.

First, historical cognition: through sites such as Baodun and Dujiangyan, students can directly engage with the historical trajectory of Chinese agricultural civilization and develop an understanding of the cultural foundations of the "Land of Abundance."

Second, ecological ethics: the traditional agricultural principles of adapting to seasonal cycles and maintaining balance in resource use provide rich, localized materials for contemporary ecological civilization education.

Third, labor education: the labor ethos embedded in agricultural production—captured in ideas such as the effort behind every grain of food and the cyclical rhythms of sowing and harvest—offers an effective medium for cultivating students' labor literacy and awareness of food sustainability. As reflected in a student's experience during a study visit to the Tianfu Agricultural Expo Park, such engagement fosters both an appreciation of the hardships of food production and the satisfaction derived from hands-on creation (Sichuan Education News, 2025).

3. Policy Context and Theoretical Foundations of Research-Based Learning

3.1 National and local policy support

Since the joint issuance of the Opinions on Promoting Research-Based Study Tours for Primary and Secondary School Students by the Ministry of Education and ten other departments in 2016, research-based learning has gradually been incorporated into formal school curricula and has become an important pathway for holistic education (Ministry of Education et al., 2016). In February 2026, a national conference on key tasks in basic education further emphasized the need to expand practice-oriented learning environments and promote the deep integration of ideological and political education with social practice and red-themed study tours (Ministry of Education of the People's Republic of China, 2026).

Guided by national policies, Sichuan Province has actively advanced the high-quality development of research-based learning. Notably, it introduced spring and autumn breaks for primary and secondary schools in 2025 and, in March 2026, released 116 high-quality research-based learning routes, thereby fostering a new model of collaborative education among schools, families, and communities. At the municipal level, Chengdu issued regulatory policies in 2025—summarized as "seven reinforcements and six prohibitions"—to standardize research-based study tours, clearly delineating boundaries in areas such as approval procedures, organizational processes, fee management, and safety supervision (Sichuan Provincial Department of Education, 2026).

3.2 Theoretical framework for curriculum design

The design of research-based learning curricula should be grounded in robust theoretical frameworks. Project-based research-oriented study tours are primarily informed by constructivist learning theory, life education theory, and embodied cognition theory. Constructivism emphasizes that learners actively construct knowledge in authentic contexts, which aligns closely with the experiential nature of agricultural learning characterized by "learning by doing."

Key principles guiding curriculum design include:

(1) the educational principle, prioritizing learning objectives while embedding them within experiential activities;

(2) the practicality principle, adapting to local conditions and enhancing situational engagement; and

(3) the experiential principle, emphasizing student agency and activity-based learning.

The "knowledge–action–inquiry" three-stage model proposed in Chengdu's high-quality study routes—comprising pre-learning with guiding questions, role transformation during field experience, and the production of visible learning outcomes—represents a practical application of these theoretical foundations.

3.3 Mechanisms for integrating agricultural culture into research-based learning

The integration of Tianfu agricultural culture into research-based learning is underpinned by three interrelated mechanisms.

First, content alignment: agricultural culture spans multiple disciplines, including history, geography, biology, labor education, and the arts, naturally supporting interdisciplinary integration and aligning with the holistic educational goals of research-based learning.

Second, form compatibility: agricultural experiences emphasize hands-on participation and embodied engagement, which correspond closely to the core characteristics of research-based learning as a combination of inquiry-based study and experiential travel.

Third, value resonance: the traditional virtues embedded in agricultural culture—such as diligence,

frugality, respect for nature, and appreciation of labor—are intrinsically consistent with the contemporary educational mission of fostering virtue.

This multi-layered alignment positions Tianfu agricultural culture as a uniquely valuable resource for research-based learning.

4. Practical Examination of Integration

4.1 Emerging models of practice

The integration of Tianfu agricultural culture into research-based learning has given rise to diverse practical models.

First, museum-based immersive learning. The China Agricultural Civilization Museum, located within the Tianfu Agricultural Expo Park, spans 2,022 square meters and presents a chronological narrative of agricultural and rural development in Sichuan over 5,000 years. Utilizing multimedia technologies—such as interactive displays, animation, light projection, and AI interfaces—the museum provides immersive learning experiences. Students can not only observe artifacts and specimens but also simulate agricultural labor postures and receive real-time feedback from AI systems, achieving an interactive mode of "seeing, playing, and learning" (Red Star News, 2022).

Second, field-based experiential learning. At the Xiangyin Menglianggu Family Farm in Renshou County, designated as a provincial natural education base, traditional agricultural courses—such as crop cultivation, tool usage, and grain processing—are integrated with modern technological modules, including drone applications. Faculty from Sichuan Agricultural University are invited to deliver on-site instruction. Over five years, the program has evolved from seasonal activities into a standardized curriculum, serving over 80,000 participants across more than 280 study groups. Similar models are observed in sites such as Baoshi Farm in Xichang, which integrates labor education with intangible cultural heritage and smart agriculture (China Report, 2025).

Third, discipline-integrated learning. Dongchenggen Street Primary School in Chengdu structures its study programs into pre-, during-, and post-activity phases. Classroom instruction includes storytelling about the "Tianfu Granary" in Chinese lessons and water cycle experiments in science classes. During field visits, students engage in museum tours, ecological model construction, and agricultural activities, followed by reflective outputs such as "grain conservation pledges." This "preparation–experience–extension" model exemplifies effective integration with formal curricula (Sichuan Education News, 2025).

Fourth, technology-enhanced agricultural exploration. In modern agricultural demonstration zones, students encounter smart greenhouses, precision irrigation systems, and drone-based plant protection technologies. These settings enable teachers to explain pathways toward sustainable and efficient agricultural development. Comparable practices are found in sites such as the Sino-French Agricultural Science and Technology Park in Nanchong, which integrates agricultural culture with ecological restoration and technological innovation.

4.2 Key challenges in practice

Despite these advances, several structural challenges persist.

First, superficial curriculum design. Some programs remain limited to isolated activities (e.g., rice planting or fruit picking) without systematic integration of objectives, content, implementation, and assessment. The deeper dimensions of agricultural culture—such as ecological philosophy, spatial aesthetics, and scientific knowledge embedded in traditional practices—are insufficiently incorporated (Yu, 2025).

Second, insufficient professional capacity. A shortage of well-trained instructors constrains program quality. Agricultural research-based learning requires both interdisciplinary knowledge and field-based pedagogical skills, posing new demands on teacher preparation systems.

Third, homogenization of learning bases. Many sites lack distinctive positioning, leading to repetitive program designs and weak brand differentiation.

Fourth, limited depth of integration. Current practices often involve simple aggregation of activities rather than systematic transformation of cultural resources into educational resources. The integration of core values—such as harmony with nature and the integration of farming and learning—into curriculum objectives and assessment frameworks remains underdeveloped.

5. Strategies for Optimizing Integration

5.1 Constructing a tiered and integrative curriculum system

A developmentally appropriate, tiered curriculum should be established to address the cognitive and developmental needs of students at different educational stages. Early primary education should emphasize sensory engagement and basic

labor awareness; upper primary levels should focus on inquiry-based learning; lower secondary education should foster analytical understanding through interdisciplinary integration; and upper secondary education should promote critical reflection on cultural heritage, modern agriculture, and sustainability. Cross-disciplinary integration should be strengthened to embed subjects such as language, science, and the arts within agricultural learning contexts (Sichuan Education News, 2025).

5.2 Developing a collaborative and professional teaching workforce

Teacher development should proceed along three lines: enhancing in-service teacher training, incorporating external expertise from universities and research institutes, and establishing multi-stakeholder collaboration mechanisms involving educators, practitioners, and community members. Such efforts will support the formation of a hybrid teaching community with complementary strengths (China Report, 2025).

5.3 Building distinctive regional learning brands

To avoid homogenization, research-based learning sites should pursue differentiated development based on local cultural resources. For example, Baodun may focus on the origins of rice cultivation, Dujiangyan on hydraulic engineering and ecological philosophy, and Linpan regions on traditional settlement culture. Branding strategies can enhance both educational value and institutional visibility.

5.4 Strengthening school–family–community collaboration

Research-based learning should evolve from episodic activities into sustained educational mechanisms. Temporally, programs can align with seasonal agricultural cycles; spatially, they should integrate school instruction, field-based experience, family participation, and community support. Such multi-dimensional collaboration fosters a holistic educational ecosystem (Sichuan Provincial Department of Education, 2026).

5.5 Advancing digital empowerment and smart learning

Digital technologies offer new possibilities for agricultural learning. Virtual and augmented reality can recreate historical agricultural environments; smart agriculture platforms enable real-time data observation; and online learning systems support blended learning models. The integration of digital tools with agricultural education aligns with broader trends in technology-enhanced learning.

6. Conclusion

From the first grain of rice sown by the Baodun ancestors to today's vast expanses of technologically advanced farmland, Tianfu agricultural culture has endured for over four millennia. Its core values—integrating farming with learning and harmonizing with nature—constitute invaluable cultural resources for contemporary education.

Integrating Tianfu agricultural culture into research-based learning for primary and secondary education represents not only the revitalization of traditional culture but also a reorientation and innovation of educational philosophy. It reconnects learning with lived experience, enabling students to appreciate the value of labor and to understand the deeper logic of civilization through direct engagement with the land.

Looking ahead, deeper integration will require coordinated efforts across policy, schools, learning bases, families, and communities. Sustained progress in curriculum design, teacher development, branding, and technological innovation will be essential. Only through such comprehensive efforts can the symbolic "grain of rice in Baodun" be transformed into a "vast field of smart farmland" that nurtures the holistic development of future generations.

Conflict of Interest

The author declares that he has no conflicts of interest in this work.

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