Exploration on the Path of Integrating Agricultural Heritage in Karst Mountainous Areas into Middle School Geography Practical Teaching

Guangfa Zhou
School of Geography and Environmental Sciences, Guizhou Normal University, Guiyang, Guizhou, China

Abstract: The agricultural heritage in Karst mountainous areas is a living wisdom system embodying the "harmonious coexistence between humans and nature". Its characteristics of "ecological fragility, human-land coordination, and cultural coupling" are highly consistent with the core literacy cultivation goals of middle school geography practical teaching, namely "regional cognition, comprehensive thinking, geographical practical ability, and the view of human-land coordination". Based on field investigations and teaching pilots of agricultural heritage in Karst areas such as Guizhou, Guangxi, and Yunnan, this paper constructs an implementation path for integrating agricultural heritage in Karst mountainous areas into geography practical teaching through three stages: "classroom teaching — field investigation — project research". The research shows that excavating learning materials contained in agricultural heritage projects in Karst mountainous areas through field investigations and transforming them into geography practical teaching resources can not only enrich geography teaching content and effectively cultivate students' core geographical literacy but also contribute to the living inheritance of agricultural heritage.

Keywords: Karst Mountainous Areas; Agricultural Heritage Projects; Middle School Geography; Practical Teaching; Path Construction

1. Introduction

1.1 Research Background

1.1.1 Practical needs

Karst landforms account for approximately 15% of the world 's land area. China is one of the countries with the most typical karst development. The area of karst in our country is 3.44 million square kilometers, accounting for 35.8% of the total land area. Among them, the area of the southern karst region (centered on Guizhou) is about 500,000 square kilometers, accounting for 55% of the total karst area in the country. The karst mountainous area is large and the terrain is complex. The land resources available for ecological agriculture are extremely limited, which to some extent restricts the scale and benefits of ecological agriculture development [1]. The agricultural production techniques adapted to the karst environment mastered by the people in the karst mountainous areas have gradually formed precious agricultural cultural heritages of mankind over the course of history, such as the rice-fish-duck system in the Dong village of Congjiang, Guizhou, the Longji terraced field agricultural system in Guangxi, and the Hani rice cultivation terraced field system in Honghe, Yunnan. However, these agricultural cultural heritages are facing the risk of "discontinuity in inheritance" under the impact of modern production methods, and the practical teaching of middle school geography often falls into the current situation of "empty talk on paper" due to "insufficient local teaching resources and single practical scenarios" [2,3]. Integrating agricultural cultural heritage into geographical practice teaching can achieve a win-win situation of "improving the quality and efficiency of geographical practice teaching" and "dynamic inheritance of agricultural cultural heritage".

1.1.2 Research gaps

Existing studies mostly focus on the ecological value of heritage or geography teaching theories, lacking the construction of a systematic path of "agricultural heritage resources → geography practical teaching → practical ability cultivation", especially the lack of geography practical teaching plans targeting the particularity of Karst landforms.

1.2 Research Significance

1.2.1 Teaching value

By embedding geographical knowledge in the context of intangible cultural heritage, students can not only learn knowledge about intangible cultural heritage but also better master, transfer, and apply geographical knowledge [4]. Transforming learning materials such as "natural water and soil regulation techniques and agricultural ecological planting wisdom" in agricultural heritage into geography practical teaching resources can make up for the deficiency of traditional geography teaching which "emphasizes the imparting of theoretical knowledge while neglecting practical operation training", thereby helping students understand the concept of "human-land coordination" featuring "harmonious coexistence between humans and nature".

1.2.2 Heritage value

Karst mountainous areas are key regions for rural revitalization. Reasonable development of agricultural cultural heritage in karst regions based on local conditions and village-specific policies can enable the dynamic inheritance of intangible cultural heritage and empower the prosperity of rural industries [5]. In addition, by exploring the construction practice and achievement dissemination of the "Digital Map of Agricultural Cultural Heritage in Karst Mountainous Areas", the public awareness of agricultural cultural heritage in karst mountainous areas can be expanded, the "heritage protection awareness" of teenagers can be cultivated, and new vitality can be injected into the living inheritance of agricultural cultural heritage.

1.2.3 Regional value

Developing characteristic agriculture, establishing agricultural advantage zones and further promoting the structural reform on the agricultural supply side can enable regional value to be realized [6]. In line with the demands of rural revitalization in karst mountainous areas, guide students to design plans for the inheritance, protection and industrial development of agricultural cultural heritage, and promote the practical application of geographical teaching in serving local development.

1.3 Research Methods and Data Sources

1.3.1 Research methods

Literature Analysis Method: Sorting out policy documents and literature related to agricultural heritage types, inheritance and protection, and geography practical teaching, and identifying the characteristics of agricultural heritage in Karst mountainous areas and the implementation cases of its integration into geography practical teaching.

Field Investigation Method: Investigating three agricultural heritage sites, namely the rice-fish-duck complex system in the Dong villages of Congjiang, Guizhou, the Honghe Hani Rice Terraced Field System in Yunnan, and the Longji Terraced Field Agricultural System in Longsheng Various Nationalities Autonomous County, Guangxi. A total of 50 villagers and 30 geography teachers were interviewed to collect information on villagers' operation of agricultural heritage techniques and geography teachers' use of agricultural heritage resources in teaching.

Teaching Experiment Method: Applying the developed agricultural heritage resource materials in Karst areas to a one-semester geography teaching pilot in 3 middle schools in Qiandongnan Prefecture, Guizhou, to verify the feasibility, scientificity, and applicability of applying agricultural heritage resources to geography practical teaching.

1.3.2 Data sources

Through investigations, 8 pieces of technical materials on agricultural heritage (such as terraced field construction manuals in Karst mountainous areas and maintenance records of the rice-fish-duck complex system), 60 students' learning practice reports from the pilot teaching middle schools, and 30 teacher feedback questionnaires were obtained.

2. Characteristics of Agricultural Heritage in Karst Mountainous Areas and Its Practical Teaching Value

2.1 Characteristics of Agricultural Heritage in Karst Mountainous Areas

2.1.1 Natural adaptability

Karst mountainous areas face the practical dilemma of "shortage of both water and soil". Through long-term labor, people have established a technical system of "stone-ridge terraced fields for soil conservation, water cellars for water collection, and selection and breeding of drought-tolerant crops". Taking the

Jiabang Terraced Fields in Congjiang County, Guizhou Province as an example, the slope generally reaches 50-70 degrees, stretching from an altitude of 400 meters to 1,200 meters, forming a steep terraced landscape and creating the unique scene of "a frog jumping over three fields". Terraced fields can reduce surface runoff by 70%-95% and soil erosion by 90%-100%.

2.1.2 Ecological synergy

Ecological synergy refers to the overall operational relationship formed by the mutual promotion and cooperation among different constituent elements in a certain ecosystem. The peach industry in Shunping County has been studied from the perspective of ecosystem synergy to promote the high-quality development of the peach industry [7]. Similarly, a circular system of "agriculture - fishery - poultry" can also be formed in the context of karst. For instance, in Zhanli Village, Gaozeng Township, Congjiang County, Guizhou Province, the traditional farming method that has been in use for over 1,400 years, through raising fish and ducks in rice fields, has created a mutually beneficial symbiotic system. In 2011, it was listed as a Globally Important Agricultural Heritage System. This "rice + fish + duck" integrated system reduces the density of pests such as rice planthoppers by approximately 70% to 90% compared to single planting, and lowers the disease index of rice blast by more than 50%.

2.1.3 Cultural coupling

Agricultural cultural heritage is deeply integrated with the folk customs of ethnic minorities. For instance, the "Rice Field Fish Farming Festival" of the Dong people in Congjiang, Guizhou Province, is a grand event of local farming culture that has been passed down for thousands of years. Currently, the adoption of "cost-saving and income-increasing" technologies not only meets the new requirements of modern ecological agriculture development but also enhances the economic benefits of agriculture [8]. The "Rice Field Fish Farming Festival" integrates ecological wisdom and folk customs, including "rice transplanting teaching and knowledge explanation of fish-rice coexistence", and the "Autumn Rush Festival" conveys the geographical wisdom of "autumn harvest and climate adaptation".

2.2 Appropriateness of Integrating Agricultural Heritage into Middle School Geography Practical Teaching

2.2.1 Meeting the requirements of core literacy cultivation in geography

Regional Cognition: Understanding the factors influencing "the impact of landforms on agricultural regional types" by comparing the differences between terraced fields in Karst mountainous areas and paddy fields in plains.

Comprehensive Thinking: Analyzing the "water cellar → paddy field → cave spring" system to construct multi-dimensional ecological civilization knowledge covering "water cycle, agricultural location, and ecological protection".

View of Human-Land Coordination: Exploring the labor practice of ancestors in the process of "converting slopes into terraced fields" and "transforming dry land into paddy fields" where "nature is transformed without destroying the natural ecological environment", so as to establish the concept of "harmonious coexistence between humans and nature".

2.2.2 Making up for the shortcomings of geography practical teaching

The practical teaching of geography has the problem that "the venue is limited to the campus and the content cannot be separated from the textbooks" [9]. To address the predicament of traditional geographical practice teaching, it is necessary to provide real geographical practice teaching scenarios that are "observable, operable and exploratory".

2.2.3 Conforming to students' cognitive laws

Geography teaching has continuous and progressive connections in terms of educational goals, learning methods, and course content, which requires teaching to conform to students' physical and mental development and cognitive laws [10]. Teaching can follow the cognitive path of "on-site observation of terraced fields (landscape) → learning technical principles (soil and water regulation) → experiencing cultural connotations (folk customs)", which is in line with the thinking development characteristics of middle school students from "concrete to abstract".

3. Construction of the Path for Integrating Agricultural Heritage in Karst Mountainous Areas into Middle School Geography Practical Teaching

3.1 Classroom Teaching: Constructing a Learning Path of "Heritage Knowledge →

Geographical Principles"

3.1.1 Teaching-oriented transformation of heritage materials

According to the principle of "geographical element decomposition - teaching objective matching", agricultural cultural heritage resources are transformed into operational geographical practice teaching materials. The specific types and application scenarios are associated in Table 1.

Table 1. Correlation between Agricultural Heritage and Geography Practical Teaching

Type of Heritage Materials	● Terrain Transformation (Jiabang Terraced Fields, Congjiang, Guizhou) ● Water Resource Utilization (Tunpu Agricultural System, Anshun, Guizhou) ● Ecological Planting (Rice-Fish-Duck Complex System in Dong Villages, Congjiang, Guizhou)
Core Technical System	● Terraced fields are built along mountain slopes, using stone ridges and vegetation to consolidate soil and reduce soil erosion ● The water conservancy system in Baojia Village adopts the Jianghuai pond-and-dam technology to build a complex system with functions such as irrigation, flood control, and water-powered grain processing ● Simultaneously planting rice, raising fish, and duck in terraced fields to form an ecological circulation model of "one field for multiple uses and one water source for three harvests"
Correlated Geographical Principles	● Impact of surface morphology on agricultural production; soil and water conservation ● Agricultural ecosystem; biological cycle; integrity of geographical environment ● Hydrological characteristics of Karst; rational utilization of water resources
Teaching Application Scenarios	● Interpretation of contour topographic maps; soil erosion simulation experiments ● Food chain analysis; comparison of ecological benefits ● Water cycle experiments; calculation of irrigation efficiency
Geography Practice	● Making terraced field models with foam boards to simulate soil erosion under different slopes ● Counting the difference in chemical fertilizer usage between rice fields with fish farming and ordinary rice fields ● Designing a device of "transparent water tank (water cellar) + sponge (rock stratum)" to simulate precipitation infiltration and water storage

3.1.2 Inquiry-based practical teaching

Situation Introduction: Playing a documentary about villagers in Jiabang Village, Congjiang, Guizhou, "building stone ridges to construct terraced fields", and raising questions such as "Why do villagers go to the trouble of building stone ridges?" and "What is the relationship between the shape of terraced fields and contour lines?" to arouse students' inquiry interest.

Group Inquiry: Dividing students into groups such as "terrain group", "water resource group", and "ecology group", and assigning agricultural heritage investigation materials to each group (the terrain group obtains data on the slope of terraced fields, the water resource group analyzes water storage records of water cellars, and the ecology group studies the impact of "converting slopes into terraced fields" on the ecological environment). Through "intra-group inquiry and inter-group communication", a knowledge learning logic chain of "Karst environment → heritage technology → geographical principles" is constructed.

Geographical Experiment: Designing a comparative experiment to address the problem of "poor water retention of Karst soil".

Experimental Materials: 100g of Karst weathered soil, 100g of plain loam soil, beakers, rain gauges, and electronic scales.

Experimental Procedures: Simulating 10mm of precipitation, and measuring the infiltration capacity and water retention capacity of the two types of soil after 5 minutes respectively.

Application of Conclusions: Combining the experimental results, analyzing the necessity of techniques such as "straw mulching and stone ridge interception" in agricultural heritage, and understanding the principle of "human activities' adaptive transformation of the natural environment".

3.2 Field Exploration: Creating a Practical Path of "Heritage Site Investigation → Decoding Geographical Principles"

3.2.1 Selection of practice sites and design of tasks

Following the principles of "proximity, safety, accessibility and typicality", three practice sites were selected, namely the rice-fish-duck compound system in the Dong village of Congjiang, Guizhou Province, the Hani rice cultivation terraced field system in Honghe, Yunnan Province, and the terraced field agricultural system in Longji, Guangxi. Hierarchical tasks were designed according to the pattern of "junior high school basic type → senior high school advanced type" [11].

Practical Tasks for Jiabang Terraced Fields, Congjiang, Guizhou.Junior High School: Measuring the slopes of 3 terraced fields with a tape measure (recorded as 50°, 60°, and 70°) and drawing a cross-sectional diagram of the terraced fields.Senior High School: Collecting soil samples from terraced fields with different slopes, testing the pH value with pH test paper (with an average value of 6.2-6.8, showing weak acidity), analyzing the correlation between slope, soil fertility, and crop selection, and calculating the soil and water conservation efficiency of stone ridges (reference formula: Soil and Water Conservation Efficiency = [(Soil Loss in Bare Slopes - Soil Loss in Terraced Fields) / Soil Loss in Bare Slopes] × 100%).

Practical Tasks for the Honghe Hani Rice Terraced Field System in Yunnan.Junior High School: Observe the structure of "water inlets and outlets" of high-mountain forest ponds and village wells; record the ratio of "pond irrigation and village well water to natural precipitation" for paddy fields (approximately 7:3).Senior High School: Use a simple rain gauge (20 cm in diameter) to monitor the daily precipitation (assumed to be 5 mm); estimate the number of days that the water cellar can meet the irrigation needs of paddy fields (approximately 15 days) by combining the water cellar volume (20 m^3); and analyze the advantages of "decentralized water resource utilization" in Karst areas.

Practical Tasks for the Longji Terraced Field Agricultural System in Guangxi.Junior High School: Observe the water system structure and water source ratio of the terraced fields. Conduct a water source structure survey: record the ratio of "irrigation by diverting mountain springs and streams" to "natural precipitation" in the terraced field area; observe the layout of "water inlets (mountain springs or streams)" and "water outlets (terraced fields)" of canals around villages; and analyze how they achieve "top-down" step-by-step irrigation. Ecological function analysis: Compare the "forest-village-terraced field" system between Longji Terraced Fields and Hani Terraced Fields, and explain the impact of the location of Zhuang villages (e.g., on hillsides) on water resource utilization.Senior High School: Water resource calculation and Karst adaptability analysis. Irrigation demand calculation: Use a simple rain gauge (20 cm in diameter) to monitor the 24-hour precipitation (assumed to be 10 mm); calculate the total water storage capacity by combining the terraced field area (e.g., 1 mu ≈ 667 m^2); and estimate the sustainable irrigation days (approximately 15 days) based on the local water cellar volume (e.g., 30 m^3) and daily irrigation volume (2 m^3/mu). Advantage analysis in Karst areas: Compare the differences in water resource utilization between Longji (Karst landform) and Hani (Ailao Mountains); explain how the "decentralized water cellars" in Longji address the problem of underground seepage; and analyze the contribution of water conservation measures in terraced fields (e.g., compacting field ridges with clay) to the ecological cycle by combining the "rice-fish symbiosis" model.

3.2.2 Implementation process of geography practical teaching

Pre-class Preparation.In terms of school-local cooperation: Collaborate with the village committee of the heritage site to determine a safe route (avoiding cliffs and underground rivers); invite 1 villager familiar with heritage-related techniques to serve as an "off-campus instructor".

In terms of student preparation: Distribute "practical task sheets" (including maps, observation record forms, and safety guidelines); guide students to preview knowledge related to "Karst landforms" and "agricultural location factors"; and have students form groups to prepare observation tools (tape measures, pH test papers, cameras, and interview outlines).

In terms of field investigation: Firstly, geographic observation. Each group conducts measurements and records in accordance with the task sheet. The "terrain group" measures the slope of terraced fields; the "water resource group" draws the structure diagram of water cellars. Each group is required to take 3 photos showing the connection between "heritage techniques and geographic elements" (e.g., "stone ridges and soil accumulation," "water cellars and paddy field water channels").Secondly, humanistic interview. Design questions around "the inheritance of heritage techniques," such as "Who taught you to build water cellars when you were young?" and "Are young people still willing to cultivate terraced fields now?" Record villagers' feedback (e.g., "Most post-90s work outside, so terraced fields are mostly cultivated by people over 50 years old") to help students understand the dilemma of heritage inheritance. Thirdly, on-site discussion. Organize a debate titled "Heritage Wisdom vs. Modern Agriculture" to discuss "Should stone-ridge terraced fields be replaced by mechanized farming?" Guide students to think from multiple dimensions (ecological protection, cultural inheritance, and production efficiency) to develop a dialectical understanding.

Post-class Extension. In terms of outcome development: Students work in groups to organize observation data and interview records, and draw a "geographic element connection map of Karst agricultural heritage" (e.g., "exposed rocks → thin soil → stone-ridge terraced fields → soil conservation → rice cultivation").

In terms of practical report: Write a practical report of approximately 1,000 words, analyzing "how agricultural heritage techniques solve the constraints of the Karst geographic environment" and putting forward suggestions for the protection of agricultural cultural heritage.

3.3 Project Deepening: Designing an Extended Path of "Heritage Inheritance - Geographic Innovation"

3.3.1 Design of "karst agricultural heritage protection plan"

Project Background: Based on problems identified during field practice (e.g., the abandonment of some terraced fields in Congjiang, Guizhou) and combined with rural revitalization policies.

Task Requirements: Students work in groups to design a "heritage protection + industrial development" plan.

Current Situation Analysis: Use geographic data to illustrate problems (e.g., "A large number of terraced fields are abandoned due to labor shortage").

Specific Measures: Terraced Field Restoration: "Organize student volunteers to participate in building stone ridges under the guidance of villagers"; Water Cellar Upgrading: "Install solar water pumping devices to improve irrigation efficiency"; Industrial Linkage: "Develop cultural and creative products of 'terraced rice' and sell them through e-commerce platforms".

Feasibility Demonstration: Explain the feasibility of the plan from three aspects: "funding (applying for school practical funds), technology (guidance from villagers), and market (targeting parents and the community)".

Outcome Presentation: Hold a "heritage protection plan hearing," invite officials from cultural and tourism departments and geography teachers to serve as judges, and score the plans based on "scientificity, innovation, and practicality." Recommend excellent plans to relevant departments of the heritage site as a reference for formulating agricultural cultural heritage protection policies.

3.3.2 Creation of "digital heritage map"

Technical Support: Select a simple online GIS platform (e.g., ArcGIS Online Student Edition) with operation difficulty suitable for middle school students.

Task Requirements: In terms of geographic labeling. Mark the longitude and latitude of heritage sites (terraced fields, water cellars, and folk activity venues) on the map, and upload landscape photos. In terms of knowledge annotation. Add "geographic principle explanations" to each heritage site. For example, for terraced field sites, "Areas with dense contour lines have steep slopes, so narrow terraced fields are designed to reduce soil erosion"; for water cellar sites, "Surface water is scarce in Karst areas, so water cellars can intercept surface runoff to ensure agricultural irrigation". In terms of cultural supplement. Add labels for ethnic minority folk customs, such as "Dong Rice Field Fish Farming Festival: Held in June every year, reflecting the ecological wisdom of 'rice-fish symbiosis'". In terms of outcome application. Publish the digital map on the official WeChat account of the school's geography club for teachers and students to access; donate the map to primary and secondary schools in the heritage site to serve as local geography teaching resources.

3.3.3 Interdisciplinary geography-themed practical collaboration

With "Karst agricultural heritage" as the theme, collaborate with biology, history, and art disciplines to design comprehensive practical activities, realizing literacy cultivation with "geography as the core and multi-disciplinary support."

Biology: Explore the ecological chain of "rice field fish farming" (rice → pests → fish → fish manure → rice). Students collect water samples from paddy fields, observe the types of plankton, and understand the "symbiotic relationship between organisms".

History: Sort out the evolution of Karst agricultural techniques (e.g., the development from "slash-and-burn farming" to "stone-ridge terraced fields"); create a "heritage technology timeline" based on local chronicles.

Art: Create paintings of "Karst agricultural landscapes" with terraced fields and water cellars as prototypes, incorporating Miao batik and Dong embroidery patterns to reflect the integration of "geographic landscapes and cultural art".

Outcome Integration: Compile the Practical Exploration Handbook of Karst Agricultural Cultural Heritage, which includes interdisciplinary practical reports, paintings, and QR codes for the digital map, forming a complete set of interdisciplinary practical outcomes.

4. Effect Evaluation of Integrating Agricultural Cultural Heritage into Geography Practical Teaching

Teachers should select appropriate evaluation methods based on multi-dimensional teaching objectives, design various evaluation tasks, and strive to achieve diversification of evaluation subjects, multi-dimensionalization of evaluation content, and diversification of evaluation methods [12]. The integration of agricultural cultural heritage into geography practical teaching adopts a comprehensive evaluation method combining process evaluation and summative evaluation (each accounting for 50%).

4.1 Process Evaluation

Evaluate students through three indicators: "completion of practical task sheets," "quality of field observation records," and "participation in group discussions," as detailed below:

Completion of Task Sheets: Evaluate the accuracy of data (e.g., the error of terraced field slope measurement $\leq 1°$) and the completeness of records (whether all observation items are filled in).

Quality of Observation Records: Evaluate the clarity of photo annotations (whether the connection between "heritage techniques and geographic principles" is explained) and the detail of interview records (whether villagers' original words are included).

Participation: Evaluate students' performance in experiments, interviews, and discussions (e.g., whether they proactively propose research questions) through group mutual evaluation (40%) and teacher evaluation (60%).

4.2 Summative Evaluation

Evaluate students' practical outcomes from three dimensions: "scientificity, innovation, and practicality," as shown in the Table 2.

5. Conclusion

Agricultural cultural heritage in Karst mountainous areas has three characteristics: "ecological fragility, human-land coordination, and cultural coupling." It can serve as high-quality resources for middle school geography practical teaching and effectively align with the core literacy cultivation goals of "regional cognition, comprehensive thinking, and the view of human-land coordination." The three-stage framework of "classroom teaching - field investigation - project research" realizes the progression of heritage resources from "material transformation" to "field verification" and then to "innovative application." Among them, geographic experiments, hierarchical field tasks, and interdisciplinary projects can effectively improve students' geographic practical abilities. The combined use of process evaluation and summative evaluation to assess the effectiveness of geography practical teaching based on Karst agricultural cultural heritage makes the evaluation conclusions more scientific and objective. However, the research pilots only cover three provinces (Guizhou, Guangxi, and Yunnan), resulting in a narrow sample range; the practical path does not involve "online virtual practice," so the forms need to be enriched. In the future, the research area can be expanded to include Karst regions such as Chongqing and Sichuan; in line with the trend of "digital education," a "VR practical course on Karst agricultural cultural heritage" can be developed to solve the problem that "students in remote areas cannot conduct on-site investigations." This will further explore the diversified integration paths of "agricultural cultural heritage and middle school geography practical teaching" and promote the integration of heritage into regular geography teaching.

Table 2. Summative Evaluation Scale

Evaluation Dimension	Practical Report	Score (100 points)
Scientificity	Accurate application of geographic principles; correct analysis of the relationship between terraced fields and soil-water conservation; verifiable slope measurement data.	40 points
Innovation	Proposal of unique suggestions for heritage protection (e.g., using VR technology to demonstrate the process of terraced field construction)	30 points
Practicality	Clear report structure; feasible suggestions (e.g., suggestions for water cellar upgrading are in line with	30 points

Acknowledgments

This study was supported by the Major Undergraduate Teaching Research Project of Guizhou Normal University, titled "Construction and Implementation of the 'Middle School Geography Practice Guidance' Course Based on Enhancing the Core Competence of Normal Students' Employment". (Project Number:2024-XZD-LH-06).

References

[1] Wei Yuan, Wu Changyong, Zhao Yongshun, et al. Research on the Development Predicament, Influencing Factors and Paths of Ecological Agriculture in Karst Mountainous Areas of Guizhou Province. Anhui agricultural science, from 1 to 5 [2025-10-12]. https://link.cnki.net/urlid/34.1076.s.20250227.2041.015.

[2] Yao Cancan, Wang Ying, Sun Yehong, et al. Appreciate type explore methods and application prospect in agricultural cultural heritage research. Journal of ancient and modern agriculture, 2021, (4): 78-87 + 14. DOI: CNKI: SUN: GJNY. 0.2021-04-009.

[3] Yan Zhenkai. Research on Teaching Strategies of Middle School Geography Education under the Goal of Core Literacy. Scientific advisory, 2025, (7): 162-165. The DOI: CNKI: SUN: KXZK. 0.2025-07-041.

[4] Liang Qianwen, Jia Yanhong, Qin Zhenjie, et al. The Integration of Intangible Cultural Heritage in High School Geography Teaching: A Case Study of "Regional Culture and Urban-Rural Landscape". Middle school geography teaching reference, 2023, (23): 52 + 49-68. The DOI: CNKI: SUN: ZDCK. 0.2023-23-013.

[5] Ding Yong. Live transmission power tea area rural revitalization of agricultural cultural heritage. Chinese tea industry bulletin, 2022, 44(3): 99-103. The DOI: 10.16015 / j.carol carroll nki jteabusiness. 2022.0026.

[6] Zhang Yifeng. Characteristic Agriculture Realizes Regional Value: A Typical Study on the High-Quality Development of Yukou Millet Industry and Ecology. Ecological civilization in China, 2021, (01): 82-84. The DOI: CNKI: SUN: STWM. 0.2021-01-018.

[7] Wang Shiyu, Liu Wenchao, Li Hui, et al. Shunping county peach industry collaborative innovation ecosystem evaluation. North garden, 2021, (23): 158-168. The DOI: CNKI: SUN: BFYY. 0.2021-23-022.

[8] Ben wang. Rice-fish reduce cost increase technology. Journal of rich fishing guide, 2019, (20): 38-40. The DOI: CNKI: SUN: YYZF. 0.2019-20-022.

[9] Hou Liyu, Tian Sining. Design of High School Performance-Oriented Geography Homework Aimed at Cultivating Practical Geographical Ability under the Background of "Double Reduction". Middle school geography teaching reference, 2025, (22): 62-66. The DOI: CNKI: SUN: ZDCK. 0.2025-22-016.

[10] Shi Tianhao, Zhe Meng. Pointing to high school geography teaching design to explore the theme of the cohesion. Journal of basic education research, 2025, (5): 55-58. DOI: CNKI: SUN: JCJY. 0.2025-05-013.

[11] Wang Shu, Feng Haijian. Curriculum Design of Research-based Learning Based on the Cultivation of Geographical Practical Ability: A Case Study of a Certain Real Estate Project. Middle school geography teaching reference, 2023, (18): 28 to 30. DOI: CNKI: SUN: ZDCK. 0.2023-18-009.

[12] Yan Yijun, Dai Wenyuan, Tian Yuan. Research on the Integration of World

Cultural Heritage into Geography Teaching from the Perspective of Systems Theory: Taking "Quanzhou: The World Maritime Trade Center of Song and Yuan China" as an Example. Geography teaching, 2023, (11): 18 to 22. DOI: CNKI: SUN: DLJX. 0.2023-11-004.