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Exploring and Applying Interdisciplinary Teaching Elements in Foreign Language Teaching and Research Press High School English Textbooks: A Case Study of B1U6 Longji Rice Terraces

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Abstract

This study aims to explore and apply interdisciplinary elements in high school English textbooks, using the lesson Longji Rice Terraces as a case. Grounded in Content and Language Integrated Learning, interdisciplinary teaching theory, and constructivism, the research employs literature review and content analysis to identify geographical, historical, and biological elements embedded in the text, illustrations, and exercises. The findings reveal that the lesson offers rich interdisciplinary content, including principles of mountain terrain modification, rainwater harvesting, soil conservation, ethnic cultural heritage, historical construction timelines, ecosystem dynamics, and sustainability concepts. Based on these analyses, a comprehensive teaching plan is designed for first-year high school students, specifying language, cultural, thinking, and learning objectives, along with modular activities such as contour mapping, historical role-play, ecosystem concept mapping, and a debate on sustainable agriculture. The study confirms the feasibility of using English textbooks as vehicles for interdisciplinary instruction and provides practical references for teachers to integrate multiple disciplines into English classrooms, thereby fostering students' holistic competencies and interdisciplinary thinking.

Keywords

Interdisciplinary teaching; High school English; Longji Rice Terraces; Content and Language Integrated Learning; Textbook analysis

1. Introduction

1.1. Research Background and Significance

Following the promulgation and implementation of the English Curriculum

Standards for Senior High School (2017 Edition, Revised in 2020), interdisciplinary teaching has become a critically important direction in English education reform. The new curriculum standards explicitly state that English courses should "further strengthen connections with other disciplines and place emphasis on cultivating students' interdisciplinary competence" (Ministry of Education, 2020). This requirement not only reflects the urgent social demand for versatile talents but also demonstrates a clear shift in the English discipline from being a mere language tool towards fostering comprehensive competences. However, in the current reality of senior high school English instruction, problems such as rigid disciplinary boundaries and fragmented teaching content remain widespread, and teachers' ability to explore and utilise interdisciplinary elements within textbooks still requires significant improvement. In recent years, many domestic scholars have actively conducted a series of exploratory studies on English interdisciplinary teaching, successfully constructing frameworks that integrate English core competencies with interdisciplinary abilities, which undoubtedly provide valuable references for this research.

This study takes the lesson Longji Rice Terraces as an example to analyse its interdisciplinary elements and design corresponding teaching plans. This undertaking holds significance in three aspects: theoretically, it enriches the application research of interdisciplinary teaching theory in senior high English education; practically, it offers practical references for teachers to implement interdisciplinary instruction; and educationally, it helps cultivate students' interdisciplinary thinking and comprehensive competences, thereby responding to the talent cultivation demands of the new era.

1.2. Research Methods

This study adopts literature review and content analysis methods. It systematically reviews relevant literature on Content and Language Integrated Learning, interdisciplinary teaching theory, and constructivist learning theory to establish a theoretical framework. Subsequently, it employs content analysis to encode and analyse the text, illustrations, and exercises in *Longji Rice Terraces*, extracting geographical, historical, and biological elements to lay a foundation for subsequent teaching design.

2. Theoretical Foundations

2.1. Content and Language Integrated Learning Theory

Content and Language Integrated Learning originated from bilingual education practices in Europe in the 1990s and has been further developed in Asian contexts in recent years. It is a dual-focused pedagogical approach that combines subject content learning with foreign language learning. Its core premise is that language

should not be treated as an isolated object of study but rather as a tool and medium for learning content from other disciplines (Coyle et al., 2010). This approach is based on the 4Cs framework—namely, the organic integration of four dimensions: Content, Communication, Cognition, and Culture (Coyle, 2006). It emphasises the creation of an immersive language environment through project-based practice and collaborative teaching-research activities in authentic contexts, aiming to cultivate versatile talents with innovative application skills and an international perspective. Under this teaching model, students naturally acquire language proficiency through the study of subject knowledge, while simultaneously using language tools to more effectively master professional content. It is precisely this mutual reinforcement between content and language that enables CLIL to transcend the limitations of traditional language instruction, enhancing both linguistic competence and subject understanding, thus achieving a "1+1>2" teaching effect.

2.2. Interdisciplinary Teaching Theory

Interdisciplinary teaching, as an innovative instructional model, is characterised by its capacity to break down the barriers traditionally existing between disciplines. It uses real-world problems or themes as connecting links to achieve an organic integration of knowledge, methods, and ways of thinking from multiple disciplines (Jacobs, 1989). According to the latest research by Drake and Reid (2018), this teaching model differs essentially from traditional multidisciplinary teaching. Specifically, the former establishes conceptual connections among different disciplines to form a new cognitive framework, whereas the latter merely maintains disciplinary knowledge in a juxtaposed state. In this process, students are no longer passive recipients of fragmented disciplinary knowledge; instead, they actively explore the intrinsic interconnections among different fields, weaving scattered knowledge points into a dynamic knowledge network. Teachers guide students to discover deep-level connections across disciplines by carefully designing open-ended problem situations, thereby fostering holistic thinking and enhancing students' ability to solve complex problems. This integration occurs not only at the knowledge level but is even more evident in the restructuring of students' cognitive structures. Students gradually learn to analyse issues from multiple perspectives, developing a more flexible and adaptive way of thinking. It is precisely this deep integration that constitutes a complete interdisciplinary cognitive system, effectively improving students' conceptual understanding and their capacity for knowledge transfer and application.

2.3. Constructivist Learning Theory

Constructivist learning theory holds that knowledge is not acquired through mere transmission by teachers, but rather that learners, situated in specific contexts, construct meaning through interaction with others and by utilising

necessary learning resources (Vygotsky, 1978). Based on this theory, the key to interdisciplinary teaching lies in creating authentic and complex learning situations that guide students, through interaction and integration of multidisciplinary knowledge, to actively construct a more comprehensive understanding of problems. Teachers are no longer mere transmitters of knowledge in a single direction; they become designers and facilitators of learning activities. By building bridges between different disciplines, they help students explore the inherent connections among knowledge from various fields. At the same time, collaborative learning and social interaction are particularly important in interdisciplinary teaching. Students can broaden the boundaries of their thinking through group discussions, project-based cooperation, and other forms of mutual exchange, thereby transcending the limitations of any single discipline. This teaching approach not only cultivates students' integrative thinking abilities but also stimulates their innovative consciousness, laying a solid foundation for addressing the complex and diverse problems of the real world.

3. Analysis of Interdisciplinary Elements in the Textbook

3.1. Geographical Elements

The Longji Terrace system in Guilin is a vivid example of how ancient ancestors adapted to and made full use of nature (Zheng, 2019). The textbook text clearly states: "there are few large, flat areas of land in the region" and "the mountains are steep and the soil is shallow," which undeniably reflect the geographical characteristics of Guangxi's mountainous areas—steep terrain and a scarcity of flat land. Under such natural conditions, the Zhuang and Yao people creatively "turn the entire mountains into terraces," achieving a functional transformation of the terrain through human intervention.

The terrace irrigation system demonstrates the ancient labouring people's profound and unique understanding of water resources and their efficient use. Yichun Wei (2010) noted that the ancient Zhuang village of Liaoja in Longji, through carefully designed canal networks and water-dividing devices, successfully achieved cascade utilisation of mountain spring water and fair distribution. As described in the text: "hundreds of waterways that connect with each other... rainwater moves down the mountains and into the terraces... The sun heats the water and turns it into vapour... rain falls down onto the mountain terraces once again." The local ecological philosophy that "only with forests can there be water" closely and organically integrates water resource protection with the forest ecosystem, offering valuable inspiration for contemporary sustainable water management.

The phrase "prevent the soil from being washed away," as mentioned in the text, effectively highlights the core ecological function of terraces. In practice, this

function has been fully verified: after transforming continuous slopes into stepped platforms, terraces not only greatly reduce surface gradients but also restructure the entire hydrological process. This stepped structure, by intercepting runoff paths and prolonging rainwater infiltration time, significantly reduces the scouring force of runoff (Xiao, 2019). Each terrace ridge acts like a natural barrier, layer by layer preventing soil and water loss, thereby preserving the tillage layer intact. Such an ingenious design both aligns with natural laws and fully demonstrates human wisdom in adapting to and modifying the environment, ultimately achieving a harmonious balance between ecological protection and agricultural production.

3.2. Historical Elements

The terrace culture of the Zhuang and Yao peoples systematically reveals the deep integration of their cosmology and ecological practices. In the case of Longji Terraces, its spatial pattern of "forest – village – terrace – water system" not only constitutes a material production system but also, through various cultural practices such as sacrificial activities and local village rules and customs, has formed an ecological ethic system characterised by "harmony between man and nature" (Bao et al., 2021). The relevant text opens by pointing out that the terraces "were built by the local Zhuang and Yao people" and later emphasises that "traditions hold much value." The ancestors of the Zhuang and Yao peoples combined the rice-growing tradition inherent in "Na culture" with the mountainous environment, developing coupled farming techniques and establishing water-management institutions such as the "water-dividing gate," thereby turning the terraces into carriers of a living culture that "governs according to the mountain" (Fu, 2017).

The clear temporal framework provided in the text—"Starting in the Yuan Dynasty... until its completion in the early Qing Dynasty"—offers precise coordinates for historical analysis. This construction process, spanning over four hundred years across three dynasties, vividly illustrates the gradual nature of agricultural development in China's minority regions. In the early Yuan Dynasty, the Zhuang ancestors began cultivating small-scale terraces in the Longji mountain area using relatively primitive "slash-and-burn" farming methods. By the mid-Ming Dynasty, with the introduction of advanced farming techniques and iron tools brought by Han immigrants, the scale of terraces expanded significantly and a preliminary irrigation system emerged. In the early Qing Dynasty, under the governance of the chieftain system, local residents further improved the terrace water conservancy facilities and farming systems, ultimately creating the magnificent landscape we see today (Li et al., 2017). This lengthy development process not only reflects the wisdom of ethnic minorities in adapting to mountain environments but also mirrors the historical path of multi-ethnic cultural exchange and integration.

The contemporary value of traditional farming wisdom is not limited to

technological inheritance; rather, it is more deeply embedded in the systematic continuity of cultural genes. The three-dimensional ecosystem composed of "forest, village, terrace, and water system" in the area, through various cultural carriers such as village rules and sacrificial activities, transforms and encodes relevant ecological knowledge into so-called "replicable cultural landscape genes" (Bao et al., 2021). As the text's conclusion emphatically states: "This knowledge is passed down through families... continue to use ancient methods of agriculture." Specifically, the Zhuang and Yao peoples have skillfully integrated the ecological concept of "harmony between man and nature" into their productive practices, so that knowledge of sustainable agriculture can be effectively revitalised through both material and intangible cultural channels.

3.3. Biological Elements

Terraces foster agricultural biodiversity and maintain ecological balance through species interactions. The text mentions that terraces "provide a perfect environment for birds and fish," and that these organisms "feed on insects that can harm the rice crops," thus demonstrating a synergistic mechanism between artificial cultivation and natural ecology. The phrase "some of which feed on insects" further reveals the implicit food-chain relationships within the terraces: birds and fish act as predators, helping to stabilise the entire system by suppressing pest populations. This mutual biological regulation is exactly the core mechanism that maintains ecosystem stability (Li et al., 2021). Consequently, terraces serve as dual carriers of biodiversity conservation and agricultural production—optimising ecological functions through species diversity while achieving a delicate balance of "rice-organism symbiosis" through human intervention.

The concluding part of the text emphasises that the terraces are "created by people and nature working together," a statement that underscores the vital concept of harmonious coexistence between humans and nature. The rice-terrace system is a significant agricultural heritage site, representing not only the wisdom of human adaptation to and transformation of the natural environment but also exemplifying the principles of sustainable agriculture. In terms of agro-ecological conservation, it achieves recycling of resources through functions such as soil and water conservation and biodiversity maintenance. In cultural heritage preservation, it retains traditional farming techniques and local knowledge. In terms of sustainable agricultural development, it offers valuable experiences for modern ecological agriculture (Min et al., 2015). This model of "human-nature collaboration" provides important insights for global agricultural sustainability.

4. Interdisciplinary Teaching Design

4.1. Teaching Objective Design

With regard to the text content, the language competence objectives focus on three

levels. At the lexical level, students are expected to master interdisciplinary core vocabulary such as terrace, irrigation, ethnic group, and ecosystem, and to accurately use subject-specific terms like contour line, soil erosion, and biodiversity. At the grammatical level, they should be able to use comparatives and the passive voice proficiently to describe geographical features and historical processes. At the discourse level, they need to integrate information from geography, history, and biology to write a short composition of about 150 words introducing the Longji Rice Terraces. To achieve these goals, teachers may design a vocabulary classification table as shown below to help students build a subject-specific lexical network.

In terms of cultural awareness, students will develop a thorough understanding of the Zhuang and Yao peoples' ecological ethic of respecting nature and living in harmony with it, thereby fostering recognition and respect for traditional cultural values. Through experiential learning activities, students will enhance their empathy towards ethnic cultures and gain a personal appreciation of the ecological wisdom and humanistic spirit embedded within. On this basis, students will translate their acquired cultural cognition into concrete actions, actively participating in cultural heritage preservation and ecological protection, thus building cultural confidence and a sense of responsibility.

The primary direction for cultivating thinking quality is to guide students in developing systematic, critical, and innovative thinking patterns. When analysing the intricate interconnections between natural and human elements within the terrace system, students will gradually cultivate systematic thinking and form holistic understanding. When discussing, comparing, and evaluating different agricultural models, students will learn to examine issues from multiple angles and construct a framework for dialectical thinking. Meanwhile, students will also attempt to propose sustainable development solutions that integrate traditional and modern elements, thereby arousing their innovative awareness and enhancing their ability to solve practical problems.

The enhancement of learning ability focuses on the integrated development of information synthesis, collaborative inquiry, and multiple modes of expression. Students will identify, select, and synthesise information from multimodal materials, thereby improving their capacity for autonomous information processing. During cooperative project-based tasks, students will strengthen teamwork and collective inquiry skills. Moreover, by effectively presenting learning outcomes through various media, they will reinforce their abilities in logical organisation and creative expression.

4.2. Interdisciplinary Module Design

The interdisciplinary teaching plan is organised around three subject modules—geography, history, and biology—each containing a set of hands-on activities that integrate language use with content learning.

For the geography component, students first engage in a contour-line mapping exercise. The teacher presents a topographic map of the Longji Terraces marked with elevations and slopes, reviews basic principles of contour lines, and explains their role in terrace design. Each student then draws a schematic on blank paper, using blue and brown pens to indicate main irrigation channels, water flow direction, and terrace ridge alignments. The teacher circulates to offer guidance, and after completion, selected drawings are evaluated by the whole class for accuracy. In a second activity, students work in groups to decide the optimal location for terrace construction—at the foot, middle slope, or top of a mountain—by considering soil depth, water access, and labour convenience. They must articulate their choice in English, and after group presentations, the teacher reveals that the middle slope is ideal because it offers thicker soil, easier water diversion, and avoids flooding and wind erosion. A third activity involves a three-minute micro-live broadcast in English, where each group introduces the terraces' geographical features with hand-drawn visuals, explains soil-conservation principles using diagrams, and delivers conservation appeals with all members on camera. The teacher provides linguistic scaffolds, and final evaluations consider scientific accuracy, fluency, and creativity, with awards for "Best Scientific Explanation" and "Best Creativity."

In the history module, students begin by constructing a timeline of terrace construction. The teacher displays key historical milestones as cards on a PPT, and students arrange them chronologically and classify them into political, technological, and cultural events. Afterward, the teacher projects the correct timeline and leads a discussion on how historical events influenced terrace development. Next, a role-play activity sets the scene in autumn 1602, when a Zhuang stone mason and a Yao wood craftsman collaborate to fix a terrace leakage problem. Students pair up to act out these roles, using English to discuss repair strategies. Each pair receives role cards with background details and key vocabulary, along with language scaffolds. After three minutes of preparation, they perform, and the teacher provides feedback on language delivery and cultural accuracy. A third activity asks students to imagine they are young labourers at the end of the Yuan Dynasty participating in terrace construction. They write a bilingual postcard with about 80 words in English to their ancestors, describing project progress, environmental challenges, and their determination to continue the work with ancestral wisdom. The front of the postcard features a hand-drawn illustration, and the back contains the message. The teacher supplies a format model and organises a class exhibition titled "Best Historical Sense" to showcase outstanding postcards.

For the biology module, the first activity focuses on ecosystem mapping. The teacher highlights the "birds – fish – insects – rice" relationship chain from the text and guides students, in groups, to draw a material-cycle diagram of the terrace ecosystem. They can add more organisms and use arrows to show matter flows, thereby visualising the ecosystem's structure and function. Groups then present

their concept maps, and the teacher emphasises ecological balance and the synergy between human-managed agriculture and natural processes. A second activity is a structured debate on the motion: "Traditional terrace farming is more sustainable than modern intensive agriculture." The class divides into pro and con sides, with the affirmative arguing for biodiversity, soil health, and ecological equilibrium, and the negative highlighting higher yields, efficiency, and resource optimisation. The teacher acts as moderator, providing language frames and argument structures so students can use subject-specific terms clearly. After the debate, a reflective discussion acknowledges that both models have appropriate contexts and limitations, fostering a dialectical understanding of sustainable agricultural pathways. In a third activity, students address real-world challenges such as labour shortages by writing a bilingual recommendation letter of about 150 words. They begin by analysing problems and must cite textual data or facts to support their suggestions. In proposing solutions, they blend traditional ecological wisdom with modern technology to demonstrate understanding of sustainability, and they conclude with three concrete, actionable recommendations. Outstanding letters may be sent to the local tourism bureau, contributing youth perspectives to terrace preservation and sustainable development.

5. Conclusion

The lesson Longji Rice Terraces closely adheres to the theme of "harmonious coexistence between man and nature," skillfully integrating perspectives from geography, history, and biology, thus providing authentic and richly contextualised materials for interdisciplinary English learning. Building on this, the present study has constructed an interdisciplinary teaching framework that spans from text analysis to activity design, clearly outlining a practical pathway for implementing interdisciplinary instruction in English and offering useful references for English teachers. Nevertheless, due to limitations such as a single case study and lack of empirical validation, future research should expand the scope of inquiry, examine the effectiveness of these designs through classroom practice, and further explore new avenues for interdisciplinary English integration supported by intelligent technologies.

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