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Virtual Simulation Technology Empowers Red Revolutionary Cultural Resources: A New Paradigm of Teaching Ideological and Political Courses in Hong Kong

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Abstract

Current ideological and political education in Chinese universities and primary/secondary schools faces structural challenges including difficulties in implementing field-based research, restoring historical contexts,and fostering student-centered participation.The traditional"teacher-led lectures+ multimedia presentations"model struggles to achieve deep integration of value guidance and emotional resonance.The National Cultural Heritage Administration's"Implementation Plan for Empowering School Ideological Education through Revolutionary Cultural Resources"explicitly requires fully activating the educational value of revolutionary relics to promote integrated ideological education across all educational levels.Grounded in this policy framework, this study constructs a new teaching paradigm of"virtual scenario support – immersive exploration–value recognition"using Hong Kong's collaborative rescue of revolutionary cultural relics with Shenzhen,Guangdong as a core initiative. The research addresses three dimensions: resolving pedagogical pain points,building theoretical systems, and developing systematic designs.It focuses on analyzing virtual simulation technology's activation mechanism for revolutionary cultural resources,exploring innovative pathways for integrating these resources into ideological education models.The study provides actionable solutions for transitioning from"one-way indoctrination"to"immersive education," while offering theoretical support and practical references for cross-regional resource integration and model innovation in ideological education development.

Key words

virtual simulation;ideological and political education;situational construction;red revolutionary cultural resources;Hong Kong rescue

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1. Introduction

As a core course for implementing the fundamental task of fostering virtue and nurturing talents, ideological and political education carries the important mission of inheriting the red gene and cultivating new-era individuals. The Great Rescue of Hong Kong Cultural Celebrities is a significant event in the history of the War of Resistance against Japan, with the Guangdong-

Hong Kong-Macao regions preserving abundant related revolutionary cultural relics, forming a historical chain of "initiated in Hong Kong—transferred in the Bay Area—placed in the mainland." The China Cultural Celebrities Rescue Memorial Hall in Longhua District, Shenzhen, as a key witness site, treasures numerous important relics, showcasing the red spirit of unity between the military and civilians in the Guangdong-Hong Kong-Macao region, and serves as precious material for situational teaching in ideological and political education. Virtual simulation technology, through digital twins, 3D modeling, and human-computer interaction, can construct a "visibly interactive" blended virtual and real teaching environment, achieving the reenactment and revitalization of red history, echoing innovative requirements such as "ideological and political education in memorial halls" and "mobile ideological and political education" [1]. This technology not only endows revolutionary relics with new vitality but also aligns with the interpretation of educational ecological innovation in the "scene era" theory. To this end, this paper leverages the cultural relics resources of the Great Rescue of Celebrities from the Guangdong-Hong Kong-Macao region to develop the virtual simulation teaching system "A Red Rescue Across Time and Space," promoting deep integration of technology and resources, and achieving "three transformations": converting scattered resources into "full-chain rescue" teaching materials; transforming abstract events into participatory immersive experiences; and shifting from one-way instruction to interactive exploration. Simultaneously, drawing on the "learning scene" theory, it optimizes the compatibility between virtual scenes and cultural relics resources, exploring practical pathways for their integration, providing references for enhancing the effectiveness of ideological and political education.

2. Design and Development of Virtual Simulation Teaching System: Practice Exploration of Hong Kong Cultural Celebrity's Rescue of Red Revolutionary Cultural Relics

The virtual simulation teaching system developed in this study centers on the theme of "Hong Kong Cultural Celebrities Rescuing Red Revolutionary Cultural Relics in the Greater Bay Area Collaboration." It adopts a core model combining virtual simulation with red revolutionary relics, aiming to address teaching challenges, enhance value guidance, and improve participation effectiveness. The system is meticulously designed and developed in strict compliance with the relevant policies of the National Cultural Heritage Administration.

2.1. Three-dimensional Target System and Four Principles of System Design

The three-dimensional goal system. Combining the educational requirements of ideological and political courses, students 'cognitive characteristics, the distinctive features of Hong Kong cultural celebrities' rescue of red revolutionary cultural relics, and the spirit of the policy, a systematic "knowledge goal—ability goal—value goal" trinity goal system is constructed: The knowledge goal focuses on mastering key historical nodes such as the strategic decision-making of the Hong Kong cultural celebrities 'rescue, the Guangdong-Hong Kong-Shenzhen transfer route, and the core hub role of Shenzhen's Baishi Long, understanding the historical value of red revolutionary cultural relics like the China Cultural Celebrities Rescue Memorial Hall, and clarifying the formation logic of the red spirit of "unity, cooperation, fearlessness in sacrifice, and adherence to faith" [2]; The ability goal emphasizes cultivating students 'historical material analysis skills, cross-regional resource integration and cognition skills, theoretical application skills, and innovative expression skills; The value goal aims to deepen students' recognition of the Communist Party of China's pivotal role in the War of Resistance, inspire their sense of responsibility in inheriting the red genes of Guangdong-Hong Kong-Macao, establish correct worldviews, outlooks on life, and values, enhance their patriotism, and implement the fundamental goal of the policy to "cultivate a new generation of patriotic dedication and responsibility for national rejuvenation." The three-dimensional goals are interconnected and progressively layered, forming a complete educational goal system[3].

The Four Principles of System Design. The system design adheres to four core principles: The Relevance Principle emphasizes deep integration of revolutionary

cultural resources from Hong Kong, Guangdong, and Shenzhen, constructing a "Hong Kong Cultural Figures 'Great Rescue Full-Chain" digital education system. This strengthens cross-regional historical connections and spiritual inheritance, highlighting Guangdong's role as the rescue destination and Shenzhen's core hub in red culture, thereby enhancing the appeal and impact of ideological and political education. The Adaptability Principle requires the system to align with actual teaching practices and students' cognitive characteristics in three aspects: class scheduling, technical operations, and cognitive difficulty. Simplified operational procedures with detailed guidelines ensure participation for students of varying learning foundations, combining universality with operability[4]. The Inquiry Principle guides students toward autonomous and exploratory learning through open-ended questions, diverse historical materials, and a fault-tolerant environment, avoiding "cramming-style" teaching. The Rigor Principle establishes a three-tiered safeguard mechanism: "historical material collection—expert review—teaching adaptation." Historical material collection includes official archives from Guangdong, Hong Kong, and Macao, authoritative documents, museum collections, and oral histories from eyewitnesses. The expert review team comprises Party history scholars, history teachers, Great Rescue researchers, and museum researchers, ensuring content accuracy and seriousness while strictly adhering to the policy requirement of "deepening revolutionary cultural research and ensuring historical authenticity" [5].

2.2. Core Module Design: Three-dimensional Architecture of Virtual Simulation of Red Revolutionary Cultural Relics

To address the three major pain points in traditional ideological and political education, this study systematically constructs three core modules— 'Digital Twin Module of Red Revolutionary Cultural Relics,' 'Cross-Regional Contextual Interaction Module,' and 'Multidimensional Feedback Evaluation Module' — by integrating the exploration needs of revolutionary relics, scenario empowerment theory, and policy requirements. These modules form a complete teaching loop of 'Resource Activation—Contextual Exploration—Effectiveness Enhancement,' ensuring the coherence and practicality of the educational process.

2.2.1. Digital Twin Module for Red Revolutionary Cultural Relics

This module provides "real, systematic, and interactive" contextual support for the exploration of red revolutionary relics, addressing three core issues in traditional teaching: "insufficient contextual authenticity," "disconnected resource relevance," and "difficulty in large-scale coverage" in field studies. The module development follows a five-step process: "field research—data collection—3D modeling—historical material review—optimization and adaptation." The project team organized a specialized team to conduct on-site investigations at key sites such as the Hong Kong Causeway Bay Shelter, Shenzhen China Cultural Celebrity Rescue Memorial Hall, Huizhou East Lake Hotel, and Longchuan Laolong Fujian Guild Hall. They collected over 1,200 high-definition images, more than 300 sets of panoramic photos, and over 300 sets of physical texture data. Using the Unity3D engine, they created a 1:1 digital twin reconstruction, accurately replicating key scenes and relics such as the straw hut "hostel," secret traffic stations, transfer boats, and coffee shop meeting points. A review panel was formed by Party history experts and memorial hall researchers to conduct dual verification of the details of the Guangdong-Hong Kong-Macao linkage scenarios and the accuracy of historical materials, ensuring historical authenticity.

The module features four core functions: "full-chain scenario positioning—cross-regional resource linkage retrieval—historical context analysis—multi-location scenario navigation." The scenario positioning function utilizes the "Digital Twin Map of Red Revolutionary Cultural Resources in the Guangdong-Hong Kong-Macao Greater Bay Area" to enable rapid positioning and autonomous selection of target scenarios such as Hong Kong junction points, Guangdong-Hong Kong transfer routes, and the Shenzhen China Cultural Figures Rescue Memorial Hall, thereby enhancing learning efficiency [6]. The resource retrieval function sets up "historical trigger points" within the scenarios. Students can click on specific red revolutionary cultural relics, such as the Hong Kong junction signal artifact, Mao Dun's inscription at the Shenzhen Memorial Hall, or the

accommodation register at Huizhou East Lake Hotel, to retrieve corresponding authoritative historical materials and the associated historical background of the three regions, achieving a cognitive connection of "cultural relics—historical materials—cross-regional history." The historical context analysis function links different scenarios along a timeline, forming a "full-chain digital corridor of the Hong Kong Cultural Figures Rescue," clearly presenting the complete journey of "Japanese occupation of Hong Kong—emergency rescue decision—multiple Guangdong-Hong Kong transfer routes—core resettlement in Shenzhen—dispersed relocation inland," helping students build a systematic historical understanding. The scenario navigation function supports rapid cross-regional scenario switching, such as directly jumping from the 1941 Hong Kong Causeway Bay junction point to the resettlement site in Shenzhen's Baishilong Village, then to the Longchuan Laolong transfer station, meeting the needs of cross-regional exploration.

Through technological innovation and functional design, this module reduces the cost of a single Guangdong-Hong Kong-Macao joint study tour to under 20 yuan per person, achieving full coverage of red revolutionary cultural resources. Meanwhile, by constructing cross-regional high-fidelity scenarios and delivering relevant historical materials, it provides a "full-chain rescue" situational support for ideological and political education. This effectively integrates scattered red resources across the Greater Bay Area, addressing the issues of resource fragmentation and lack of relevance in traditional teaching methods [7].

2.2.2. Cross-regional Scenario Interaction Module

This module centers on red revolutionary relics as its core medium to create multidimensional interactive scenarios, effectively addressing the traditional teaching challenges of "low engagement and superficial exploration." Focusing on four key teaching themes— "the strategic decision-making behind the rescue of Hong Kong cultural luminaries," "the collaborative mechanisms of the Guangdong-Hong Kong-Shenzhen transit," "Shenzhen's historical significance as a pivotal hub," and "the contemporary inheritance of the red spirit" —it designs interactive tasks such as "decoding secret signals," "planning transit routes," "recreating resettlement scenarios," and "interpreting relic narratives." Each task centers on red revolutionary relics as its core inquiry, tailored for 1-2 class hours of ideological and political education to prevent task overload [8].

The module supports multiple interactive formats: In terms of human-computer interaction, students can converse with AI-voiced historical figures such as Liao Chengzhi, Zeng Sheng, and Mao Dun, asking questions like "the challenges of rescue decisions" or "the details of Bai Shilong's resettlement." The AI responds by integrating authoritative historical records and the background of red revolutionary relics, offering both voice and text interactions for natural and smooth dialogue. For artifact interaction, students can zoom in to examine details of the Shenzhen China Cultural Figures Rescue Memorial Hall, such as celebrity manuscripts and models of transport ships, triggering relevant historical scene animations. For example, clicking on the "cattle shed model" allows students to view a recreated scene of cultural figures resting and teaching there, while clicking on the "flying pigeon bicycle model" reveals its historical background as a rendezvous marker. In collaborative interaction, students work in groups to complete the "cross-regional transport route planning" task online. By considering factors like Hong Kong's topography, Guangdong's transportation network, and Shenzhen's base distribution, and referencing clues from red revolutionary relics in virtual scenes, they formulate reasonable plans and explain their rationale. The system synchronizes group discussion progress and ideas in real time [9].

The module's innovation lies in its seamless integration of "cultural relic revitalization" and "interactive exploration." By employing "red-themed murder mystery" interactive tasks, it ignites students' enthusiasm while avoiding the monotony of traditional red-themed education. Cross-regional resource collaboration guides students toward systematic thinking, transcending narrow regional perspectives. Through deep integration of relics with historical settings, students gain profound insights into the value of revolutionary heritage during interactions, fully leveraging the educational potential of Hong Kong's cultural figures in rescuing revolutionary relics. Data shows that after implementing

this module, classroom participation surged from 45% to 92%, with students even discussing post-class: "This is so thrilling—our predecessors worked so hard!" This completely transformed the passive listening culture in ideological and political education classes.

2.2.3. Multidimensional Feedback Evaluation Module

This module enhances the exploration of revolutionary heritage through three core functions: intelligent feedback, achievement expansion, and multi-dimensional evaluation, effectively addressing traditional teaching challenges such as delayed feedback, rigid outcomes, and monotonous assessment. The module features an "spatiotemporal dialogue" intelligent feedback system that builds a knowledge base using authoritative documents and historical materials from the Guangdong-Hong Kong-Macao region. AI analyzes students' interactions and task performance to provide personalized feedback and supplementary recommendations on aspects like "accuracy in artifact interpretation," "historical coherence," and "collaborative coordination," ensuring timely and precise evaluation [10].

The module facilitates diversified expansion and sharing of inquiry outcomes. Students can transform their findings into research reports, micro-videos, cultural relic commentaries, and virtual drama scripts[11]. The system establishes a "Red Inquiry Outcomes Sharing Platform" to promote and reuse high-quality resources across schools, fulfilling the policy mandate to "establish a resource-sharing mechanism." Some students even formed "Red Propaganda Teams" to share the Great Rescue story in communities, turning virtual experiences into real-world practices[12]. This achieves the core goal of ideological and political education: "unity of knowledge and action."

The evaluation framework adopts a multi-dimensional system encompassing "knowledge mastery, competency enhancement, and value recognition." At the knowledge level, students 'grasp of historical significance of revolutionary relics and pivotal events in the Hong Kong cultural figures' rescue operation is assessed through historical material interpretation and artifact value analysis questions. Data indicates a 20% improvement in historical knowledge accuracy (from 68% to 89%). Competency evaluation measures task completion quality, teamwork performance, and presentation effectiveness to gauge students 'abilities in historical material analysis, collaborative inquiry, and innovative expression[13]. Value recognition is measured through students' project presentations, interactive participation, and practical actions, ensuring comprehensive and objective assessment that fully reflects the educational impact of ideological and political education courses.

3. Conclusion

As spiritual carriers of the red gene, the deep integration of red revolutionary relics with ideological and political education courses is an important approach to fulfilling the fundamental task of fostering virtue and nurturing talents[14]. This paper, based on the distinctive features of Hong Kong's rescue of cultural celebrities and red revolutionary relics in the Guangdong-Hong Kong-Macao Greater Bay Area, centers on the rescue site in Hong Kong, the transportation route remains in Guangdong, and the collection of the Shenzhen China Cultural Celebrities Rescue Memorial Hall[15]. By integrating virtual simulation technology with red revolutionary relics resources, it constructs a new paradigm of ideological and political education teaching— "virtual scene support—red resource activation—immersive exploration" —systematically addressing the challenges of traditional ideological and political courses, such as "difficulty in implementation, difficulty in restoration, shallow participation," and "weak resource correlation."

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