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AI-Empowered Inheritance of Red Industrial Culture and Ideological and Political Education in Universities in the Hainan Free Trade Port

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Abstract

At present, Hainan's red industrial cultural resources have profound educational potential. However, in the process of their practical inheritance, development, and integration into ideological and political education, several prominent practical shortcomings remain, including insufficient exploration of local resources, a low level of digital activation and development, and monotonous forms of educational integration. Closely following the fundamental educational purpose of fostering virtue through education, and based on the core strategic positioning of the high-quality development of the Hainan Free Trade Port, this paper deeply analyzes the internal value logic through which artificial intelligence technology supports the continuation and development of Hainan's red industrial cultural lineage and strengthens ideological and political education for value formation. Drawing on real local cases of red industrial practice in Hainan, including agricultural reclamation and pioneering development, coastal defense construction, aerospace supporting facilities, and port development, this paper systematically examines the current practical barriers and deep-seated causes that hinder the integration of red industrial culture into ideological and political teaching in local universities. From five practical dimensions—building a digital resource database, reconstructing digital-intelligent ideological and political classrooms, promoting multi-party coordination among universities, local governments, and enterprises, creating education-oriented intellectual property with Free Trade Port characteristics, and improving long-term development mechanisms—this paper explores a new practical pathway for universities in which artificial intelligence empowers the inheritance and development of red industrial culture and adapts ideological and political education to the needs of Free Trade Port construction.

Keywords

artificial intelligence, Hainan red industrial culture, Free Trade Port construction, ideological and political education in universities

1. Introduction

Hainan's red industrial culture is a comprehensive term for the material industrial relics, institutional construction practices, and spiritual value genealogy gradually accumulated under the leadership of the Party among cadres and people of all ethnic groups in Hainan across different historical stages, including the development of the agricultural reclamation and rubber industry, coastal defense infrastructure construction, port economic development, aerospace supporting engineering construction, and the early development of local industries. This culture is not only a continuation and concrete manifestation of the Qiongya red revolutionary cultural lineage in the field of industrial construction and development, but also a core original local resource for local universities to advance high-quality construction of the "big ideological and political education" framework and build an education system with local characteristics under the background of Hainan Free Trade Port construction. With the continuous implementation of the national education digitalization strategy, artificial intelligence, relying on multiple core technological advantages such as large language models, intelligent knowledge graphs, virtual digital human interaction, VR immersive experience, and big-data-based learning analytics, can effectively overcome the inherent shortcomings of traditional red culture communication, including static display, one-way didactic indoctrination, and weak educational effectiveness of on-site visits (Luo, 2026). It therefore provides new technological support and innovative practical models for the activation and utilization of red industrial cultural resources, the transformation and implementation of spiritual value, and the practice of ideological and political teaching.

Red industrial culture was born from the great practice of national industrialization construction in which the Party led the people of the whole country in self-reliance and hard struggle. It is a distinctive cultural type formed through the deep integration of red revolutionary culture and socialist industrial civilization. It centrally carries four core spiritual connotations: the founding spirit of the Party, the spirit of entrepreneurship, the spirit of struggle, and the craftsman spirit, and it has multiple core educational values, including the preservation of historical memory, the continuation and inheritance of culture, and ideological and political cultivation (Shang, 2024). Compared with conventional red revolutionary culture, red industrial culture focuses more on the practice of production and construction, the process of industrial development, and the struggle narratives of grassroots construction groups. It is highly consistent with labor education, the cultivation of professional literacy, and the formation of a spirit of practical work in universities, and it fits the core goal of ideological and political education in universities in the new era: cultivating students' values and ideals. As China's only free trade port, Hainan is not only an important national frontier of opening-up, but also a revolutionary land where the Qiongya revolutionary spirit has been passed down from generation to generation. In the long process

of revolutionary construction, agricultural reclamation and pioneering development, coastal defense industrial layout, aerospace supporting construction, and marine port development, Hainan has gradually nurtured and formed a distinctive red industrial cultural system that combines island regional features with the openness of the Free Trade Port (Yin, 2024). The revolutionary heritage and spiritual core contained in Qiongya red culture have laid a solid foundation for the innovative inheritance of red culture and the practice of ideological and political education in the process of building the Hainan Free Trade Port (Yin, 2024). From the large-scale rubber planting and processing of Hainan's agricultural reclamation in the early days of the People's Republic of China, which consolidated the foundation for safeguarding national strategic materials, to the implementation of local supporting industries and coastal defense projects during the Third Front construction period; from the rapid rise of port-adjacent industries at Haikou Port and Sanya Port after reform and opening up, to the construction of supporting industrial facilities for the Wenchang Space Launch Site and the continuing inheritance of the aerospace spirit in the new era, the development of Hainan's red industry has a clear historical trajectory, rich material carriers, and profound spiritual heritage. It is therefore an irreplaceable high-quality local red educational resource for ideological and political education in universities in the Free Trade Port.

From the perspective of practical education, although most universities in Hainan have regularly carried out practical teaching activities related to red culture and ideological and political education, their overall teaching work still relies mainly on traditional forms such as classroom theoretical lectures, on-site visits to memorial halls, and themed Youth League Day lectures. The development and utilization of red industrial resources remain superficial, and teaching models are highly homogenized, making it difficult to match the digital, interactive, and immersive information reception and learning cognition habits of Generation Z university students (Wang, 2025). It is therefore urgent to rely on artificial intelligence and digital technologies to solve the practical dilemmas of difficult inheritance of Hainan's red industrial culture, difficult integration into ideological and political education, and difficult implementation of educational outcomes. Scattered red industrial sites, historical archives and materials, exemplary deeds of heroes and role models, and grassroots struggle stories should be transformed into high-quality digital ideological and political education resources that are interactive, experiential, and teachable, so as to build a new digital-intelligent model of ideological and political education suited to the development and construction needs of the Free Trade Port. Based on the overall development of the Hainan Free Trade Port and the actual work of ideological and political education in universities, and combined with real local cases of red industrial development, this paper systematically explores the internal mechanism, practical dilemmas, and practical pathways of AI-empowered inheritance of Hainan's red industrial culture and ideological and political education. It aims to promote the internalization of the red industrial spirit in the mind and its externalization in action, and to ensure that ideological and political education in universities becomes deeper and more effective.

2. Core Value of AI-Empowered Inheritance of Hainan's Red Industrial Culture and Ideological and Political Education

2.1 Activating Local Red Industrial Resources and Consolidating the Exclusive Content Foundation for Ideological and Political Education in the Free Trade Port

The core feature that distinguishes Hainan's red industrial culture from red culture in other regions of China lies in its deep integration of Qiongya revolutionary red genes, the pioneering and entrepreneurial qualities of island reclamation, national strategic industrial attributes, and the open development background of the Free Trade Port. It mainly covers four core development sectors: the agricultural reclamation and rubber industry, the coastal defense supporting industry, port logistics industry, and aerospace supporting industry. Each category of industrial relic resources and each process of construction and development contains unique connotations for ideological and political education and value cultivation. In the early days of the People's Republic of China, in order to achieve the national goal of self-sufficiency in natural rubber as a strategic material, Hainan established agricultural reclamation farms and rubber processing and production bases on a large scale. Hundreds of thousands of agricultural reclamation cadres and workers took root in remote island areas, overcame multiple practical difficulties such as frequent typhoon disasters, shortages of daily necessities, poor land conditions, and backward production technologies, opened up wasteland, developed rubber planting, and gradually built a core national natural rubber production base. In this process, they forged the agricultural reclamation entrepreneurship spirit of "hard struggle, pioneering progress, selfless dedication, and practical responsibility." The Haikou Reclamation Museum preserves a large number of old agricultural reclamation production equipment, historical images, paper archives and documents, and physical production tools. It provides a complete record of the arduous struggle through which Hainan's rubber industry developed from nothing to something, from small to large, and from weak to strong. It is the most vivid and infectious local industrial ideological and political teaching material for local universities. Relying on technologies such as AI-based three-dimensional laser scanning, high-precision digital modeling, AI image restoration, and intelligent digital archiving of historical materials, digital filing and permanent activation-based protection can be carried out for physical red industrial resources such as the collections of the Haikou Reclamation Museum, the old production site of Hainan's First Rubber Processing Plant, and the production sites of old agricultural reclamation farms. This can effectively solve practical problems such as the difficulty of protecting traditional red industrial resources, monotonous display forms, scattered and lost historical materials, and breaks in spiritual inheritance. At the same time, relying on red industrial culture knowledge graph technology, the historical trajectory of Hainan's red industrial development, major historical events, exemplary heroes and role models, and core spiritual connotations can be systematically organized. A standardized, systematic, and intelligent red industrial ideological and political education resource database exclusive to the Free Trade Port can be built, providing sufficient high-quality localized teaching content for compulsory ideological and political courses, Situation and Policy courses, labor education, and social

practice teaching in universities. This will reduce dependence on red educational resources from other regions and consolidate a solid local foundation for value-based education in universities in the Free Trade Port.

2.2 Innovating the Narrative Mode of Red Culture Communication and Enhancing Emotional Resonance and Immersive Effectiveness in Ideological and Political Education

For a long time, the ideological and political communication of Hainan's red industrial culture has mainly relied on traditional forms such as textual explanation, picture-board display, static exhibition of physical objects, and cursory on-site visits. Narrative expression has been outdated and rigid, and interactive experience has been seriously insufficient, making it difficult to touch the ideological cognition and emotional value identification of Generation Z university students (Wang, 2025). Most students' participation in practical visits to red industrial sites remains at the level of checking in. Their understanding of the hardships of agricultural reclamation entrepreneurship, the difficulty of tackling problems in industrial construction, and the core meaning of the spiritual essence remains shallow and weak, greatly reducing the actual effect of ideological and political education in reaching the mind and heart. The deep integration of artificial intelligence technology with new technologies such as VR-based virtual scene reconstruction, AR real-scene overlay interaction, AI virtual digital human explanation, and intelligent voice interaction and dialogue can comprehensively reconstruct the narrative communication mode of red industrial culture and the experiential scenarios of ideological and political practice. Taking Wenchang's aerospace red industrial relics as an example, the area is not only a core national strategic base for space launches, but also preserves a large number of red industrial resources such as early aerospace supporting industrial workshops, scientific research and testing facilities, and former living and working sites of builders. These resources carry the aerospace industrial spirit of "independent innovation, overcoming difficulties, selfless dedication, and striving for new heights" in the new era. Relying on AI-based VR modeling technology, early aerospace industrial construction sites and frontline scenes of agricultural reclamation and rubber production can be realistically restored at a 1:1 scale. This allows students to immerse themselves in historical sites of struggle without leaving campus, directly experience the years of struggle in which older generations of builders relied on themselves and battled against harsh conditions, and realize a transformation in the educational model from passive listening and indoctrination to active immersive experience and deep emotional resonance. At the same time, AI virtual digital human figures for ideological and political education can be created based on agricultural reclamation heroes, aerospace builders, and other figures. These figures can enable cross-temporal intelligent dialogue, online interactive Q&A, and cloud-based narration of red deeds between students and red industrial heroes and role models. In this way, static and cold industrial relics can be transformed into vivid carriers of ideological and political education that have warmth, stories, and emotion, continuously improving the appeal of red industrial culture communication and the actual effectiveness of ideological and political education.

2.3 Aligning with the Talent Cultivation Orientation of the Free Trade Port and Strengthening the Foundation of Patriotism and Practical Responsibility among Youth in the New Era

As a new strategic highland for national high-level opening-up, the development and construction of the Hainan Free Trade Port require not only professionally skilled talents in economics and trade, finance, culture and tourism, and digital technology, but also young builders in the new era who possess firm ideals and convictions, deep patriotism, a strong practical work style, an international vision, and a sense of responsibility. Against the background of Free Trade Port construction, diverse social ideological trends intersect and collide. Some young students show practical problems such as weakened ideals and convictions, insufficient willingness to endure hardship, weak consciousness of struggle, and a weak sense of local belonging. It is therefore urgently necessary for red industrial culture to play a key role in value guidance, spiritual nourishment, and character shaping. The spiritual qualities contained in Hainan's red industrial culture, including self-reliance, hard entrepreneurship, willingness to dedicate, openness and inclusiveness, practical work, and innovation, are highly consistent with the core requirements for cultivating talent in the new era of the Free Trade Port. AI-empowered innovation in red industrial culture inheritance and ideological and political education is not only an internal requirement for continuing the Qiongya red lineage and inheriting the industrial spirit of struggle, but also a practical need for connecting with the development of the digital economy in the Free Trade Port and cultivating talent for the construction of new quality productive forces (Lin, 2025). Deeply exploring the educational heritage of Hainan's local red culture and innovating practical models of ideological and political education are important means by which local universities can implement the work of fostering virtue through education based on regional development realities (Lin, 2025). Through a new digital-intelligent model of ideological and political education, contemporary university students can be guided to systematically understand the history of Hainan's industrial construction and development and the entrepreneurial struggle history of the Free Trade Port, cultivate a deep local sentiment of "understanding Hainan, loving Hainan, and building Hainan," strengthen their ideals and convictions to take root in, build, and contribute to the Free Trade Port, and actively integrate their personal growth and development into the overall situation of national strategic development and local construction, thereby providing solid talent support and spiritual safeguards for the high-quality development of the Hainan Free Trade Port.

3. Practical Development Dilemmas in Integrating Hainan's Red Industrial Culture into Ideological and Political Education in Universities in the Free Trade Port

3.1 Superficial Exploration and Organization of Red Industrial Resources and a Serious Lag in Digital Activation and Transformation

Hainan's red industrial cultural resources are characterized by wide distribution, numerous sites, and regional dispersion. They cover multiple cities and counties such as Haikou, Wenchang, Sanya, Danzhou, and Qionghai, and belong to different management entities, including agricultural

reclamation groups, competent departments of culture and tourism, aerospace institutions, port groups, local universities, memorial halls, and museums. For a long time, prominent problems have existed, including an unclear resource inventory, incomplete organization of historical materials, insufficient exploration of spiritual connotations, and weak protection of relics. Some old red industrial workshops, former agricultural reclamation production sites, old port docks, and other physical relics lack systematic repair and protection, while valuable oral history materials, recollections of veteran workers, and original production archives and documents face the risk of loss and discontinuity. From the perspective of resource development and utilization, work on red culture in Hainan has long focused on the publicity and promotion of Qiongya revolutionary war culture and the revolutionary deeds of the Red Detachment of Women, while insufficient attention has been paid to the historical status, contemporary value, and educational function of red industrial culture. Systematic resource surveys, academic research, and transformation design for ideological and political education have not yet been carried out. More prominently, the digital construction of Hainan's red industrial culture started late, has received limited financial input, and has progressed slowly. Existing digital resources remain at the basic level of simple image scanning, text uploading, and elementary online graphic and textual display. There is a lack of in-depth digital development products empowered by artificial intelligence, such as three-dimensional modeling, virtual scene restoration, intelligent interactive experience, knowledge graph construction, and virtual digital human narration. Taking the Haikou Reclamation Museum as an example, although it preserves a large number of valuable physical historical materials related to red industry, its digital display still follows the traditional model of exhibition boards and manual explanation. It has not built an AI intelligent explanation system or an online virtual digital exhibition hall. Its level of digital activation is far lower than that of similar red industrial education bases nationwide, making it unable to meet the development needs of digital ideological and political teaching in universities in the new era.

3.2 Monotonous and Rigid Integration Models for Ideological and Political Education and Superficial Integration of Technology and Content with Weak Effectiveness

At present, the practical pathways through which universities in Hainan integrate red industrial culture into ideological and political education are generally traditional and monotonous. They mainly rely on conventional forms such as classroom theoretical teaching, offline visits to educational bases, themed class meetings and lectures, essay contests, and speech competitions. They lack in-depth integrated design that combines artificial intelligence and digital technology with ideological and political teaching and red industrial content. Most practices of red industrial ideological and political education in universities place greater emphasis on form than connotation, on visits rather than reflection, and on activities rather than long-term mechanisms. Students' willingness to participate is insufficient, and the effects of ideological impact and value internalization are weak. Although some universities have attempted to introduce basic digital technologies into red culture teaching, their applications remain limited to superficial uses such as playing red-themed videos and browsing online pictures and texts.

Problems such as superficial technology application, disconnection between content and technology, and fragmented teaching design still exist. Technological empowerment is only used as an embellishment for classroom teaching and has not become a core carrier of ideological and political education. Artificial intelligence has not yet been effectively used to realize personalized teaching recommendations, immersive scenario construction, precise learning analytics, and long-term value guidance, and the potential of red industrial culture for ideological and political education has not been fully released. Meanwhile, most ideological and political education teachers lack the ability to apply artificial intelligence technologies and the mindset for digital teaching design. Red culture researchers do not understand technology research and development, while technical professionals are unfamiliar with the rules of ideological and political education. Insufficient cross-boundary integration causes the integration of digital-intelligent ideological and political education to remain formalistic, greatly reducing its actual educational effectiveness.

3.3 Incomplete Multi-Party Collaborative Education Mechanisms and Insufficient Resource Integration, Sharing, and Coordinated Action

AI-empowered red industrial culture-based ideological and political education is a systematic project that requires coordinated linkage, resource co-construction and sharing, and synchronized advancement among government culture and tourism departments, agricultural reclamation enterprises, aerospace institutions, port groups, memorial halls and museums, local universities, and digital technology enterprises (Xu, 2018). However, Hainan has not yet established a special collaborative mechanism for the digital inheritance of red industrial culture and ideological and political education. Different management entities remain segmented by administrative divisions and sectors, act independently, and have dispersed powers and responsibilities. Three major problems are prominent: resource barriers, information barriers, and cooperation barriers. Government culture and tourism departments mainly focus on the protection of red industrial sites and the development of the culture and tourism industry; universities focus on the routine implementation of ideological and political teaching; enterprises focus on production and business development; and memorial halls focus on daily exhibition management. The work objectives of all parties differ, and their rhythms of advancement are inconsistent. There is a lack of normalized communication and cooperation, joint research and development, and long-term mechanisms for joint construction and co-education. Cooperation between universities and red industrial bases or artificial intelligence technology enterprises is mostly limited to short-term and one-off activities, lacking stable mechanisms for long-term strategic cooperation, joint research projects, co-development of digital products, and joint training of teaching staff. At the same time, an interdisciplinary integrated education system has not yet been established. Disciplines such as Marxist theory, ideological and political education, artificial intelligence technology, history, and cultural industry management remain relatively independent from one another. No special interdisciplinary research and teaching teams have been formed. Theoretical research, technological research and

development, and teaching practice are disconnected from each other, seriously restricting the high-quality advancement of AI-empowered red industrial ideological and political education.

3.4 Insufficient Refinement of the Regional Characteristics of the Free Trade Port and Weak Brand Influence of Red Industrial Ideological and Political Education

Hainan's red industrial culture combines the pioneering characteristics of island reclamation, national strategic attributes, and the open background of the Free Trade Port. It has very strong regional recognizability and educational uniqueness. However, current academic and practical work has not sufficiently refined and summarized its spiritual core, contemporary value, and Free Trade Port characteristics. It has not yet formed a red industrial spiritual IP and ideological and political education brand with a distinctive Hainan identity. Existing publicity and teaching related to red ideological and political education often copy general models of red cultural education and fail to build distinctive education characteristics exclusive to the Free Trade Port by integrating the agricultural reclamation pioneering spirit, the aerospace spirit of overcoming difficulties, and the marine spirit of openness. Homogenization is serious and recognizability remains low. At the same time, the publicity and promotion of achievements in AI-empowered red industrial ideological and political education are insufficient. There is a lack of systematic brand building, high-quality content development, and new media matrix communication. A replicable, promotable, and demonstrative digital-intelligent ideological and political education model for the Free Trade Port has not yet been formed. Regional radiation capacity and industry influence remain weak, making it difficult for red industrial culture to fully play its core role in cultivating students' values and ideals and empowering Free Trade Port construction.

4. High-Quality Practical Pathways for AI-Empowered Inheritance of Hainan's Red Industrial Culture and Ideological and Political Education in the Free Trade Port

4.1 Conducting a Comprehensive Survey and In-Depth Exploration of Red Industrial Resources across the Entire Region and Building an AI-Empowered Digital Ideological and Political Education Resource System

Based on the long-term development needs of ideological and political education in the Free Trade Port, local culture and tourism departments and education authorities should take the lead in overall coordination. They should work jointly with Hainan Agricultural Reclamation Group, the Wenchang aerospace base, port groups, schools of Marxism in various universities, and professional AI and digital enterprises to carry out a special survey and filing project for red industrial cultural resources across Hainan. The project should comprehensively identify core resources such as agricultural reclamation industrial sites, aerospace supporting industrial relics, old port industrial facilities, red industrial documents and historical materials, heroic and exemplary figures' deeds, and oral history materials. It should establish a standardized, digitalized, and dynamic master account of Hainan's red industrial cultural resources, ensuring a clear resource inventory, standardized classification management, and

orderly protection and development. Relying on technologies such as AI-based three-dimensional scanning, high-precision modeling, AI image restoration, and big data archiving, key real red industrial carriers—such as the core collections of the Haikou Reclamation Museum, the production site of Hainan's First Rubber Processing Plant, early industrial construction sites related to Wenchang aerospace, and old industrial relics at Haikou Port—should be digitally restored at a 1:1 scale and permanently protected in digital form. Online permanent exhibition halls for cloud-based digital red industrial sites should be created, breaking through temporal and spatial limitations and enabling all-weather access and full-coverage sharing of red industrial resources. Based on large language models and knowledge graph technology, an intelligent knowledge graph database of Hainan's red industrial culture should be constructed to organize industrial development trajectories, connections among historical events, stories of heroic and exemplary deeds, and spiritual value connotations, thereby realizing intelligent retrieval, associated recommendations, in-depth interpretation, and intelligent Q&A functions. At the same time, AI virtual digital human figures for ideological and political narration should be developed around agricultural reclamation heroes and aerospace builders, and intelligent explanation robots and online interactive Q&A systems should be created to provide intelligent and personalized digital resource support for ideological and political classrooms, practical teaching, and autonomous research-based learning. Using artificial intelligence to systematically organize industrial culture and integrate resources into a material database for ideological and political education is a core foundation for implementing industrial culture-based education and strengthening value guidance from the perspective of the "big ideological and political education" framework (Tang & Xie, 2025).

4.2 Reconstructing a Digital-Intelligent Integrated Ideological and Political Teaching Model and Building an Immersive Red Industrial Ideological and Political Classroom Matrix

Relying on AI-based VR/AR immersive interactive technology, the temporal and spatial limitations of traditional ideological and political classrooms should be broken, and a new three-in-one red industrial ideological and political classroom system should be created, integrating "online virtual immersion + offline real-scene practice + AI intelligent assistance" (Xu, 2018). Focusing on real historical themes such as Hainan's agricultural reclamation and rubber entrepreneurship, Wenchang's aerospace industrial problem-solving efforts, and island coastal defense industrial construction, a series of AI virtual simulation ideological and political courses should be developed, including Reclamation and Rubber Pioneering for Value Formation, Aerospace Industry Serving the Nation and Building Dreams, and Island Industry Promoting Hainan through Practical Work. Students should be organized to use VR devices to immerse themselves in historical scenes of red industrial construction and directly experience the noble spirit of hard struggle and selfless dedication among older generations of builders. This can realize a closed educational loop from passive listening to active experience, emotional resonance, and value internalization. Classroom teaching models should be reconstructed by introducing AI-based intelligent learning analytics systems, virtual digital human teaching assistants,

and intelligent interactive teaching terminals, thereby building a new classroom ecology characterized by "ideological and political education teachers as the main guide + AI technology as assistance + interactive student participation." Teachers can rely on AI big data to analyze students' learning status, ideological dynamics, and cognitive weaknesses in real time, accurately recommend personalized red industrial learning resources, and realize differentiated instruction and targeted education. A Hainan red industrial culture AI ideological and political education cloud platform should be built, integrating digital exhibition halls, virtual courses, online seminars, intelligent Q&A, practice check-ins, and learning analytics and evaluation. In this way, the deep integration of online and offline ideological and political teaching can be achieved, and a new all-weather, full-coverage, intelligent pattern of ideological and political education in the Free Trade Port can be constructed.

4.3 Strengthening Collaboration among Universities, Local Governments, Enterprises, and Disciplines and Constructing a New Multi-Party Co-Construction and Co-Education Pattern

A special collaborative mechanism for digital-intelligent ideological and political education based on red industrial culture in the Hainan Free Trade Port should be established. The government, universities, agricultural reclamation enterprises, aerospace institutions, memorial halls, and AI digital enterprises should sign long-term strategic cooperation agreements and jointly build AI-based red industrial ideological and political education practice bases, digital research and development centers, and teaching and training platforms, thereby realizing resource co-construction, joint technology research, joint teacher cultivation, and shared achievements. The red roots accumulated through the Qiongya revolution and the struggle-oriented foundation tempered by island construction are intertwined, laying a solid foundation for universities to carry out ideological and political education based on local red resources (Xu, 2018). University-enterprise collaboration should be deepened. Universities and AI technology enterprises should jointly develop red industrial digital collections, virtual digital human content, immersive ideological and political courses, and intelligent research-based learning products, promoting the creative transformation and industrial activation of red industrial cultural resources. Disciplinary collaboration should be strengthened by breaking disciplinary barriers and integrating disciplinary strengths from Marxist theory, artificial intelligence technology, history, cultural industry management, ideological and political education, and other fields. Special interdisciplinary research and teaching teams should be formed to carry out theoretical research and practical exploration on AI-empowered red industrial ideological and political education, and to cultivate a compound ideological and political education workforce that possesses both red cultural literacy and digital technology capabilities. Joint teaching research, teacher training, and technical exchanges should be carried out regularly to improve ideological and political education teachers' digital teaching capabilities and red culture research levels, thereby consolidating the talent foundation for digital-intelligent ideological and political education.

4.4 Highlighting the Shaping of Free Trade Port Regional Characteristic IP and Building a Distinctive Brand of Digital-Intelligent Red Ideological and Political Education

The core spiritual connotations of Hainan's red industrial culture—namely, "the Qiongya red flag never falling, practical work in agricultural reclamation and pioneering, aerospace innovation serving the nation, and openness and inclusiveness of the ocean"—should be deeply refined. These should be combined with the contemporary qualities of openness, innovation, practical work, and responsibility in the Free Trade Port to create the exclusive ideological and political education brand of the Free Trade Port: "Red Coconut Digital Intelligence · Craftsmanship Casting the Soul." Around the three major red industrial themes of agricultural reclamation, aerospace, and ports, a series of high-quality AI ideological and political education contents, digital narration products, and short video communication materials should be developed, forming a distinctive education system guided by branding, supported by content, empowered by technology, and implemented through practice. Relying on technologies such as AI digital human live streaming, intelligent short-video editing, and algorithmic recommendation on new media platforms, Hainan's red industrial struggle stories and Free Trade Port construction stories should be communicated through multiple channels. This will enhance the influence and radiation capacity of the red industrial culture-based ideological and political education brand and build a nationally replicable and promotable model of AI + red industry + Free Trade Port ideological and political education.

4.5 Improving the Threefold Guarantees of Policy, Talent, and Evaluation to Promote the Long-Term and Sustainable Development of Digital-Intelligent Ideological and Political Education

Special support policies should be introduced for the digital inheritance of Hainan's red industrial culture and AI-based ideological and political education, and special construction funds should be established. These funds should focus on supporting digital resource surveys, digital platform construction, curriculum product research and development, teacher team cultivation, and brand publicity and promotion. The construction of three teams should be strengthened: high-quality red culture research talent, artificial intelligence technology research and development talent, and digital ideological and political teaching talent. A compound professional education team should be built [10]. A diversified intelligent evaluation system should be constructed, combining process evaluation and outcome evaluation, quantitative evaluation and qualitative evaluation, and on-campus evaluation and off-campus practice evaluation. Relying on AI big data, data on students' participation in research-based learning, classroom interaction, practical experience, ideological reflection, and other aspects should be automatically collected and analyzed. The effectiveness of ideological and political education should be scientifically assessed, educational outcomes should be incorporated into university ideological and political work assessment and students' comprehensive quality evaluation, and the enthusiasm of all parties should be fully mobilized. These measures can ensure the long-term and stable advancement of AI-empowered red industrial ideological and political education.

5. Conclusion

AI-empowered inheritance of red industrial culture and innovation in ideological and political education in the Free Trade Port represent an inevitable trend in the creative transformation and innovative development of red culture in the new era. They are also a strategic choice for universities in the Free Trade Port to implement the fundamental task of fostering virtue through education and cultivate new-era talent. Hainan's red industrial culture has profound heritage, rich relics, and distinctive characteristics. It carries the history of island pioneering struggle, the history of entrepreneurship in industrial construction, and the foundational history of Free Trade Port development, making it a unique and valuable local resource for ideological and political education in the Free Trade Port. With its unique advantages in digital activation, immersive experience, precise education, and intelligent management, artificial intelligence can effectively solve practical dilemmas such as weak inheritance of Hainan's red industrial culture, outdated education models, and insufficient integration effectiveness. It can construct a new paradigm of ideological and political education that is digital-intelligent, immersive, precise, and long-term. Based on the overall situation of Free Trade Port construction, only by continuously exploring red industrial resources in depth, reconstructing digital-intelligent ideological and political classroom models, strengthening multi-party collaborative education, building education brands with Free Trade Port characteristics, and improving long-term development guarantee mechanisms can the deep integration of artificial intelligence, red industrial culture, and ideological and political education be continuously promoted. This will continue the red industrial lineage, inherit the spirit of hard struggle, guide young people in the new era to cultivate patriotism and strengthen practical abilities, and train more new-era talents with firm convictions, strong capabilities, and a sense of responsibility for the high-quality development of the Hainan Free Trade Port.

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