

Research on the Localized Application of Huang Yanpei's Vocational Education Philosophy in Shaanxi

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Abstract: Huang Yanpei's vocational education philosophy centers on social adaptability, providing theoretical support for contemporary vocational education reform. Addressing current challenges in Shaanxi's vocational education-including insufficient exploration of regional culture, unclear industry alignment pathways, and slow digital transformation-this study constructs a three-dimensional collaborative model of "Culture-Industry-Technology" based on Huang Yanpei's ideas to explore localized application pathways. Cultural Dimension: Tracing the spiritual genes of Zhou, Qin, Han, and Tang dynasties-such as the "system of craftsmen" and "engraving craftsmen's names on artifacts"-alongside revolutionary legacies like the Yan'an Spirit and the Westward Relocation Spirit, this dimension bridges traditional craftsmanship with modern vocational competencies. In the industrial dimension, it reconstructs a three-stage integrated training system tailored to the needs of distinctive industries like energy chemicals, modern agriculture, and new energy vehicles, addressing inefficiencies in industry-education collaboration. In the technological dimension, it leverages VR, digital twins, and big data to empower blended virtual-physical teaching, transforming instructional spaces from physical boundaries to symbiotic virtual-physical environments, and shifting practical logic from skill imitation to innovation iteration.

Keywords: Huang Yanpei; vocational education philosophy; Shaanxi; localized application

1. Introduction

Huang Yanpei proposed that vocational education should "employ educational methods to enable everyone to acquire the means of livelihood and enjoyment according to their individuality, while fulfilling their obligations to the community" [1]. He developed a vocational education philosophy centered on social adaptability, with concepts such as "the integration of manual and intellectual labor" and "comprehensive vocational educationism" continuing to provide theoretical support for contemporary vocational education reform. In the context of regional development, applying Huang Yanpei's vocational education philosophy to Shaanxi's local vocational education reform requires addressing three core challenges. First, there is insufficient depth in exploring and interpreting regional cultural resources and their educational value. Second, the pathways for aligning the vocational education system with regional industrial development remain unclear and fragmented. Third, the digital transformation of vocational education is progressing unevenly, with disparities in infrastructure, curriculum design, and faculty competencies. These challenges constrain the formation of a systematic and adaptive vocational education framework suited to regional characteristics [2].

From a cultural perspective, Shaanxi, historically associated with the Zhou, Qin, Han, and Tang periods, possesses abundant intangible cultural heritage resources as well as significant modern historical and cultural traditions, including the "Westward Relocation Spirit" and the "Yan'an Spirit." However, several structural issues persist. The number of

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practitioners engaged in traditional crafts has gradually declined, the apprenticeship transmission mechanism has weakened, and traditional craftsmanship is often disconnected from modern vocational competency standards. As a result, the potential of cultural resources to support curriculum development, skills training, and professional identity formation has not been fully realized.

From an industrial perspective, Shaanxi has made notable progress in developing its energy and chemical industry chain and has promoted a modern agricultural framework often referred to as a "3+X" system covering multiple county-level economies. Nevertheless, the vocational education system has not yet fully leveraged its institutional advantages in supporting talent cultivation for these sectors. Industry-education integration mechanisms remain relatively superficial, enterprise participation in curriculum co-development is limited, and talent supply does not always precisely match the structural transformation needs of regional industries. Consequently, there is considerable room for improvement in building a dynamic and demand-oriented vocational training ecosystem.

From a practical perspective, some higher vocational institutions in the region have explored innovative models. For example, certain institutions have established interdisciplinary integration models such as "Automotive+" programs, while others have enhanced graduate employability by integrating "job positions, courses, competitions, and certifications" into a coordinated training pathway. Although these initiatives demonstrate valuable experimentation, they are largely confined to single-institution reforms and lack a systematic, region-wide adaptation framework capable of coordinating cultural resources, industrial demands, and technological transformation at a macro level.

This paper closely follows the core concept of social adaptability in Huang Yanpei's vocational education philosophy and deconstructs it into three interrelated dimensions: cultural foundations, industrial demands, and technological contexts. On this basis, a three-dimensional collaborative model of "culture-industry-technology" is constructed. The proposed model not only seeks to address the structural challenges currently facing Shaanxi's vocational education—such as limited cultural integration, insufficient industrial alignment, and uneven technological application—but also aims to provide a theoretically grounded and practically feasible framework for vocational education reform in other regions with similar developmental conditions.

2. Decoding Cultural Genes and Reshaping Vocational Ethos

The civilizations of the Zhou, Qin, Han, and Tang dynasties, as core manifestations of Chinese civilization, have profoundly shaped the developmental trajectory of vocational education through their foundational spiritual legacies. The Zhou dynasty's "hundred craftsmen" system established the earliest framework for a technical division of labor. This system was not merely a technical categorization but also embodied the rudiments of vocational education centered on specialized expertise, creating a historical resonance with the philosophy that every individual should pursue a livelihood suited to their specific aptitudes and talents. The historical records in the *Records of the Craftsman*—which note that the wise create, the skilled describe, and those who maintain these traditions through generations are called craftsmen, and that metal has specific standards of purity—are more than ancient technical benchmarks. They reveal that practitioners of that era had already developed a dual pursuit: a rigorous adherence to technical operational norms and a commitment to ethical conduct in professional practice. This represents the primary origin of the traditional artisan spirit, emphasizing that true craftsmanship requires both physical skill and moral integrity.

The Qin Dynasty's system of marking craftsmanship on products directly linked quality accountability to individual artisans, ensuring a high level of personal responsibility. Historical records from the period, such as those found in ancient bamboo slips, state that for vessels of the same category, dimensions such as size, length, width,

and thickness had to be identical [3]. This confirms that handicraft production had already adopted unified standards, integrating standardized professional practices with institutional constraints—an early manifestation of regulated training in historical vocational education. The commercial prosperity of the Silk Road during the Han Dynasty further facilitated the convergence of craftsmanship from diverse regions. The frequent interactions between international merchants and local artisans fostered a more diverse and inclusive ecosystem for professional development. By the Tang Dynasty, the dual-track model of "craft workshops"—operating under both official patronage and private initiative—provided dual pathways for the transmission of vocational skills, combining structured institutional support with autonomous grassroots innovation.

These historical and cultural legacies, crystallized over millennia, now face challenges in their integration within modern vocational education. On one hand, the rapid iteration of modern technology has sometimes created a disconnect between traditional craftsmanship and contemporary training, leaving the core essence of many traditional skills unintegrated into modern professional competency frameworks. On the other hand, current vocational education systems often prioritize rapid skill acquisition over the long-term cultivation of character, occasionally neglecting the vital core of professional ethics. The philosophy of "dedication to one's profession and harmony with others" serves as a vital bridge connecting these historical roots with modern training requirements. "Dedication" demands that practitioners master specialized skills while upholding their original professional aspirations and ethical standards. "Harmony" emphasizes that professionals must possess a collaborative spirit and a strong sense of social responsibility. Integrating this philosophy with regional historical heritage transforms abstract historical elements into tangible, actionable professional codes, creating a synergy between traditional values and contemporary work ethics.

As a significant region for historical and patriotic heritage, local cultural resources provide unique value for cultivating professional ethics. During key historical periods of the mid-20th century, specialized military and political institutions consistently adhered to the principle of linking theory with practice. Historical educational guidelines emphasizing a "steadfast direction and a hardworking, frugal work style" served not only as training principles but also embodied a core ethos of pragmatism, responsibility, and selfless dedication. This resonates with vocational philosophies that prioritize collective contribution and taking responsibility before others, laying a solid foundation for the cultivation of spirit in regional vocational education. The "Spirit of Westward Relocation," which involved the movement of key educational and industrial institutions to develop the inland regions, embodies the virtues of prioritizing the greater good and maintaining deep roots in challenging environments. This spirit provides a tangible vehicle for cultivating a sense of mission and professional resilience among students.

To achieve a modern transformation of the traditional artisan spirit alongside regional historical heritage, it is essential to systematically organize and refine local cultural elements. We propose establishing a digital database titled "The Genealogy of Artisan Spirit," which would systematically compile the ethical norms and operational standards of indigenous traditional crafts, such as bronze casting and silk weaving. For instance, from ancient craftsmanship records stating that all materials must be strictly categorized by their quality [4], we can extract a consciousness of striving for perfection and pursuing excellence. Simultaneously, compiling stories of historical labor models and exemplary workers transforms these narratives into teaching materials suitable for modern classrooms. Digital resources such as micro-courses and case studies can be developed, enabling vocational institutions to directly reference and utilize them.

Building on this foundation, digital technology can further bridge traditional and patriotic culture with practical vocational education scenarios. High-level "Virtual Archaeology Laboratories" allow students to engage in the entire cultural relic restoration process through virtual reality technology, gaining hands-on insight into the meticulous nature of traditional craftsmanship. Meanwhile, AR technology deployed at historical

memorial halls can immerse students in scenes of historical production campaigns, allowing them to personally experience the labor spirit embodied in the pursuit of self-reliance and hard work. Such visual and immersive experiences transform abstract historical concepts into tangible vocational experiences, making it easier for students to internalize these values while developing the high-level technical skills required by modern industry.

3. Mapping Industrial Demands and Reconstructing Integrated Training Systems

3.1. Analysis of Industrial Upgrading and Diversified Talent Demands

As a significant national base for energy, chemical industries, modern agricultural demonstrations, and new energy vehicle clusters, the regional industrial chain in Shaanxi is undergoing a profound structural transformation. This evolution has generated a tripartite demand for technical-skilled talent. First, there is an urgent need for multidisciplinary capabilities spanning the entire energy and chemical value chain. The industry is currently shifting toward sustainable green development and high-end value chain extension. For instance, energy enterprises in northern regions show an increasing demand for intelligent mining specialists. These roles require a sophisticated blend of traditional process mastery and proficiency in digital equipment operation. However, the current supply of such composite talent remains insufficient to keep pace with rapid industrial digitalization.

Second, a significant digital skills gap has emerged within the modern agricultural system. While the regional goal is to expand modern agricultural coverage across the majority of county-level economies, technical limitations persist. Only a small fraction of agricultural operators possess the skills to independently conduct drone-based soil monitoring or manage intelligent greenhouse control systems. Third, the new energy vehicle (NEV) industry cluster demands intensified cross-sector integration. As a major production hub for NEVs, the region faces structural imbalances: while there is a shortage of highly skilled workers in core manufacturing, the scarcity of specialized professionals in emerging fields such as power battery research and development and intelligent connectivity technology is even more pronounced.

3.2. Identifying Structural Inefficiencies in the Current Training System

Despite these clear industrial demands, the current integrated training framework faces several practical challenges. A primary issue is the "redundant inefficiency" found in the curriculum transition from secondary to higher vocational education. Significant overlaps in course content mean that students advancing to higher levels often repeat foundational material, leading to a waste of educational resources and time. Under current segmented training models, the low recognition rate of course credits further exacerbates this issue, forcing students to spend excessive time on repetitive coursework rather than advancing to specialized skills.

Furthermore, school-enterprise collaborations often lack depth. Many partnerships are restricted to providing basic internship positions, with minimal corporate involvement in core curriculum development or long-term talent cultivation strategies. Consequently, the utilization rates of equipment in jointly established training bases remain suboptimal. There is also a notable mismatch between the professional skill certification systems and the actual needs of local industrial upgrading. In the energy and chemical sectors, for example, certifications related to emerging technologies like intelligent mining and green chemical processes represent only a small proportion of the total, failing to provide an accurate evaluation of the high-level technical competencies required by modern industry.

3.3. Designing a Progressive Three-Tiered Competency Framework

Historical vocational education principles suggest that establishing educational institutions must align with the trends of the times; when society requires specific talents, schools must be established to fulfill those needs [5]. This principle serves as the core logic for resolving the disconnect between education and industry. To address the requirements of the energy, agricultural, and NEV sectors, a three-tiered competency development framework is required, spanning secondary vocational education, higher vocational education, and applied undergraduate education.

In this framework, the secondary vocational stage focuses on standardized training for foundational operational skills through modular packages tailored to entry-level industrial positions. The higher vocational stage prioritizes technical application and innovation through project-based teaching, preparing students to meet complex frontline technical demands. Finally, the applied undergraduate stage addresses cutting-edge technological research and high-end applications, utilizing a dual-mentor system that combines academic and industrial expertise. To support this progression, the system must implement robust safeguards, including curriculum alignment, seamless credit transfer mechanisms, and dynamic adjustments to certification standards. This integrated approach ensures that the vocational education system evolves in tandem with industrial innovation, providing a sustainable pipeline of high-quality talent.

4. Technology-Scene Empowerment and Virtual-Physical Integration in Teaching Innovation

4.1. Reconstructing Pedagogical Spaces through Immersive Technologies

The rapid advancement and deep integration of digital technologies are fundamentally reshaping the teaching spaces and training models of modern vocational education through technological scenario immersion. Technologies such as Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR) effectively break the physical boundaries of traditional vocational classrooms. In the past, high-level technical training was often constrained by geographic location, the high cost of specialized equipment, and safety risks associated with high-voltage or high-pressure environments. Today, these are being transformed into immersive learning environments characterized by virtual-physical synergy and multidimensional interaction.

This technological shift provides a sophisticated pathway for digital transformation, allowing students to engage with complex systems in a safe and repeatable digital space. By restructuring the spatial logic of the classroom, these tools move vocational training beyond simple observation into a realm of deep experiential learning. This evolution is particularly critical in regional contexts where industrial upgrading requires a workforce capable of navigating increasingly complex technological landscapes.

4.2. Enhancing Technical Proficiency through Virtual-Physical Synergy

The integration of virtual and real technologies has not only restructured teaching spaces but fundamentally reshaped the underlying logic of vocational practice. It propels skill development from "standardized imitation"-where students simply follow a set of manual instructions-to "creative iteration," where students can experiment with different solutions in a digital environment. For instance, the implementation of a specialized training lab for new energy vehicle fault diagnosis offers significant insights into this pedagogical shift [6].

By using AR technology to simulate real-world vehicle malfunction scenarios, students can utilize professional diagnostic tools to complete end-to-end training. This process covers everything from initial symptom identification to pinpointing precise hardware or software failures [7]. The system provides instantaneous feedback on operational errors and generates automated improvement suggestions, effectively transforming abstract mechanical and electrical principles into tangible, visualizable

procedures [8]. This "virtual-first, practical-second" model allows for a closed-loop cycle of virtual trial-and-error followed by real-world application, which significantly enhances a student's ability to analyze and resolve complex problems [9].

4.3. Data-Driven Precision and the Future of Educational Governance

The integration of artificial intelligence and big data technologies has also propelled vocational education toward data-driven precision governance. Moving away from traditional experience-based approaches, modern systems like the "Field Classroom + Digital Twin" model link actual production data-such as orchard management records-with real-time environmental sensors [10]. When students adjust management plans within a virtual simulation, the system automatically models the potential outcomes based on real-world variables, creating a competency development chain defined by data-driven decision optimization.

This system makes practical training more aligned with actual production cycles and enables intelligent diagnostics of the learning process itself. It allows instructors to identify specific learning gaps and teaching weaknesses with high accuracy. This shifts the educational model from a generalized, mass-instruction approach to a personalized, precision-oriented cultivation strategy [11]. As emerging technologies like generative AI and the industrial metaverse continue to mature, vocational education must further explore cutting-edge areas such as human-machine collaborative teaching. By building a new vocational education ecosystem tailored to modern industrial needs, institutions can ensure that talent cultivation remains both technologically relevant and future-oriented.

5. Conclusion

Huang Yanpei's vocational education philosophy, centered on social relevance, provides crucial theoretical anchors and practical pathways to address the current challenges facing Shaanxi's vocational education-including cultural disconnection, industrial disconnect, and technological lag. This study, grounded in Huang Yanpei's vocational education philosophy and integrated with Shaanxi's regional cultural characteristics and industrial development realities, constructs a three-dimensional collaborative model of "culture-industry-technology." This model not only achieves the modern transformation of the traditional artisan spirit from the Zhou, Qin, Han, and Tang dynasties and Shaanxi's revolutionary heritage but also reconstructs a seamless training system connecting vocational education with industry. Furthermore, it drives the innovative upgrading of the virtual-physical integrated teaching paradigm.

Naturally, this study has certain limitations. The selected cases primarily focus on specific vocational institutions and distinctive industries within Shaanxi, resulting in restricted regional coverage. Furthermore, the dynamic impact of rapid digital technology iteration on the vocational education ecosystem has not been fully considered. Future research could expand the applicability of the "culture-industry-technology" three-dimensional synergy model to other provinces in Northwest China, enabling this framework to inform vocational education reforms across more central and western regions. Concurrently, efforts should deepen the precision of digital platforms in tracking personalized student learning and explore innovative applications of generative AI in preserving Shaanxi's intangible cultural heritage skills and developing vocational education curricula, thereby better empowering local vocational education development through technology.

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