

"Dual-Culture-AI-Industry" Trilateral Synergy: A Breakthrough Strategy for Talent Adaptation in Private Higher Education Institutions

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Abstract

The convergence of the "Manufacturing Powerhouse" and "Cultural Security" dual strategies represents far more than a mere parallel implementation of policies-it directly addresses the core pathology plaguing contemporary vocational education: the disconnection between skill cultivation and value formation. Liaoning Province's comprehensive revitalization demands for "dual-core" technical talent-combining both technical competencies and value systems-precisely epitomize this critical dilemma. This study, an 18-month, full-chain research endeavor, constitutes essentially a disruptive exploration of vocational education paradigms: anchoring value foundations through the integration of "Red Culture + Industrial Culture," resolving technological empowerment challenges through "AI Tutors," and aligning talent cultivation directions with "industrial demands," thereby constructing a "Dual-Culture-AI-Industry" trilateral synergy model. It merits particular emphasis that this study's core breakthrough lies in theoretical reconstruction-incorporating cultural identity into the human capital function, dismantling the traditional one-dimensional "skill-centric" constraints, and proposing a three-dimensional coupling framework of "Culture-Technology-Industry." The establishment of China's first "Red Industrial Culture" knowledge graph and provincial-level data interoperability standards, the pioneering creation of the Cultural-Embedded Vector (CEV), and the development of low-code AI systems provide robust infrastructure for translating theory into practice. This research not only delivers a customized solution for Liaoning's revitalization but also offers a replicable paradigm for the digital transformation of vocational education nationwide, the safeguarding of cultural security, and regional industrial upgrading, with theoretical and practical value that extends far beyond the exploration of any single region.

Keywords

Red Culture, Industrial Culture, artificial intelligence, Industry-Education Integration, Value Quantification, vocational education paradigm.

1. Problem Statement: The Essence of Liaoning's Dilemma Lies in the Dual Dislocation of Culture and Technology

Liaoning possesses 42 national-level industrial heritage sites and 68 red education bases-such uniquely endowed cultural resources-yet faces a conversion rate of less than 30%. This is no coincidence, but rather the inevitable consequence of the disconnection between cultural education and vocational education. [1] Research data from Northeastern University reveals that only 15% of ideological and political courses in private universities in Shenyang incorporate local industrial cases, with student engagement below 40%-profoundly exposing a harsh reality: excellent local cultural resources are being marginalized, and vocational education has degenerated into "soulless skill training." Even more alarming is that Western general-purpose large language models implicitly embed individualistic values,[2] which are

attempting to penetrate the education sector through technological advantages. If directly applied to ideological and political education, this will inevitably trigger severe cultural security crises. It can be said that the "bottleneck" issue for Liaoning's revitalization has never been a mere shortage of technical talent, but rather the absence of "rooted" talent who possess both solid skills and firm cultural identity. In the era of artificial intelligence, how to achieve synchronized resonance between skill enhancement and value reconstruction has become a critical proposition determining the success or failure of regional revitalization. The basic funamental of BP neural network

2. Literature Review: The Fragmentation of Three Research Trajectories Exposes Critical Research Gaps

A systematic review of existing literature reveals that the isolated development of three research trajectories-AI education, dual-culture education, and foreign AI education-constitutes the fatal flaw in current scholarship. Domestic AI education research, represented by platforms such as "Rain Classroom," has achieved notable results with an average 15% improvement in academic performance.[3] However, its critical shortcoming lies in the complete neglect of value guidance-technological empowerment divorced from value leadership ultimately produces "skilled but faithless" instrumentalized individuals, fundamentally contradicting the essential purpose of vocational education. Domestic research on red culture and industrial culture education has fallen into a "formalization trap." The dominant "visit-and-lecture" model not only fragments resources but also lacks educational integration and quantitative assessment tools, reducing cultural cultivation to mere "going through the motions" and failing to genuinely internalize value identification among students. Foreign AI education research, exemplified by Century Tech's neural network models, may offer technical merits, but its design completely stripped of cultural context essentially embodies Western centrism-the value conflicts experienced by Indian students using English-version systems precisely demonstrate that education AI detached from local culture possesses no universal applicability.[4]The fragmentation of these three trajectories clearly points to three critical research gaps: First, how cultural resources can transform from "static heritage" into "computable educational data"-a prerequisite for the digitalization of cultural cultivation; second, how values can break through the limitations of "qualitative description" to achieve dynamic alignment with skills-the core of dual-core talent cultivation; and third, how resource-constrained private universities can cross the "cost threshold" to deploy AI-a crucial factor for research implementation.Acknowledgements

3. Theoretical Construction: The Revolutionary Value of the Three-Dimensional Coupling Model

Any profound breakthrough in educational reform necessarily accompanies the reconstruction of theoretical systems. The "Culture-Technology-Industry" three-dimensional coupling model proposed in this study represents a significant innovation in vocational education theory. The definition of the talent adaptation function $F = \alpha \cdot \text{Culture} + \beta \cdot \text{Technology} + \gamma \cdot \text{Industry}$ is far from a simple superposition of variables; rather, it profoundly reveals the growth patterns of technical talent in the new era. Through the DEMATEL-ISM method, the ratio $\alpha:\beta:\gamma = 0.34:0.36:0.30$ was obtained, with cultural weight exceeding traditional expectations. This result forcefully refutes the misconception that "vocational education need only emphasize skills," demonstrating that cultural identity has become a core component of human capital. The construction of the "Values-Skills" double-helix growth equation further provides theoretical proof of the "1+1>2" synergistic effect-when the coupling coefficient $\delta \geq 0.18$, values and skills form a mutually reinforcing symbiotic relationship, offering mathematical grounding

and theoretical support for resolving the dilemma of "value-skill disconnection." More critically, by introducing Bourdieu's concept of cultural capital into Schultz's human capital model, this study constructs a new human capital function for the "Culture–Technology–Industry" trilateral synergy. This essentially establishes new value coordinates for vocational education: what vocational education cultivates is not "screws" passively adapting to industry, but "active creators" possessing technical competence, cultural identity, and industrial insight. This theoretical innovation not only fills gaps in existing research but also points the direction for the future development of vocational education.

4. Research Design: The Inevitable Choice of Interdisciplinary Action Research

The construction of the "Dual-Culture–AI–Industry" trilateral synergy model is by no means achievable through a single discipline alone. The "dual-wheel drive" interdisciplinary research design represents the inevitable choice to ensure both depth and breadth of inquiry. This study adopts the main thread of "needs analysis–model construction–system development–empirical verification," which appears to be a conventional research path but actually embodies a dual commitment to "problem orientation" and "practice orientation": needs analysis directly targets talent pain points in Liaoning's revitalization; model construction responds to theoretical gaps; system development resolves implementation challenges; and empirical verification ensures research effectiveness. The deep integration of three disciplines—pedagogy's value leadership, computer science's technical support, and management science and engineering's systems thinking—enables the research to avoid both the "technological blindness" of pedagogical research and the "value nihilism" of computer science research. More importantly, conducting action research in collaboration with three private universities and seven leading enterprises breaks through the limitations of "ivory tower research," allowing industrial needs to be directly embedded in every stage of the research process. [5] This ensures that research outcomes not only remain "paper strategies" but can truly "take root and bear fruit." This interdisciplinary and cross-sectoral research paradigm itself constitutes a critique and transcendence of the "closed-door" approach to academic research.

5. Data Governance: Breaking Barriers as the Prerequisite for Synergy

In the digital age, data serves as the core production factor, while data barriers represent the greatest obstacle constraining the "Dual-Culture–AI–Industry" synergy. The key to this study's breakthrough lies in constructing a comprehensive data governance system, whose core logic is "breaking fragmentation to achieve interoperability." The establishment of the "Red Industrial Culture" knowledge graph is far from a simple accumulation of historical materials; rather, it involves deep mining and integration of dispersed historical sources through OCR, NLP, and other technologies, transforming static cultural resources into queryable and trainable dynamic data—this constitutes the foundation for making culture "computable." The collaborative construction of the "Liaoning Industrial Demand Database" breaks the information gap between enterprises and universities—parsing 186,000 job descriptions and extracting skill standards and professional competencies essentially transforms industrial demands from "vague perception" to "precise profiling," providing clear targeting for talent cultivation. [6] The formulation and approval of the "Liaoshen Education–Industry–Culture Data Interoperability Standard" by the National Information Technology Standardization Committee carries even greater significance: its adoption of the "7-bit metadata + URI mapping + knowledge linking" model achieves seamless integration of educational, industrial, and cultural data, institutionally resolving the "data silo" dilemma. It must be emphasized that the essence of data governance is to build an "information highway" for trilateral synergy. Without

this system, subsequent algorithmic innovation and system development would become water without a source.

6. Research Limitations and Future Prospects: Sober Self-Criticism and Continuous Exploration

No research can achieve perfection, and the limitations of this study precisely indicate directions for future exploration. Regarding external validity, the sample is confined to private universities in Liaoning, meaning the generalizability of research findings still requires validation across multiple regions and educational levels nationwide-after all, cultural resources and industrial structures vary across regions, and the model's adaptability needs further optimization. In terms of dynamism, the current "Red Industrial Culture" knowledge graph remains predominantly static, making it difficult to keep pace with cultural inheritance and industrial development. Integrating VR real-time behavioral data to achieve dynamic evolution represents the key to enhancing the model's vitality.

7. Conclusion

In summary, the construction of the "Dual-Culture-AI-Industry" trilateral synergy model is far from a simple combination of elements; rather, it represents a systematic resolution of the core contradictions in vocational education and a fundamental response to three major challenges: the disconnection between skills and values, the non-computability of cultural resources, and the high cost of AI implementation. The closed loop formed across five dimensions-theory, data, algorithms, systems, and applications-not only reconstructs the talent cultivation paradigm of vocational education but also provides solid educational support for safeguarding cultural security and upgrading regional industries. The successful pilot implementation across three universities and seven enterprises in Liaoning fully demonstrates the feasibility and superiority of this model. Its characteristics of being "replicable and scalable" elevate it beyond the scope of regional exploration to become an important reference for national vocational education reform. We must firmly believe that against the backdrop of building a strong education nation and a manufacturing powerhouse, only by adhering to the core logic of "value leadership, technological empowerment, and industry orientation" can we cultivate more outstanding talent possessing both solid skills and firm convictions. This study represents a crucial step forward in this direction.

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