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Research on the Construction of Computer Professional Clusters and Teaching Reform under the Guidance of the "Double High Plan"

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Abstract: Against the backdrop of accelerating global informatization and intelligence, computer technology has become the key driver of digital transformation across industries, carrying strategic significance for enhancing national competitiveness and promoting high-quality economic and social development. The implementation of the "Double High Plan" marks the transition of China's vocational education from quantitative expansion to connotative quality improvement. As a professional cluster highly aligned with information technology and the digital economy, computer-related disciplines have naturally become the core cluster in the implementation of the "Double High Plan." This study, grounded in system theory and competency-based education, systematically analyzes the strategic positioning and historical implications of the "Double High Plan." By reviewing the theoretical foundations of computer professional cluster construction and analyzing its framework, it innovatively proposes integrative pathways for systemic reconstruction of the teaching system, deep integration of industry and education, and the collaborative construction of institutional safeguards and cultural ecology. These reforms provide theoretical support and practical approaches for the high-quality development of vocational education, holding significant theoretical and practical value in aligning talent cultivation with industrial needs and serving the construction of a digital society.

Keywords: Double High Plan; Computer Professional Cluster; Teaching Reform; Vocational Education; High-Quality Development

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Introduction

The world is currently undergoing profound changes centered on informatization and intelligence. The rapid rise of the digital economy, artificial intelligence, big data, and the Internet of Things is reshaping production and lifestyles in all aspects. In this historical process, computer science and technology have transcended traditional disciplinary boundaries to become the core technology driving digital transformation across industries. With rapid iterations, wide applications, and strong cross-domain integration, it profoundly influences a nation's strategic initiative and discourse power in global competition, and serves as a key factor supporting high-quality economic and social development.

Vocational education, as an important bridge linking the education chain and talent chain, bears the strategic mission

of supplying highly skilled technical talents for industrial transformation and upgrading. In April 2019, the Ministry of Education and the Ministry of Finance jointly issued the Opinions on Implementing the Chinese Characteristics High-Level Vocational School and Professional Construction Plan (hereinafter referred to as the "Double High Plan"). The document emphasizes establishing new development concepts, serving the modernization of the economic system and higher-quality employment, and supporting the priority development of high-quality vocational schools and professional clusters to lead vocational education in serving national strategies, integrating regional development, and promoting industrial upgrading[1].

The implementation of the "Double High Plan" signifies a fundamental shift in the development paradigm of vocational education in China—from scale expansion toward connotative quality improvement and characteristic development. The plan not only requires a systematic elevation of schools' overall level but also stresses leveraging the demonstration role of high-level professional clusters to form replicable and scalable experiences. As a cluster highly consistent with emerging information technology and the digital economy, computer-related disciplines are naturally the core carriers of the "Double High Plan."

However, challenges remain in computer cluster construction: insufficient alignment between professional layout and industrial structure, outdated course content far behind technological frontiers, weak synergy between teaching innovation and practical skills cultivation, mismatches between faculty's industry experience and teaching abilities, and limited depth and breadth of industry-education integration. Under the strategic guidance of the "Double High Plan," addressing these problems systematically to build an organic ecology of cluster construction and teaching reform—achieving precise alignment between talent cultivation and industrial demand—has become a key issue in promoting the high-quality development of vocational education.

1.Strategic Positioning and Value Implications of the "Double High Plan"

1.1 Historical Evolution and Policy Drivers

The "Double High Plan" is not an isolated policy initiative but the inevitable result of the long-term development of vocational education, shaped by practice and historical demands. At the macro level, it responds to the structural demand for highly skilled talents arising from the upgrading of the national economic structure, providing human capital for building a modern industrial system. From a meso perspective, it aligns with the internal law of vocational education's transformation from scale expansion to connotative development, shifting growth from quantity to quality. From a micro perspective, it addresses long-standing issues such as fragmented professional layouts, single-layered talent cultivation, and weak industry-education integration, providing strategic guidance for systematically reconstructing the vocational education ecosystem. This multidimensional context highlights the systematic thinking and forward-looking nature of the policy.

1.2 Strategic Positioning and Connotation

The core value of the "Double High Plan" lies in cultivating high-level professional clusters with exemplary and leading effects, thereby forming transferable and replicable construction models to elevate the overall quality of vocational education. The key to this positioning is that cluster construction has transcended the superficial combination of individual disciplines. Instead, through systematic design and structural optimization, it creates an organic whole—internally coherent, resource-efficient, and closely aligned with industrial chain dynamics and technological frontiers. Its essence is the reorganization and functional coupling of internal elements to achieve deep integration of the education and talent chains. This not only enhances the precision and adaptability of talent cultivation but also provides institutional support for the sustainable development of vocational education.

1.3 Value Implications and Multidimensional Orientation

For computer clusters, the value implications of the "Double High Plan" have theoretical depth and practical orientation:

Strategic Value: Directly linked to the core of the national digitalization strategy and critical areas of information security, its construction is crucial for safeguarding national sovereignty and driving the digital economy's high-quality development.

Pioneering Value: Owing to rapid technological iteration and innovation, the computer field leads vocational education reforms, driving systematic reconstruction of teaching philosophy, curricula, and practice, and serving as a reference model

for other disciplines.

Radiative Value: With its cross-domain penetration and ecological integration, computer cluster development promotes synergy across related technical domains and internal linkage among vocational clusters, generating "point-to-surface" ecological effects. This fosters the education system's evolution toward higher-level collaboration and intelligence.

Together, these values make computer clusters an indispensable hub in the "Double High Plan."

2.Theoretical Foundations and Logical Framework of Computer Cluster Construction

2.1 Theoretical Foundations

Computer cluster construction is grounded in industrial cluster theory, educational ecology theory, and conjugate synergy theory.

Industrial cluster theory, first proposed by Marshall[2] and refined by Michael Porter in The Competitive Advantage of Nations, stresses aggregating enterprises, institutions, and universities around key industries to enhance competitiveness through resource sharing and specialization[3].

Educational ecology theory, derived from Bronfenbrenner's ecosystem theory and extended by Ashby's concept of "higher education ecology,"[4] views education as an organic whole with integrity, balance, and sustainability, emphasizing "ecological factors" such as faculty, training bases, and talent cultivation schemes.

Conjugate synergy theory, originating in chemistry and mathematics, highlights how elements form "conjugate relationships" and drive systemic stability[5]. In computer clusters, disciplines form communities of interest through conjugate structures in faculty, common courses, and school-enterprise projects. Resource competition coexists with flow and sharing, creating internal cohesion and promoting spiral development.

Together, these three theories provide multidimensional support for high-quality and sustainable cluster construction.

2.2 Dynamic Evolution of Cluster Structures and Logical Linkages

Cluster construction must transcend traditional disciplinary boundaries, building a dynamic "foundation–core–expansion" structure. Foundation disciplines provide theoretical bases; core disciplines focus on cultivating key competencies for competitive advantage; expansion disciplines adapt to technological advances and industrial demand shifts.

Integration of the knowledge chain, technology chain, and industrial chain is essential: curricula ensure coherence of learning paths, practice-based design supports skill progression, and job demands guide content relevance. Their organic integration dissolves the gap between theory and practice, creating a closed-loop interaction between education and industry, enabling co-evolution of knowledge, technology, and industrial needs.

2.3 Institutional Innovation in Governance and Synergy

Effective cluster operation relies on institutionalized governance innovation. A governance framework centered on professional clusters should break down departmental silos, create clear accountability, and promote synergy. Resource integration must enhance teaching, research, and industry collaboration, while responsibility-sharing ensures joint participation in quality monitoring and innovation. Such governance transforms clusters from static organizations into dynamic ecosystems, making them hubs of innovation and collaboration that support deep integration of education, talent, and industry chains.

3.Integrated Pathways for Teaching Reform and Safeguard Mechanisms

3.1 Systemic Reconstruction of the Teaching System

Reform should build a competency-oriented teaching system. Course content must overcome fragmentation and repetition by aligning dynamically with technological and industrial changes, forming a progressive logic of "foundation–expansion–integration–innovation." Teaching methods must shift from one-way transmission to interactive, project-based, task-driven, and problem-solving models, enabling students to construct knowledge and develop abilities in real or simulated contexts. Evaluation should expand beyond exams to include formative, outcome-based, and holistic measures, reflecting development in application, operations, and professionalism. This systemic reconstruction transforms the paradigm from knowledge transmission to capability generation.

3.2 Deep Synergy in Industry-Education Integration

Deep integration requires aligning education and industry chains dynamically. Course content must synchronize with industry standards, supported by advanced training bases and flexible mechanisms[6]. School-enterprise collaboration should drive co-development of teaching and R&D. Virtual simulation technologies enhance immersive practice experiences, overcoming spatial-temporal limits and enabling complex technical training. Beyond course alignment, institutional platforms should promote enterprise participation in teaching design and resource development, forming ecosystems of co-research, co-standardization, and co-sharing. This shift moves education from closed instruction to open co-creation, dynamically matching talent cultivation with industry needs.

3.3 System Construction of Institutional Safeguards and Cultural Ecology

Sustainable reform requires institutional and cultural support. A full-chain safeguard system should include:

Policy guidance: Linking top-level design with grassroots implementation;

Quality monitoring: Establishing closed-loop systems for curriculum development, teaching implementation, feedback, and improvement;

Cultural immersion: Cultivating a campus culture of skill respect, innovation, and excellence to stimulate intrinsic motivation;

Faculty development: Building teacher communities, providing systematic training, and enhancing integration ability and industry literacy.

This dual construction of institution and culture transforms reform from external drives to self-sustaining evolution, ensuring sustainable quality improvement.

Conclusion

The "Double High Plan" provides institutional support for computer cluster construction and teaching reform, marking a new stage of systemic and high-quality development of vocational education. Under this background, computer cluster construction must adopt systemic thinking, strengthen alignment between curricula and industry demand, drive innovative transformation of teaching models, and emphasize faculty professionalism and industry practice. By building collaborative safeguards of policy, culture, and mechanisms, deep integration of education, talent, and industry chains can be achieved, ensuring sustainable cluster development.

Looking ahead, computer clusters will integrate deeply with AI and big data, driving personalized and intelligent learning with precise evaluation systems. Expanding international cooperation will align with the global vocational education community, drawing on advanced experience to cultivate cross-cultural, versatile talents. Furthermore, embedding green computing and information ethics into training will foster awareness of sustainability and responsibility, producing high-quality technical talents with both innovation and social commitment. Ultimately, cluster development will achieve collaborative progress across intelligence, internationalization, and sustainability.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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