

Innovative Research on the Training System of Senior Compound Talents in Private Universities from the Perspective of Industry-Education Integration

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Abstract

Against the backdrop of new-quality productive forces development and industrial digital upgrading, private higher education institutions, as a vital component of China's higher education system, shoulder the crucial task of cultivating high-level interdisciplinary talents who adapt to regional industrial development, possess cross-disciplinary literacy and strong practical and innovative capabilities. Industry-education integration serves as a fundamental solution to resolve prominent dilemmas in private university talent cultivation, including the disconnect between talent training outcomes and industrial market demands, rigid disciplinary segmentation, and insufficient practical competency of graduates. Taking the cultivation mechanism of high-level interdisciplinary compound talents in private universities as the core research object, this study systematically explores existing deficiencies in current training systems from six key dimensions: training positioning, curriculum setup, practical teaching platforms, teaching team construction, and assessment mechanisms. Guided by the industry-education integration philosophy, this research innovatively establishes a holistic six-dimensional cultivation system covering "training objectives, education subjects, curriculum design, practical training, teaching faculty, and evaluation mechanisms". Meanwhile, targeted implementation strategies are proposed, including the joint establishment of municipal industry-education alliances, operational optimization of industrial colleges, development of interdisciplinary modular courses, cultivation of dual-qualified teaching teams, and construction of diversified whole-process evaluation systems. The research findings can provide solid theoretical support and operable practical schemes for the transformative upgrading of private universities and the improvement of regional talent supply quality.

Keywords

Industry-education integration; private universities; senior compound talents; talent training system; innovative development path.

1. Introduction

1.1. Research Background and Significance

With the continuous deep fusion of digital economy and real economy, industrial talent demand has undergone a fundamental shift. Traditional single-skilled professionals can no longer meet market needs, while interdisciplinary, compound, innovative and application-oriented talents have become the core demand of industrial upgrading. Private universities leverage their flexible institutional mechanisms and market-oriented operational advantages to become key providers of applied talents for local industrial development. Nevertheless, long-term inherent problems have restricted their talent cultivation quality, such as ambiguous training positioning, isolated disciplinary settings, superficial practical teaching links, and low-depth

school-enterprise cooperation, making it difficult to meet the cultivation standards of high-level compound talents.

To promote the high-quality development of vocational and higher education, Chinese authorities have issued a series of guiding policies, including Opinions on Deepening the Reform and Construction of the Modern Vocational Education System and Action Plan for Empowering and Improving Industry-Education Integration in Vocational Education (2023–2025). These policy documents explicitly encourage private universities to deepen industry-education integration reform, build modern industrial colleges, and advance the construction of municipal industry-education alliances, laying a solid policy foundation for the innovative optimization of talent training systems. From the industry-education integration perspective, reconstructing the compound talent cultivation system of private universities can effectively compensate for the shortcomings of traditional talent training modes, enhance the core competitive strength of private higher education institutions, promote the seamless connection of education, talent, industry and innovation chains, and further boost the high-quality economic development of regional industries.

1.2. Research Status at Home and Abroad

International applied universities have formed relatively mature talent cultivation models through long-term exploration of school-enterprise collaborative education. Representative practices include the industry-university-research integration model of Stanford University, Germany's dual vocational education system, and Finland's phenomenon-based interdisciplinary teaching mode. Foreign educational practices attach great importance to deep industrial embedding in teaching processes and cross-disciplinary knowledge integration to cultivate students' comprehensive practical abilities.

Domestic academic researches mainly focus on the operational mechanisms of industry-education integration, applied talent training modes, and transformative development paths of private universities. Existing research results mostly concentrate on institutional construction, platform development and teaching team building [1]. However, there is a lack of systematic, innovative and implementable research targeting high-level compound talent cultivation in private universities, especially in the fields of cross-domain resource integration, digital educational empowerment and multi-stakeholder collaborative education mechanisms.

1.3. Research Ideas and Methods

This research adopts three mainstream academic research methods: literature analysis, case study and field investigation. On the basis of sorting out relevant national policy documents and theoretical achievements, combined with typical practical cases of industry-education integration reform in domestic private universities, the study summarizes the practical dilemmas of current talent training, constructs an innovative systematic framework, and puts forward feasible optimization paths. The overall research logic follows a progressive research framework of “theoretical foundation sorting – current situation dilemma analysis – systematic framework construction – innovative path design – supporting guarantee mechanism formulation”.

2. Core Concepts and Theoretical Basis

2.1. Definition of Core Concepts

Industry-education integration: It is a modern educational development mode guided by actual industrial demands, which realizes deep integration between university education and industrial practice in multiple core elements including major setting, curriculum system, teaching staff, practical platforms and evaluation standards, so as to build a long-term stable school-enterprise collaborative education community.

Private universities: A type of social-run higher education institution with market-oriented operational characteristics and flexible institutional mechanisms, whose core educational positioning is to cultivate high-quality applied and interdisciplinary compound talents for social and industrial development.

Senior compound talents: High-end applied professionals who possess solid professional basic knowledge, diversified interdisciplinary knowledge reserves, strong engineering practice capabilities, innovative thinking awareness and comprehensive professional literacy, and are competent to solve complex industrial engineering and management problems.

2.2. Theoretical Basis

Competency-Based Education Theory: This theory takes post competency requirements of industrial positions as the core orientation, optimizes and reconstructs university curriculum systems and teaching modes, focusing on the cultivation of students' practical operation capabilities and comprehensive professional literacy.

Collaborative Governance Theory: It breaks the single-subject educational mode dominated by universities, integrates resource advantages of government, universities, enterprises and industrial associations, and builds a multi-party collaborative co-governance pattern for talent cultivation.

Cross-Border Integration Theory: The theory aims to break through the rigid barriers between different disciplines and the boundary separation between schools and enterprises, promote the cross-domain integration of professional knowledge, industrial technology and social resources, and lay a foundation for the formation of students' compound comprehensive competencies [2].

3. Practical Dilemmas of the Training System for Senior Compound Talents in Private Universities

3.1. Disconnection Between Training Objectives and Industrial Market Demands

Most private universities adopt homogeneous talent training positioning, which overemphasizes theoretical knowledge teaching while ignoring practical ability cultivation, and focuses on single professional training rather than interdisciplinary compound ability development. This traditional training orientation fails to adapt to the diversified compound talent needs of regional leading industries and emerging digital industries that require integrated capabilities of "technology, management, digital application and innovation", resulting in a serious mismatch between graduate competency and actual job requirements.

3.2. Rigid and Isolated Curriculum System with Disciplinary Barriers

The curriculum setup of most private universities is centered on single disciplines, lacking systematic interdisciplinary curriculum modules and cross-major teaching designs. Curriculum content and teaching materials fail to keep pace with the iterative upgrading of industrial technologies. The teaching arrangement presents an unreasonable structural proportion, with excessive theoretical class hours and fragmented, simulated practical courses that are divorced from real industrial business scenarios and operational processes.

3.3. Insufficient Construction and Application of Practical Teaching Platforms

On-campus practical training equipment in private universities is relatively outdated with single teaching scenarios, which cannot meet the needs of modern industrial practical teaching. Off-campus enterprise practice bases mostly exist in formal form, and students have few opportunities to participate in real industrial project practice. In addition, the supply of digital

practical teaching resources such as virtual simulation platforms and digital twin teaching systems is insufficient, which greatly weakens the practical teaching effect and restricts the improvement of students' practical abilities.

3.4. Deficient Comprehensive Competency of Dual-Qualified Teaching Teams

Full-time teachers in private universities generally lack front-line enterprise work experience and interdisciplinary teaching and scientific research capabilities. Meanwhile, the employment, assessment and management systems for enterprise part-time tutors are not perfect, leading to low standardization and poor sustainability of enterprise practical teaching. Moreover, the university's teacher evaluation mechanism overemphasizes scientific research achievements while neglecting teaching quality, and values theoretical research over practical teaching ability.

3.5. Superficial School-Enterprise Collaborative Cooperation Mechanism

Current school-enterprise cooperation in private universities mostly stays at the shallow level of student internship, graduate employment and enterprise lecture exchanges. In-depth collaborative education modes such as joint enrollment, co-training of talents, joint curriculum development and cooperative scientific research evaluation are rarely implemented. The absence of a sound benefit-sharing and risk-sharing mechanism between schools and enterprises reduces the enthusiasm and initiative of enterprises to participate in talent cultivation [3].

3.6. Single and Rigid Talent Evaluation System

The existing student evaluation system mainly relies on final written examinations, ignoring the assessment of learning process, practical operation performance and comprehensive literacy. The evaluation subjects are single, dominated by internal university teachers, with insufficient participation of industrial and enterprise professionals. Evaluation indicators focus excessively on students' theoretical knowledge mastery, while ignoring the assessment of practical ability, innovative thinking and comprehensive professional literacy, failing to objectively reflect students' compound innovative capabilities.

4. Innovative Framework of the Training System from the Perspective of Industry-Education Integration

Centering on the core goal of serving regional industrial high-quality development, focusing on the cultivation of students' interdisciplinary compound abilities and practical innovative literacy, this study constructs an innovative "six-in-one" systematic framework for senior compound talent training in private universities.

4.1. Goal System: Accurate Positioning for Compound Talent Development

Combined with the development requirements of new-quality productive forces and regional industrial transformation, a four-dimensional talent training goal system is established, covering professional core competency, interdisciplinary integration ability, practical innovation capability and comprehensive professional literacy. This positioning highlights the cultivation standard of senior compound talents with proficient professional skills, broad industrial vision, strong practical capabilities and high comprehensive literacy.

4.2. Subject System: Multi-Party Collaborative Education Governance

A diversified education subject pattern of "government guidance, university leadership, enterprise main participation, industrial guidance, and scientific research support" is constructed. By promoting the construction of municipal industry-education alliances, school-run industrial colleges and school-enterprise collaborative education communities, the study

realizes resource sharing, responsibility co-sharing and achievement co-creation among multiple subjects [4].

4.3. Curriculum System: Interdisciplinary Modular Reconstruction

Breaking the closed disciplinary teaching barriers, a five-level progressive curriculum system is built, including general basic courses, professional core courses, interdisciplinary modular courses, industrial practical courses and innovative expansion courses. Industrial technical standards, post operation norms and cutting-edge industrial technologies are integrated into curriculum content. Project-driven, case-based and digital new textbooks are developed, and the integrated development of curriculum learning, vocational certificate acquisition and discipline competition training is vigorously promoted.

4.4. Practice System: Three-Stage Progressive Practical Ability Empowerment

A staged and progressive practical teaching chain of “basic skill training – comprehensive ability training – on-site industrial practice” is designed. Universities and enterprises jointly build industrial colleges, practical training bases and technological innovation centers, and introduce real industrial projects, operational data and production processes into teaching links, so as to realize the integrated teaching mode of learning, researching and innovation through practical operation.

4.5. Faculty System: Cross-Dimensional Development of Dual-Qualified Teachers

A two-way interactive training mechanism is implemented for teaching teams: in-service university teachers take enterprise post practice and technical research, while enterprise technical backbones receive professional teaching training. The university improves supporting systems including dual-qualified teacher certification, salary incentive and professional title evaluation, and builds interdisciplinary compound innovative teaching teams suitable for industry-education integration teaching.

4.6. Evaluation System: Diversified Whole-Process Assessment Mechanism

A three-dimensional evaluation indicator system based on “knowledge mastery, practical ability and comprehensive literacy” is established. It adopts multi-subject joint evaluation modes including university assessment, enterprise evaluation, industrial professional evaluation and third-party institutional evaluation. The assessment mode combines whole-process process evaluation and final result evaluation, focusing on examining students’ project practice achievements, on-site performance and innovative practical capabilities.

5. Implementation Paths of System Innovation

5.1. Link Industrial Dynamic Demands to Optimize Major Setting and Training Goal Adjustment

Universities should establish a long-term industrial demand research and early warning mechanism, and set up interdisciplinary emerging majors targeting regional pillar industries and emerging industries, such as artificial intelligence + advanced manufacturing, digital technology + cultural and creative industry, and finance + technological innovation. Guided by the Outcome-Based Education (OBE) concept, industrial post competency standards are transformed into quantifiable talent training goals and graduation requirements to ensure the alignment of talent training and industrial demands.

5.2. Deepen Cross-Domain Integration to Build Modular Interdisciplinary Curriculum System

Taking real industrial production tasks and technical problems as the driving force, the university designs targeted interdisciplinary curriculum modules and comprehensive practical projects. It adopts a flexible curriculum selection mode combining compulsory courses, elective courses and micro-major courses to meet students' personalized compound development needs. Meanwhile, vocational skill certification standards and industrial norms are integrated into daily teaching, realizing the organic integration of academic education and vocational skill training.

5.3. Jointly Build Industrial Platforms to Create Immersive Practical Teaching Scenarios

Private universities actively promote the construction of modern industrial colleges and mixed-ownership secondary colleges through school-enterprise cooperation. Both parties jointly build professional training bases, industrial technology innovation centers and staff training platforms, and introduce enterprise production equipment, core technologies, practical projects and technical tutors into campus teaching. This realizes the scenario-based teaching transformation of "classrooms upgraded to workshops, homework transformed into practical projects, and students trained as reserve enterprise employees".

5.4. Strengthen Dual-Qualified Teacher Training to Build Cross-Domain Compound Teaching Teams

The university formulates standardized systems for teachers' enterprise post practice and project research, encouraging teachers to participate in enterprise technological innovation breakthroughs and product development projects to accumulate practical teaching experience [5]. At the same time, outstanding enterprise technical backbones and senior management personnel are employed as part-time tutors to guide students' practical training and innovative projects, forming a mixed school-enterprise teaching team for collaborative curriculum development and teaching research.

5.5. Innovate Collaborative Mechanisms to Accelerate the Construction of Municipal Industry-Education Alliances

Relying on local government resource advantages, a unified school-enterprise talent docking and cooperation platform is built. The platform promotes in-depth cooperation modes such as joint enrollment and training, order-oriented talent customization and modern apprenticeship systems. Local incentive policies for industry-education integration enterprises are formulated to fully mobilize enterprises' participation enthusiasm, and build an integrated development channel covering talent training, technological research and development, and social public services.

5.6. Reform Evaluation Mechanisms to Construct Closed-Loop Quality Assurance System

A complete closed-loop quality management system of "goal formulation – teaching implementation – effect evaluation – optimization improvement" is established. The university implements credit bank management and flexible academic system, and recognizes academic credits for students' enterprise practice experience and innovative competition achievements. Third-party professional evaluation institutions are introduced to conduct objective quality assessment, promoting continuous iterative optimization of the talent training system through evaluation reform.

6. Safeguard Measures

6.1. Policy and Institutional Guarantee

Universities fully implement national and local supportive policies for private education development. They continuously optimize institutional systems related to industry-education integration, school-enterprise cooperative education and industrial college operational management, so as to protect the legitimate participation rights of enterprises and ensure the independent school-running autonomy of private universities.

6.2. Resource Investment Guarantee

The university increases capital investment in practical training equipment upgrading, digital teaching resource development and teacher team training. It actively applies for special government education funds and absorbs enterprise social donations to form a diversified and multi-channel educational resource investment mechanism [6].

6.3. Cultural and Ecological Guarantee

The university cultivates a distinctive campus culture featuring industry-education integration, unity of knowledge and practice, and innovative exploration. It strengthens the integration of campus academic culture and enterprise industrial culture, helping students establish correct professional cognition and cultivate rigorous craftsmanship spirit and innovative awareness.

6.4. Management Mechanism Guarantee

A cross-department collaborative management organization composed of university, government and enterprise representatives is established to clarify the power and responsibility division of all parties. The internal school governance structure is optimized to improve the operational efficiency and standardized management level of industry-education integration work.

7. Conclusion and Prospect

Industry-education integration is an inevitable development path for private universities to cultivate high-level interdisciplinary compound talents. At present, the talent training systems of domestic private universities still have prominent defects in training positioning, curriculum design, practical teaching, faculty construction and evaluation management. It is imperative to take industrial market demands as the core driving force, take cross-domain resource integration as the main line, and rely on multi-party collaborative education to reconstruct the six-in-one innovative talent training system.

Through dynamic optimization of major setting, interdisciplinary modular curriculum reform, co-construction of industrial practical platforms, compound teaching team cultivation and diversified evaluation system innovation, private universities can effectively improve the matching degree between talent training quality and industrial development demands, and enhance their core competitiveness in higher education.

Future research can further explore the iterative optimization path of talent training models under the background of digital transformation and new-quality productive forces development. Combined with the differentiated school-running positioning of different private universities, in-depth case tracking and empirical research can be carried out to provide more targeted practical references and theoretical support for the innovative reform of compound talent training systems.

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