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Research on the Construction of Characteristic Major Groups in Private Vocational Undergraduate Colleges and the Coordinated Development of Regional Industries

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Abstract: In the context of national efforts to promote high-quality development of vocational education and deepen industry-education integration, private vocational undergraduate institutions serve as crucial platforms bridging the cultivation of high-level technical and skilled talents with regional industrial development. The alignment between their distinctive specialty clusters and regional industrial synergy directly impacts talent development quality and regional economic efficiency. This paper analyzes the inherent logic of coordinated development between specialty clusters and regional industries, leveraging the flexible operational mechanisms and direct industry connections of private vocational institutions. It identifies current challenges, including "inaccurate demand alignment, insufficient resource integration, and loose interest coordination," and proposes four strategic dimensions: establishing collaborative research mechanisms, optimizing cluster layouts, deepening industry-education integration, and improving support systems. These recommendations provide actionable references for advancing high-quality coordinated development between private vocational institutions and regional industries.

Keywords: Private vocational undergraduate colleges; Characteristic major groups; Regional industries; Coordinated development; Industry-education integration

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1. Introduction

The 2025 *Modern Vocational Education System Development Plan (2024–2030)* explicitly states that "vocational undergraduate institutions should align with regional industrial upgrading strategies, develop distinctive program clusters matching local economic structures, and establish a collaborative development framework where program clusters connect with industrial chains and talent pipelines support innovation chains" [1,2]. Private vocational undergraduate institutions, leveraging their high autonomy and rapid market responsiveness, possess inherent advantages in serving regional industrial development. However, some institutions still face challenges such as "program cluster development disconnected from industrial realities, superficial

collaboration with regional enterprises, and talent cultivation mismatched with job requirements," which limit their capacity to serve regional industries [3].

In this context, researching the development of distinctive program clusters in private vocational undergraduate institutions and their synergistic integration with regional industries not only helps these institutions clarify their educational positioning and enhance core competitiveness but also provides high-level technical and skilled talents tailored to regional needs [4,5]. This approach achieves "mutual growth between schools and local communities, as well as win-win outcomes for industry and education," carrying significant theoretical and practical implications for advancing vocational education reform and promoting high-quality regional economic development [6].

2. The internal logic of the coordinated development of characteristic majors and regional industries in private vocational undergraduate colleges

2.1. Regional industrial demand serves as the "navigation system" for developing specialized academic clusters

The structural adjustment and upgrading of regional industries directly determine the "types, levels, and specifications" of talent demand. On one hand, industrial advancements such as "extended value chains, improved supply chains, and breakthroughs in innovation chains" will give rise to new professions and positions [7,8]. For instance, the development of regional new energy industries requires a large number of professionals in "new energy vehicle testing and energy storage technology applications" [9]. On the other hand, the digital and intelligent transformation of industries will impose new requirements on traditional roles. For example, the upgrading of regional manufacturing needs interdisciplinary talents in "smart manufacturing engineering technology and industrial robot applications." The construction of specialized program clusters in private vocational undergraduate institutions should focus on regional industrial demands. By adopting a "cluster-based" professional layout, these institutions can cover the needs of industrial position groups, avoid the limitations of single-discipline training, and ensure precise alignment between talent supply and industrial demands [10].

2.2. Specialized clusters serve as the "talent engine" for regional industrial development

Specialized professional clusters, operating under the framework of "core disciplines leading and related disciplines supporting," achieve dual alignment: curriculum content with occupational standards and teaching processes with production workflows [11]. Firstly, they cultivate high-level technical professionals with "solid theoretical foundations and advanced practical skills," addressing regional industrial talent gaps. For instance, the "Cross-border E-commerce Professional Cluster" developed for local cross-border e-commerce industries trains professionals covering "e-commerce operations, international logistics, and foreign trade documentation." Secondly, leveraging the clusters' faculty and practical resources, these clusters provide technical training and R&D support to regional enterprises, facilitating technological upgrades. The "Smart Manufacturing Professional Cluster" exemplifies this approach by offering "Industrial Robot Maintenance" training to small and medium-sized manufacturers, effectively resolving technical challenges during corporate transformation [12].

2.3. Collaborative development represents a mutually beneficial choice for private vocational undergraduate institutions and regional industries

For private vocational undergraduate institutions, collaborating with regional industries provides access to "real-world teaching cases, industry-accredited faculty, and practical training bases," enhancing the practicality

of talent development. This partnership also improves graduate employment rates through targeted talent supply, boosting institutional appeal. For regional industries, such collaboration enables early talent acquisition, reducing corporate "recruitment and training costs," while leveraging academic research resources to overcome technical bottlenecks and strengthen industrial competitiveness. This symbiotic relationship of "joint talent cultivation, resource sharing, and mutual benefit" forms the cornerstone for achieving deep integration between educational institutions and local industries [13,14].

3. Existing problems in the coordinated development of characteristic majors and regional industries in private vocational undergraduate colleges

3.1. The industrial demand research mechanism is not sound, and the coordination foundation is weak

The research scope remains narrow, with most institutions conducting industry demand surveys independently. Regional governments, industry associations, and leading enterprises show limited participation, resulting in findings that remain at the level of "job position statistics" without in-depth analysis of long-term industry trends or core competencies. Outdated methods like "offline seminars and paper questionnaires" hinder the use of big data technology to capture real-time regional talent demand data (e.g., job postings on recruitment platforms, industry development reports). This causes research outcomes to lag behind industry changes. For instance, while the regional digital economy sector has emerged, universities have yet to adjust their program offerings accordingly. The low conversion rate of research results reflects poor alignment between survey data and program adjustments (e.g., curriculum design, practical training directions), creating a disconnect between research and practice. A typical case is when surveys identify "battery testing professionals" needed in the regional new energy industry, yet relevant courses remain absent from program offerings [15].

3.2. The professional cluster layout shows low alignment with regional industries, with misaligned collaborative directions

The education sector suffers from severe homogenization. Many private vocational colleges blindly follow trends by establishing "hot major clusters" (e.g., artificial intelligence, big data) without aligning with regional industrial characteristics, resulting in a disconnection between academic programs and local industries [16]. For instance, in agriculture-focused regions, institutions prioritize "fintech major clusters," creating a paradox of talent oversupply and industrial demand gaps. These clusters lack coordinated development, with insufficient integration between core and related majors, repetitive course content, and poor resource sharing. For the "Smart Tourism" cluster, both "Tourism Management" and "Hotel Management" offer identical "Tourism Etiquette" courses, while separate training bases lead to resource waste and ineffective collaboration. Furthermore, institutions neglect emerging industries, showing insufficient sensitivity to regional "future industries and new business models" and failing to proactively develop relevant clusters. For example, despite the regional marine economy launching "marine ranching" projects, colleges have yet to establish "marine ecological aquaculture" clusters, leaving industries vulnerable to talent shortages [17].

3.3. Insufficient depth of industry-education integration and a loose coordination mechanism

The current collaboration model remains superficial, with most school-enterprise partnerships remaining at the basic stage of "enterprises providing internship positions and institutions delivering interns," without

progressing to deeper collaboration such as "jointly developing talent cultivation plans, creating curricula, and establishing industry-academy institutes." Enterprises show low enthusiasm for teaching participation, often merely sending technicians to conduct occasional lectures without involvement in curriculum design. The lack of a "shared benefit mechanism" between schools and enterprises results in enterprises needing to invest in "faculty, equipment, and facilities" for collaboration while struggling to gain direct benefits (such as cost savings from targeted talent delivery or profit-sharing from R&D). This creates insufficient motivation for corporate collaboration, leaving many agreements as mere "paper deals" without real implementation [18].

It is difficult to share practical training resources. Most of the training bases in colleges and universities are "simulated scenes" and lack real production equipment in enterprises [19]. Due to "safety risks and production efficiency," enterprises are reluctant to open training to colleges and universities, resulting in students' difficulty in contacting real production processes and the disconnection between skill training and job requirements.

3.4. The guarantee system is not perfect, and the coordination stability is poor

Policy support remains inadequate, with regional governments lacking dedicated policies for "industry-academia collaboration in private vocational colleges." Key gaps include the absence of a "co-development fund" (for establishing training bases and subsidizing corporate participation in education) and the exclusion of enterprise involvement in incentive measures like tax breaks and credit score boosts, leaving collaborative efforts without policy guidance. Faculty support is weak, with less than 40% of institutions having dual-qualified teachers (those with both academic and industry experience). Full-time faculty members often lack corporate work experience, making it difficult to teach "practical job skills." Part-time corporate instructors struggle to maintain teaching stability due to "busy schedules and limited teaching experience," compromising the quality of professional cluster education. The evaluation system remains simplistic, focusing primarily on metrics like "employment rates and course pass rates" rather than incorporating "enterprise satisfaction, graduates' job competency, and the clusters' contribution to regional industries." This lack of comprehensive assessment prevents institutions from being motivated to optimize collaborative development [20].

4. Optimization strategies for the coordinated development of characteristic majors and regional industries in private vocational undergraduate colleges

4.1. Establishing a collaborative research mechanism among government, industry, enterprises, and schools to strengthen the foundation for cooperation

Establish multi-disciplinary research teams led by regional governments (e.g., education bureaus, human resources and social security bureaus), collaborating with industry associations, leading enterprises, and academic leaders to form an "Industrial Demand Research Committee." Clear responsibilities are defined: governments provide regional industrial planning and talent demand data; industry associations establish job competency standards; enterprises provide authentic job requirements; and academic institutions handle data integration and analysis. A digital research platform is built through the regional governments' "Industrial Big Data Center," which continuously collects real-time data from "job postings on recruitment platforms, industry development reports, and corporate technical needs." The "Regional Industrial Talent Demand White Paper" is regularly published to provide real-time data support for adjusting professional clusters. For example, the platform identifies a 30% growth in "battery maintenance job demand" within the regional new energy vehicle industry, enabling academic institutions to promptly add "Battery Testing and Maintenance" courses to the "New Energy Professional Cluster." A research-to-action mechanism is established, with "Professional Cluster

Adjustment Review Meetings" held every 1–2 years. These meetings, led by the research committee, determine "cluster directions, curriculum systems, and practical training content," ensuring research data directly translates into professional cluster development measures and avoiding "research-practice disconnect."

4.2. Aligning with regional industrial characteristics to optimize the layout of professional clusters

By anchoring regional development in core industries, we strategically design specialized clusters around local pillars and distinctive industries to avoid homogenization. For instance, agricultural regions may establish a "Tropical Crop Cultivation and Processing Cluster" encompassing horticultural technology, food quality and safety, and agricultural e-commerce. Industrial regions could develop an "Intelligent Manufacturing Cluster" covering mechanical design, industrial robotics, and smart control systems. To enhance coordination within clusters, we prioritize "industry-specific competency frameworks" in curriculum design, creating cross-disciplinary shared courses (e.g., "International Trade Practice" in the Cross-border Trade Cluster) to eliminate redundancy. A "Cluster Training Resource Center" will be established to centrally manage laboratories and equipment through a reservation system, ensuring efficient utilization. The "Virtual Scenic Area Training Platform" in the Smart Tourism Cluster, for example, is accessible to all related disciplines.

By proactively positioning emerging industries and tracking regional "future industry" trends, institutions can collaborate with startups to establish "forward-looking specialized clusters." For instance, when developing regional "low-altitude economy" initiatives, universities may partner with local drone manufacturers to create "low-altitude economy application clusters" covering "drone operations, low-altitude logistics, and aviation safety," thereby cultivating talent reserves in advance.

4.3. Deepening the integration of industry and education, and improving the coordination mechanism

Collaborative establishment of "industry-academy partnerships" centered on "shared benefits" involves co-building industrial colleges with regional industry leaders. These institutions operate under a "dean responsibility system under council leadership," where schools and enterprises jointly develop talent cultivation plans, create "project-based curricula," and form "dual-mentor teams" (school mentors + corporate mentors). For instance, the "New Energy Vehicle Industry College" might introduce real corporate production projects (e.g., "new energy vehicle charging station R&D") where students participate as "project teams," achieving "learning-as-work." Enterprises are incentivized through government policies offering "tax incentives" (e.g., tax deductions for equipment investments) and "credit bonuses" (priority access to government projects). Institutions reciprocate with "targeted talent supply, technical training, and R&D collaboration," such as providing "free skill enhancement training" to meet corporate talent upgrade needs. A "shared training base" model adopts "institution-provided venues, enterprise-provided equipment" to establish "production-oriented training bases" that serve both academic education and partial corporate production tasks, achieving "win-win teaching-production synergy." For example, the "Smart Manufacturing Training Base" could accept corporate component processing orders, enabling students to complete real production tasks in the training, improve skills, and reduce production costs for enterprises.

4.4. Improving the guarantee system and enhancing the stability of coordination

To secure policy and financial support, educational institutions actively engage with regional governments to apply for "Special Funds for Industry-Education Integration in Vocational Education," which will be used

for cultivating “dual-qualified” teachers and establishing practical training bases. Efforts are being made to incorporate the coordinated development of private vocational undergraduate institutions into “regional industrial planning,” clarifying the government’s responsibilities in “resource coordination and policy guidance.” The development of “dual-qualified” faculty teams is being strengthened through the “Teacher Enterprise Practice Program,” requiring full-time teachers to complete at least six months of enterprise practice every three years, with practical experience factored into professional title evaluations. High-salary recruitment and flexible hiring strategies are employed to attract corporate technical directors and senior engineers as full-time faculty or academic leaders. A “dual-mentor training mechanism” between schools and enterprises is being established to enhance part-time corporate instructors’ teaching capabilities. A diversified evaluation system has been constructed, incorporating “enterprise satisfaction (30%), graduate job competency (25%), professional cluster contribution to regional industries (20%), depth of school-enterprise collaboration (15%), and employment rate (10%)” into the assessment criteria. Evaluations are jointly conducted by the “government, industry, enterprise, and school” stakeholders, with results serving as critical references for adjusting professional clusters and determining government funding support, thereby promoting continuous optimization of collaborative development.

5. Conclusion

The development of distinctive professional clusters in private vocational undergraduate institutions and their coordinated advancement with regional industries forms the cornerstone for vocational education to serve regional economies and deepen industry-education integration. Current challenges in this collaboration—including inadequate research mechanisms, low alignment, superficial integration, and insufficient support—require coordinated efforts from government, industry, enterprises, and educational institutions. By implementing a four-dimensional approach encompassing research, strategic planning, integration, and support mechanisms, we can establish a collaborative framework that fosters talent co-cultivation, resource sharing, and shared benefits.

In the future, private vocational undergraduate institutions should further strengthen their “regional service” positioning, closely follow regional industrial development trends, and continuously optimize the construction of specialized program clusters. Regional governments, industry associations, and enterprises need to actively participate in collaborative efforts to form a “school-local symbiosis, industry-education win-win” ecosystem. This will ultimately achieve high-quality coordinated development between private vocational undergraduate education and regional industries, providing strong support for national vocational education reform and regional economic upgrading.

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