Article

Research on the Linkage Mode of Vocational Education Promoting High-Quality Development of Regional Economy

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Abstract: At present, the high-quality development of regional economy is faced with two co-occurring challenges of industrial upgrading and human capital adaptation. Due to vocational education being the core carrier for building a skill-based society, the structural mismatch between the lag of specialty setting in vocational education and the changing demand of regional industry remains an ongoing issue. In school-enterprise cooperation, no motivation for enterprises to participate and the regional disparity of resource allocation also limits efficient economic services from vocational education. It is necessary to address the long-standing imbalance between academic credentials and skill-oriented training, and form an enablers' mechanism for the in-depth integration of the education chain, industry chain and innovation chain, with the aim of developing vocational colleges as a network platform for regional technology breakthroughs and talent reserves.

Keywords: vocational education; regional economy; quality development

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1. Introduction

The regional economic development has entered the stage of innovation-driven transformation, and high-quality technical and skilled talents have become the key variable for industrial leapfrogging. The existing vocational education system shows three types of discontinuities when serving the regional economy: the connection between the specialty layout and the industrial chain is loose, the integration of industry and education remains at the agreement level without substantial R & D cooperation, and policy incentives can hardly arouse the enthusiasm of enterprises for in-depth participation. This phenomenon reflects that vocational education has not been truly incorporated into the regional innovation ecosystem, and the dual values of technology incubation and skill development remain underutilized in many regions. The solution lies in reconstructing the institutional framework to enable vocational education to shift from passive adaptation to actively leading the regional industrial upgrading, which is related to the underlying logic of the transformation of the economic growth model.

2. Theoretical Basis of Vocational Education and Regional Economic Development

2.1. Connotation and Functional Orientation of Vocational Education

Fundamentally, vocational education is a system for skill cultivation that targets specific occupational fields through the precise integration of systematic curriculum development and training and practical situations. It utilizes contextualized practical technical knowledge every step of the way, localized professions qualities cultivated down-to and tempering methodically overall vocational education. The functional positioning is intrinsic to the actual needs of an industrial iteration, hence the emphatic adaptedness between the educational process and service targets, adjusting the labor structure through a professional capacity-building functional mechanism. Operationalizing this process is de-

pendent on institutional level planning, effectively means vocational education is constantly located where technological-upgrade intersects with matching personnel with jobs. The ongoing implementation of educational disbursement in the practical context forms a practically closed loop, continuously syphoning the fundamental point between skill inheritance with economic transformation. Careful management of ratiocination of educational production engages the resonance effect between education outputs with physical work requirements [1].

2.2. Characteristics and Requirements of High-Quality Development of Regional Economy

The high-quality development of regional economy is based on an endogenous growth model driven by innovation. The industrial structure has been reconfigured into technology-intensive, high-value-added, and cohesive industries and must have the core resilience to adapt to the changes in global value chain reconstruction. For development momentum to continuously increase, the structural configuration of human capital must be matched at a high level, meaning the skills of the workforce must precisely meet the dual demands of digital manufacturing and the service economy. The resource factor allocation model is intensive under environmental constraints; the path of green development indicators is embedded in the deeper logic of regional industrial planning. The governance mechanism must create an institutional environment for the collaborative innovation of the market entities, paying special attention to the closed-loop connection between the industrial chain and the innovation chain; ultimately, to create a balance between economic efficiency and welfare. This transformational pressure pushes the regional development mechanism to shift beyond the constraints of traditional path dependence.

2.3. Theoretical Basis of Interaction between Vocational Education and Regional Economy

The vocational education system and the regional economic system are linked in a deep-running symbiotic relationship, and the flow of human capital and the diffusion of technology are the main transmission mechanism of their interrelation. The characteristics of regional industry evolution stages significantly directs adaptation adjustment of talent cultivation standards of vocational education, and the rate of accumulation of technical skills directly restricts the resilience boundary of industrial transformation and upgrading. At the institutional design level, the consensus framework for cross-system resource integration must be designed. In particular, the incentive compatibility of policy instruments for school-enterprise collaborative R & D has a significant impact on collaborative transformational efficiency of innovation factors. The practice of organizational carriers such as modern industrial colleges illustrates principle of dynamic coupling between educational supply elasticity and market demand fluctuation, and relies on spatial nesting density between knowledge production chain and regional industry chain for successful operation. The continually optimized collaboration network gradually dismantles the contradictory tension of the educational lag compared to the speed of technological iteration, to drive the collaborative evolution of the skill ecosystem and the industrial ecosystem [2].

3. Problems and Challenges of Vocational Education in Promoting Regional Economic Development

3.1. Structural Contradiction between Vocational Education Supply and Industrial Demand

The slow response of the specialty adjustment mechanism in vocational colleges struggles to keep up with the accelerating pace of industrial technology evolution. The update cycle of curriculum content generally falls behind the actual pace of production equipment upgrades. This gap leads to a persistent mismatch between the skill inventory of graduates and the job-related ability requirements. The prediction data of industrial planning have not been effectively transformed into decision-making basis for the allocation of educational resources. There is often a significant gap in timing between the scale

of talent cultivation in emerging fields and the expansion needs of regional industrial clusters, resulting in a resource misallocation phenomenon where there is a structural shortage of technical personnel and an oversupply of graduates from common majors. In the recruitment process, the human-resource departments of enterprises frequently encounter cognitive biases in talent specifications. There is a substantial disconnection between the description of job-related ability models and the standards of vocational qualification certification, and the frictional losses in the process of human capital efficiency transformation continue to accumulate. The deeper root of the contradiction lies in the fact that the evaluation system for educational supply overemphasizes the assessment of static indicators and ignores the real impact threshold of industrial development fluctuations on the skill depreciation rate [3].

3.2. Insufficient Depth and Breadth of School-Enterprise Cooperation

The interaction between schools and enterprises has long been limited by a shallow cooperation framework. Most practices only involve the ceremonial establishment of internship bases and sporadic enterprise visits, and the penetration rate of substantial technological R&D collaboration and joint curriculum development is seriously insufficient. The enthusiasm of enterprises to engage in teaching activities is limited by the lack of intellectual property protection mechanisms. The proportion of core production process knowledge being transformed into teaching cases has remained at a low level for a long time. The enterprise practice path for dual-qualified teachers often becomes a mere formality due to production confidentiality clauses. The gap between the update rate of practical training equipment in vocational colleges and the generational change of industrial production lines continues to widen. The teaching resources transformed from second-hand equipment can hardly simulate the technological complexity of real production scenarios, resulting in a systematic reduction in the quality of students' skill acquisition. The loopholes in the policy coordination mechanism have led to a long-term mismatch between regional industrial maps and the distribution of educational resources. In particular, the technological upgrading needs of small, medium and micro-enterprises are difficult to be incorporated into the regular service scope of vocational education groups, and the driving force of industrial frontier changes cannot effectively feedback to the iteration of teaching standards. This superficial cooperation ultimately restricts the release of the multiplier effect of technical skill accumulation.

3.3. Unbalanced Regional Distribution of Vocational Education Resources

The inertia of regional resource allocation continues the centralized characteristics of traditional industrial corridors. The intensity of facility investment in vocational colleges in economically active areas far exceeds that in underdeveloped and remote regions. The generational gap in the technology of practical training bases forms an invisible barrier to cross-regional talent flow. Differences in local financial support capabilities lead to a gradient gap in the renewal frequency of per-student teaching equipment. In particular, there is an obvious geographical gap in the coverage of high-value practical training modules such as industrial robots. The imbalance in the structure of the teaching staff is more profound. The natural flow of holders of industrial frontier technologies to regions with higher salaries accelerates the hollowing-out trend of teaching capabilities in underdeveloped areas [4]. The cross-regional cooperation mechanism lacks an effective compensatory institutional design. In the process of transferring the eliminated equipment from developed regions to marginal colleges, there is a risk of secondary depreciation due to the lack of technical applicability review, and the obstructive effect of the teaching resource transmission chain continuously intensifies the quality gap in regional technical talent cultivation.

3.4. Policy Support and System Guarantee Need to Be Improved

The synergy of various special policy provisions within the legislative framework can be further enhanced. There are areas where the operational alignment between local regulations on industry-education integration and central financial support measures could be strengthened, which sometimes leads to unclear power and responsibility attribution in the approval process for school-enterprise co-construction projects. The operational efficiency of the multi-department cooperation mechanism is influenced by the fragmented state of the information-sharing platform. The gap between the update cycle of talent cultivation standards led by the education department and the industrial early-warning data from the economic department is becoming more apparent. There are opportunities to improve the incentive structures for market entities in the institutional design. Specifically, the tax deduction rules for small and medium-sized enterprises involved in technological R&D cooperation could benefit from a more graduated design, and greater clarity on the ownership of intellectual property rights may help strengthen enterprises' willingness to engage in core technology transfer. A more fundamental opportunity lies in better aligning regional differentiated industrial policies with a flexible adjustment mechanism for vocational education resource allocation. The current pace of institutional development in underdeveloped areas presents challenges that could be addressed to create a broader scope for enterprises to engage in educational innovation.

4. Construction of a Linkage Model for Vocational Education to Promote the High-Quality Development of Regional Economy

4.1. Optimizing the Layout of Specialties to Dock the Regional Industrial Chain

The characteristics of the regional industrial spectrum should provide a foundational basis for the specialty arrangement of vocational colleges. The technological trends of leading industries must be closely incorporated into the decision-making criteria for the flexible adjustment of the specialty catalog. Colleges should establish a routine participation mechanism for technical directors of enterprises in specialty construction committees, converting production line equipment update plans into plans for updating teaching units in situ, to effectively address the issue of curricula lagging behind production. The specialty arrangement demonstration method should be connected to the industrial early-warning analysis system of the economic department, and the enrollment quota scale should be flexibly adjusted based on the variation in the gaps of key positions in the regional industrial chain. In particular, the specialty arrangement in strategic emerging areas should seize the key moments of industrial growth. The regular specialty evaluation process should establish strict quantitative thresholds to ensure alignment with production capacity. For specialties that have been disconnected from the needs of local pillar industries for three consecutive years, a flexible exit mechanism, such as suspension, closure, merger, or transfer, should be implemented to ensure that educational resources are continually aligned with the transformation of the regional economic structure [5]. This dynamic adjustment model, rooted in the industrial context, is a fundamental guarantee for the effective transmission of technical skills.

4.2. Deepening the Integration of Industry and Education and Innovate School-Enterprise Cooperation

The technology research cooperative institutions need to break the surface-level cooperative boundary of traditional order-type training. The technical backbones of enterprises and the teachers of colleges should build a physical R&D studio together to realize the organic integration of the teaching process and production innovation in the upgrading project of real-on production line technical production technology. In the reform of the property-right characteristics of the college practice training center real mainstream must retain an access link to equipment as equity investment, allowing an enterprise to

implant new production module to be verified into the teaching environment for operative verification. The soils and processes data could then be synchronously transferred into material for compiling the loose-leaf textbook. The construction of the school-enterprise joint laboratories must include a mandated classification intellectual property rights confirmation mechanism. The industry income generated from R&D achievements should be required to support the teaching equipment iterative fund, based on a fixed proportion, to enable a closed loop link, reinvesting the technological dividends into the education. The modern apprenticeship system should be upgraded to a composite cultivating work plan with the possibility of multi-position rotation training. The original experience of enterprise masters teaching apprentices must be transformed into standardized training modules through educational reform. The growth records of students should comprehensively document their technology proficiency curves during a complete production cycle.

4.3. Promoting Technological Innovation to Serve Industrial Upgrading

The technology R&D teams of vocational colleges should actively embed themselves in the innovation network of regional industrial clusters, transforming the urgent process pain-points in enterprise workshops into sources for horizontal research project establishment, so that teachers' research papers are written in the real scenarios of production lines rather than being developed in isolation. The school-run technology transfer centers must set up plans to run a market-oriented patent broker system, develop modular technology transformation solutions for small and medium-sized enterprises in specialty regional industries, and package laboratory results into plug-and-play technology upgrade enablers. Skill master studios need to carry out a public technology diffusion function and host cross-company technology research-cooperation camps to solve common technology bottlenecks across the industry. Students are able to master both application of cutting-edge technologies and the industrial iteration context through practical project operations. The reform of the scientific and technological achievement evaluation system should increase the industrial adaptation dimension with a required technology maturity report chapter for small and medium-sized enterprises on cost-bearing capacity analysis to reverse the embarrassing situation where research outputs just sit in display cabinets. The regional industrial technological transformation demand information platform should interface with the school's scientific research equipment sharing portal. The unused pilot-scale workshops of key enterprises can be repurposed for teaching and serve as hands-on facilities for students to get involved in technology verification [6].

4.4. Improving the Governance System and Strengthen the Policy Guarantee

The regional vocational education council is an important decision-making node to connect industrial departments and schools. It should directly link the talent needs of local key construction projects with the professional adjustments of vocational colleges in order of priority. This will help eliminate coordination challenges created by fragmented departmental management. The cross-department joint meeting scheme should create a manageable and traceable supervision ledger. Time-limits for joint office work should be set for approval difficulties related to industry-education integration projects. In particular, a standard protocol for joint inspections should be established for land use approval and fire safety acceptance across supervisory fields. The performance appraisal of dedicated fiscal funds should include clear indicators for enterprise involvement in technology. Support levels should be dynamically adjusted based on the output efficiency of the schools' and enterprises' joint technology transfer centers, to avoid the inefficient allocation of funds. Third-party evaluation institutions should construct a dynamic tracking model for industrial adaptability, conducting semi-annual early-warning ratings on the alignment between professional settings and regional industrial chains, and using the evaluation results as the core basis for adjusting college leadership teams. The credit score management system should cover all types of market entities participating in industry-

education integration. Enterprises that consistently provide high-quality practical training positions should be granted a green channel for title evaluation, while educational institutions that leave internship resources idle for extended periods should be issued a yellow card affecting their operational licenses.

4.5. Constructing Evaluation Mechanism to Promote Sustainable Development

The regional industrial technology development observatory needs to build a dynamic monitoring platform for the quality of industry-education integration, which can capture in real-time the mapping relationship between the technology upgrading data of enterprise production lines and the practical training projects of vocational colleges, so that the evaluation of technology adaptability can be based on factual evidence with millimeter-level accuracy. The institution designing the evaluation index system must reserve permanent seats for enterprise engineers, and revise the core parameters for skill attainment according to the quarterly reports on changes in industrial talent demand, and be especially vigilant against the potential risk of the practical training content lagging behind the equipment iteration. The evaluation results of third-party organizations should be mandatory for implementing a weight for the allocation of funds for universities building technical vocational colleges. When the person in charge of professional courses has lagged in technology transfer for two rounds of evaluation, a program for reconstructing teaching ability should be implemented. The commission and evaluation standards for appointment to a teaching position should take into account the records on the students' ability to solve real-world problems in enterprises. The weight coefficient of the enterprise's participation in the evaluation should have a positive correlation with the enterprise's contribution to technological transformation. Enterprises that truly accept students experiencing core technology research should be strongly incentivized with tax credit entitlements [7]. The working hours of technical backbones guiding students need to be converted to legal conversion indicators for enterprise innovation performance. The regional economic data of the industrial upgrading dimensionality analysis should be required to provide a special module for the contribution rate of vocational education, and the local statistical yearbook should have an independent accounting item for the increase in technological transformation from industry-education collaboration.

5. Conclusion

The positive relationship between vocational education and regional economy must go beyond the conventional conception of school-enterprise cooperation. Establishing a dynamic adjustment mechanism for majors and integrating it into the regional industrial plan, and capping it off with the "technology feedback" model to spur school-enterprise joint innovation potentials, constitute the fundamental approaches to breaking through structural contradictions. Policy design should focus on creating a cost-compensation and tax-deduction system as a mechanism for enterprises' participation, while promoting in parallel the connections between vocational education quality evaluation standards and industrial upgrading performance indicators. Only when vocational education institutions act as the technology originators in the regional science and innovation system can the closed-loop value reconstruction be genuinely realized, from the talent supply side to the industrial demand side. Education-empowered in-depth transformation will be the key footnote for the future regional competitiveness.

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References

1. D. Yu, L. Yang, and Y. Xu, "The Impact of the Digital Economy on High-Quality Development: An Analysis Based on the National Big Data Comprehensive Test Area," *Sustainability*, vol. 14, no. 21, p. 14468, 2022, doi: 10.3390/su142114468.
2. X. Gong, "Performance evaluation of industry-education integration in higher education from the perspective of coupling co-ordination-an empirical study based on Chongqing," *PLoS ONE*, vol. 19, no. 9, e0308572, 2024, doi: 10.1371/journal.pone.0308572.
3. M. B. Carstensen and C. L. Ibsen, "Three dimensions of institutional contention: efficiency, equality and governance in Danish vocational education and training reform," *Socio-Economic Rev.*, vol. 19, no. 3, pp. 1037–1063, Jul. 2021, doi: 10.1093/ser/mwz012.
4. D. Raffe, "Pathways Linking Education and Work: A Review of Concepts, Research, and Policy Debates," *J. Youth Stud.*, vol. 6, no. 1, pp. 3–19, 2003, doi: 10.1080/1367626032000068136.
5. Y. Po and L. Yunbo, "Balanced Development for Provincial-Level Coordination and Higher Vocational Education," *Chinese Educ. Soc.*, vol. 50, no. 5–6, pp. 469–498, 2017, doi: 10.1080/10611932.2017.1408321.
6. Y. Mei, J. Miao, and Y. Lu, "Digital Villages Construction Accelerates High-Quality Economic Development in Rural China through Promoting Digital Entrepreneurship," *Sustainability*, vol. 14, no. 21, p. 14224, 2022, doi: 10.3390/su142114224.
7. L. Hou, C. Tian, R. Xiang, C. Wang, and M. Gai, "Research on the Impact Mechanism and Spatial Spillover Effect of Digital Economy on Rural Revitalization: An Empirical Study Based on China's Provinces," *Sustainability*, vol. 15, no. 15, p. 11607, 2023, doi: 10.3390/su151511607.