



Digitalization Empowers the Talent Training of Industry-Education Integration Community in Hunan Province

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Abstract: This study focuses on industry-education integration communities in Hunan Province, conducting an in-depth analysis of their current development status. It identifies prominent challenges such as insufficient resource integration and low collaborative efficiency, while digital technologies provide effective solutions. The research proposes a "platform + ecosystem" digital transformation pathway, encompassing multiple dimensions including digital platform construction, teaching model innovation, evaluation feedback mechanisms, and governance system optimization. Supporting measures are outlined across policy frameworks, technological applications, organizational structures, and resource allocation. The study aims to clarify how digitalization empowers talent cultivation model innovation within Hunan's industry-education integration communities, offering theoretical insights and practical references for enhancing vocational education quality and adaptability through concrete digital empowerment pathways.

Keywords: digital empowerment; industry-education integration; professional community; talent cultivation

1. Introduction

Against the backdrop of rapid digital economy development and accelerated industrial transformation, vocational education faces new challenges in talent cultivation. In 2022, the General Office of the CPC Central Committee and the State Council issued the "Opinions on Deepening the Reform of Modern Vocational Education System Construction," proposing the strategic initiative to establish industry-education integration communities. This aims to consolidate resources, build collaborative training mechanisms, and enhance alignment between vocational education and industrial demands. However, practical implementation reveals challenges such as insufficient resource integration, information asymmetry, and low coordination efficiency within these communities. Meanwhile, rapid advancements in digital technology provide innovative solutions to these issues. This study seeks to analyze the current status of high-skilled talent policies in Hunan Province and examine collaborative training practices in vocational colleges. It explores optimization strategies for enhancing collaborative talent development systems, focusing on improving efficiency in partnerships between vocational institutions and other stakeholders. The research aims to contribute to building a sustainable vocational education ecosystem where cities, industries, and skilled professionals mutually support and develop synergistically. Key objectives include: (1) Reviewing existing research on high-skilled talent cultivation, clarifying current training patterns, interaction models among stakeholders, and identifying critical challenges in collaborative education initiatives at vocational colleges. (2) Collect and systematically analyze policies on highly skilled talent development issued by Hunan Province to identify collaborative training themes within its talent policies. Using "Collaborative Governance Theory" as the analytical framework and "Community Theory" to support mechanism research, this study examines the collaborative training mechanisms for highly skilled talents in Hunan's vocational colleges across three dimensions: collaborative motivations, driving forces, and outcomes.

2. Literature Review

2.1 Operational Mechanism of Industry-Education Integration Communities

The structural differences between vocational colleges and enterprises as two core stakeholders significantly impact the establishment of industry-education integration communities. Scholars including Duan Wenzhong, Wan Weiping, Li Mengqing, and Chen Shuyi have highlighted that distinct management models and organizational frameworks between educational institutions and businesses lead to divergent decision-making approaches and outcomes in integration processes. Vocational colleges with bureaucratic tendencies often lack final approval authority for secondary colleges engaged with industries, resulting in lengthy decision-making cycles and inefficiency due to hierarchical reporting



systems. In contrast, enterprises participating in integration initiatives adopt flat management structures where decision-makers typically hold final authority. These governance disparities further isolate originally independent organizational systems, hindering effective collaboration. Duan Wenzhong identifies this structural misalignment as a critical challenge in building industry-education integration communities, proposing a "dual-stakeholder governance framework" to establish regular interdepartmental coordination mechanisms. Wan Weiping suggests establishing specialized coordination bodies for industry-education integration and academic program development, thereby creating a vertically and horizontally integrated matrix-style flexible organizational structure.

2.2 Research on Industry-Education Collaborative Training for High-Skilled

Talents Studies on high-skilled talent cultivation models are abundant, primarily focusing on two aspects: training objectives and curriculum design aligned with industrial structures. Academic research on talent development goals demonstrates diverse perspectives. Zhu Houwang and Gong Tianmiao analyzed the evolution of vocational education objectives since China's reform and opening-up, tracing their progression from "technical-oriented" to "practical-oriented," then to "application-oriented," and ultimately developing into "high-skilled-oriented" and "technical-skilled-oriented" frameworks. They also examined the driving forces behind this transformation. From the perspective of objective positioning, Wu Nanzhong and Xie Hong highlighted the prominent issue of "short-sightedness" in vocational education goals. They proposed emphasizing learners' agency in talent development, advocating for a comprehensive approach that prioritizes cultivating learners' interdisciplinary competencies through restructured training objectives.

Scholars exploring pathways for collaborative innovation and talent development in higher education institutions have proposed adopting interdisciplinary integrated education, practice project-driven learning, integration of innovative technologies, and collaborative innovation platform construction to jointly establish comprehensive and pioneering training models. Interdisciplinary education enhances students' holistic literacy, cultivating their global perspective and interdisciplinary problem-solving capabilities. Practice project-driven learning refines practical application skills through real-world problem-solving experiences. Integration of innovative technologies improves students' adaptability to educational technologies, enhancing their competitiveness in the digital era. The establishment of collaborative innovation platforms requires joint efforts from universities and external partners. To deepen collaboration among schools, enterprises, and social organizations, researchers recommend expanding diverse cooperative projects to broaden students' practical experience channels, facilitating seamless industry integration. Research findings indicate that individuals with high cognitive and social skills demonstrate superior job performance, while those with high cognitive but low social skills exhibit particularly poor work performance.

2.3 Research on Collaborative Training Mechanisms for Skilled Professionals

From an internal mechanism perspective, multi-stakeholder collaboration ensures efficient participation of enterprises, industry associations, and other stakeholders in education and training programs, facilitating the integration of skills and knowledge. Externally, cultivating highly skilled professionals requires close alignment with industrial and sectoral development trends, where collaborative training mechanisms guarantee graduates' adaptability to practical industry demands. The development of skilled talent involves multiple stakeholders including vocational colleges, enterprises, industries, and governments. A collaborative training mechanism refers to a cooperative framework established through consensus-building among stakeholders to achieve common objectives. Domestic research on internal collaborative training mechanisms primarily focuses on synergy dynamics and resource-sharing mechanisms.

From an external perspective, collaborative training of highly skilled professionals constitutes a social endeavor operating under multifaceted conditions. Policy regulation, collaborative barriers, and underlying causes have become key focal points in this field. Regarding policy frameworks for collaborative training, the lack of specificity in policy content, poor timeliness, and implementation constraints due to funding limitations and regional disparities remain critical factors affecting policy effectiveness. The establishment and refinement of collaborative training mechanisms fundamentally represent a strategic process driven by national policies. Policy objectives consistently emphasize building a multidimensional support system covering the entire professional ecosystem of skilled talents. This involves integrated advancements through key dimensions such as optimizing economic incentive mechanisms, enhancing social recognition, and expanding career advancement pathways. Pilot initiatives include annual salary systems, equity incentive programs, special appointment allowances, and mentorship subsidies to achieve comprehensive value enhancement for professionals. Comprehensive analysis reveals that there is still room for further in-depth research on collaborative training of highly skilled talents: (1) Insufficient sensitivity and exploration of newly introduced government policies on highly skilled talents, and the need to further investigate the new changes, impacts, and breakthroughs brought by the advancement of physicalized organizations in industry-education integration communities on collaborative training of highly skilled talents. (2) Research on collaborative training of highly skilled talents exhibits high similarity, focusing mainly on theoretical discussions of pathways and strategies. There is limited research on collaborative barriers and their causes, which requires further updates and expansion. (3) Many scholars have localized foreign experiences in highly skilled talent cultivation to optimize China's training model. However, the exploration of practices and experiences on how to achieve collaboration among training entities in China remains insufficient and comprehensive, and the research level needs improvement.

3. Research technique, research method

3.1 Literature Review Method

The literature review method was implemented throughout the research process. In the initial phase, researchers collected and analyzed policy documents related to industry-education integration communities and high-skilled talent development

in Hunan Province. This enabled a comprehensive understanding of current challenges and key priorities in high-skilled talent cultivation, as well as the historical context of such initiatives. By thoroughly examining the background of industry-education integration communities and collaborative training mechanisms for high-skilled professionals, researchers further consulted relevant theoretical frameworks to provide robust academic support for their study.

3.2 LDA Topic Model Text Mining Method

This study employs LDA topic model functions including topic generation and keyword extraction to conduct text mining on policy documents related to high-skilled talent cultivation. The process follows three steps: "data preprocessing – data filtering – LDA model training." (1) Vectorization of 86 collected Hunan Province high-skilled talent cultivation policies; (2) Data filtering; (3) Through LDA model training, optimal topic counts are calculated to generate "topic-word" distribution tables and "text-topic" distribution tables for Hunan Province's high-skilled talent policies. By analyzing cloud-based topic and keyword distributions, the study identifies specific measures and practices under each topic category, rapidly pinpointing core components of collaborative high-skilled talent cultivation in vocational colleges. This provides theoretical and data foundations for analyzing collaborative training mechanisms in Hunan's vocational education system.

3.3 Survey Research Method

The survey research method was employed in this study to investigate the obstacles encountered by higher vocational colleges in Hunan Province during the collaborative training of highly skilled talents, as well as the effective experiences developed and other relevant current situations. Interviews were selected as the data collection method, with face-to-face conversations conducted with respondents.

4.Result

4.1 Current Status of Industry-Education Integration Community Construction in Hunan Province

4.1.1 Construction Outcomes

The development of industry-education integration communities in Hunan Province has demonstrated rapid growth and in-depth exploration. Multiple provincial-level industry-education integration communities have been established in key sectors such as equipment manufacturing, electronics information, and modern agriculture, forming well-established organizational structures and operational mechanisms. According to statistics released by the Hunan Provincial Department of Education in 2025: (1) Equipment Manufacturing Sector: Led by Zoomlion and Hunan Industrial Vocational College, the Construction Machinery Industry Community was formed through collaboration with 9 educational institutions and 15 enterprises. By establishing resource-sharing platforms and implementing joint talent cultivation programs, this community has successfully integrated educational systems, talent pipelines, industrial chains, and innovation networks, achieving a 20% increase in enterprise talent satisfaction rates. (2) Electronics Information Sector: The Electronics Information Industry Community, spearheaded by Great Wall Information and Hunan Information Vocational College, partnered with 7 schools and 18 enterprises to develop 12 AI courses. This initiative has supplied the electronics industry with a substantial number of highly skilled professionals, cultivating over 5,000 talents in recent three years. (3) Modern Agriculture Sector: The Modern Agriculture Industry Community, initiated by Longping Hi-Tech and Bio-Mechanical Vocational College, collaborated with 5 educational institutions and 9 enterprises to establish a blockchain-based traceability system covering five counties. This technological solution has significantly enhanced agricultural product traceability efficiency by 30%, providing robust technical support for modern agricultural development.

4.1.2 Existing Issues

(1) Insufficient digital transformation. Issues such as inadequate digital infrastructure, difficulties in data sharing, and low levels of intelligent application adoption are prominent. According to surveys, approximately 60% of community member units reported that digital infrastructure fails to meet their needs, hindering the implementation of digital teaching and data circulation.

(2) Low collaborative efficiency. Inadequate communication and coordination mechanisms among stakeholders, coupled with inconsistent interest demands, resulted in an average 15% extension of project implementation cycles. For instance, during joint research initiatives, communication barriers and collaboration challenges frequently arise due to differing work rhythms and objectives between academic institutions and enterprises.

(3) Unequal profit distribution. This has affected the enthusiasm and initiative of various stakeholders in participating in community development, with approximately 40% of enterprises expressing dissatisfaction regarding profit distribution. Some enterprises have invested substantial human, material, and financial resources in industry-education integration initiatives, yet have not received corresponding returns in terms of outcome distribution and benefit acquisition.

4.2 Practical Path of Digital Empowerment for Industry-Education Integration Communities in Hunan Province

4.2.1 Establishing a Digital Industry-Education Integration Platform

Based on the actual conditions of Hunan Province, establishing a digital industry-education integration platform serves as the primary practical approach. The platform should encompass functional modules including resource sharing, talent cultivation, technological innovation, and employment services to achieve organic integration between educational chains, talent chains, industrial chains, and innovation chains. (1) Resource Sharing Module: Integrates school teaching resources, corporate equipment resources, and industry technical resources to provide shared services for all stakeholders. Schools can upload high-quality courses and teaching cases for use by other institutions and enterprises, while companies can open production equipment and training bases to offer internship opportunities. (2) Talent Cultivation Module: Develops personalized training programs based on industrial demands and student characteristics, providing online course learning

and virtual training services. Students can select suitable courses through the platform and participate in virtual projects to enhance technical skills. The platform analyzes big data on learning behaviors and interest preferences to recommend customized learning paths and resources. (3) Technological Innovation Module: Establishes a technical exchange platform for enterprises and schools to promote innovation and technology transfer. Companies can post technical challenges and R&D needs on the platform, while schools organize faculty-student teams to tackle technical issues and convert research outcomes into practical productivity. The platform provides project management tools to track progress and ensure timely completion. (4) Employment Services Module: Offers student services including job information dissemination, resume submission, and interview scheduling, while providing corporate services such as talent recruitment and competency assessments. The "Evaluation-Planning" objective system proposed by Xu Shijian and Wang Tingting can serve as a critical reference for platform development, ensuring its practicality and effectiveness. This system emphasizes the evaluation of platform functions and outcomes during the construction process, with reasonable planning formulated based on assessment results to continuously optimize and enhance platform capabilities.

4.2.2 Promoting Digital Transformation of Teaching Models

By leveraging technological innovations such as virtual simulation and augmented reality to enhance teaching methods, we develop digital educational resources and implement blended online-offline teaching models. (1) Virtual Simulation Technology Application: Virtual simulation technology creates immersive environments where students can conduct practical operations and experiments, thereby improving hands-on skills and innovative capabilities. A vocational college implemented virtual simulation teaching, resulting in a 25% reduction in operational error rates among students. The virtual simulation platform provides diverse scenarios and equipment models, enabling interactive learning through user interfaces. (2) Augmented Reality Technology Application: Augmented reality integrates virtual information with real-world environments, offering students rich and intuitive learning experiences. Through mobile devices or specialized glasses, students can access additional virtual data during field visits. (3) Digital Educational Resource Development: We create digital resources including online courses, instructional videos, and virtual experiments, providing flexible learning materials accessible anytime via internet. Multimedia production tools and interactive design techniques are employed during resource development to enhance engagement and interactivity. (4) Blended Teaching Implementation: Combining online learning with offline practice improves instructional effectiveness and student experience. Online modules allow self-directed acquisition of foundational knowledge, while hands-on sessions deepen understanding through practical experimentation. Research by Jiang Xiaoli et al. demonstrates that digital and intelligent transformation can significantly enhance the quality and efficiency of vocational education, providing robust support for cultivating high-quality talent. By leveraging digital transformation, traditional teaching models can overcome time and space constraints, increase instructional flexibility and personalization, and better meet diverse student learning needs. A vocational college implemented blended online-offline teaching, resulting in an average score improvement of 10 points among students. This blended approach is facilitated through a Learning Management System (LMS), enabling teachers to assign learning tasks, monitor progress, and organize online discussions on the platform.

4.2.3 Establishing a Digital Evaluation and Feedback Mechanism

Drawing on the "community" evaluation framework proposed by Li Dingzhen et al., we establish a comprehensive evaluation system encompassing talent cultivation quality, industrial service effectiveness, and technological innovation contributions, leveraging big data technology to achieve real-time and precise assessment. (1) Talent cultivation quality evaluation assesses students' knowledge mastery, skill proficiency, and professional competence. By collecting learning data, examination results, and practical experience through big data analytics, we conduct comprehensive evaluations of student performance. Learning analytics technologies utilizing data mining and machine learning algorithms identify individual learning patterns and identify learning challenges. (2) Industrial service effectiveness evaluation measures corporate satisfaction with students and student contributions to enterprises. Through big data collection of corporate feedback and employment statistics, we assess service outcomes. Data analysis tools employing statistical methods and visualization tools enable decision-makers to rapidly interpret data insights. (3) Technological innovation contribution evaluation evaluates research achievements and technology transfer between academic institutions and enterprises. Big data systems collect scientific research data and technology transfer metrics to measure innovation impact. This evaluation is supported by a research achievement database and technology transfer tracking system ensuring data accuracy and completeness. (4) Real-time and precision evaluation implementation utilizes big data technology to enable immediate problem identification and optimization. Real-time monitoring systems leveraging sensor networks and IoT technologies collect and analyze data in real-time, providing timely decision-making support.

4.2.4 Improve the digital governance system

Based on the recommendations of Hu Dexin and Kan Baoxiao, efforts should focus on top-level design, multi-stakeholder collaboration, quality enhancement, and clear accountability to establish a digital governance community that improves operational efficiency and service capabilities. (1) Top-level design: Develop comprehensive digital governance plans and strategic objectives to define clear directions and priorities. Expert consultations and policy research should be conducted to ensure scientific validity and feasibility of the plans. (2) Multi-stakeholder collaboration: Establish collaborative governance mechanisms involving governments, industries, enterprises, and educational institutions to strengthen interagency communication. Effective coordination requires creating communication platforms and collaborative frameworks. (3) Quality improvement: Utilize digital technologies to enhance governance efficiency and service quality through advanced tools and management methodologies. (4) Accountability clarification: Define rights and responsibilities for all stakeholders in digital governance, and implement robust accountability systems. This involves establishing regulations and signing cooperation agreements to ensure compliance with obligations.

5. Conclusion

5.1 Policy Support: Strengthening Guidance to Stimulate Participation Vitality

In terms of policy support, the Hunan Provincial Government should take the lead in formulating specialized and targeted digital transformation policies. It is essential to clearly define the responsibilities and rights of stakeholders—including governments, enterprises, and educational institutions—in the industry-education integration ecosystem empowered by digitalization. For instance, specific obligations for enterprises in providing practical resources and participating in curriculum development should be explicitly outlined, along with institutional duties in talent cultivation and technology R&D feedback. Concurrently, rights and interests regarding collaborative outcome sharing and intellectual property protection must be clearly established to prevent potential disputes in the future.

To boost corporate engagement, the government should provide substantial fiscal and tax incentives. On the fiscal front, dedicated subsidy funds should be established to offer financial support to enterprises actively participating in digital transformation of industry-education integration, with significant investments in equipment upgrades and technological advancements. Liu Jingjing emphasized that local governments play a pivotal role in coordinating community development efforts and should fully leverage policy guidance mechanisms. By formulating industrial development plans aligned with industry-education integration strategies, local authorities can guide enterprises to collaborate with educational institutions based on regional industrial needs.

5.2 Technical Support: Strengthening Foundations and Overcoming Technical Bottlenecks

In terms of technical support, strengthening digital infrastructure development remains the top priority. Enhancing network bandwidth and stability ensures efficient data transmission and real-time interaction between educational institutions and enterprises. Meanwhile, upgrading digital teaching equipment configurations by equipping schools with advanced virtual simulation lab devices and smart teaching terminals provides students with more immersive and intuitive learning experiences.

Enhancing data security protection capabilities is of paramount importance. With the deepening digital transformation, vast amounts of educational data, corporate production data, and student personal information are circulating across networks, posing severe challenges to data security. Therefore, it is essential to establish a comprehensive data security management system and employ advanced encryption technologies to protect data during transmission and storage, preventing theft or tampering. Additionally, strengthening data access permission management through tiered access controls ensures that only authorized personnel can access specific data, effectively preventing data breaches.

Cultivating digital professionals remains a critical component of technological infrastructure development. Educational institutions should optimize academic programs and curriculum frameworks to strengthen digital-related disciplines, while enterprises must collaborate with academic institutions to implement targeted training initiatives that enhance digital literacy and practical skills for both staff and faculty. The "Solidifying Digital Foundations" strategy proposed by Huang Bo et al. offers valuable insights, particularly in addressing technical barriers such as outdated infrastructure and limited data interoperability. To tackle equipment obsolescence, governments and businesses should jointly fund upgrades for obsolete digital devices. Regarding data exchange, establishing unified data standards and interface specifications will facilitate seamless integration and sharing of information between academic institutions and enterprises.

5.3 Organizational Support: Collaborative Efforts to Establish Efficient Mechanisms

Regarding organizational support, it is recommended to establish a dedicated digital transformation task force. The team should comprise representatives from relevant government agencies, university administrators, and corporate executives, with clearly defined responsibilities. Government agencies will be responsible for policy formulation and overall coordination, university leaders will oversee internal digital transformation planning and implementation, while corporate executives will manage resource allocation and collaborative advancement efforts.

Establishing a regular communication mechanism serves as a crucial approach to foster collaboration among stakeholders. Monthly or quarterly meetings can be organized where representatives from educational institutions and enterprises exchange updates on digital transformation progress, address challenges encountered, and discuss future action plans. Additionally, online communication platforms such as dedicated WeChat groups, QQ groups, or internal corporate collaboration systems should be implemented to facilitate seamless communication at any time.

Research by Zhang Wei and colleagues based on complex adaptive system theory highlights that establishing an entity-based operational mechanism is crucial for the sustainable development of communities. Such a mechanism can establish a dedicated operational management agency responsible for daily operations and governance. The agency should possess independent decision-making and executive authority, enabling timely adjustments to operational strategies in response to market fluctuations and collaborative needs.

5.4 Resource Assurance: Integration and Optimization to Provide Adequate Support

To ensure resource allocation, dedicated funds should be established to support digital transformation. The government may create a special fund for industry-education integration digital transformation, which would support digitalization projects in both educational institutions and enterprises. Additionally, private capital participation in this digital transformation should be encouraged. This can be achieved by establishing industrial investment funds or introducing venture capital to attract private investment in industry-education integration projects.

Promoting high-quality resource sharing constitutes a key objective in resource security. Educational institutions and enterprises should establish collaborative platforms to integrate and share their respective competitive resources. Research by Pan Haisheng et al. demonstrates that resource integration and optimal allocation serve as critical safeguards for deepening industry-education collaboration, with digitalization offering new possibilities to achieve this goal. Through

digital technologies, temporal and spatial constraints can be overcome to enable remote resource sharing and real-time interaction.

In conclusion, the digital transformation and high-quality development of industry-education integration communities can be achieved through establishing digital platforms, innovating teaching models, refining evaluation systems, and optimizing governance structures. Digital platforms provide integrated collaborative environments that facilitate information flow and resource sharing. Innovative teaching models stimulate students' learning interest and innovation capabilities, enhancing talent cultivation quality. Improved evaluation systems ensure educational outcomes and provide direction for continuous improvement. Optimized governance structures clarify responsibilities and rights, boosting operational efficiency and management standards. Digital empowerment of talent development in Hunan Province's industry-education integration communities holds significant importance for elevating vocational education quality, aligning with industrial demands, and driving regional economic growth. Moving forward, it is essential to strengthen policy support, technological innovation, organizational coordination, and resource integration to further advance digital empowerment in industry-education integration.

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REFERENCES

- [1] Liu Zhiwen, Chen Shunli. Transformation and Optimization of Organizational Forms in Industry-Education Integration of Vocational Education from the Perspective of Contingency Theory . Vocational Education Forum, 2025,41(07):25-32.
- [2] Xu Shijian, Wang Tingting. Strategies for the Physical Construction of Industry-Education Integration Communities Based on System Resilience . Vocational Education Forum, 2025,41(06):22-28.
- [3] Zhou Jing, Yuan Lin, Zhang Qiwu. The Field Pattern of Industry-Education Integration in Vocational Education: Forms, Dilemmas, and Governance Breakthroughs . Educational Academic Monthly, 2025, (06):25-33.
- [4] Huang Bo, Wu Xiangming, Huang Yanhong. The generation logic, practical obstacles and optimization paths of digital empowerment in industry-education integration . China Vocational and Technical Education, 2025, (10):52-60.
- [5] Jin Jingbiao, Liu Bin. Implementation Challenges and Breakthrough Strategies of Industry-Education Integration in Urban Areas from the Perspective of Field Theory . Guizhou Social Sciences, 2025, (04):93-99.
- [6] Wang Yufei. Theoretical Implications and Practical Approaches of Industry-Education Integration in Vocational Education under the Background of High-Quality Development . Vocational and Technical Education, 2025,46(10):52-58.
- [7] Jiang Liping. The Basic Framework and Practical Approaches of Collaborative Governance in Industry-Education Integration Communities Empowered by Digitalization . Education and Vocational, 2025, (06):48-55.