

Research on Innovative Paths of Education Management in Vocational Undergraduate Colleges under the Background of Industry-Education Integration

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Abstract: In the context of the deep integration of industrial transformation and educational transformation, vocational undergraduate colleges, as the main position for cultivating technical and skilled personnel, have seen the improvement of their education management capabilities become an important proposition for deepening industry-education integration and serving the high-quality development of regional economy. With industry-education integration as the background, this article analyzes the new requirements put forward by industry-education integration for the education management of vocational undergraduate colleges, explores the theoretical basis of education management innovation, constructs a framework system for education management innovation, and proposes implementable paths. Through systematic research, it strives to promote vocational undergraduate colleges to establish a new type of education management system adapted to the requirements of industry-education integration, provide institutional guarantees for the cultivation of high-quality technical and skilled personnel, and contribute to the high-quality development of vocational undergraduate education in China.

1. Introduction

With the profound adjustment of China's economic structure and the accelerated advancement of industrial transformation and upgrading, the modern industrial system has an increasingly urgent need for high-level technical and skilled personnel. In this context, vocational undergraduate education, as a key component of the modern vocational education system, bears the important mission of cultivating innovative technical and skilled personnel who can adapt to the needs of emerging industries and serve regional economic development. Industry-education integration, as the fundamental operating model of vocational education, has become the core driving force for promoting the reform and development of vocational undergraduate education, and its depth and breadth directly determine the quality and effectiveness of talent cultivation[1]. The increasingly significant incompatibility between traditional education management models and the new requirements of industry-education integration is evident. The management systems of most

institutions still follow the path dependence of general undergraduate education, making it difficult to fully reflect the characteristics of vocational education in terms of governance structure, operational mechanisms, and resource allocation[2]. These contradictions not only restrict the in-depth advancement of industry-education integration but also affect the realization of the characteristic and high-quality development of vocational undergraduate education. This study, based on the era background of industry-education integration and focusing on the educational management innovation of vocational undergraduate colleges, is committed to constructing a systematic theoretical framework and practical path, aiming to provide theoretical guidance and practical reference for the educational management reform of vocational undergraduate colleges.

2. Challenges

Against the backdrop of the in-depth advancement of industry-education integration, vocational undergraduate institutions face profound systemic challenges in educational management. These challenges are rooted in the structural contradiction between traditional educational management models and the inherent requirements of industry-education integration, specifically manifested in four core dimensions: management system, data governance, assessment and evaluation, and resource allocation[3].

2.1 “Path Dependency” of the Management System

From the perspective of the management system, vocational undergraduate institutions generally exhibit a clear "path dependency" phenomenon. The management structure of most institutions still follows the traditional bureaucratic model. This system, which emphasizes vertical management and functional division, is in significant conflict with the flat, networked governance structure required for industry-education integration. Bureaucratic management is characterized by long decision-making chains and slow response speeds, while industry-education integration requires institutions to quickly respond to changes in industrial technology and market talent demands. This contradiction manifests in practice as follows: in the process of school-enterprise cooperation, reaching an agreement from the initial intention often requires layer-by-layer approval from multiple departments, leading to missed cooperation opportunities. The legal status and boundaries of rights and responsibilities of new educational entities such as industry-based colleges are not clearly defined, lacking both sufficient autonomy in running the school and difficulty in establishing an effective school-enterprise co-governance mechanism[4]. A deeper problem lies in the fact that the school's rules, regulations, and management processes are mostly designed for traditional full-time academic education and cannot adapt to new industry-education integration teaching models such as "alternating work and study" and "project-based teaching." For example, fixed semester systems are difficult to coordinate with the production cycles of enterprises, and unified teaching schedule arrangements cannot meet personalized training requirements. These institutional obstacles severely restrict the in-depth advancement of industry-education integration.

2.2 "Data Island" Dilemma of Data-Driven Approach

In terms of data governance, vocational undergraduate institutions face a serious "data island" dilemma. Currently, various departments within the institutions, such as academic affairs, student affairs, practical training, scientific research, and school-enterprise cooperation, have established their own information management systems. However, these systems lack unified data standards and sharing mechanisms, forming closed data islands. This fragmented data management situation makes it difficult for schools to form a comprehensive and accurate panoramic view of talent

cultivation, and even more difficult to provide data support for personalized training and precise management. Specifically, students' classroom learning data is separated from enterprise internship data, professional skill cultivation is disconnected from comprehensive quality evaluation, and talent cultivation process data is separated from employment development data. This data fragmentation state prevents school management from making analysis and decisions based on complete data, making it difficult for teachers to fully grasp students' growth status, and making it difficult for enterprises to understand the actual situation of talent cultivation in a timely manner. Although some institutions have begun to build data mid-ends, data integration work is progressing slowly due to departmental interest barriers and technical capabilities limitations, and there is still a considerable distance to go before building a "data brain" that supports industry-education integration.

2.3 The "Double Failure" of Assessment and Evaluation

Another prominent challenge is the "double failure" of the assessment and evaluation system. Regarding the evaluation of teachers within the institution, the existing assessment indicators still place excessive emphasis on scientific research projects and academic papers, with significantly insufficient weight given to teaching reform, practical guidance, and social services. This orientation results in teachers lacking intrinsic motivation to participate in industry-education integration, preferring to invest their energy in scientific research work that is easier to quantify. In particular, investments in areas such as enterprise practice guidance, curriculum development, and technical skill cultivation are often neglected because they are difficult to reflect reasonably in the existing evaluation system. On the other hand, the evaluation system for enterprise mentors is almost entirely absent[5]. The contribution of enterprise technical personnel to the school's talent cultivation is difficult to quantify and evaluate, and their teaching input cannot be reasonably reflected in the enterprise's performance evaluation, resulting in poor stability and low participation of the enterprise mentor team. A deeper problem is that the existing evaluation standards are still primarily academic-oriented, lacking a scientific measure of the contribution to industrial services. This makes it difficult to accurately assess the actual effect of industry-education integration and affects the enthusiasm of all parties to participate.

2.4 The "Response Lag" of Resource Allocation

The issue of "response lag" in resource allocation is also not to be ignored. The resource allocation mechanisms of vocational undergraduate colleges mostly follow the annual budget model of traditional universities. This relatively rigid resource allocation method cannot quickly respond to changes in industrial needs. This is specifically manifested in: the allocation of professional construction funds is often based on historical base numbers rather than market demand, resulting in emerging majors and the cultivation of urgently needed talents not receiving timely and sufficient resource support; the verification of teacher establishment lags behind the needs of industrial development, and the introduction of "dual-qualified" teachers faces the dual constraints of establishment and salary system; the renewal cycle of practical training equipment is long, and it cannot keep up with the pace of industrial technology upgrading. In addition, due to the imperfect resource flow mechanism between schools and enterprises, the resources of enterprises, such as equipment, technology, and talent, are difficult to integrate smoothly into the talent cultivation process, and the educational resources of schools cannot effectively serve the technological research and development and employee training of enterprises. This rigidity and lag in resource allocation makes it difficult for vocational undergraduate colleges to fully play their due role in serving regional industrial development.

These challenges are interrelated and mutually reinforcing, constituting a systemic obstacle restricting the improvement of education management effectiveness in vocational undergraduate colleges. The path dependence of the management system leads to rigid organizational structures, which in turn exacerbates the phenomenon of data silos. The lack of data governance makes the assessment and evaluation lack a scientific basis, and resource allocation lacks data support. The failure of assessment and evaluation in turn weakens the motivation of all parties to participate in industry-education integration. To break through this predicament, it is necessary to carry out holistic reforms and innovations at the system level, rather than piecemeal and local adjustments. Vocational undergraduate colleges must break the shackles of traditional management models and build a new type of governance system that is adapted to the requirements of industry-education integration. This requires not only active exploration at the college level, but also strong support at the policy level, and more profound changes in multiple dimensions such as concepts, systems, and methods.

3. Theoretical Framework and Core Dimensions

3.1 Innovative Theoretical Framework

The in-depth advancement of industry-education integration has put forward completely new requirements for the education management of vocational undergraduate colleges, and the traditional education management model has been difficult to adapt to this profound change. Building an education management innovation system suitable for the background of industry-education integration requires a solid theoretical foundation and clear core innovation dimensions. Starting from the theory of collaborative governance and combining resource dependence theory and social network theory, we construct an education management innovation theoretical framework from the perspective of a "community of shared future between schools and enterprises," and on this basis, propose four core innovation dimensions: concept, structure, process, and evaluation. This provides systematic theoretical guidance for the education management reform of vocational undergraduate colleges.

Collaborative governance theory provides core theoretical support for education management innovation in the context of industry-education integration.

3.1.1 Resource Dependence Theory

Resource dependence theory further explains the internal driving force of education management innovation. This theory holds that organizations need to obtain external resources to maintain survival and development, and this dependence prompts organizations to adjust their own structure and management methods to adapt to environmental changes. Vocational undergraduate colleges have obvious dependence on enterprises' technical resources, practical resources, and employment resources in the process of talent cultivation, while enterprises also need schools to provide talent resources and technical services[6]. This two-way dependency constitutes the basic driving force for education management innovation. The traditional closed education management model cannot effectively acquire and integrate enterprise resources, which will inevitably lead to the separation of talent cultivation from industrial needs. Therefore, education management innovation must be committed to establishing a more open and flexible management system, and promoting the two-way flow and effective integration of school-enterprise resources through system design. Specifically, it is necessary to set up a special resource coordination agency in the management structure, establish an incentive mechanism for resource sharing in the management system, and optimize the efficiency of resource allocation in the management process. This innovation not only

requires schools to change their internal management methods, but also requires the establishment of a normalized interaction mechanism with the industry, so that education resources and industry resources can be deeply integrated in the process of talent cultivation.

3.1.2 Social Network Theory

Social network theory provides an important perspective for understanding the realization path of educational management innovation. This theory emphasizes the significant role of inter-organizational relationship networks in resource acquisition and capability enhancement. In the context of industry-education integration, the cooperative relationship network formed between vocational undergraduate colleges and enterprises has become an important carrier for talent cultivation. The key to educational management innovation lies in how to construct and maintain this cooperative relationship network and make it function to the fullest extent. Traditional educational management is often limited to the coordination of internal relationships within schools, while management innovation based on social network theory requires extending the management perspective to the entire industry-education integration network. This includes establishing entry and exit mechanisms for network members, designing communication and coordination rules within the network, and formulating measures to ensure the operation of the network. It is particularly important to note that this network-based management not only focuses on the bilateral relationship between schools and enterprises, but also emphasizes the construction of an ecosystem involving multiple stakeholders. By introducing forces from industry associations, government departments, and research institutions, a more diverse and stable cooperative relationship network can be formed, providing more comprehensive support for talent cultivation.

3.2 Four Core Dimensions of Innovation

Based on the aforementioned theoretical framework, educational management innovation within the context of industry-education integration necessitates systemic transformation across four core dimensions. Conceptual innovation is the primary dimension, requiring a fundamental shift from "managing students" to "cultivating talent." This shift implies that educational management is no longer limited to maintaining teaching order and handling routine affairs but, rather, elevates to the level of human resource development, treating students as the most valuable capital for systematic cultivation. Specifically, the management philosophy must undergo three transformations: from focusing on process standardization to emphasizing developmental outcomes, from stressing uniform requirements to supporting personalized development, and from maintaining campus stability to promoting holistic growth. This conceptual innovation requires managers to possess an industry perspective and market awareness, accurately grasping industry development trends and changes in talent demands, and truly placing talent cultivation within the macro-context of industry development for planning and design. Simultaneously, a whole-life-cycle management concept must be established, extending the management scope from the period of schooling to the entire career development process, establishing a graduate tracking and feedback mechanism to form a closed-loop talent cultivation system.

3.2.1 Structural Innovation

Structural innovation serves as the organizational guarantee for educational management innovation, requiring a transition from "vertical hierarchy" to "matrix platform." While the traditional hierarchical organizational structure is conducive to unified management and standardized operation, it struggles to adapt to the flexibility and adaptability demands of industry-education integration. The matrix organizational structure breaks down departmental

barriers and promotes resource sharing and collaborative innovation by establishing horizontal project teams and professional committees. The core of this structural innovation lies in establishing new types of educational entities represented by industry-specific colleges, granting them full autonomy and flexibility. Industry-specific colleges should not be simple replicas of traditional departments but, rather, become platforms for deep integration between schools and enterprises, enjoying full autonomy in aspects such as major setting, curriculum development, faculty development, and practical training base construction. Simultaneously, a cross-departmental collaborative work mechanism must be established, ensuring the effective advancement of various industry-education integration initiatives through the establishment of dedicated project offices and coordination positions. This structural innovation not only involves the adjustment of organizational forms but also requires supporting reforms in the allocation of powers and responsibilities and operational mechanisms, forming a new type of governance structure that maintains necessary centralization and unity while being full of vitality.

3.2.2 Process Innovation

Process innovation is the implementation path for innovation in education management, aiming to transition from "functional fragmentation" to "process closure." Traditional education management processes are often divided according to functional departments, resulting in the artificial segmentation of the talent development process into disjointed segments. Process innovation requires redesigning and optimizing management processes with student growth as the main focus, establishing a complete closed-loop system that spans the entire process of enrollment, training, and employment. This innovation is specifically reflected in three aspects: first, establishing a data analysis-based enrollment and selection mechanism to effectively connect industry demand characteristics with the quality requirements of student sources; second, constructing flexible teaching management processes to adapt to new teaching models such as "work-study alternation" and "project-based teaching"; and third, improving the employment feedback mechanism to promptly relay graduate employment status and career development information to all aspects of talent development. The key to process innovation lies in breaking down departmental boundaries, establishing cross-functional collaborative workflows, and achieving full-process data sharing and business collaboration through information technology. This process reengineering not only improves management efficiency but, more importantly, ensures the close connection and continuous improvement of all aspects of talent development.

3.2.3 Evaluation Innovation

Evaluation innovation is an important guide for innovation in education management, aiming to transition from "academic orientation" to "contribution orientation." Traditional education evaluations often emphasize academic indicators and process specifications, making it difficult to accurately reflect the actual effectiveness of industry-education integration. Evaluation innovation requires establishing a new evaluation system centered on the actual contributions to student growth and industrial development. This innovation includes four levels: the evaluation of students should break through the single academic achievement evaluation model and establish a comprehensive evaluation system that includes multiple indicators such as professional skills, professional qualities, and innovative abilities; the evaluation of teachers should change the tendency to emphasize scientific research over teaching, incorporating industry-education integration achievements such as curriculum development, practical guidance, and technical services into the evaluation indicators; the evaluation of management departments should go beyond the assessment of the completion of administrative tasks, focusing on their substantive contribution to the quality of talent development;

and the evaluation of cooperative enterprises should establish a scientific evaluation mechanism, focusing on examining the depth and effectiveness of their participation in talent development. The core of evaluation innovation lies in establishing an evaluation culture oriented towards value creation, guiding all resources towards the core goal of improving the quality of talent development through scientific indicator design and result application.

4. Innovative Paths Constructing

Based on the aforementioned theoretical framework and core dimensions, the innovative paths for education management in vocational undergraduate institutions require systematic reconstruction from multiple levels, including organizational structure, operational mechanisms, resource integration, and evaluation systems. The construction of this innovative path should focus on improving the quality of talent cultivation, take the deepening of industry-education integration as the main line, and establish a new education management system that meets the development requirements of modern vocational education through institutional innovation and methodological innovation. In the specific implementation process, it is necessary to focus on breaking through the constraints of the traditional management model and building a new management pattern of school-enterprise collaboration, process controllability, and continuous improvement.

4.1 Restructuring the Organizational Architecture

Restructuring the organizational architecture is the foundational project of the innovation path. Vocational undergraduate institutions should break the traditional hierarchical organizational structure and establish a flat governance system based on industrial colleges. Industrial colleges should not simply be renamed or reorganized from traditional departments; instead, they should become governance entities with substantial autonomy in running schools. In the architectural design of industrial colleges, it is necessary to establish a council composed of representatives from schools, industry enterprises, research institutions, and other parties, granting it decision-making power in professional settings, talent training program development, faculty development, and practical training base construction. At the same time, a professional management team should be established within the industrial college to be responsible for daily operation management and school-enterprise coordination. This organizational structure innovation is not only reflected in form, but more importantly, it is necessary to clarify the rights and responsibilities of all parties through the construction of charters and systems, and establish scientific and effective decision-making mechanisms and execution mechanisms. In particular, in terms of personnel management, industrial colleges should be given greater autonomy in teacher appointment, assessment, and evaluation, so that they can flexibly allocate faculty resources according to the needs of industrial development. In addition, it is also necessary to establish a cross-departmental collaborative work mechanism, through the establishment of a special project management office, to coordinate and solve various problems arising in the process of industry-education integration, and ensure the smooth progress of all work.

4.2 Construction of a Digital Management Platform

The construction of a digital management platform is the technological foundation for supporting innovation in education management. Vocational undergraduate institutions should make full use of modern information technology to build an intelligent management platform that integrates functions such as teaching management, student management, school-enterprise collaboration, and quality monitoring. This platform should not only achieve data sharing and business collaboration

between various departments within the school but also break down information barriers between the school and enterprises to establish a complete and traceable system for talent cultivation. In terms of platform function design, it should cover the entire process management of students from enrollment to employment, including various aspects such as enrollment selection, curriculum learning, internship and training, and employment development. Through big data analysis technology, the platform can accurately profile students' learning behavior and growth trajectory, providing data support for personalized training. At the same time, the platform should also establish a school-enterprise collaborative work mechanism to realize online management of enterprise participation in the talent cultivation process, including the selection of enterprise mentors, the release of internship tasks, the monitoring of practical processes, and the evaluation and feedback of results. What is particularly important is that the platform should establish an industry talent demand forecasting model, which provides decision-making references for professional adjustments and talent training program optimization through the analysis of industry data and employment data. In the process of platform construction, attention should be paid to data standardization and system openness to ensure the interconnection of various types of data and effective connection with enterprise management systems.

4.3 Innovation in Teaching Operation Mechanism

Innovation in the teaching operation mechanism is the core content of education management reform. Vocational undergraduate institutions should establish a flexible teaching management system that adapts to the requirements of industry-education integration, breaking through the rigid management constraints of traditional semester and class systems. Specifically, it is necessary to promote a project-oriented teaching organization method, introduce real enterprise projects into the teaching process, and realize the organic integration of theoretical learning and practical training. In terms of teaching time arrangement, a flexible credit system management system should be established to allow students to adjust their learning progress according to the needs of enterprise practice. In terms of teaching space utilization, the boundaries between classrooms and training rooms should be broken to build multi-functional teaching places that integrate teaching, training, and research and development. What is particularly important is to establish a "credit bank" system to recognize the credits for students' achievements in enterprise practice, skills competitions, and technological innovation, and to realize the accumulation and transformation of learning outcomes. In addition, a cross-major course selection mechanism should be established to allow students to select courses across majors according to their career development needs, and to cultivate composite technical and skilled talents. These mechanism innovations require teaching management departments to change their management concepts, shift from process control to goal management, and from administrative management to service support, to create favorable conditions for the implementation of diversified talent training models.

Innovation in the management of the teaching staff is a key factor in ensuring the effectiveness of education management reform. Vocational undergraduate institutions should build a "dual-teacher" teacher management mechanism for mutual appointment and sharing between schools and enterprises, breaking down the barriers to talent flow between schools and enterprises. First, it is necessary to establish a special appointment system for industrial teachers, set up flexible employment quotas, and attract high-level technical and skilled talents from enterprises to teach in schools. Secondly, it is necessary to improve the teacher enterprise practice system, establish a long-term mechanism for professional teachers to regularly exercise in enterprises, and link it with professional title evaluation, performance appraisal and other systems. In terms of teacher evaluation, an evaluation system oriented to industrial contribution should be established, and the

results of teachers' participation in enterprise technology services, curriculum development, practical guidance and other aspects should be included in the assessment indicators and given corresponding weight. In particular, a school-enterprise dual-mentor system should be established to clarify the responsibilities, requirements, and treatment guarantees of enterprise mentors, so that they can deeply participate in the entire process of talent cultivation. At the same time, a teacher development center should be established to provide teachers with systematic training and support to help them adapt to the teaching requirements in the context of industry-education integration. In the design of the incentive mechanism, egalitarianism should be broken, and a distribution system based on actual contributions should be established to fully mobilize teachers' enthusiasm and creativity in participating in industry-education integration.

4.4 Innovation in the Quality Evaluation System

Innovation in the quality evaluation system is a vital guarantee for guiding the direction of education management reform. Vocational undergraduate institutions should establish a multi-dimensional evaluation system with the quality of talent cultivation as the core, integrate industry and enterprise standards into the evaluation indicators, and realize the diversification of evaluation subjects and the diversity of evaluation methods. In terms of evaluation content, it is necessary to break through the traditional academic achievement evaluation model and establish an evaluation system that includes multiple indicators such as professional ethics, professional skills, and innovative ability. In terms of evaluation subjects, third-party organizations such as industry associations and cooperative enterprises should be introduced to participate in the evaluation to ensure the objectivity and authority of the evaluation results. In particular, a graduate career development tracking mechanism should be established to assess the social benefits of talent cultivation through continuous monitoring of indicators such as graduate employment quality, career advancement, and enterprise satisfaction. At the same time, a dynamic adjustment mechanism for professional development should be established, linking evaluation results with resource allocation, professional settings, and other decision-making, forming a virtuous cycle of continuous improvement. In terms of evaluation methods, attention should be paid to the combination of formative evaluation and developmental evaluation, focusing not only on the immediate effect of talent cultivation but also on the long-term development potential of students. In addition, a school-enterprise cooperation benefit evaluation mechanism should be established to regularly evaluate the implementation effect of industry-education integration projects and optimize cooperation models and management methods in a timely manner.

The innovative path of education management in vocational undergraduate institutions is a systematic project that requires the coordinated promotion and continuous optimization of all levels. Through the restructuring of organizational structures, the construction of digital platforms, the innovation of operating mechanisms, the reform of faculty management, the improvement of the evaluation system, and the strengthening of resource guarantees, a new type of education management system that truly meets the requirements of industry-education integration can be established. This innovation process should not only focus on top-level design but also encourage grassroots innovation, and through the combination of theory and practice, continuously explore and improve a new model of vocational undergraduate education management with Chinese characteristics.

5. Conclusion

In the process of promoting industry-education integration, vocational undergraduate institutions currently face multiple contradictions in their education management systems, including the

singularity of the governance structure versus the need for multi-faceted collaboration, the rigidity of teaching operations versus the dynamic needs of industry, and the closed nature of quality evaluation versus the openness of talent cultivation. This paper proposes innovative paths such as establishing an industry-education integration governance system, building a digital management platform, innovating a flexible teaching operation mechanism, building a dual-teacher faculty, and improving an industry-oriented evaluation system by constructing a theoretical framework of "concept reshaping - structural reorganization - process reengineering - evaluation reform". Vocational undergraduate institutions need to break the shackles of traditional management models through systematic reform and build a new type of education management system with school-enterprise collaboration, controllable processes, and continuous improvement, thereby effectively improving the quality of technical and skilled personnel training and promoting the high-quality development of vocational undergraduate education.

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