

Practice and Countermeasures of Vocational Education Serving the Development of Advanced Manufacturing in Strong Manufacturing Provinces

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Abstract: Building strong manufacturing provinces and developing advanced manufacturing are core measures to promote the quality and efficiency of the real economy and strengthen the foundation of industrial security. Vocational education, serving as the primary front for cultivating high-quality technical and skilled talents, is a crucial link bridging the education chain, talent chain with the industrial chain, and innovation chain. Against the backdrop of constructing strong manufacturing provinces, this paper elucidates the core value and inherent logic of vocational education serving the development of advanced manufacturing, summarizes the current practical explorations and existing challenges in aligning vocational education with advanced manufacturing in China's strong manufacturing provinces. Integrating industrial development needs, it proposes optimization strategies from the dimensions of program construction, teacher development, integration of industry and education, and policy support, aiming to provide theoretical reference and practical pathways for vocational education to precisely empower the development of advanced manufacturing and assist in the construction of strong manufacturing provinces.

Keywords: Strong Manufacturing Province; Vocational Education; Advanced Manufacturing; Integration of Industry and Education; Talent Cultivation

0. Introduction

Currently, China is accelerating the construction of a manufacturing powerhouse. Strong manufacturing provinces, as key supports, are focusing on advanced manufacturing sectors such as high-end equipment manufacturing, new-generation information technology, and new energy/new materials to drive industrial transformation, upgrading, and high-quality development. The development of advanced manufacturing relies on the support of high-quality technical and skilled talents. With its distinctive type attribute, vocational education precisely aligns with industrial job demands, undertaking the important mission of cultivating technical and skilled talents and promoting technological inheritance and innovation, thereby serving as a vital talent guarantee for building strong manufacturing provinces.

In recent years, strong manufacturing provinces have gradually strengthened the synergistic linkage between vocational education and advanced manufacturing, issuing multiple policies to promote their deep integration. However, challenges persist, such as misalignment between program offerings and industrial needs, insufficient practical capabilities of teaching staff, and superficial integration of industry and education, which constrain the full realization of vocational education's service effectiveness. Against the background of manufacturing transformation, upgrading, and accelerating technological iteration, in-depth exploration of practical pathways for vocational education serving advanced manufacturing development and overcoming these difficulties holds significant theoretical and practical importance for advancing the construction of strong manufacturing provinces and consolidating the foundation of a manufacturing powerhouse.

1. The Core Value and Inherent Logic of Vocational Education Serving the Development of Advanced Manufacturing

1.1 Core Value

The value of vocational education serving advanced manufacturing development is reflected in three dimensions: talent support, technology enablement, and industrial adaptation. Firstly, talent support value: Advanced manufacturing's requirements for technical and skilled talents in terms of specialization, refinement, and comprehensiveness are continuously increasing. Vocational education addresses the issues of "labor shortage" and "skill gap" in manufacturing by cultivating talents with solid skills and professional ethics through precise alignment with job demands. Secondly, technology enablement value: Relying on practical training bases and research teams, vocational education participates in the promotion, application, and process improvement of advanced manufacturing technologies, helping enterprises enhance production efficiency and innovation capabilities. Thirdly, industrial adaptation value: Vocational education can dynamically adjust training programs based on the technological iteration and industrial upgrading needs of advanced manufacturing, promoting precise matching between educational supply and industrial demand and facilitating the optimization and upgrading of the industrial structure.

1.2 Inherent Logic

The development needs of advanced manufacturing determine the direction of vocational education reform, while the high-quality development of vocational education provides core support for advanced manufacturing. The two form a bidirectional linkage logic of "industrial demand driving educational reform, and education enabling industrial upgrading." From the industrial perspective, technological iterations in advanced manufacturing (e.g., smart manufacturing, industrial robot applications) drive vocational education to update program content, upgrade practical training facilities, and optimize training models. From the educational perspective, vocational education addresses talent bottlenecks and technical challenges in industrial development by cultivating talents adapted to industrial needs and conducting technology R&D and training, thereby promoting the quality and efficiency of advanced manufacturing. This bidirectional linkage is the core logic for achieving synergistic development between education and industry in the construction of strong manufacturing provinces.

2. Practical Explorations and Existing Challenges of Vocational Education Serving Advanced Manufacturing in Strong Manufacturing Provinces

2.1 Practical Explorations

Strengthening Policy Guidance, Establishing a Synergistic Development Framework: Strong manufacturing provinces have introduced specific policies clarifying development goals and key tasks for vocational education serving advanced manufacturing, establishing collaborative platforms involving government, schools, and enterprises. For example, provinces like Jiangsu and Guangdong have issued supporting policies for building strong manufacturing provinces, promoting the alignment of vocational colleges with key industries such as high-end equipment manufacturing and new energy, setting up special funds to support industry-education integration projects and practical training base construction, and guiding vocational education to precisely meet industrial needs.

Optimizing Program Layout, Aligning with Industrial Development Needs: Focusing on key areas of advanced manufacturing, vocational colleges across regions have gradually adjusted their program structures, adding emerging programs such as Intelligent Manufacturing, Industrial Robotics Technology, and New Energy Vehicle Technology, while renovating traditional manufacturing-related programs to build a program system compatible with advanced manufacturing development. Simultaneously, some vocational colleges have collaborated with

enterprises to establish characteristic programs, implementing an integrated cultivation model combining “post-course-competition-certification,” integrating enterprise job standards into curriculum teaching to enhance the job adaptability of talent cultivation.

2.2 Existing Challenges

Insufficient Adaptability of Program Construction to Industrial Needs: Program offerings in some vocational colleges suffer from homogenization and lag, lacking precision in grasping the technological iterations and job demands of advanced manufacturing. The construction of new programs lags behind industrial development, and the renovation of traditional programs is incomplete. Furthermore, curriculum systems are not updated promptly, lacking teaching content matching advanced manufacturing technologies, resulting in a gap between talent cultivation and enterprise job requirements.

Insufficient Depth of Industry-Education Integration, Inadequate Synergistic Mechanisms: Current industry-education integration often remains at a superficial level of cooperation, lacking long-term synergistic mechanisms. Enterprises lack motivation to participate deeply in vocational education, mostly focusing on short-term talent supply without long-term investment in talent cultivation. Additionally, a phenomenon of “enthusiastic schools, lukewarm enterprises” exists in school-enterprise cooperation, where enterprises’ educational responsibilities are not fully fulfilled, and the combined force of industry-education integration and collaborative cultivation has not been fully realized.

3. Optimization Strategies for Vocational Education Serving Advanced Manufacturing in Strong Manufacturing Provinces

3.1 Precisely Aligning with Industrial Needs, Optimizing Programs and Curriculum Systems

Based on the development needs of advanced manufacturing, a dynamically adjusted program and curriculum system should be constructed. First, establish an industrial demand research mechanism. Collaborate with industry associations and advanced manufacturing enterprises to regularly conduct research on industrial job demands, accurately grasp the direction of technological iteration and talent requirement standards, dynamically adjust program layouts, phase out programs detached from industrial development, accelerate the construction of new programs, and build characteristic program clusters matching key areas of advanced manufacturing. Second, deepen the integration of “post-course-competition-certification.” Integrate enterprise job standards, industry skill competition content, and vocational skill level certificate requirements into the curriculum system, update teaching content, add cutting-edge technology courses, and enhance the relevance and practicality of the curriculum.

3.2 Strengthening Teaching Faculty Development, Enhancing Practical Teaching Capabilities

Build a “dual-qualification” teaching faculty adapted to the development of advanced manufacturing. First, improve the cultivation and introduction mechanisms for “dual-qualification” teachers. Encourage vocational college teachers to undertake practical training in advanced manufacturing enterprises, participate in enterprise technology R&D projects, and enhance their practical teaching capabilities and frontier technology literacy. Simultaneously, relax employment conditions for skilled enterprise technicians and masters, increase the introduction of part-time teachers, and optimize the structure of the teaching faculty. Second, reform teacher evaluation mechanisms. Establish evaluation standards centered on practical teaching ability, industrial service capability, and technology R&D capability, moving away from academically-oriented evaluation constraints to stimulate teachers’ enthusiasm for engaging in practical teaching and industrial services.

3.3 Deepening Industry–Education Integration , Building Long–term Synergistic Talent Cultivation Mechanisms

Address the challenge of “enthusiastic schools, lukewarm enterprises” to promote deep industry–education integration. First, strengthen government coordination. Establish incentive mechanisms for school–enterprise collaborative talent cultivation, providing policy support such as tax reductions and subsidies to advanced manufacturing enterprises participating in industry–education integration, clarifying enterprises’ educational responsibilities, and guiding increased enterprise investment in vocational education. Second, promote the joint establishment of industrial colleges, practical training bases, and master skill studios by schools and enterprises to achieve resource sharing and complementary advantages. Involve enterprises in the entire process of talent cultivation, technology R&D, and achievement transformation, forming a long–term mechanism of “school–enterprise co–cultivation and synergistic development.” Third, implement modern apprenticeship systems and new enterprise apprenticeship systems to achieve “enrollment as recruitment, entering school as entering the factory,” enhancing the job adaptability of talent cultivation.

4. Conclusion

In the construction of strong manufacturing provinces, the high–quality development of advanced manufacturing is inseparable from the strong support of vocational education, and the typological value of vocational education also needs to be demonstrated through serving industrial development. Currently, certain practical achievements have been made in vocational education serving advanced manufacturing in strong manufacturing provinces. However, challenges such as insufficient program adaptability, weak faculty capabilities, and shallow industry–education integration persist, constraining the full realization of its service effectiveness. In the future, it is necessary to base efforts on the development needs of advanced manufacturing. Through measures such as optimizing programs and curriculum systems, strengthening teaching faculty development, deepening industry–education integration, upgrading practical training systems, and improving policy support, promote deep synergy between vocational education and advanced manufacturing. Enable vocational education to better cultivate high–quality technical and skilled talents, empower industrial technology innovation, and provide solid talent support and intellectual guarantee for the construction of strong manufacturing provinces and the manufacturing powerhouse.

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