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Research on Talent Cultivation Models for Intelligent Manufacturing in the Hydraulic Industry with Distinctive Features

Xiaoliu Cui and Guanghua Zhang

Shandong Labor Vocational and Technical College, Shandong 250000, China

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Abstract: This paper explores the research on the talent training mode for intelligent manufacturing in the hydraulic industry with distinctive features. The development of the hydraulic industry urgently requires professional talents. It analyzes the new demands for talents in intelligent manufacturing catering to the hydraulic industry with distinctive features. The cultivation of talents in intelligent manufacturing majors faces issues such as students' weak practical abilities, the disconnection between teaching content and new technologies, the lagging construction of professional teaching staff, and insufficient industry-education integration. To address these problems, strategies such as improving curriculum settings, strengthening school-enterprise cooperation, and enhancing the construction of the teaching staff are proposed. By strengthening practical teaching, initiating targeted practical courses, focusing on the cultivation of students' comprehensive qualities, deepening the construction of industry-education integration, strengthening the construction of school-enterprise cooperation platforms, jointly formulating talent training programs, encouraging teachers to participate in enterprise practices, enhancing teacher training, and introducing professional and technical talents, this paper provides theoretical support and practical guidance for educational reform and innovative practices in the field of intelligent manufacturing.

1. Introduction

In today's era of intelligence, the global manufacturing industry is in the midst of a tumultuous wave of technological innovation, with deeper applications of new technologies such as artificial intelligence, big data, and cloud computing, driving the manufacturing industry to continuously move forward towards a more efficient, precise, and sustainable development path. Hydraulic

technology, as a core technology in the field of modern industrial transmission and control, not only supports the development of high-end equipment manufacturing but also constitutes an important pillar of the national industrial system. As a strategically foundational industry in the field of machinery, the level of innovation in hydraulic, pneumatic, and sealing technologies directly determines the performance breakthroughs and quality leaps of high-end electromechanical products [1]. Currently, global industrial powers universally regard the breadth of application and depth of research and development of hydraulic transmission technology as one of the core indicators for measuring the degree of national industrial modernization.

Against this backdrop, the hydraulic lifting equipment industry faces unprecedented opportunities and challenges. Talent is the core driving force for the development of the hydraulic lifting equipment industry, and research on the talent training mode for intelligent manufacturing catering to the hydraulic industry with distinctive features is a topic worthy of in-depth exploration and practice.

1. New Demands for Talents in Intelligent Manufacturing Catering to the Hydraulic Industry with Distinctive Features

Hydraulic lifting equipment is widely used in various fields such as building construction, logistics and warehousing, aerospace, and industrial production, and its performance and efficiency directly affect the production and operation levels of various industries. However, with the increasingly diversified market demands and intensifying competition, traditional manufacturing modes and technological levels of hydraulic lifting equipment have gradually become difficult to meet the needs of modern industrial development. To stand out in the fierce market competition, the hydraulic lifting equipment industry must keep pace with the times, actively embrace technological innovation, and steadfastly promote industrial innovation.

With the acceleration of industrial upgrading, the current demand for composite skilled talents in the industry is increasing. Such talents not only need to possess sufficient technical knowledge in their professional fields but must also have innovative thinking to develop and apply new technological solutions based on new trends and demands in industry development. Meanwhile, with the intelligentization and complexity of production equipment, the industry has put forward higher requirements for the practical operation abilities of skilled talents. Possessing only theoretical knowledge is no longer sufficient to compete for jobs; enterprises require talents who can skillfully operate intelligent equipment systems and diagnose problems under complex working conditions.

2. Current Status of Talent Training in Intelligent Manufacturing Catering to the Hydraulic Industry with Distinctive Features

2.1. Weak Practical Abilities of Students

In the talent training of intelligent manufacturing majors in the hydraulic field, the systematic disconnection between theory and practical teaching has become a structural contradiction restricting the development of industry-education integration. Students have learned a lot of theoretical knowledge, such as hydraulic transmission characteristic curves. However, in practical training, due to practical factors such as low frequency of exposure to enterprise-level equipment and scarcity of engineering case resources, learners generally exhibit insufficient technical transfer abilities in practical operations such as system debugging and fault diagnosis. This imbalance in

ability cultivation not only restricts the development of innovative thinking under complex working conditions but also directly affects the job adaptability of graduates, ultimately forming a mutually restrictive relationship between talent training and industrial upgrading [2].

2.2. Disconnection Between Teaching Content and New Technologies

The hydraulic field is in a critical stage of technological iteration, with the continuous emergence of intelligent equipment, composite materials, and digital processes. However, the current knowledge update speed of the education system lags significantly behind the pace of industrial innovation. There is a notable generational gap between course settings and industry frontiers, making it difficult to match the requirements for talent abilities in intelligent manufacturing upgrades. A cognitive gap has formed between teaching scenarios and real production environments. This phenomenon leads to graduates generally having skill blind spots when exposed to advanced hydraulic systems. They lack practical experience with innovative processes and struggle to understand the operational logic of intelligent production lines, resulting in a significant gap between their professional competitiveness and industry employment standards. This imbalance between supply and demand not only affects the conversion of talent effectiveness but also restricts the upgrading process of the entire industrial chain.

2.3. Lagging Construction of Professional Teaching Staff

The field of hydraulic education faces structural shortcomings in the teaching staff. The current teacher population exhibits three characteristics: lagging knowledge iteration - teachers rarely master the core hydraulic technologies newly introduced in the industry in the past five years and fail to integrate new technologies, standards, and processes into daily teaching; imbalance in industry-education abilities - 78% of teachers have not participated in enterprise-level hydraulic component research and development projects, leading to inadequate teaching of key skills in teaching scenarios; and homogenization of development pathways - the current teacher evaluation system is still dominated by paper indicators, lacking recognition standards for dual-qualified teachers in industry-education integration.

2.4. Insufficient Industry-Education Integration

The education of hydraulic majors has shortcomings in multi-dimensional collaboration, mainly manifested in three aspects. First, there is a notable asynchrony between the current curriculum structure and the pace of industrial technology upgrades. It is difficult to timely convert frontier technological changes into teaching elements, leading to systematic deviations between training programs and job competency models. Second, student internship and employment opportunities are limited. Internship programs are often mere formalities, lacking substantive technical training and professional skill development, which cannot effectively promote the development of students' professional competencies. Third, against the backdrop of accelerating technological iteration, schools and enterprises have not yet established a dynamic knowledge transfer channel. This results in a three- to five-year technological generational gap in the teaching system, making it difficult to construct a curriculum system that truly responds dynamically to market demands.

3. Exploration of Strategies for Talent Training in Intelligent Manufacturing Catering to the Hydraulic Industry with Distinctive Features

3.1. Improving the Curriculum System

3.1.1. Strengthening Practical Teaching

Addressing the issues in talent training for intelligent manufacturing in the hydraulic industry requires the urgent construction of a learning system based on real industrial production scenarios, with a focus on strengthening the connection between theoretical knowledge and practical operation skills. By integrating theory and practice, such as introducing teaching methods like case analysis and problem-solving, students can not only grasp theoretical knowledge but also engage in deep thinking about specific problems and perform practical operations. Virtual Reality (VR) and Augmented Reality (AR) technologies can be leveraged to build practical training systems, connecting to enterprise real-time production data platforms and integrating professional courses such as thermodynamic analysis and fault detection technology of hydraulic equipment with intelligent tools. This creates a practical training environment closer to real working conditions, allowing students to complete the entire learning process from basic principles to technical optimization through three-dimensional operations [3].

3.1.2. Offering Targeted Practical Courses

When constructing the practical teaching system for intelligent manufacturing majors, course content should be designed based on the technological trends and industrial demands of the hydraulic field. By conducting concentrated practical training, students can transform theoretical knowledge into practical skills, and develop comprehensive professional qualities through hands-on experience. Institutions should establish practical training bases with related enterprises, introduce real enterprise projects, and create industrial scenarios for industry-education integration. Through application operations driven by job tasks, students can simultaneously enhance their technology transfer abilities and professional adaptability.

3.1.3. Emphasizing the Cultivation of Students' Comprehensive Qualities

When cultivating the comprehensive abilities of talents in intelligent hydraulics, efforts should be made to advance through three dimensions: technical enhancement, career guidance, and teamwork. Systematic analysis methods can be applied in teaching, such as guiding students to solve practical problems related to the balance between energy consumption and accuracy in hydraulic systems, thereby exercising their overall thinking abilities and complex problem-solving skills in engineering systems. Vocational ability training should incorporate the concept of quality and safety, utilizing virtual simulations to restore quality traceability processes and risk identification scenarios in production. By participating in joint development projects on intelligent production lines, students can complete tasks such as cost assessment and process validation in cross-job collaboration, enhancing their sense of engineering responsibility and teamwork abilities. Meanwhile, digital practical courses should be offered in combination with industry service demands, training students to convert customer needs into technical solutions and improving their communication and coordination abilities in equipment operation and maintenance services with the help of human-computer interaction tools.

3.2. Strengthening School-Enterprise Cooperation

3.2.1. Deepening the Integration of Industry and Education

We should promote the deep integration of the intelligent hydraulic education system with the industrial ecology and construct an interactive mode in which education and industry promote each other. For example, a strategic collaborative development framework between schools and enterprises should be established, and a long-term mechanism for school-enterprise cooperation should be improved to realize real-time connection between educational content and industry demands, ensuring that teaching content resonates in real time with the trend of intelligentization in hydraulic equipment. Meanwhile, enterprise technical standards should be converted into teaching resources, and cutting-edge technical equipment should be introduced into practical sessions so that students can directly engage with and learn the latest technologies [4]. Industry seminars and technical exchange activities should be organized regularly to realize collaborative research and development and knowledge sharing between school and enterprise teaching teams, jointly creating a practical teaching environment with native industrial characteristics.

3.2.2. Strengthening the Construction of School-Enterprise Cooperation Platforms

Constructing a stable school-enterprise cooperation platform is the core support for upgrading the intelligent manufacturing education system in the hydraulic industry with distinctive features. This platform needs to carry out composite functions, serving as both a hub for data sharing among schools, enterprises, and scientific research institutions and a bridge for collaborative innovation between both parties. The platform needs to support two-way information flow, enabling enterprises to obtain real-time information on the growth process of talent abilities and professional skills, while institutions can accurately connect with the latest technological developments and talent demands of enterprises. The platform should regularly organize school-enterprise dialogues and workshops to promote mutual understanding of each other's needs and expectations and explore specific forms and content of cooperation. The platform should also provide internship and employment channels, not only providing students with practical work opportunities but also providing enterprises with qualified technical talents. Under this mechanism, both school and enterprise can participate in the process of student cultivation, which not only strengthens the cultivation of students' professional abilities and employment prospects but also brings education closer to actual demands.

3.2.3. Jointly Formulating Talent Cultivation Programs

The collaborative development of talent cultivation programs between schools and enterprises is an important way to precisely match educational goals with industrial demands. This program needs to establish a school-enterprise supply and demand matching mechanism to ensure that courses not only meet teaching standards but are also close to actual industrial demands. Enterprises should become involved at the initial stage of teaching module development, enhancing the practical applicability of courses by providing technical support and production cases. Both cooperating parties need to standardize the operating standards and evaluation system for practical training sessions to ensure that students complete the transformation of job skills and the accumulation of professional qualities. The program must embed a career development guidance system, establishing a model of career cognition and growth paths based on industry talent demand analysis. The feedback optimization mechanism jointly built by schools and enterprises promotes dynamic

adjustments to the cultivation program through periodic data evaluation, ultimately forming a virtuous cycle of improving talent supply quality and employment abilities.

3.3. Enhancing the Construction of the Teaching Staff

3.3.1. Encouraging Teachers to Participate in Enterprise Practice

To strengthen the quality of talent training in intelligent manufacturing for the hydraulic industry with distinctive features, it is crucial to establish an incentive mechanism for teachers to engage in industrial practice. This mechanism aims to facilitate teachers' understanding of the latest industry trends, acquisition of the newest industry skills, and precise grasp of market demands through school-enterprise collaborative practice platforms, thereby achieving dynamic adaptation between teaching resources and industrial development. The implementation path should include: establishing a periodic on-site training system to arrange for teachers to enter the production departments of cooperating enterprises for technical follow-up and gain experience in equipment upgrades and process optimization; building an industry-academia dialogue platform to promote teachers' participation in actual enterprise projects and construct a long-term support environment for collaborative innovation in industry, academia, and research; and effectively enhancing the cutting-edge nature of professional courses and the industry fit of talent training through the continuous conversion of practical outcomes into teaching case libraries.

3.3.2. Conducting Teacher Training

Constructing a teacher capability development system is a key support for improving the quality of talent training in the field of hydraulic intelligent manufacturing. Schools need to incorporate the professionalization of the teaching staff into their strategic plans and achieve iterative upgrades in teaching capabilities through systematic training programs. The implementation path includes: developing hierarchical and classified teacher training modules covering innovations in teaching paradigms, optimization of course development frameworks, reconstruction of ability evaluation systems, and tracking of frontier technologies; establishing a digital empowerment mechanism, relying on virtual simulation platforms and intelligent teaching systems to realize innovative applications of educational technology tools; constructing an inter-school collaborative training mechanism, jointly establishing an expert think tank with universities and scientific research institutions, and integrating high-quality educational resources through joint workshops and research projects. At the same time, policies to support academic exchanges should be improved, with priority funding for teachers to participate in international academic forums and industrial technology summits to strengthen their knowledge transfer abilities and teaching innovation momentum.

3.3.3. Introducing High-Level Professional and Technical Talent

Constructing a high-end talent introduction system in the hydraulic field is a core measure to enhance the synergistic efficiency of the intelligent manufacturing education chain and innovation chain. Schools should focus on the needs of interdisciplinary integration and industrial fusion, and targetedly introduce academic backbones and technical experts with industry-leading levels to enrich the teaching staff. Teachers with industry skills can provide students with frontier technologies and integrate practical work experience into teaching, making the teaching content closer to reality and demand [5]. Through the implementation of a flexible introduction mechanism

and a dual-appointment professor system, industrial technological innovation achievements can be converted into modular teaching resources to ensure that teaching content iterates synchronously with industry development. A systematic policy system, including market-oriented salaries, special research start-up funds, and promotion channels for technical positions, should be constructed to ensure the attraction and retention of high-level professional and technical talents.

4. Conclusion

The talent training system for intelligent manufacturing in the hydraulic industry with distinctive features is a typical multi-agent collaborative project that requires cooperation among the government, schools, enterprises, and the industry. By improving curriculum design, strengthening school-enterprise cooperation, enhancing the construction of the teaching staff, and other measures, we can systematically resolve the supply-side structural contradictions in talent training and provide suitable human capital support for industrial technological iteration. In the future, we will more closely integrate industrial demands with teaching resources to cultivate high-quality skilled talents who meet market demands and provide students with broader career development opportunities.

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