Exploration and Practice of Cultivating Innovative Talents in Intelligent Manufacturing Major of Higher Vocational Education Based on "Self Learning Psychological Stimulation and Personalized Training" Under the Background of Deep Integration of Industry and Education

Honggang Duan*
Shandong Vocational College of Science and Technology, Weifang, Shandong, China
** Corresponding Author*

Abstract: In the context of the current deep integration of industry and education, this article focuses on the urgent need for the cultivation of innovative abilities of high-quality technical and skilled talents in the intelligent upgrading of manufacturing enterprises. It relies on the cooperation between vocational colleges and undergraduate colleges to build laboratories to promote the integration of vocational education and science education, and the cooperation between vocational colleges and enterprises to build pilot workshops for the transformation of scientific research achievements to promote the deep integration of industry and education. Combined with the educational psychology theory of student learning motivation stimulation and personalized learning, research is carried out on the connotation and positioning of cultivating innovative talents in the intelligent manufacturing major, the construction of the "three integration, four progression" professional group course system, teaching mode and assessment system, etc., to achieve the research goal of closely integrating professional group teaching, scientific research and industry, and opening up the implementation channel of innovative talent cultivation. Practice has proven that measures such as stimulating learning motivation, implementing personalized teaching, and strengthening practical learning can effectively improve the quality of innovative talent cultivation and provide stronger talent support for the development of the intelligent manufacturing industry.

Keywords: Integration of Industry and Education; Personalized Learning; Zone of Proximal Development; Constructivism; Innovative Talents; Teaching Path

1. Urgent Demand for Innovative High Skilled Talents under the Intelligent Upgrading of Manufacturing Industry

By promoting the reform of universities through classification, establishing a discipline setting adjustment mechanism and talent cultivation model driven by technological development and national strategic needs, laying out urgently needed disciplines and majors, strengthening the construction of basic disciplines, emerging disciplines, interdisciplinary disciplines, and top-notch talent cultivation, and focusing on strengthening the cultivation of innovation capabilities[1]. Improve the mechanism of scientific and technological innovation in universities and enhance the efficiency of achievement transformation.

In the new wave of technological revolution and industrial transformation, the intelligent upgrading of manufacturing has become a global competitive focus. The promotion of strategies such as Industry 4.0 and Intelligent Manufacturing 2025 will accelerate the transformation of manufacturing enterprises towards digitization, networking, and intelligence. From industrial robots replacing repetitive labor, to digital twin technology achieving full process simulation optimization, and to AI quality inspection systems breaking through the bottleneck of manual detection accuracy, the widespread application of new technologies has reshaped the underlying logic of production and manufacturing[2]. In this context, the skill requirements for traditional production positions have undergone a

fundamental transformation, and vocational innovative technical and skilled personnel who understand intelligent manufacturing technology and have innovative practical abilities have become an indispensable core force in the digital transformation process of enterprises.

The digital transformation of enterprises faces multiple technological challenges and urgently needs high skilled talents to fill the capacity gap. In the intelligent factory, the industrial Internet platform requires professionals to conduct data collection, analysis and system operation and maintenance[3]. The precision debugging of CNC machining centers and the collaborative optimization of automated production lines require higher programming skills and equipment operation levels from practitioners. At the same time, complex technical problems often arise on the production site, such as robot welding parameter optimization, sensor anomaly warning, etc., which require composite talents with interdisciplinary knowledge to quickly respond and solve. Taking the automobile manufacturing industry as an example, the intelligent production of new energy vehicles involves emerging fields such as battery management systems and autonomous driving modules. Enterprises urgently need innovative high skilled talents who master skills such as intelligent assembly and electronic and electrical debugging.

Innovation capability has become a core element for enterprises to break through development bottlenecks. In the process of digital transformation, enterprises not only need execution oriented talents, but also need innovative talents who can proactively identify production process pain points and propose technological improvement solutions. For example, by optimizing the motion trajectory algorithm of industrial robots to improve production efficiency and using digital twin technology to simulate the effect of process parameter adjustment, these innovative practices rely on practitioners' deep understanding and flexible application of new technologies. Innovative high skilled talents in vocational colleges, with solid professional foundations and strong practical abilities, can quickly transform innovative ideas into practical solutions, becoming a driving force for promoting technological innovation and enhancing product competitiveness in enterprises.

However, there is still a significant gap between the current supply and demand of manufacturing talent. According to the "China Intelligent Manufacturing Development Index Report", the talent gap in China's intelligent manufacturing field has reached millions and is showing a trend of expanding year by year[4]. Graduates under the traditional vocational education training model often struggle to meet the demands of enterprises for digital and intelligent skills. Therefore, the demand of manufacturing enterprises for deepening the integration of industry and education, and cultivating innovative high skilled talents through school enterprise cooperation is becoming increasingly urgent. Enterprises look forward to jointly building industrial colleges with vocational colleges, developing customized courses, and integrating cutting-edge technologies and industry standards into teaching content. Through models such as order classes and modern apprenticeship systems, we aim to achieve precise alignment between talent cultivation and enterprise needs, injecting lasting momentum into the high-quality development of the manufacturing industry. However, the above training methods still focus more on the cultivation of talent skills in terms of cooperation mode, cooperation mechanism, and curriculum system, and there is still a lack of effective measures and executable specific methods for the cultivation of innovation ability.

2. Problems in the Cultivation of Innovative High Skilled Talents in Intelligent Manufacturing in Higher Vocational Education

2.1 The Positioning of Cultivating Innovative High Skilled Talents is Unclear

The training elements and positioning of professional innovation talents are not clear, and the adaptability of training abilities to the needs of industrial development and technological innovation is poor. Under the rapid development of new quality productivity in intelligent manufacturing, innovative technical and skilled talents with research capabilities, innovation literacy, and job adaptability play an important role in promoting innovation and transformation in the manufacturing industry[5]. However, at present, the talent cultivation of intelligent manufacturing majors in higher vocational education has not been effectively coordinated with the development of new quality

productivity to play a role in technological innovation. The key lies in the unclear ability cultivation elements of the innovative talent cultivation stage, unclear training positioning, and mismatch with the needs of industrial development.

2.2 Unreasonable Construction of Curriculum System for Cultivating Innovative High Skilled Talents

The construction of the curriculum system for cultivating innovative talents is unreasonable, the mutual benefit effect between teaching content and scientific research content is poor, and it is not closely connected with the industry[6-7]. At present, the construction of the curriculum system for cultivating innovative talents in the field of professional innovation has not kept pace with the development of new technologies in the industry and has been updated slowly, which cannot effectively achieve the teaching objectives of cultivating innovative talents[8-9]. The key to its solution lies in integrating real scientific research content and industrial content that can be transformed into curriculum content, constructing a curriculum system that integrates "education, science, and industry" elements, and achieving close integration and mutual support among the three parties.

2.3 Unclear Path for Cultivating Innovative High Skilled Talents

The training logic of teaching, scientific research, and practical stages is unclear, and the path for cultivating innovative talents in the field of professional innovation is not clear. The lack of coordinated development in teaching, research, and practice around the process of cultivating innovative talents has led to unclear logic in talent cultivation[10]. We should rely on a real platform for transforming scientific research achievements, with teaching as the main line, combined with scientific research activities and practical training, to enhance students' innovative application abilities and build a logically clear path for cultivating innovative talents.

3. Construction of an Innovative High Skilled Talent Training System for Intelligent Manufacturing

3.1 Strengthen the Positioning of Talent Cultivation

The key elements of the current development of intelligent manufacturing new quality productivity technology, such as the demand for talent cultivation and the quality requirements of enterprises for talent cultivation, are important indicators for cultivating innovative technical and skilled talents that serve society and accelerate the development of intelligent manufacturing new quality productivity technology[11]. At the same time, accurately identifying the ability elements for cultivating innovative technical and skilled talents can also help build a capability demand model for cultivating innovative technical and skilled talents, and provide effective guidance for the subsequent development of curriculum systems and teaching models[12]. By conducting research and analysis on the needs of enterprises such as Shandong Dihui Intelligent Technology Co., Ltd., and summarizing the experience of talent cultivation in the school enterprise joint construction pilot workshop, the cultivation of students' four key abilities of learning exploration, problem analysis and solving, job practice, and application innovation is combined with the basic, core, job, and innovation advanced ability cultivation stages. Through the use of first-year research assistants and basic courses, students are able to develop active learning and innovation awareness during the learning stage, laying a solid foundation for learning. Developing independent thinking and analytical problem-solving skills among members of the sophomore research team and core course learning stage. Cultivate the ability to endure hardship and work hard, as well as the ability to innovate and explore in the practical and project tackling stages of junior high school enterprises.

3.2 Constructing a "Three Integration, Four Progression" Talent Training Curriculum System

Based on the demand for cultivating innovative technical and skilled talents, we will study and construct a "three integration, four progression" professional group course system to promote and transform new quality productivity technologies and teaching content[13]. The freshman stage is divided into three learning modules: professional group basic courses, basic practical training, and basic technology research. The basic courses are mainly designed around the basic production

content of intelligent detection equipment, while the basic practical training is carried out around the basic operation technology and assisting enterprises in equipment production[14]. At the same time, students enter the detection technology research laboratory in different directions to carry out research and learning on the basic technology of intelligent detection equipment research and development, achieving the integration and integration of basic research, basic practical training, and basic teaching content, promoting each other. The sophomore stage is divided into three learning modules: core courses for professional groups, core practical training, and research on detection technology topics. The course content in this stage focuses on combining enterprise application project content and production environment with the core practical training environment, integrating cutting-edge research technology content into the core course content, and implementing a combination of training and obstetrics integrated training in these two stages[15]. In the third year, the production of intelligent detection equipment in enterprises is divided into five job directions, including non-standard mechanical and electrical equipment design. At the same time, based on the two semesters before and after the internship in the third year, practical courses for the fifth semester and project research content for the sixth semester are designed for different job directions, further enhancing students' technical application and innovation abilities, and gradually growing into technical backbone of enterprises. Through the design of course content at each stage, the three-dimensional integration of obstetrics education and the progressive development of four levels of innovative talent cultivation can be achieved.

3.3 Innovate the Teaching Mode of "Industry Docking, Research and Education Cycle, Real Job Reality"

Combining the "three integrations and four progressions" curriculum system, the teaching content is aligned with the cutting-edge industries of new quality productivity, achieving synchronous updates between teaching content and the development of new quality productivity technology. By implementing the triple identity of students, research members, and enterprise employees, a teaching team composed of teachers, doctoral research teams, and enterprise engineers respectively carry out teaching in teachers, laboratories, training rooms, and on campus enterprise pilot workshops, realizing the teaching promotion of scientific research, the feedback of scientific research projects to teaching content, the combination of teaching and research to achieve the transformation of technological achievements to promote the landing and production of enterprise projects, and the reverse combination of student training scenarios and training projects in the "research education cycle" teaching operation mode. At the same time, relying on the school's digital teaching platform, an intelligent detection research team project service platform and an enterprise practice project platform will be added. The laboratory and related projects, technical service cases, advanced research and development technologies, etc. will be uploaded to the platform to achieve ubiquitous learning for students and provide content materials for teachers to develop course resources, further facilitating the implementation of teaching methods through digital platforms.

3.4 Establish a Talent Cultivation Assessment and Evaluation System

By dividing the talent training objectives, process monitoring, and improvement into three modules, key training objectives such as professional qualities, innovation ability, and technical skills of professional innovation and new technology and skill talents are determined. Multiple monitoring is carried out in key implementation aspects such as the "vocational enterprise" cooperation mode, professional group curriculum system, and teaching mode. Through specific discussions, exchanges, inspections, lectures, surveys, questionnaires, etc., problems are summarized and feedback is given on the actual teaching effect and the achievement of students' abilities in the training stage. The implementation situation is compared with the planned training effect, and problems are analyzed for supervision and improvement. Rectification and improvement are carried out in five aspects including course content, teaching team, and teaching methods to promote the achievement of the goal of cultivating innovative technology and skill talents. A "three-dimensional, five dimensional, Multiple ' The assessment and evaluation system for the cultivation of innovative technical and skilled talents, implementing dynamic monitoring and improvement of the entire talent cultivation

process, ensuring the quality and sustainability of talent cultivation.

4. Results

Based on laboratory research projects, cutting-edge technological achievements are extracted and integrated into courses such as "Machine Vision Technology and Applications". Around the production project of the pilot workshop, a professional group's "progressive job ability" practical teaching system is improved, and a "real job reality" practical teaching environment is constructed to connect with the development and training projects of practical job positions in enterprises on campus. Based on a team of full-time and part-time teachers composed of research team teachers and enterprise engineers, teaching, research, and practical training are carried out in real production projects in pilot workshops, including integrated practical training rooms, visual laboratories, and pilot workshops. The learning process of students is connected with the real production process, and the learning content is combined with the work content. The practical training project is a real pilot production project, and the academic work is a pilot production product. The learning evaluation is jointly completed by teachers, enterprise engineers, and product acceptance customers, achieving a virtuous cycle of promoting scientific research through teaching, scientific research projects feeding back teaching content, combining teaching and scientific research to promote the transformation of technological achievements, connecting the pre employment and post employment development paths of students, promoting the implementation of enterprise projects, and improving the quality of talent cultivation.

5. Conclusions

The joint construction of intelligent testing pilot workshops by vocational colleges, undergraduate colleges, and enterprises has accumulated rich experience in the deep integration of industry, academia, and research in vocational colleges, the high-quality training of innovative technical and skilled talents, and the typical implementation path of research, innovation, and application integration and promotion.

Building a collaborative mechanism is the cornerstone. Based on the visual inspection laboratory and R&D team, and in accordance with the interests and demands of all parties involved, a cooperation agreement for deep integration of industry and education has been signed. The three parties clarify their respective rights, responsibilities, and obligations in the construction and operation of the pilot plant, and have clear division of labor. At the same time, a joint management team will be established to communicate regularly, solve problems in a timely manner, and promote the smooth implementation of pilot production and practical teaching projects.

Improving the quality of talent cultivation is key. Based on the professional group talent training curriculum system and practical teaching system, students are exposed to and learn laboratory research projects from their freshman year, and further integrate through courses such as "Machine Vision Technology and Applications" and "Intelligent Manufacturing System Integration" jointly developed by the school and enterprise. The sophomore practical training project is integrated with the enterprise order project to promote technological innovation ability, and the junior year further deepens the enterprise practical link, enhances technical application ability, and achieves high-quality training of innovative and composite talents.

Improving the operational management system is the support. The government provides policy support and builds a platform for enterprise communication. Schools and enterprises develop standardized management processes for projects, equipment, quality, etc. around the pilot plant, share teachers, equipment, technology, and information, and achieve resource co construction and sharing.

Developing incentive and guarantee mechanisms is the driving force. Implement an incentive mechanism that combines material and spiritual rewards to stimulate the enthusiasm of all parties. Actively seek policy support, broaden financing channels, improve safety management, and ensure workshop construction and operation.

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