Exploration and Construction of Innovative Paths for the New Higher Vocational Smart Pipeline Network Curriculum System from the Perspective of Industry Education Integration

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Abstract. Creating a new type of vocational education represents a pivotal measure adopted by Shanghai in actively responding to the national vocational education reform initiative and optimizing the local vocational education landscape. In this endeavor, the integration of industry and education is deemed as the linchpin for fostering the high-quality development of the emerging vocational education sector. By deeply integrating industrial and educational resources, we have implemented a "triple-double" collaborative mechanism, encompassing dual subject participation, dual combination interaction, and two-way mutual employment. This mechanism aims to forge a novel paradigm for the integration of smart pipeline network industry and education. On this foundation, we have redesigned the teaching and curriculum systems for the Smart Pipeline Network professional group, tailored to meet the demands of industry-education integration. The new system encompasses shared platform courses, distinctive modular courses, and innovative extension courses. This reform effectively addresses the issue of isolated professional courses and the wastage of scattered teaching resources that previously existed. This article further elucidates the core ideas and essential considerations underpinning the construction of this curriculum system, aiming to serve as a reference for similar educational reforms.

Keywords: New-type higher vocational education; intelligent management network; integration of industry and education; curriculum system.

1. Introduction

Under the guidance of the spirit of the 20th National Congress of the Communist Party of China, the spirit of the National Education Conference and the 2035 modernization of China's education, China's higher education is undergoing changes, and it is urgent to cultivate high-quality talents to adapt to the development of modern industry. In 2023, the Ministry of Education launched the national education digitalization strategic action to promote the comprehensive upgrading of education, and issued the implementation plan for the empowerment and improvement action of the integration of industry and education in vocational education. In this context, Shanghai has launched a new type of Higher Vocational Education (five-year consistent system). The integration of production and education is regarded as a key path to enhance the adaptability of the education system, meet market demand, and provide more employment opportunities and practical skills training. In higher vocational education, the integration of production and education is essential to ensure that graduates master the necessary skills and knowledge and lay a solid foundation for their future career.

2. The Current Situation of the Integration of Industry and Education in the Construction of Smart Pipeline Network

The integration of industry and education, as an important trend in educational development, emphasizes the deep integration of education and industry, aiming to cultivate high-quality talents that meet the needs of the industry. Smart pipeline network, as a fusion model of new generation information technology, has put forward new requirements for higher vocational education.

2.1 Domestic Research Progress

In China, the research and Practice on the integration of production and education are deepening. Since 2007, domestic scholars have begun to explore the construction of industrial colleges, emphasizing the depth and breadth of school enterprise cooperation [1, 2]. In recent years, the government has issued a series of policies to encourage cooperation between universities and enterprises and promote the integration of production and education. The new type of Higher Vocational Colleges responded positively, established cooperative relations with enterprises in the smart pipe network industry, jointly developed professional courses, and provided practical opportunities and employment support. The curriculum system reform introduces information technology, big data analysis and other contents, and uses modern technologies such as virtual laboratory and online education platform to improve the teaching quality. International cooperation is also increasing, and joint development of courses, research projects and training programs.

2.2 Foreign Research Progress

The development of integration of production and education in foreign countries started early. Developed countries such as the United States, Japan, Germany and the United Kingdom have built a perfect education system, and their industrial universities have formed a mature talent training system[3-10]. Some countries in Europe, the United States and Asia actively promote higher vocational education of smart pipe network to meet market demand. Colleges and universities cooperate with industry-leading enterprises to provide students with practical opportunities and cultivate relevant skills.

Worldwide, the construction of smart pipe network professional group is booming, and countries are actively cultivating professionals to meet the needs of the industry. In the future, with the progress of technology and the expansion of application fields, it is expected that more colleges and universities at home and abroad will participate in the construction, jointly promote the in-depth development of the integration of production and education, and cultivate more high-quality professionals for the industry.

3. Integration and Optimization of Smart Pipe Network Curriculum System

The underground pipe network is known as the "invisible blood of the city", maintaining the normal operation of the city [11-15]. Scientific and technological progress promotes the intelligent transformation of pipe network, and the intelligent pipe network system integrates data to provide comprehensive solutions. However, in the new type of higher vocational education, the talent training of smart pipe network technology lags behind, and the traditional municipal road and Bridge specialty is difficult to meet the market demand, which restricts the smart pipe network and urban development. The strategic position of smart pipe network is increasingly important. It is urgent to reconstruct the curriculum system of Higher Vocational Education under the integration of production and education, which is the key for students to master skills and connect with emerging fields. The survey shows that the construction of domestic smart pipe network professional group has started, and the maturity of "big municipal" professional group in first tier cities is insufficient. Based on the new concept of higher vocational education, this topic closely follows the market

dynamics, and explores the construction path of smart pipe network specialty group for the cultivation of high skilled talents [26].

3.1 Construction Ideas of Smart Pipe Network

The construction of Hui pipe network professional cluster needs to deeply integrate the concept of production and education with the needs of the industry, flexibly adjust the education system, ensure that students master the skills and knowledge closely related to the actual work, accurately meet the market demand, and promote the in-depth development of the integration of production and education. This move aims to cultivate more high-quality talents who meet the high standard requirements in the field of smart pipe network.

We will adopt the strategy of dual track parallel, integration and innovation, and take the local industrial chain as the guide to comprehensively reform the talent training specifications, curriculum standards, textbook compilation, teacher training and student evaluation system in the education chain. Through the construction of "three double" coordination mechanism - Double Subject coordination, double combination interaction, two-way mutual employment and exchange, build a smart pipe network professional cluster, and create a new chapter in the integration of industry and education.

3.2 Reconstruction of Smart Pipe Network Curriculum System

The original curriculum system of the smart pipe network specialty group referred to the undergraduate model, with "discipline standard" and "skill standard" as the core. However, facing the new requirements of the integration of production and education, its shortcomings are prominent, and it is difficult to meet the needs of enterprises for high skilled talents.

Before the reconstruction of the curriculum system, in-depth analysis of industry needs, cooperation with the industry, clear enterprise expectations and required skills and knowledge, and accurate navigation for the curriculum design. After detailed investigation, according to the policy of integration of production and education, the classified training mode is implemented, and a new way of flexible and expandable post group curriculum construction is explored. Follow the "platform+module+expansion" architecture reconstruction course, cultivate "smart pipe network+x" interdisciplinary talents, integrate into the occupation recognition standard, encourage double certificates, strengthen the 1+x system, implement the credit system, and promote the cross integration of majors. The platform course integrates knowledge, skills and literacy, and builds a cognitive framework; Module courses are connected with standard shunt training to help master core competencies; Expand courses to optimize with changes and promote resource sharing. Due to technological development, the partners provide equipment resources to support facility construction.

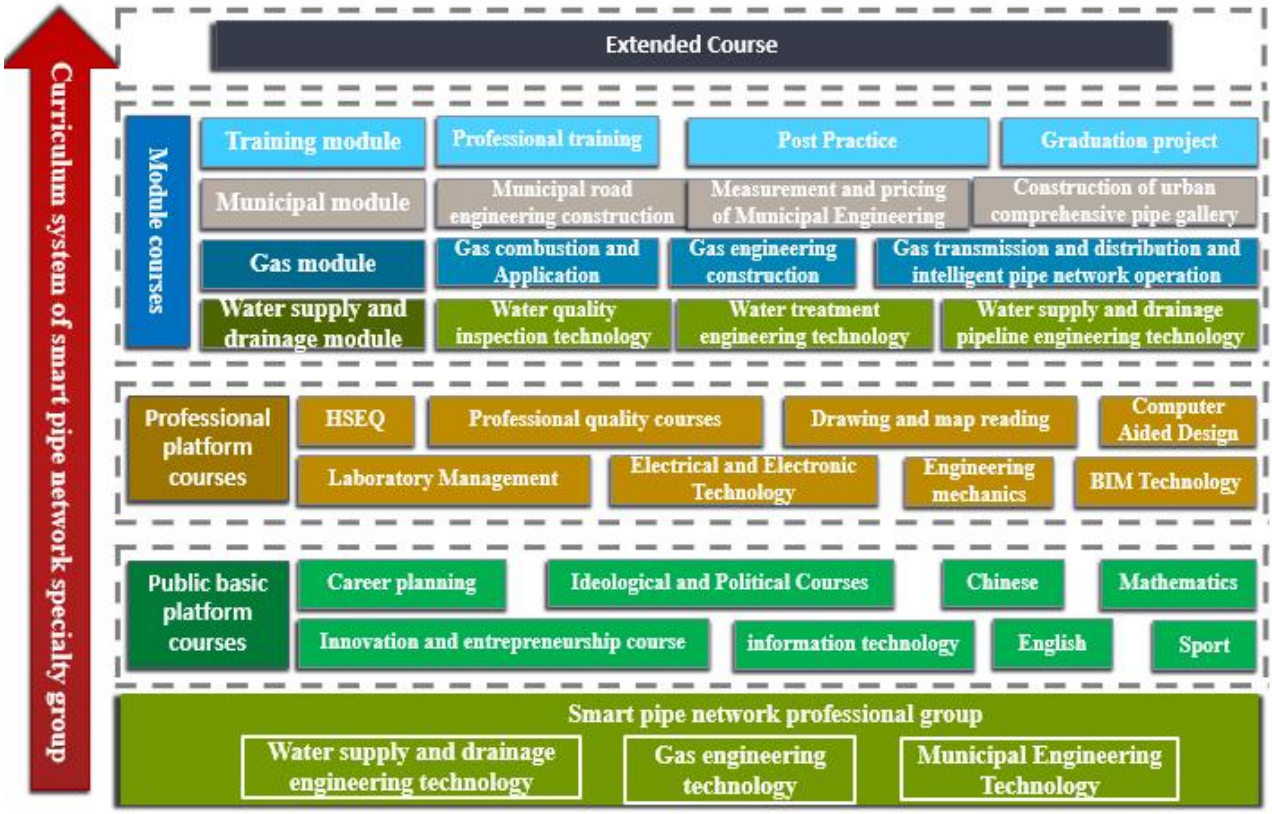

Fig. 1 Diagram of smart pipe network professional group course system

4. Prospect

With the promotion of the integration of production and education, the new smart pipe network curriculum system in Higher Vocational Colleges in Shanghai has broad prospects. In the future, we will strengthen interdisciplinary integration, update the course content, ensure that students master cutting-edge knowledge, and open up channels for academic promotion. Digital education technology is integrated into a new trend, and the teaching effect is improved by using digital technology and online platform. The integration of production and education will be closer, providing rich opportunities for practice and internship. At the same time, the course of Ideological and political education focuses on the cultivation of students' comprehensive quality, strengthens international cooperation, promotes transnational education and research, broadens students' international vision, and ensures that students have digital skills and "prospective employees" level.

Acknowledgements

This research was funded by the National Natural Science Foundation of China (2024), grant number 52472450; Shanghai Educational Science Research Project (2024), grant number C2024184; China association of construction education Teaching and Research Project Key Projects (2023), grant number 2023054; Re-search and Innovation Team of Shanghai Communications Polytechnic (2024), grant number 2024T01.

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