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Analysis of Countermeasures for the Construction of an Integrated Curriculum System for the Chemical Technology Major in Secondary Vocational Schools

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Abstract: Currently, the social market has increasingly high requirements for the capabilities and qualities of chemical industry professionals. Against the backdrop of the new round of educational reform, secondary vocational schools, as an important base for cultivating chemical technology professionals, can effectively break the separation between traditional theoretical teaching and practical teaching by strengthening the construction of an integrated curriculum system, which is conducive to promoting the in-depth integration of "teaching, learning, and doing". Therefore, this paper mainly analyzes and studies the significance, problems, principles, and countermeasures of constructing an integrated curriculum system for the chemical technology major in secondary vocational schools, aiming to cultivate a group of chemical technology professionals more in line with the current employment market demand, and hoping to provide some reference for peers.

Keywords: Secondary vocational schools; Chemical technology major; Integration; Curriculum system; Construction countermeasures

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1. Introduction

In the new era, as a pillar industry of the national economy, the chemical industry is gradually transforming and upgrading from a traditional labor-intensive industry to a technology-intensive and knowledge-intensive one [1]. Especially with the continuous rise of emerging fields such as the green chemical industry, the fine chemical industry, and intelligent production, the chemical industry has put forward higher new requirements for the comprehensive quality and capabilities of front-line technical and skilled talents. As the core educational carrier connecting the talent supply of the chemical industry, the quality of talent training in the chemical technology major of secondary vocational schools is closely related to the transformation, upgrading, and future development of the chemical industry. However, the construction of the curriculum system for the chemical technology major in some secondary vocational schools currently has an obvious phenomenon of separation between "theory

and practice", resulting in students' difficulty in applying the learned knowledge and skills to practice, and it is difficult to ensure that they meet the actual needs of modern chemical production. By constructing an integrated curriculum system, we can effectively promote the "integration of teaching, learning, and doing", help break the boundary between theoretical teaching and practical teaching, and promote the coordinated development of students' knowledge and skills [2]. Therefore, as a teacher of the chemical technology major in secondary vocational schools in the new era, it is necessary to attach importance to the construction of an integrated curriculum system to better assist students' learning and development.

2. Significance of constructing an integrated curriculum system for the chemical technology major in secondary vocational schools

2.1. Meeting the industry's demand for technical and skilled talents

In recent years, with the continuous development of emerging fields such as the green chemical industry and the fine chemical industry, the chemical industry, as a pillar industry of the national economy, has also begun to put forward higher new requirements for the practical operation ability, problem-solving ability, and comprehensive quality of front-line technical personnel. However, in the traditional curriculum system of chemical technology in secondary vocational schools, theoretical teaching and practical operation usually belong to different links, and there is a certain disconnection between them, which easily leads to the problem that students "understand theory but cannot apply it." By constructing an integrated curriculum system, we can realize the organic integration of theoretical knowledge and practical training, transform real tasks in chemical production into specific teaching content, and enable students to gradually master relevant theoretical principles and practical operation skills in the process of completing tasks. This is conducive to cultivating "plug-and-play" talents more in line with the job requirements of the chemical industry, thereby effectively alleviating the shortage of skilled talents in the chemical industry [3].

2.2. Implementing the type orientation and educational goals of secondary vocational education

Essentially, secondary vocational education is vocational education, emphasizing "competency-based", and its main purpose is to cultivate high-quality technical and skilled talents [4]. The construction of an integrated curriculum system requires teachers to abandon the traditional one-sided teaching mode of "valuing theory over practice", adhere to the cultivation of students' vocational ability as the basic orientation, and reconstruct and optimize the curriculum content and teaching process. Specifically for the chemical technology major, teachers can organically combine chemical principles, chemical processes, equipment operation, and other contents with production practice, allowing students to gradually deepen their understanding and cognition of professional knowledge in specific practices, and gradually improve their professional practical skills in solving practical problems, which is of great significance for students' future career development.

2.3. Improving students' comprehensive quality and employment competitiveness

At present, the demand and requirements of the chemical industry employment market for talents are no longer limited to a single operational ability, but tend to employ professional talents with high comprehensive quality and ability. Carrying out teaching based on an integrated curriculum system allows teachers to not only attach importance to the training of students' professional practical skills but also pay attention to the cultivation of

students' vocational literacy, innovative thinking, and teamwork ability. In this way, students can not only master a solid professional theoretical foundation and practical operation skills but also have good vocational literacy, which is of great significance for improving their employment competitiveness [5].

3. Problems existing in the construction of an integrated curriculum system for the chemical technology major in secondary vocational schools

3.1. Disconnection between curriculum content and job requirements

At present, the construction of the integrated curriculum system for the chemical technology major in some secondary vocational schools has not conducted in-depth research in enterprises, nor has it fully analyzed the actual needs of positions. This easily leads to the disconnection between the content setting of the curriculum system and the actual job requirements, resulting in the lack of practicality of the knowledge and skills learned by students.

3.2. Lagging construction of a "dual-qualified" teacher team

The construction of an integrated curriculum system for the chemical technology major in secondary vocational schools requires a "dual-qualified" teacher team as support and guarantee. Generally speaking, such teachers need to have solid theoretical knowledge of chemical technology and rich practical experience in chemical production. Only in this way can they organically combine theoretical teaching with practical guidance, thereby providing students with better teaching services. However, at present, the construction of the "dual-qualified" teacher team for the chemical technology major in many secondary vocational schools still has some problems, which to a certain extent restricts the construction process of the integrated curriculum system. Specifically, it is manifested in the following two aspects: first, some teachers are directly employed as college graduates and lack work practice experience in front-line enterprises, resulting in their relatively low practical guidance ability [6]. Second, although some teachers have certain practical work experience in enterprises, they lack systematic educational and teaching theoretical support, making it difficult to design scientific and effective integrated teaching activities.

4. Principles for constructing an integrated curriculum system for the chemical technology major in secondary vocational schools

4.1. Guided by vocational competence

When constructing an integrated curriculum system for the chemical technology major, secondary vocational schools need to adhere to the orientation of vocational competence, ensuring that the curriculum content and the development of teaching activities are always carried out around the vocational competence requirements of core positions in the chemical industry. Only in this way can a solid foundation be laid for students' future employment and career development. Specifically, before construction, secondary vocational schools can further clarify the professional skills (such as reactor operation, process regulation, product testing, etc.), theoretical knowledge (such as chemical thermodynamics, chemical kinetics, process calculation, etc.), and vocational literacy (such as safety awareness, sense of responsibility, standardized operation habits, etc.) required for core positions such as chemical operators, process controllers, and quality inspectors through enterprise research, job analysis, and other measures. Then, based on this, they can be transformed into specific curriculum goals and teaching modules, thereby ensuring that the construction of the curriculum system is always highly consistent

with the actual requirements of job capabilities in the chemical industry [7].

4.2. Integration of theory and practice

Essentially, the construction of an integrated curriculum system is the in-depth integration of theory and practice, emphasizing the need to break the traditional pattern of separated theoretical and practical teaching. In curriculum design, secondary vocational schools need to decompose abstract chemical technology theoretical knowledge into several specific practical tasks, allowing theoretical teaching to serve students' practical operations, so that students can gradually deepen their understanding and cognition of professional theoretical knowledge in specific practical operations, and ultimately achieve the goal of enabling students to "learn by doing and do by learning" [8].

4.3. Combination of practicality and forward-looking

When constructing an integrated curriculum system for the chemical technology major, secondary vocational schools also need to consider its practicality and forward-looking. On the one hand, practicality requires that the content design of the curriculum system should be closely aligned with the actual needs of current chemical production, focusing on mainstream industry technologies and equipment. Its main purpose is to ensure that the professional knowledge and skills learned by students can be directly applied to job practice [9]. On the other hand, forward-looking requires that the construction of the curriculum system should pay more attention to the development trends of the chemical industry, such as the application of green chemical technology and intelligent production equipment, and appropriately integrate relevant cutting-edge knowledge and skills. Its main purpose is to avoid the curriculum content lagging behind the industry development and effectively cultivate students' ability to adapt to the future development of the industry [10].

5. Countermeasures for constructing an integrated curriculum system for the chemical technology major in secondary vocational schools

5.1. Deepening the integration of production and education and reconstructing the curriculum content system

To ensure the construction effect of the integrated curriculum system for the chemical technology major, it is necessary for secondary vocational schools to further deepen the integration of production and education, strengthen the optimization and reconstruction of the curriculum content system, and ensure the accurate connection between curriculum content and job requirements. On the one hand, the school can set up a curriculum development team composed of college teachers, enterprise technical backbones, and industry experts. Through on-site research, job competency analysis, and other measures, the competency requirements of each core position can be further clarified and transformed into specific curriculum modules and learning tasks [11]. For example, for the position of chemical operator, the school can develop core modules such as chemical equipment operation and maintenance, process regulation, and set up specific learning tasks such as centrifugal pump operation and reactor parameter adjustment under each module to better ensure the learning effect of students. On the other hand, the school can establish a sound dynamic update mechanism for curriculum content, regularly invite enterprise experts to participate in curriculum seminars, and timely integrate new industry technologies, processes, and specifications into the curriculum content system, thereby effectively ensuring the practicality and forward-looking of the curriculum [12].

5.2. Strengthening teacher training and building a "dual-qualified" teacher team

A "dual-qualified" teacher team is the core guarantee for the implementation of the integrated curriculum system. To this end, secondary vocational schools can take the following measures to build a "dual-qualified" teacher team with strong comprehensive capabilities: first, improve the teacher training mechanism. For example, teachers can be regularly organized to take on temporary positions in cooperative enterprises to actively participate in enterprise production practice and accumulate practical experience. At the same time, regular teaching ability training can be carried out to further improve teachers' ability in integrated teaching design and implementation [13]. Second, increase the intensity of talent introduction, and actively recruit technical backbones with rich front-line work experience from enterprises to continuously optimize the structure of the teacher team. Third, establish a sound incentive mechanism, link the identification of "dual-qualified" teachers with professional title evaluation and performance appraisal, encourage teachers to take the initiative to improve their "dual-qualified" abilities, and thus form a new pattern of teacher training featuring "teaching benefits teachers and students alike, and school-enterprise integration" [14].

5.3. Improving teaching resources to support the development of integrated teaching

In practice, secondary vocational schools also need to strengthen the construction of teaching resources to provide sufficient hardware and software support for integrated teaching. On the one hand, in terms of hardware, the school needs to increase capital investment, actively build a comprehensive training base integrating theoretical teaching areas, practical training areas, and simulation areas, and equip it with training equipment synchronized with enterprises. At the same time, it can introduce chemical production simulation software and build a virtual training platform to effectively make up for the shortcomings of high risk and high cost in real equipment operation [15]. On the other hand, in terms of software, the school can organize teachers and enterprise technical personnel to jointly compile integrated textbooks, integrating theoretical knowledge, operation steps, safety specifications, and other contents into the textbooks. At the same time, it is necessary to establish an integrated teaching resource library and actively integrate microcourses, teaching videos, practical cases, and other resources to provide more support and guarantee for students' independent learning.

6. Conclusion

In a word, strengthening the construction of an integrated curriculum system for the chemical technology major in secondary vocational schools can better adapt to the development needs of the chemical industry and greatly improve the quality of talent training in schools. In specific practice, secondary vocational schools can realize the construction of an integrated curriculum system for the chemical technology major through various measures such as deepening the integration of production and education, reconstructing the curriculum content system; strengthening teacher training, building a "dual-qualified" teacher team; and improving teaching resources to support the development of integrated teaching, thereby cultivating more high-quality professional technical and skilled talents for the chemical industry.

Disclosure statement

The authors declare no conflict of interest.

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