

Exploration and Practice in the Curriculum Construction of Integrated Production & Education under the Background of New Engineering-Taking the Chemical Engineering Safety and Environmental Protection as an Example

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Abstract

With the rapid development of chemical engineering in China, the demand for professional talents in chemical engineering safety and environmental protection is becoming larger. As a traditional major, chemical engineering is undergoing a transformation and transition towards a new engineering direction, during which it lays a great emphasis on innovation, interdisciplinary comprehensive abilities, and practical applications. And for students in this major, the process will have higher requirements on the safety and environmental protection literacy. The integration model of production and education is a combination of scientific research and technological services, which can well connect the practice with theory, thus forming a unified teaching practice model that integrates enterprises and universities. It plays a significant role in overcoming the insufficiencies of training ability of chemical engineering safety professionals and promoting the synergistic development of the professional and industrial chains in environmental protection engineering. Therefore, it is necessary to apply the teaching model of integrating production and education to the teaching of chemical engineering safety and environmental protection. This article initially explores the possible paths of integrating chemical engineering safety and environmental protection with production and education based on the background of new engineering disciplines, and then reflects on the integration of production and education in chemical engineering.

Keywords: New Engineering, Integration of production and education, Chemical engineering safety and environmental protection.

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1. Introduction

In the background of building a new engineering discipline in China, the integration of production and education has been endowed with new characteristics of the times. In 2017, the General Office of the State Council issued several policies on deepening the integration of production and education, which is proposed to enhance the participation of industry enterprises in higher education and then comprehensively promote the concept of university-enterprise collaborative education, which will finally accelerate the collaborative innovation of education and industrial development. Meanwhile, in response to the needs of national strategic development, the field of higher education has ushered in a new wave of engineering education reform, which is targeted at promoting the construction of new engineering disciplines [1]. The cooperation between industry and academia, as well as the integration of production and education, is a main theme for the high-quality development of higher education, which is aimed at promoting the comprehensive development of students. As an undergraduate university, the integration of production and education is a methodology to improve the quality of talent cultivation in the new era. Through the university and enterprise cooperation, talent cultivation standards can be aligned with industry standards, hence academic and employment can be connected, effectively improving the quality of talent cultivation, and achieving a two-side situation that is beneficial to universities and enterprises. The safety and environmental protection issues in the course "Chemical engineering safety and Environmental Protection" usually belong to complex engineering problems, which normally involve knowledge in various fields such as chemical processes, factory design, logistics, storage, and engineering ethics. It has the characteristics of multiple knowledge points, wide subject coverage, and strong engineering practicality. In the context of the new engineering discipline, this model is able to enhance students' comprehensive safety and

environmental protection literacy, allowing them to deeply understand and practice the knowledge they have learned during the learning process. Subsequently, it will strengthen their comprehensive ability to discover, analyze, predict, prevent and solve complex engineering problems such as safety and environmental protection in their future careers. To summarize, it plays a core role in talent cultivation in higher engineering education.

2. Implementing the integration model of chemical engineering safety and environmental protection with production and education

By implementing a model of integrating production and education, the chemical engineering major can effectively overcome the difficulties in cultivating talents in safety and environmental protection to higher education institutions. Actually, this model relies on the university and enterprise cooperation platform, allowing students to receive education and engage in practical exercises in a real business situation, cultivating innovative thinking and problem-solving abilities, and being able to adapt and respond to challenges in complex and ever-changing social environments. In recent years, the Chinese government has issued numerous policy documents, such as the "Pilot Implementation Plan for National Industry Education Integration Construction", which is aimed at promoting deeper integration between the education and the industry [2]. Therefore, adopting the integrated education model of production and education as a development strategy for the chemical engineering profession is not only an effective response to policy guidance, but also a critical measure to improve education quality and talent cultivation mechanisms.

In the current context of the construction of new engineering disciplines, the teaching mode of integrating production and education in the chemical engineering major can connect teaching with industry needs more frequently, then promote the close integration and synchronous development of production and education, and finally cultivate high-quality professional talents who can meet the current economic and technological development. In terms of the students, this model means that they will have the ability to enhance their employment prospects, practical skills, and comprehensive qualities, achieving multi-dimensional development that is closely required by enterprises. At the same time, higher education institutions cultivate new era engineering graduates with greater market competitiveness by more effectively connecting with the demands of the industry. Enterprises will get more solid technical and talent support from it, and thus a strong competitiveness in a fierce market environment is secured [3]. The practice of integrating production and education not only enhances the combination of professional knowledge and industrial practice, but also creates a mutually beneficial situation for students, universities, and enterprises.

3. Exploring the integration model of chemical engineering safety and environmental protection with production and education

3.1 Building the practical platforms for enterprises to participate in course content design.

Normally, chemical engineering safety and environmental protection includes safety technology and three waste treatment parts, with a wide range of practical contents and various reference books. How to emphasize the teaching highlights and enrich the teaching contents has put forward new requirements for teachers. In order to satisfy the needs of the integration for industry and education in environmental design under the background of new engineering disciplines, it is necessary to create a course design practice platform that can cooperate with enterprises. In the process of formulating professional course plans, universities should positively get advice from enterprises and invite them to participate in the construction of course content. This cooperation not only involves curriculum content, but also explores a "customized" talent training model, which makes educational programs according to the specific needs of enterprises. To be specific, the educational content of chemical engineering can be divided into two main parts: learning theoretical knowledge and obtaining comprehensive skills. When conducting practical teaching, the specific needs of enterprises should be taken as the starting point to help students to gain a deep understanding of both software and hardware technologies in the field of chemistry to achieve the goal of cultivating professional talents in multiple aspects. Additionally, adopting a "customized" teaching model enables universities to cultivate graduates who can better meet the requirements of the labor. This not only quickly assists students to adapt to the workplace, but also decrease training costs and time for enterprises. Through collaborative efforts between universities and enterprises, the resulting customized education outlines and talent development plans will ultimately enable the students to meet the specific needs of enterprises. This collaborative approach promotes mutual cooperation among universities, students, mentors, and enterprises, thus jointly promoting the integration of production and education.

3.2 Taking the advantages of practical teaching effectiveness in university and enterprise cooperation.

In the context of the construction of new engineering disciplines, the goal of chemical engineering training is to improve the students' practical and operational skills [4]. To make this, the cooperations between universities and enterprises are very crucial. Universities can increase the number of practical courses. For instance, freshman students will have one month of internship, sophomore students will have two months, and junior students will have a longer time. These practices are not limited to the classrooms, but also involve other parts such as graduation projects and graduate projects. More practices should also be integrated into daily teaching to stimulate students' interest in learning and strengthen teacher-student interaction.

3.3 Establishing the integrated paths of industry, academia and research.

In the context of new engineering, it is an effective way for higher education to cultivate technical talents by combining industry, academia, and research to achieve deep integration between education and industry. To improve the quality and efficiency of this integration, it is necessary to carefully design and adjust the collaborative relationship between production and education. In the field of chemical engineering, students participate in real projects, practical internships, and scientific research explorations to cultivate their safety awareness and environmental thinking [5]. In this regard, the university is expected to start to improve and implement the following aspects. First of all, universities are supposed to fully utilize and improve existing industry academia research platforms, establish close cooperation with the industry, enrich their content and connotation, and ensure that enterprises can discover value-added potential on this platform and actively participate. Under this framework, universities can provide students with true projects and practical opportunities to enhance their innovative spirit and practical skills in a real situation, allowing them to be exposed to the latest industry trends and technological needs. Secondly, universities should focus on the practicality and innovation of curriculum design. In the curriculum of environmental design major, the proportion of practical projects and practical courses should be increased, so that students can participate in true projects firsthand, exercise practical abilities and innovative thinking. Meanwhile, universities can also establish innovation laboratories and studios, providing students with a platform for innovative practice, cultivating their innovation ability and teamwork spirit. To achieve this, direct participation of enterprises in the teaching and practical training, joint guidance for students to complete internships, assistance in designing graduation theses, and providing career planning suggestions are all necessary. Deep participation of enterprises can not only make students have a better understanding of professional knowledge, but also cultivate the necessary thinking and skills for new engineering talents, thus achieving a multi-side situation for the university, students and enterprises that are beneficial to all. Finally, for students who have participated in the integrated learning path of industry, academia, and research, universities should establish an evaluation system that includes their practical achievements, innovative abilities, and scientific research achievements. A comprehensive evaluation of students should be conducted to improve their learning motivation and effectiveness.

4. Conclusion

With the gradual transformation of the chemical engineering industry, safety and environmental protection have become one of the key indicators to measure the industrial level of the chemical industry. In order to optimize the current situation of industry education integration and promote the continuous innovation and growth of industry education integration models in the context of new engineering, it is necessary for chemical engineering safety and environmental protection to continuously explore and innovate teaching models, focus on strengthening industry academia cooperation, and build a closer industry academia cooperation platform and mechanism. This can be achieved by inviting enterprises to participate in course design, increasing the proportion of practical teaching, deepening university enterprise cooperation, and innovating teaching strategies. In addition, we need to create a project practice platform for cooperation with enterprises and guide students to pursue a learning path that integrates industry academia and research. Moreover, it is also important to strengthen the training and introduction of professional teachers, improve their professional level and innovative awareness. Continuously optimizing education models and content to meet the development needs of the new engineering background and cultivating chemical engineering professionals with strong safety awareness and environmental thinking.

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