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Research on the Innovative Mode of Integrating Production and Education to Cultivate Mechanical Professional Talents

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Abstract: *In the process of education, universities should focus on cultivating innovative and skilled talents in line with the requirements of the era. At present, the training mode of mechanical students in universities is difficult to meet the requirements of regional development for innovative and skilled talents. In addition, the new engineering also put forward new requirements for the innovation ability and engineering practice level of mechanical talents. Therefore, under the background of new engineering, universities improve the innovative consciousness and practical ability of talents through the integration of production and education and the cooperative education mode of universities and enterprises, research and explore new methods and new paths for the cultivation mode of innovative talents of mechanical majors in universities, and focus on cultivating application-oriented innovative talents to help the development of regional economy and equipment manufacturing industry.*

Keywords: *new engineering, mechanical majors, integration of production and education, innovative talents*

1. Introduction

The development of the world manufacturing industry has entered a new era, and higher education should meet the needs of the industry, based on the cultivation of innovative, composite and application-oriented high-quality talents, and transform from large-scale expansion to optimization of structure and improvement of quality. The new training concept guides the new engineering talents, and today's education should change from the traditional engineering discipline-oriented training concept to results-oriented[1]. With the integration of production and education and the cooperation between schools and enterprises to cultivate innovative talents, enterprises can transform the most cutting-edge technology and actual needs into theoretical and practical courses of professional teaching and pass them on to students, so as to cultivate innovative talents who adapt to the development trend of the age.

This paper takes the College of Mechanical and Electrical Engineering of Qiqihar University as an example, through the establishment of a mechanical professional group, in-depth cooperation with the local well-known national important backbone enterprise Qizhong CNC Equipment Co., LTD., taking the road of integration of production and education, and proposing a constructive and innovative talent plan, the mechanical professional group will be built into a special professional group with "professional characteristics and local cannot be left". This plan can alleviate the transformation and upgrading of local machinery industry enterprises and the problem of talent shortage. Further promoting the integration of production and education can improve the transformation and development level of local undergraduate colleges and universities, and cultivate a large number of technical talents who serve the transformation and upgrading of enterprises and the adjustment of national economic structure[2].

2. The Form of Innovative Talent Training Has Developed from Single to Diversified

First of all, universities should actively change their teaching concepts, build a curriculum system with comprehensive coverage, rich types, progressive levels and mutual support, build diversified disciplines and majors, and improve students' learning interest and initiative by introducing new

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educational concepts and modes, so that students can truly become talents with innovative ability and practical ability. To meet the different needs of the market. The single school education, towards the integration of production and education, school-enterprise collaborative training (schools to solve theoretical education, enterprises to improve professional training), close cooperation, to run a special mechanical professional higher education[3].The College of Mechanical and Electrical Engineering of Qiqihar University adopts a 1.5+2.5 training mode to recruit and train according to the "mechanical class" in accordance with the requirements of compound and innovative talents with strong moral character, thick foundation, wide caliber, multi-direction, strong application and high quality. That is, when freshmen enter the mechanical category, they do not have any major or major direction. After completing the basic courses of the mechanical category platform, according to the relevant provisions of the "Measures for the Implementation of Professional Training and Distribution Work of Qiqihar University by Class Enrollment", they carry out professional distribution work in the third semester, select specific majors in the mechanical category, and formally enter the selected major in the fourth semester.

Secondly, universities should pay attention to the cultivation of students' engineering consciousness and innovation and entrepreneurship ability, strive to achieve the deep integration of production and education, and form diversified integration training forms such as building laboratories, undertaking discipline competitions, and combining internship and employment. In the science and technology competitions represented by "National Advanced Mapping Competition", "China Robot and Artificial Intelligence Competition", "National College Student Mechanical Innovation Hui Yu Regional Competition", our students have won more than 220 national and provincial awards. Those competitions exercise and enhance the students' ability of scientific and technological innovation and creation.

3. Innovate the Collaborative Education Mechanism, and Promote the Long-Term Development of The Dual Tutorial System Inside and Outside the School

The double tutorial system is an innovative training method for the majors with strong technical skills, and it is also the mainstream innovative talent training method in the undergraduate higher education at home and abroad. The implementation of the school-enterprise dual tutorial system is of great significance for strengthening the seamless connection between universities and enterprises and other educational subjects and education links, forming the joint force of school-enterprise education, realizing the synergy between universities and enterprises in the process of education, improving the teaching process of universities and enterprises, and improving the quality of talent training[4].But how to ensure the effective implementation of this system? The College of Mechanical and Electrical Engineering of Qiqihar University adopts a combination of "going out" and "inviting in" in the construction of the double tutor platform, so as to achieve the goal of cultivating innovative and applied talents in mechanical majors, and actively promote the long-term development of the double tutor system inside and outside the school.

3.1. Strengthen the Training of Double-Qualified Teachers in the School and Enhance the Teaching Practice Ability of Teachers

Table 1: The number of full-time mechanical teachers in the School of Mechanical and Electrical Engineering of Qiqihar University

major	Specialty code	Name of major	Number of full-time teachers	Double-professionally-titled teachers	Teachers with enterprise background
machinery majors	080202	Mechanical design, manufacture and automation	*20*	*5*	*12*
	080204	*Mechatronic Engineering*	*9*	*0*	*5*
	080206	*Process Equipment and Control Engineering*	*11*	*0*	*5*

According to statistics, in 2022, there will be 22 teachers with industry and enterprise background in the mechanical major of the School of Mechanical and Electrical Engineering of Qiqihar University, accounting for 55% of the total number of professional teachers, and 5 double-qualified teachers, accounting for 12.5% of the total number of professional teachers. Detailed data are shown in Table 1. Therefore, we should strengthen the training of double-qualified teachers from many aspects. First of all,

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through teachers "going out" to the enterprise temporary practice, exchange learning, to carry out school-enterprise horizontal research and other forms to improve their ability, hierarchical, type, and professional to promote the "double teacher" training. Secondly, in order to "introduce" to promote "training", the school teacher teaching development center jointly with various teaching units, inviting senior professional talents from enterprises to enter the campus to train teachers' practical ability. We have made statistics on the number of teachers in the School of Mechanical and Electrical Engineering, and the results are shown in the table below.

3.2. Introduce High-Level Teachers From Outside the School, and Realize Resource Sharing Through Collaborative Education Mechanism

Experts from machinery enterprises be invited in universities to enter the school part-time, participate in guiding students' practice, and enrich teacher resources. Universities should strengthen the construction of enterprise tutor team, deepen the school-enterprise collaborative education mechanism, create a long-term multi-subject collaborative education, achieve the effective connection of the education chain, talent chain, industrial chain and innovation chain, improve the practical teaching effect in multi-party cooperation, improve the quality of talent training, and train excellent engineers in the new era.

4. Innovative Production and Education Integration Platform Construction, to Achieve the Characteristics of School-Enterprise Cooperation

School-enterprise cooperation has always been an important way for schools and enterprises to jointly train talents. The talents cultivated in this way, because of its targeted training, can better adapt to the needs of enterprises and provide directional transportation for enterprises. At the same time, resources can be shared between schools and enterprises to achieve mutual benefit and win-win goals. However, with the introduction of the concept of innovation, the school-enterprise cooperative teaching mode is also undergoing new changes. Through the innovative personnel training mode of "integration of industry and education and school-enterprise cooperation", the School of Mechanical and Electrical Engineering of Qiqihar University actively explores cooperation with government and enterprise, industry and research institutes to build laboratories, practice bases and industrial colleges, build joint training platforms and highlight the cultivation of students' practice and innovation ability.

In May 2019, on the basis of the school-enterprise strategic cooperation agreement signed by Qiqihar University and Qizhong Numerical Control Equipment Co., LTD., relying on the School of Mechanical and Electrical Engineering, the "Intelligent Equipment Industry College" was established with the participation of government, school and enterprise. A demonstration talent industry college integrating talent training, scientific research and technological innovation was created. In the combination of production, university and research, we will continue to promote the supply-side structural reform of education, teaching and education, realize the effective docking of the professional chain and the industrial chain, constantly improve the quality of professional construction, ensure the effectiveness of the construction of industrial colleges, effectively play the leading and demonstration role of the construction point of provincial modern industrial colleges, and provide intellectual support and talent guarantee for regional economic and industrial development.

5. Innovative Production and Education In-Depth Integration Training Mode to Achieve Sustainable Cultivation of Innovative Talents

Innovative personnel training mode is the core of new engineering construction. However, the traditional mode of higher education often focuses on the transfer of theoretical knowledge, but neglects the cultivation of manipulative ability and innovative spirit. The cultivation of innovative talents is an important driving force for the current social development and an important mission of higher education. Therefore, it is particularly important to reform and innovate the training mode of mechanical talents and realize the sustainable cultivation of innovative talents. The concept of PDCA is introduced into the deep integration of production and education in mechanical majors and the collaborative training of innovative talents by schools and enterprises, and a sustainable PDCA cycle of training innovative talents in mechanical majors is established, as shown in Figure 1. PDCA cycle (Deming Ring) is a total quality management system model, which has the characteristics of continuous improvement, continuous innovation and continuous circulation [5].

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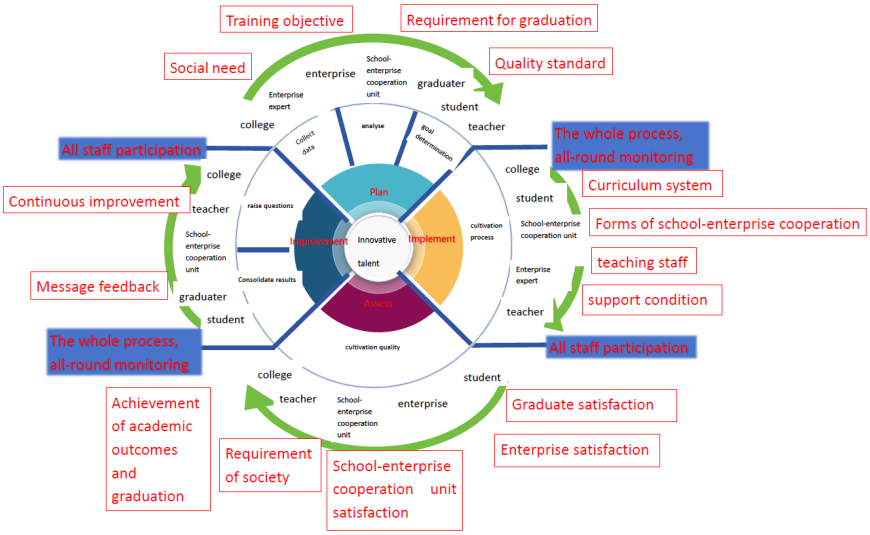

Figure 1: Cultivate innovative talents of mechanical profession PDCA cycle.

6. Conclusions

This paper mainly studies the innovative mode of training mechanical talents through the integration of production and education in universities. Under the background of new engineering, in-depth research and practice on the training mode of innovative mechanical talents should be carried out through theoretical innovation, policy optimization, as well as promotion and implementation in practice, so as to help gradually realize the goal of building a powerful country in education. It can better play the function of colleges and universities to serve local economic construction. In the process of education and teaching reform, we should build a new platform for the integration of production and education, explore a new model of school-enterprise cooperation and collaborative education for mechanical majors, cultivate innovative talents in mechanical majors with innovative thinking and practical ability, introduce new technologies, new thinking and new models into the industry, and realize the talent training system of undergraduate and graduate students and the school-enterprise dual system of education. The new models provide application-oriented high-quality professional and technical personnel for the comprehensive revitalization of Longjiang equipment manufacturing industry.

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