The Innovation on Talent Training Mechanism of Vehicle Engineering Specialty for the Education Program of Outstanding Engineers

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Abstract: The excellence program is an important measure to promote China from a big engineering education country to a powerful engineering education country. It is very important to improve the quality of engineering education. According to the general requirements of "Construction of talent training program", this paper explores the innovative research on the talent training mechanism of "excellent class" of vehicle engineering specialty from the Innovation and reform of curriculum system, curriculum system innovation and reform, college-enterprise co-operation and industry university research studio, the construction of teacher team and promotion of the student science and technology competition.

Keywords: excellence program; engineering education; quality of personnel training; personnel training mechanism; innovation

1. Introduction

The "Plan for Educating and Training Outstanding Engineers (PETOE)" is a major reform project of the Ministry of Education to implement the National Medium-and Long-term Education Reform and Development Program (2010-2020), which aims to train a large number of innovative and high quality engineering and technical talents that are suitable for economic and social development, and to improve the quality of training of engineering education talents in a comprehensive manner [1]. In recent years, the rapid development of China's automobile industry requires a large number of professional and technical personnel, so it is a very important topic to transform the demand pressure of society, enterprises and the market into the training goal of higher education automobile talents. In 2016, the Ministry of Education of Hubei Province approved 83 projects of 46 general undergraduate colleges and universities in the province as the collaborative parenting program of "Jingchu Outstanding Talents", and selected Wuhan Huaxia University of Technology as the first batch of colleges in Hubei Province for implementing the Excellence Program, with the Vehicle Engineering Major as one of the pilot majors.

The major of vehicle engineering is mainly to train high-quality applied technology talents who can adapt to the needs of modernization and can be engaged in design and research and development, production and manufacturing, production management, experimental testing, technical services and other work in the automotive professional field and related cross-fields. At present, there are mainly the following problems in talent training: (1) the curriculum system is not reasonable and the main courses in the direction of intelligent vehicles are weak; (2) the practical teaching content does not fully meet the "graduation requirements" for students in the Accreditation Standards for Engineering Education; (3) cross-curricular practical projects and the construction of experimental bases is relatively backward; (4) the formulation of practical curriculum system lacks the participation of relevant industry personnel, and the goal of personnel training is relatively single; (5) the "dual-qualification" teaching staff is relatively insufficient, and some teachers lack engineering practice background.

In this paper, according to the overall goal of "PETOE", the course system of "Excellence class" of Vehicle Engineering Major is optimized to meet the new talent needs and the future development direction, and the teaching content is updated with the latest development of disciplines, industries and technologies; guided by the needs of industrial development, the personnel training is carried out to deepen the integration of industry and education and the cooperation between schools and enterprises.

2. Reform and Optimization of Talent Training Program for "Excellence Class" of Vehicle Engineering Major

Based on the analysis of the general standard of "PETOE" of the Ministry of Education and in-depth enterprise research, the credits of professional education module and practice teaching module are added in the "excellence class" of vehicle engineering major, the engineering practice in enterprise is increased, and the talent training scheme is reformed. Under the guidance of

new engineering, the curriculum system of vehicle engineering is optimized and integrated, and the concept of constructing the curriculum system based on the traditional systematic standards of the discipline is changed. In close combination with the development of modern automobile industrialization and the needs of the automobile industry, with the goal of improving students' self-learning ability, engineering practice ability, the use of modern engineering tools and innovation ability, the professional curriculum system is optimized, the theoretical teaching hours are appropriately reduced, and more hours are used for extra-curricular self-learning and enterprise learning.

3. Constructing Application-oriented Talent Training Mechanism for Engineering Education Accreditation

The model of engineering education has been the latest outcome of recent reforms in international engineering education, which is based on the whole life cycle of the product "conception, design, realization, operation" and allows students to learn the expertise in a proactive, practical, organic connection between courses. General standards for engineering education accreditation are engineering knowledge, problem analysis, design/development solutions, research, use of modern tools, engineering and social, environmental and sustainable development, professional norms, individuals and teams, communication, project management, lifelong learning. The core elements of the accreditation standards for engineering education include curriculum system, training objectives, quality improvement, teaching staff and supporting conditions, etc. [2]. In the major of vehicle engineering, according to the training objectives of its own position and social needs, the students-oriented standards are formulated, and a suitable course system for training "outstanding engineers" is constructed through the establishment of a quality monitoring system; a contingent of teachers who meet the requirements of teaching is constructed, laboratories and other teaching equipment are added, and a system for training automobile professionals who meet the accreditation standards for engineering education is established to improve the level of engineering education.

3.1. Constructing Enterprise-oriented and Social-oriented Curriculum System to Meet New Talent Needs

The proportion of practical teaching links should be increased, the professional core courses should be constructed, and a curriculum system oriented by enterprises and society should be built. Specialized basic courses and specialized backbone courses should be set up in theory and practice teaching, such as Automotive Testing, automotive circuit electronic practice, etc. to train students with vehicle engineering system thinking, and have a comprehensive understanding of the whole process of automobile development. Based on the "graduation requirements" of students in Accreditation Standards for Engineering Education, the existing practice teaching system should be reformed and optimized to provide a theoretical system and operational basis for graduates to achieve the ability to solve complex engineering problems [3]. Table 1 shows the corresponding practical teaching modules in the practical teaching system of "excellence class" of vehicle engineering major in our school, aiming to improve the engineering practice ability, ability to use modern engineering tools and innovation ability of students, and cultivate students to become high-quality applied technical talents.

Table 1. Each module of practical teaching system

Practical teaching system											
Practical teaching of major courses		Centralized practice teaching module				Innovation and entrepreneurship module			Vocational skills module		
Specialized core courses	Specialized in-class experiment	Internship in vehicle circuit	Enterprise engineering practice	Automobile structure training	Graduation project	Automobile innovative design	Science and technology competitions	Innovation and entrepreneurship activities	CATTA design	Motor Mechanic	Solidworks design etc.
Cultivation of theoretical knowledge application ability		Cultivation of professional design ability				Cultivation of innovation and practice ability			Cultivation of practice and design ability		

3.2. Constructing a School-enterprise Cooperation Platform, Industry-university-research Studio and Innovating the Talent Training Mechanism

The coordination mechanism for the implementation of the education and training plan for outstanding engineers at all levels of the school, the implementation mechanism for the industry guidance, the education and training plan for outstanding engineers jointly by schools and enterprises, and the training mechanism for cooperative talents between schools and enterprises should be established [4].

The new mode of cooperation between schools and enterprises should be actively explored. Relying on the construction of practice bases inside and outside schools, the cooperation platform between schools and enterprises should be established. Emphasis should be placed on the construction of laboratories and practice bases to achieve in-depth cooperation between universities and enterprises. The Vehicle Engineering Department has built a "Future Star" automobile industry-university-research studio; schools and enterprises have jointly conducted "Oriented Class" training, such as "Safe Vehicle Insurance Oriented Class"; and cooperation with enterprises such as WUTEP, has been made to make full use of the "Tuhu Car Maintenance" practice teaching base. Taking specific projects as the subject, the students are grouped for practical training to help them better enter the automobile

industry, so that they can learn and practice in combination with the production of enterprises, and can be engaged in the design and research and development, production and manufacturing, production management, experimental testing and other work of high-quality application technology talents after graduation in the automotive professional field and related cross areas [5].

3.3. Training Practical Innovation Ability with Comprehensive Student Competition Project as the Carrier

Discipline competitions should be actively organized to encourage students to innovate in practice. According to the general standard of "PETOE" and the automobile industry norms, referring to the characteristic orientation of higher education, students majoring in vehicle engineering should be organized to actively participate in various discipline competitions to promote the cultivation of students' innovative thinking ability and their interest in electric cars and smart cars. Promoting teaching and learning by competition will promote the construction and development of courses such as Automotive Testing, Automotive Electrical and Electronic Control Technology and Automotive Single Chip Microcomputer. Integrating students' competition projects into classroom theoretical teaching, and integrating specific tasks and practices into practical training links can promote the optimization of curriculum content, which can not only arouse students' learning enthusiasm, but also enhance their practical innovation ability. For example, the smart car competition is applied to the theoretical and practical teaching of many professional courses. In Automobile Circuit Analysis course and automobile circuit electronic internship, students can learn while doing. Welding flasher and intermittent wiper relay, covering the power supply voltage circuit, voltage regulator circuit and other knowledge of learning and application, can help students to master the basic knowledge of the circuit, circuit board of the actual welding and debugging technology, etc., to achieve a more comprehensive use of theoretical knowledge, which improves students' practical ability and strengthens their team cooperation ability, so that they gradually have the quality and accomplishment that outstanding engineers should possess.

3.4. Strengthening the Construction of Teaching Staff and Improving the Teaching Quality in an All-round Way

In order to meet the demand for talents training of vehicle engineering major, the training and construction of teaching staff should be strengthened by arranging planned exchange and study of teachers to famous domestic universities and to domestic enterprises on site, encouraging young and middle-aged teachers to go on-the-job internship or go to the labs, introducing outstanding engineers and technicians from enterprises to teach in schools, inviting industrial experts and senior technicians from Dongfeng and other companies to give lectures on automotive frontier for students.

Through the construction of a team of teachers with dual qualification, a team of outstanding engineers and teachers with rich teaching experience, comprehensive knowledge and skills as a whole, and integration of teaching, engineering application and scientific research will be gradually formed, laying a foundation for improving teaching quality.

4. Conclusions

It is a systematic project to formulate and implement the training mechanism for professional talents of vehicle engineering [6]. In this paper, the innovative research on the talent training mechanism of the "excellence class" in Vehicle Engineering is explored from the aspects of talent training scheme construction, course system innovation and reform, school-enterprise cooperation platform, industry-university-research studio construction, faculty construction and improvement of student science and technology competition. As a pilot specialty for the collaborative parenting program of "Jingchu outstanding talents" in Hubei Province, it is required to combine the actual education situation of schools, optimize the curriculum system, strengthen the hands-on teaching link, perfect the management mechanism and safeguard mechanism, further fall the professional talents training mechanism to practice, and further promote the deep integration of colleges and enterprises, so as to fully realize the training goal of the outstanding talents plan and cultivate more outstanding engineering talents for the automobile industry.

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