

Talent Training Mode Reform Based on the "Specialty Plus Smart Transportation" in Transportation Specialties

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Abstract: Focusing on the development needs of the smart transportation emerging industry, the "Specialty Plus Smart Transportation" talent training mode is put forward in the transportation specialties. The emerging engineering talent training objective and its curriculum system based on integration of general and special courses and "Three Stages and Six Platforms" have been constructed. The students' ability to solve complex engineering problems in the field of smart transportation has been extremely trained with the help of the teaching system, and the students' adaptability to the development of the smart transportation industry has been improved. The reform has achieved remarkable results in the reform and practice of training mode.

1. Introduction

The development strategy of building a transportation power in China was put forward in 2019, and "The Outline of building China into a Country with Strong Transportation Network" has laid out a grand blueprint for the strategy. Under the background of the rapid development of national economy and infrastructure construction, the rapid development of intelligent vehicles, intelligent logistics and digital transportation related to the smart transportation industry has put forward new requirements for the knowledge structure and ability of relevant employees, and has a huge impact on the cultivation of relevant professionals in universities.

The three aspects of smart transportation roughly correspond to the three traditional engineering specialties of vehicle engineering, logistics engineering and transportation engineering. Although they do not belong to the same discipline, they all serve the transportation industry and can be collectively referred to as transportation specialties. The impact of smart transportation on the transportation specialties is mainly reflected in the fact that the traditional engineering specialties can not foresee the rapid development of the new economy at the beginning of setting up and in the process of adjustment, and the professionals trained by the traditional training objectives and curriculum system cannot adapt to the new needs of industrial development in terms of knowledge structure and ability to solve complex engineering problems. This condition results in a serious disconnection between training and demand.

In order to solve the problems, the Ministry of Education put forward the requirement of "Developing of research and practice of emerging engineering talent training" in 2017, and began to implement the emerging engineering construction in universities. In view of the challenges brought by the development of smart transportation industry, the School of Automobile and Traffic engineering of Wuhan University of Science and Technology has implemented the talent training reform of "Specialty Plus Smart Transportation" for transportation specialties, and achieved remarkable results.

2. Construction of Emerging Engineering Talent Training Mode of "Specialty Plus Smart Transportation"

"Specialty Plus" is the integration of a subject and a certain object X which has diversity. For example, if X is an emerging industry, then "Specialty Plus X" is to cultivate professionals different from traditional industries; if X is some other specialty, "Specialty Plus X" is to cultivate compound talents; if X is a special skill, then "Specialty Plus X" is to cultivate professionals with a special skill. Here, the industry, specialty and skill become the key factors of specific talent cultivation. Through the integration with the main specialty, a new structure and mode of talent cultivation will be formed. Then, according to the difference of the key element X in "Specialty Plus X", different paths of talent training can be formed.

In general, the early "Specialty Plus X" mode mostly refers to the cultivation of dual degree or specialty-minor compound talents, rather than the cultivation of talents in a certain emerging industry. With the continuous emergence of new technologies and new industries, the traditional "Specialty Plus X" talent training cannot fully meet the industry's requirements for new professional knowledge and new ability. This is also the bottleneck of talent training that needs to be solved in the process of emerging engineering construction.

With the gradual deepening of the practice of emerging engineering education, new thinking and practice have emerged on the "Specialty Plus" talent training. Some scholars believe that interdisciplinary education is the key to the implementation of emerging engineering talents training. This kind of interdisciplinary education is different from the dual degree training and general education. Therefore, from the perspective of serving the emerging engineering talent training for emerging industry, the "Industry Integration" talent training reform of Engineering "Specialty Plus Industry", is proposed. Here, the "Industry Integration" is to cultivate "Interdisciplinary, and Industry-Education Integration" professional talents closely around the internal technical needs of the specialty involved in emerging industries. This kind of training mode is not compound talent training, but a new interdisciplinary training mode. It fully integrates the interdisciplinary characteristics of emerging industries into the curriculum system and teaching system of talent training, and fully pays attention to the construction of interdisciplinary curriculum system and the cultivation of students' ability to solve interdisciplinary complex engineering problems in emerging industries. Taking smart transportation as an example, it is developing towards intellectualization, networking and digitization, involving machinery, automation, computer, communication and artificial intelligence, which have obvious interdisciplinary characteristics.

If the "Industry Integration" concept is applied to the integration of transportation specialty and smart transportation industry, the "Specialty Plus Smart Transportation" training mode will be formed, in which three specialties, such as vehicle engineering, logistics engineering and transportation engineering, are integrated with smart transportation industry respectively.

3. Practice of the Talent Training Mode of "Specialty Plus Smart Transportation"

3.1. Training Objectives and Curriculum System

In view of the development trend of smart transportation in intelligent and connected vehicle, smart logistics and intelligent transportation, the three specialties, vehicle engineering, logistics engineering and traffic engineering, have adjusted their training objectives respectively so as to cultivate high-quality talents who can engage in intelligent and connected vehicle design and manufacturing, smart logistics design and planning, intelligent transportation planning and control in the field of smart transportation.

According to the talent training objectives of smart transportation industry, the "Integration of General and Special" curriculum system is constructed as shown in Figure 1. "General" refers to the "Disciplinary Basic Courses" and "General Courses of Smart Transportation" constructed by the three specialties, and "Special" refers to the professional characteristic courses of the three specialties around the three developing directions of smart transportation.

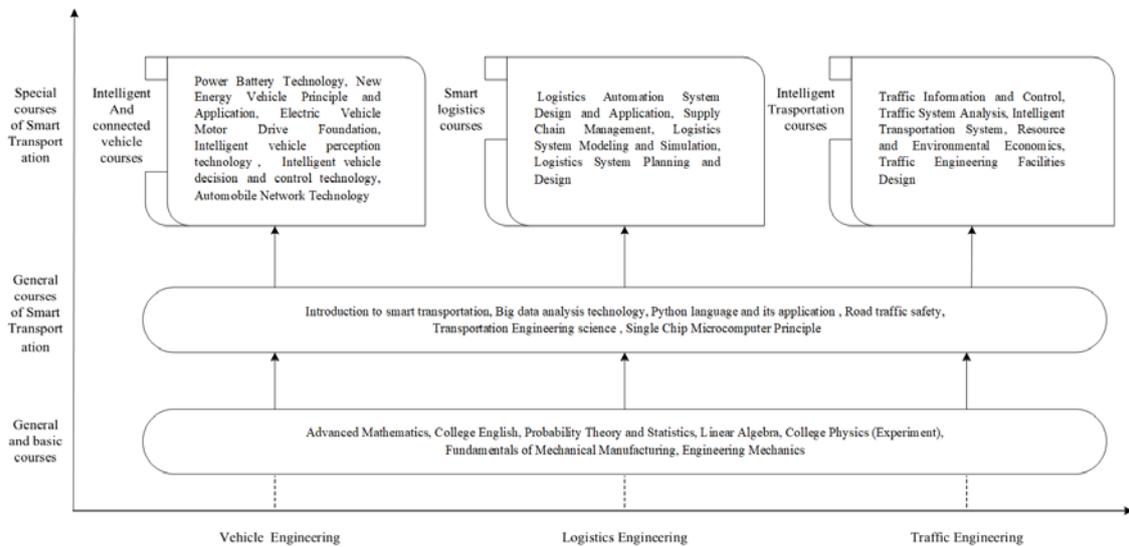


Figure 1 Curriculum systems for cultivating smart transportation talents

3.2. Course Classification and Teaching System

There are a lot of interdisciplinary courses in the curriculum system of the three specialties involved in smart transportation. In order to put the training concept into practice, the teaching content design, teaching method reflecting the concept of "Specialty Plus Smart Transportation" are explored. The professional courses are divided into four types: professional discipline basis, professional core, and professional elective and professional practice. The professional core courses are divided into low-level and high-level, which mainly cultivate students' low-level thinking and advanced thinking, and train students' ability to solve complex engineering problems.

In the teaching process, the course content focuses on interdisciplinary, the teaching form emphasizes the integration of industry and education, and boldly tries a variety of teaching methods based on such courses as online and offline hybrid, seminar, virtual simulation experiment, etc., fully develops all kinds of teaching resources, and forms a course classification and teaching system of "Interdisciplinary, Integration between Industry and Education", as shown in Figure 2, taking the specialty of vehicle engineering as an example.

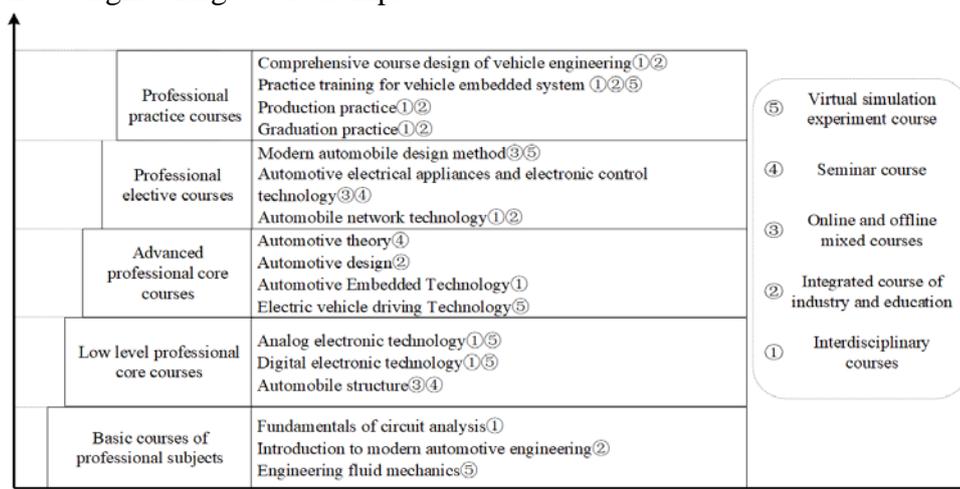


Figure 2 Course classification and teaching system of "Interdisciplinary, Integration between Industry and Education"

3.3. The Cultivation of Student's Engineering Ability

According to the requirements of the reform mode of "Specialty Plus Smart Transportation" for the cultivation of students' engineering ability, this research divides students' engineering ability into three kinds: basic practical ability, comprehensive practical ability and innovation and

entrepreneurship ability. Among them, basic practical ability includes cognitive ability, communication and organization ability and lifelong learning ability.

According to the characteristics of these ability training, by integrating various kinds of teaching, scientific research, base and other resources, six practice platforms, such as professional basic experiment platform, off-campus practice bases, intelligent automobile research center, students' scientific innovation center and entrepreneurship practice base, etc. are built to serve the students' ability training, forming the "Three Stages and Six Platforms" practice teaching system, in which, the professional basic experiment platform and off-campus practice bases are responsible for cultivating students' professional basic practical ability, the intelligent automobile research center and students' scientific innovation center are responsible for cultivating students' professional comprehensive practical ability and innovation ability, and the entrepreneurship practice base is responsible for cultivating students' Innovation and entrepreneurship ability, respectively.

This practice system provides good practice bases for students' ability training, and solves the problems of insufficient hardware and software and resources in the practical ability training of "Specialty Plus Smart Transportation" talents.

4. Conclusion

The college began to explore the reform of the talent training mode of "Specialty Plus Smart Transportation" in 2017, and a complete training system has been basically formed in 2021, and the emerging engineering education and teaching reform focusing on the talent training of emerging industries for traditional engineering majors has been carried out.

The teaching reform has greatly stimulated the students' motivation of professional learning, and the quality of students' training and employment has been significantly improved.

Although the new training mode has insufficient optimization of teaching resources and uncertain factors in the future, there is a strong demand for new engineering graduates who can adapt to the industrial development in emerging industries. In the future, we will continue to optimize and adjust the talent training reform program, and continue to promote its application, so as to cultivate more high-quality applied talents to adapt to the development of the new economy.

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