

## Construction of Curriculum System of Transportation Specialty for Emerging Engineering

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**Keywords:** Industrial Integration, Economic Management Compound, Transportation Specialty Plus, Emerging Engineering Education, Curriculum System

**Abstract:** This paper puts forward the concept of "industrial integration, economic management compound" to adapt to the development of intelligent transportation industry, and constructs the curriculum system of "specialty plus industrial" and integration of intelligent transportation talents training with industrial characteristics. The results of the reform show that the effect of talent training is good.

### 1. Introduction

The development of city and transportation is changing from construction to management, service, public policy and decision-making technology. Based on it (Information Technology) and new IT (Intelligent Technology) technology, the emerging technology and industry represented by BAT, as well as the Internet of vehicles, Internet of things and other industries are fully embracing the city (smart city) and transportation (Intelligent Transportation) technology. Combined with the influence of industry 4.0 on the transportation industry, the concept of transportation engineering discipline 2.0 appeared. Transportation Engineering 2.0 is the deep integration of transportation, information, management and other technologies. The talent training system should meet the needs of this aspect of talent training.

This paper puts forward the "specialty plus" emerging engineering talent training concept and reform ideas of "industrial integration, economic management composite". We integrates resources, sets up teaching reform guidance organization, establishes teaching reform specialty responsibility professor team and composite professional responsibility professor team, and introduces a series of supporting measures, forming a good teaching reform and education environment.

### 2. Talent Training Reform of "Specialty Plus Industry"

In terms of talents training, the three transportation majors implement the talent training reform of "specialty plus industry". From the beginning of the freshman year, the Teaching Guidance Committee of the college and three Responsibility Professor Teams are responsible for the guidance and implementation of the teaching reform. In the aspect of compound talents training, we should optimize the combination of specialties and carry out selective pilot projects. In logistics engineering and transportation engineering, we should implement the "specialty plus economy management" compound talents training reform of combining industry with economy and combining industry with management. Students are selected from sophomores, and the joint conference of teaching guidance of three related colleges and three multi Responsibility Professor Teams are responsible for the guidance and implementation of teaching reform.

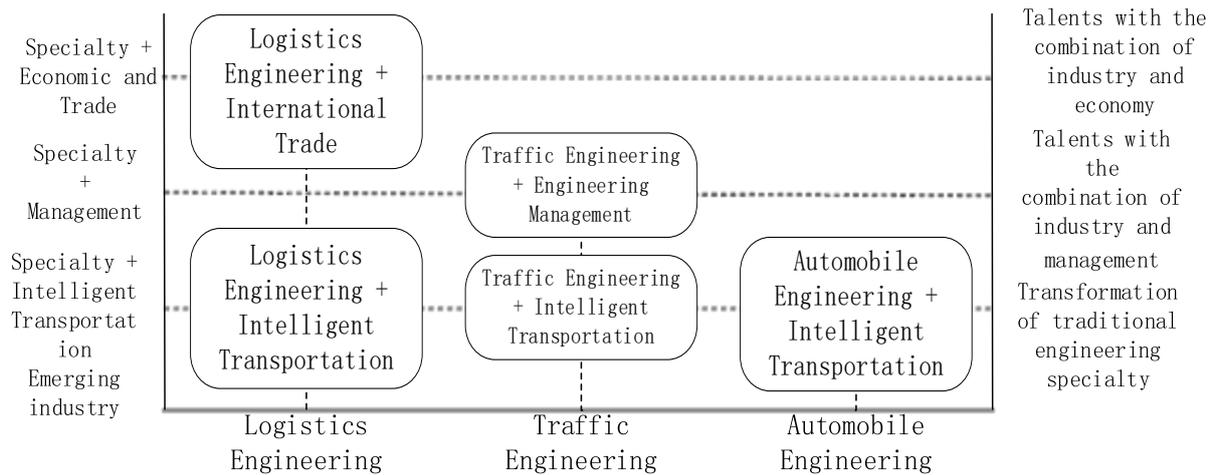


Figure 1 Reform ideas of emerging engineering talents training

### 3. Curriculum System Reform of "Specialty Plus Industry"

The curriculum system reform of "specialty plus industry" focuses on the development needs of intelligent transportation emerging industry. In transportation majors such as vehicle engineering, logistics engineering and transportation engineering, it has formed a "specialty plus industry" professional talent training scheme with industrial characteristics, a "two general and three special" curriculum system and a "discipline integration, production and education integration" teaching system, so as to enhance students' understanding of the development of intelligent transportation industry and to cultivate talents of intelligent transportation.

In view of the development trend of transportation tools, transportation logistics and transportation facilities in intelligent transportation, vehicle engineering, logistics engineering and transportation engineering are respectively oriented to the adjustment and training programs of intelligent internet connection automobile, intelligent logistics and intelligent transportation, forming a "two general and three special" curriculum system as shown in Figure 3. "Two general" refer to "general and basic courses" and "general courses of intelligent transportation" respectively, and "three special" refer to the characteristic courses of the three majors.

Among them, the general courses of transportation specialty are set in the basic platform, the general courses of transportation specialty are included in the professional module courses, and the special courses of vehicle engineering, transportation engineering and logistics engineering are also set for intelligent internet connection automobile, intelligent transportation and intelligent logistics.

#### 3.1. Curriculum System of "Specialty Plus Industry" in Vehicle Engineering

In the "specialty plus industry" training program of vehicle engineering, combined with the trend of "intellectualization and networking" in the development of automobile industry, the basic courses of electronics in the curriculum system are adjusted to the basic courses of control "Circuit Analysis", "Analog Electronics Technology" and "Digital Electronic Technology"; at the same time, the professional courses of information and computer are supplemented, mainly including "Single Chip Microcomputer Interface technology", "Digital Electronic Technology", and the courses of intelligent networked vehicles, such as "Automobile Embedded Technology", "Principle and Application of New Energy Vehicles", "Introduction to Intelligent Networked Vehicles" and "Automobile Network Technology", cultivate students' ability to solve complex engineering problems in the field of intelligent networked vehicles.

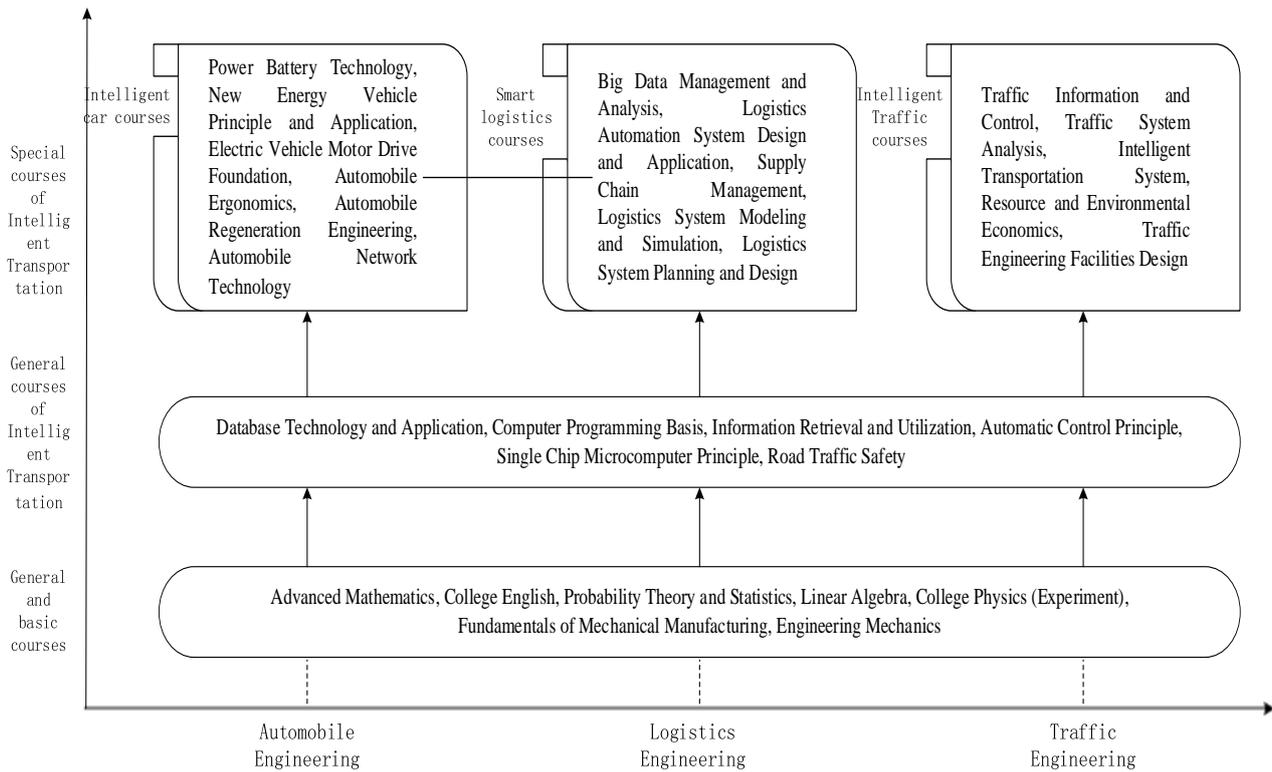


Figure 2 Curriculum system for cultivating intelligent transportation talents

### 3.2. Curriculum System of "Specialty Plus Industry" in Logistics Engineering

In the "specialty plus industry" training program of logistics engineering, the knowledge structure of logistics engineering specialty is expanded by integrating the industrial development of intelligent logistics and introducing many characteristic courses. General courses are set up such as in the "specialty plus industry" training program of logistics engineering. The knowledge structure of logistics engineering specialty is expanded by integrating the industrial development of intelligent logistics and introducing many characteristic courses. General courses are set up such as "Mechanical Manufacturing Foundation" and "Engineering Mechanics" to help students establish mathematical thinking to solve engineering problems. General courses are set up such as "Database Technology and Application", "Automatic control principle", "Single Chip Microcomputer Principle" and "Traffic Engineering" to train students' basic ability to solve complex problems in the transportation industry. We build "logistics System Modelling and Simulation", "Big Data Management and Analysis", "Seminar on Environmental Protection and Sustainable Development" and other intelligent logistics courses expand curriculum resources and enhance students' innovation ability for intelligent logistics industry engineering problems. "Mechanical Manufacturing Foundation" and "Engineering Mechanics" are set up to help students establish mathematical thinking to solve engineering problems. General courses are set up such as "Database Technology and Application", "Automatic Control Principle", "Single Chip Microcomputer Principle" and "Traffic Engineering" to train students' basic ability to solve complex problems in the transportation industry. We build "logistics system modelling and simulation", "Big data management and analysis", and other intelligent logistics courses expand curriculum resources and enhance students' innovation ability for intelligent logistics industry engineering problems.

### 3.3. Curriculum System of "Specialty Plus Industry" in Traffic Engineering

In the "specialty plus industry" training program of traffic engineering, digital transportation curriculum is designed to meet the needs of "Intelligent Transportation Management", "Transportation Operation Monitoring", "Transportation Planning and Design", "Transportation Information Service" and other fields. Digital transportation is based on profound mathematical

knowledge. Therefore, a series of courses such as "Advanced mathematics", "College physics ", "Linear algebra", "Probability Theory and Mathematical Statistics", "Database Technology and Application" are set up in the freshman and sophomore stages. On this basis, we will carry out traffic planning step by step. A series of courses, such as "Road engineering CAD", "Vehicle Positioning and Navigation System ", " Road Construction Organization and Budget", "Intelligent Transportation System", "Traffic Geographic Information System", "Traffic Management and Control", "Traffic System Simulation Technology", "Traffic Information Technology", "Subgrade and Pavement Engineering Detection Technology", lay a solid foundation for the whole process of digital traffic simulation, monitoring, diagnosis, prediction and control knowledge base, so that students have the ability to solve the complexity and uncertainty problems in the process of traffic planning, design, construction, management and service closed-loop.

### **3.4. Reform Achievements**

In the past three years, students have won 75 national awards, 36 provincial and ministerial awards, and 43 patents. Compared with before, the annual average number of published scientific research papers increased by 28%, the number of patents approved by students increased by 35%, and the number of provincial and ministerial awards increased by 32%.

## **4. Conclusion**

The curriculum system of "specialty plus industry" and "specialty plus economic management" talents training for transportation meets the new demand of the new economy for compound talents. It's worthy of further implementation and promotion.

## **Acknowledgements**

The research was supported by Teaching Research Project of Wuhan University of Science and Technology (2019Z008, 2020Z004), National Emerging engineering research and practice project (E-JX20201521, E-CL20201928).

## **References**

- [1] Ding, X.-H.. The educational research under the context of big data: Opportunities and challenges. *Tsinghua Journal of Education*, vol.38, no.5, pp.8-14, 2017.
- [2] Li, Z., Liao, R., & Dong, L. Y.. Specialty construction for the emerging engineering education: Connotation, formation path and training mode. *Research in Higher Education of Engineering*, no.2, pp.21-24, 2018.
- [3] Xie, X. Outstanding teacher program in Canada: Objective and path. *Global Education*, vol.45, no.10, pp.114-119, 2016.
- [4] Zhao Shuli , Zhang Hua, Wang Junlin. Cognition and system construction of civil engineering innovation and entrepreneurship system in emerging engineering education. *Cognitive Systems Research*, vol.52, pp.1020-1028, 2018.