

Research on the Construction of the New Energy Vehicle Maintenance Technology Curriculum System and Optimization of Teaching Content

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Abstract: With the rapid development of the new energy vehicle industry, new demands are placed on automotive maintenance professionals. This paper focuses on the construction of the new energy vehicle maintenance technology curriculum system and the optimization of teaching content. It analyzes the characteristics of the demand for new energy vehicle maintenance technical talents, elaborates on the principles and framework for constructing the curriculum system, and discusses strategies for optimizing teaching content. The aim is to provide theoretical support and practical guidance for cultivating high-quality maintenance technical talents that meet the development needs of the new energy vehicle industry.

Keywords: New energy vehicles; Automotive maintenance; Curriculum system construction; Teaching content optimization

1. Introduction

Against the backdrop of increasingly severe global energy crises and environmental pollution, new energy vehicles have become an inevitable trend in the automotive industry due to their advantages in energy saving and environmental protection. The Chinese government attaches great importance to the development of the new energy vehicle industry, having issued a series of supportive policies that have driven rapid growth in the new energy vehicle market. However, significant differences exist between new energy vehicles and traditional fuel vehicles in aspects such as power systems and control systems. This poses entirely new challenges to the professional knowledge and skills of automotive maintenance technicians. Currently, China's automotive maintenance professional education lacks a well-established teaching system for new energy vehicle maintenance technology, and there is a gap between the teaching content and actual needs. Therefore, constructing a scientific and rational curriculum system for new energy vehicle maintenance technology and optimizing teaching content hold significant practical importance.

2. Analysis of the Characteristics of Demand for New Energy Vehicle Maintenance Technical Talents

2.1 Diversified Knowledge Structure

New energy vehicles integrate multi-disciplinary knowledge such as electronic technology, automatic control technology, and new material technology. Maintenance technicians not only need to master basic knowledge of traditional automotive maintenance (e.g., engines, chassis, electrical systems) but also need to deeply study knowledge specific to new energy vehicles, such as battery management systems, motor control systems, and electric power steering systems. Simultaneously, a certain understanding of computer technology and network communication technology is necessary to accurately diagnose and troubleshoot faults in new energy vehicles.

2.2 Specialized Skill Operation

The high-voltage electrical systems of new energy vehicles pose significant risks. Maintenance technicians must possess specialized high-voltage operation skills and safety awareness. They need to be proficient in using special tools and equipment for new energy vehicle maintenance (e.g., insulation testers, battery charge/discharge testers) and strictly follow operating procedures

during maintenance tasks to ensure safety and reliability. Furthermore, they must master fault diagnosis and troubleshooting methods for new energy vehicles, utilizing advanced diagnostic equipment and techniques to quickly and accurately locate fault points.

2.3 Sustained Learning Ability and Rapid Technological Development

New vehicle models and technologies are constantly emerging. Maintenance technicians need to possess continuous learning capabilities, staying updated on the latest industry trends and technological developments, and constantly refreshing their knowledge and skills to adapt to changes in new energy vehicle maintenance work. At the same time, they should be adept at summarizing experiences and lessons to improve their ability to solve practical problems.

3. Principles for Constructing the New Energy Vehicle Maintenance Technology Curriculum System

3.1 Market Demand Orientation

The construction of the curriculum system should be closely aligned with the actual demands of the new energy vehicle maintenance market. Understanding the knowledge, skills, and quality requirements of enterprises for maintenance technical talents enables the targeted setting of courses and teaching content, ensuring that trained students meet corporate hiring needs and enhancing their employment competitiveness.

3.2 Systematic Principle

New energy vehicle maintenance technology involves multiple disciplinary fields. The curriculum system should be systematic, covering various systems and key technologies of new energy vehicles. Courses should connect and coordinate with each other, forming an organic whole, enabling students to comprehensively and systematically master new energy vehicle maintenance technology and related knowledge.

3.3 Practicality Principle

New energy vehicle maintenance is a highly practical profession. The curriculum system should emphasize the setup of practical teaching components. Increasing the proportion of experimental and practical training courses, establishing and improving practical training bases, and providing students with ample hands-on operation opportunities allow students to consolidate their knowledge in practice, improve their practical operation skills, and enhance their ability to solve practical problems.

3.4 Forward-looking Principle

Considering the rapid development of new energy vehicle technology, the curriculum system should possess a certain degree of foresight. Timely introduction of the latest industry technologies and standards, attention to development trends in new energy vehicle technology, and timely adjustment of course content and teaching methods enable students to acquire knowledge and skills that can adapt to the future development needs of the new energy vehicle maintenance industry.

4. Framework Construction of the New Energy Vehicle Maintenance Technology Curriculum System

4.1 Public Basic Courses

Public basic courses are crucial for cultivating students' comprehensive qualities and basic abilities. They mainly include courses such as Ideological and Political Education, Chinese, Mathematics, English, Fundamentals of Computer Application, and Physical Education. These

courses aim to enhance students' cultural literacy, scientific literacy, and physical fitness, laying a foundation for subsequent professional course learning and career development.

4.2 Professional Basic Courses

Professional basic courses lay the foundation for students to learn professional courses in new energy vehicle maintenance. They mainly include courses such as Mechanical Drawing, Mechanical Fundamentals, Automotive Electrical and Electronic Technology, Automobile Structure, and Construction and Maintenance of Automotive Electrical Equipment. Through these courses, students can master basic knowledge like mechanical drawing, mechanical principles, and electrical and electronic technology, understand the basic structure and working principles of traditional automobiles, and establish a solid foundation for learning new energy vehicle maintenance technology.

4.3 Professional Core Courses

Professional core courses are the focal point of the curriculum system. They mainly include courses such as Introduction to New Energy Vehicles, Inspection and Repair of New Energy Vehicle Batteries and Management Systems, Inspection and Repair of New Energy Vehicle Motors and Control Systems, Inspection and Repair of New Energy Vehicle Electric Power Steering Systems, Inspection and Repair of New Energy Vehicle Braking Systems, and Inspection and Repair of New Energy Vehicle Air Conditioning Systems. These courses focus on the key systems and components of new energy vehicles, detailing their structure, working principles, fault diagnosis, and troubleshooting methods, enabling students to master the core technologies and skills of new energy vehicle maintenance.

4.4 Professional Extension Courses

Professional extension courses are designed to broaden students' knowledge base and horizons, improving their comprehensive professional abilities. They mainly include courses such as Installation and Maintenance of New Energy Vehicle Charging Facilities, New Energy Vehicle Marketing and Service, and Comprehensive Practical Training in New Energy Vehicle Fault Diagnosis. Through these courses, students can learn about the construction and maintenance knowledge of new energy vehicle charging facilities, master skills in new energy vehicle marketing and service, improve their comprehensive ability in new energy vehicle fault diagnosis, and provide more career development options.

4.5 Practical Teaching Components

Practical teaching components are an essential part of the new energy vehicle maintenance technology curriculum system, mainly including experiments, practical training, and internships. Experimental courses are primarily conducted in laboratories, allowing students to operate various experimental equipment to deepen their understanding and mastery of theoretical knowledge. Practical training courses are mainly conducted in on-campus training bases, simulating actual maintenance work scenarios for hands-on operation training to improve students' practical skills. Internships are conducted in enterprises, allowing students to engage in post internships in real work environments, familiarize themselves with corporate production processes and management models, accumulate practical work experience, and enhance their professional abilities and employment competitiveness.

5. Strategies for Optimizing New Energy Vehicle Maintenance Technology Teaching Content

5.1 Update Teaching Content

With the continuous development of new energy vehicle technology, teaching content should be updated promptly, incorporating the latest industry technologies, standards, and cases

into teaching. For example, introduce the latest battery technologies and development trends of battery management systems in the “Inspection and Repair of New Energy Vehicle Batteries and Management Systems” course; explain the structure and working principles of new types of motors in the “Inspection and Repair of New Energy Vehicle Motors and Control Systems” course. Simultaneously, remove outdated and obsolete content to keep teaching content advanced and practical.

5.2 Strengthen Practical Teaching

Increase the proportion of practical teaching and optimize its content. Based on the actual needs of new energy vehicle maintenance positions, design targeted practical projects and tasks, allowing students to master the skills and methods of new energy vehicle maintenance through practice. For example, set up comprehensive practical projects for diagnosing and troubleshooting common new energy vehicle faults, enabling students to independently complete fault diagnosis and repair work using acquired knowledge and skills. Simultaneously, strengthen the construction of on-campus training bases, introduce advanced new energy vehicle maintenance equipment and tools, and provide students with a good practical operation environment.

5.3 Adopt Diverse Teaching Methods

Move away from traditional teacher-centered lecturing methods and adopt diverse teaching methods such as project-based teaching, case-based teaching, and task-driven teaching. Project-based teaching uses actual projects as carriers, allowing students to learn and master knowledge and skills while completing projects. Case-based teaching guides students to think and solve problems by analyzing real cases, improving their analytical and problem-solving abilities. Task-driven teaching uses tasks as drivers, encouraging students to actively learn and explore while completing tasks, cultivating their independent learning ability and innovative spirit.

6. Conclusion

The construction of the new energy vehicle maintenance technology curriculum system and the optimization of teaching content are key to cultivating high-quality maintenance technical talents that meet the development needs of the new energy vehicle industry. By analyzing the characteristics of talent demand, following the principles of curriculum system construction, building a scientific and rational curriculum system framework, and adopting optimization strategies such as updating teaching content, strengthening practical teaching, adopting diverse teaching methods, enhancing faculty development, and establishing a teaching evaluation system, the teaching quality of the new energy vehicle maintenance technology major can be improved, students' comprehensive professional abilities can be cultivated, and strong talent support can be provided for the development of the new energy vehicle industry. At the same time, with the continuous development of new energy vehicle technology, the curriculum system and teaching content need to be continuously improved and updated to adapt to changes in industry development.

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