

Research on the Training Path of Automotive Maintenance Field Engineers under the Background of Industry Education Integration

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Abstract: With the rapid development of technology, the demand for on-site engineers in the automotive maintenance industry is constantly upgrading. This article is based on the background of industry education integration and explores the training path for automotive maintenance on-site engineers. Firstly, the article analyzes the current development status of the automotive maintenance industry and the demand for talents. Then, it elaborates on the importance of industry education integration in the training of automotive maintenance on-site engineers. Through research and practice, this article proposes several training strategies and suggestions aimed at providing strong talent support for the sustainable development of the automotive maintenance industry.

Keywords: Integration of Industry and Education; Automotive Maintenance; On Site Engineer; Cultivation Path; Personnel Training

1. Introduction

1.1 Research Background

With the rapid development of the automotive industry, the automotive maintenance industry has also shown vigorous vitality. At present, the main current situation faced by the automotive maintenance industry is as follows: with the continuous increase in the number of cars, the demand for the automotive maintenance market is also expanding, which provides a broad market space for the automotive maintenance industry; With the continuous updating and upgrading of automotive technology, the technical level of the automotive maintenance industry is also constantly improving. Modern automotive

maintenance not only requires mastery of traditional mechanical maintenance skills, but also requires knowledge in various aspects such as electronics and computers to adapt to the increasingly complex needs of the automotive maintenance industry; with the increasing demand from consumers for automotive repair services, the automotive repair industry is also constantly improving service quality. Many maintenance companies have begun to focus on brand building and service quality improvement, attracting and retaining customers by providing high-quality maintenance services.

Automotive maintenance on-site engineers play a crucial role in the automotive industry, their work not only directly affects the performance and safety of automobiles, but also has a profound impact on the overall development of the automotive maintenance industry. They have promoted the progress and development of the automotive repair industry through their efforts in fault diagnosis and repair, optimization of repair processes, quality control and assurance, technical training and guidance, safety management and supervision, maintenance of tools and equipment, technological innovation and improvement, as well as cost control and benefit analysis. In the future, with the continuous innovation of automotive technology and the continuous expansion of the automotive market, the role of on-site automotive maintenance engineers will become more prominent and important.

1.2 Research Meaning

With the rapid development of the automotive industry and continuous technological progress, the automotive maintenance industry is facing unprecedented challenges and opportunities. In this process, the training of automotive maintenance on-site engineers is particularly

important. The integration of industry and education, as an effective educational model, has profound significance and value for the cultivation of automotive maintenance on-site engineers. It can improve the quality and effectiveness of education, promote student employment and career development, promote innovation and development in the automotive maintenance industry, and meet the actual needs of the automotive maintenance industry. Therefore, we should actively promote the application and practice of industry education integration in the training of automotive maintenance on-site engineers, providing strong support for the sustained and healthy development of the automotive industry.

2. The Background of the Construction of On-site Engineer Training Mode

In May 2022, the Zhilian Research Institute released a report on the demand and development environment of high-tech manufacturing talents, which showed that the year-on-year growth rate of recruitment positions in the high-tech manufacturing industry in the first quarter of 2022 reached 28.2% [1]. It can be seen that cultivating composite and innovative technical skills talents who can solve practical problems on site has become an urgent need for enterprises to improve efficiency. In September 2022, the Notice of the General Office of the Ministry of Education and five other departments on the Implementation of the Special Training Plan for Vocational Education Field Engineers proposed to cultivate a large number of on-site engineers with the spirit of craftsmanship, proficient in operation, craftsmanship, management, collaboration, and innovation, in order to meet the needs of digital development in key fields, and to focus on talent scarce technical positions, using the Chinese characteristic apprenticeship system as the main form of training [2]. In October 2022, the Office of the Ministry of Education and five other departments launched the "Special Training Plan for Vocational Education Field Engineers", focusing on key areas such as advanced manufacturing. The goal is to cultivate no less than 200000 field engineers by 2025. In November 2022, the person in charge of the Vocational Education and Adult Education Department of the Ministry of Education clarified in a response to a reporter's

question about the implementation of the on-site engineer special training plan for vocational education that compared with conventional talent training, the "special training plan" has three characteristics: improving the engineer training system, creating a community with a shared future for schools and enterprises, and promoting the apprenticeship system with Chinese characteristics [3]. Through literature review, it was found that previous theoretical research on on-site engineer training mainly explored its basic concepts, challenges, and optimization directions from a macro perspective, but its specific targeting and practicality were not strong enough [4-5]. In view of this, this study will focus on the automotive maintenance industry and explore in depth the quality requirements of on-site engineers in the industry. This article aims to explore the training path for automotive maintenance on-site engineers in the context of industry education integration, analyze the current demand for talents in the industry, conduct in-depth discussions, and propose effective training strategies and suggestions to promote the sustainable and healthy development of the automotive maintenance industry.

3. Building a Talent Cultivation Model for Automotive Maintenance On-site Engineers through the Integration and Co Construction of Schools and Enterprises

The establishment of an industrial college through deep integration of schools and enterprises, and the construction of a "mutual integration and construction" education model between schools and enterprises: the integration of school professional directors and enterprise experts, the formation of a teaching committee, and the joint discussion and formulation of talent training plans and the construction of a curriculum system based on the actual needs of enterprises; The integration of school professional teachers and enterprise technicians, the formation of a dual teacher team, full participation in student teaching and practical operations, integration of enterprise work orders into teaching content, joint development of loose leaf work order textbooks, and joint research and technical discussions on topics[6]; Integrating the job standards of enterprise production sites into teaching evaluation standards, innovating the

design of teaching evaluation systems, seamlessly integrating student learning evaluation standards with enterprise job level evaluation standards; Facing the real production needs of enterprises, schools and enterprises jointly build practical teaching bases, comprehensively improve practical teaching conditions, and implement full process workplace education. Driven by the Industrial College, we will establish a "mutual integration and construction" education model between schools and enterprises and cultivate on-site automotive maintenance engineers.

4. Practice of the "Integration and Co Construction" Talent Training Model for Automotive Maintenance Field Engineers between Schools and Enterprises

4.1 Creating a Dual Subject Responsibility Education Model to Achieve Collaborative Education between Schools and Enterprises

The school and the enterprise signed a cooperation agreement to jointly build a characteristic industrial college, fully leveraging the main role of the school and the enterprise in education and achieving collaborative linkage and close cooperation between the two parties. This cooperation model runs through the entire enrollment and training process, ensuring that students become quasi employees of the enterprise while enrolling, truly realizing the apprenticeship system of "recruiting as soon as they enroll, and entering the school as soon as they enter the factory"[7]. At the same time, schools and enterprises jointly undertake the responsibility of cultivating talents. Schools are responsible for providing systematic theoretical knowledge and basic education, while enterprises enable students to learn and grow in practical work environments through practical training and internship opportunities. This dual subject training model helps to cultivate students' practical abilities and professional qualities.

4.2 Integrating Professional Settings with Industry Demands to Jointly Develop Talent Training Programs

Deeply understanding the current and future development trends and specific needs of industries, including predicting talent demand, changes in skill requirements, and predicting

industry development trends. By collecting and analyzing industry data, it can ensure that professional settings are closely linked to industry demand [8]. The professional director of the school, together with experts and executives from the enterprise, establishes a teaching guidance committee and regularly holds seminars to discuss professional settings, formulate (revise) professional talent training plans, continuously optimize the curriculum system, and formulate (revise) curriculum standards based on the actual needs of the enterprise, providing strong talent support for the development of the industry.

4.3 Integrating Talents from Schools and Enterprises to Form a Dual Teacher Team

School and enterprise personnel engage in mutual recruitment and two-way mobility, mainly including mutual evaluation and exchange, as well as mutual evaluation between schools and enterprises for the exchange and learning of teachers and technicians. School teachers engage in practical training in enterprises to enhance their practical operational abilities; Enterprise technicians come to schools to participate in teaching, share practical experience and skills; Co teaching: A dual teacher team designs and teaches together. In the course, school teachers are responsible for explaining the theoretical part, while enterprise technicians are responsible for guiding practical operations, achieving a close integration of theory and practice; Joint research and development: School teachers and enterprise technicians jointly participate in the research and update of teaching resources, jointly develop teaching resource libraries, work order style loose leaf textbooks, etc., continuously update teaching content and methods according to the development of the industry and technological changes, and ensure the synchronous development of teaching and industry.

4.4 Integrating Job Standards and Teaching Evaluation Standards in Enterprise Production Sites to Improve the Teaching Evaluation System

Integrating teaching objectives and standards with the actual needs of the enterprise, ensuring that students can quickly adapt and be competent in on-site positions after completing their studies. At the same time,

teaching objectives are also consistent with professional development trends and industry needs, ensuring the timeliness and foresight of teaching content [9]. The evaluation subjects include teachers, enterprise technicians, and students. The evaluation methods include the evaluation of the learning platform, teacher evaluation, enterprise technician evaluation, student self-evaluation and mutual evaluation, and multiple evaluation methods from multiple subjects, ensuring fairness and impartiality in the evaluation. By clarifying teaching objectives and standards, analyzing on-site job requirements in enterprises, coordinating teaching content and positions, designing practical teaching processes, establishing a teaching effectiveness evaluation machine, implementing feedback and continuous improvement mechanisms, enhancing teacher abilities, and strengthening supervision and execution of the evaluation system, the quality and effectiveness of the teaching evaluation system are comprehensively improved, providing strong support for the sustainable development of enterprises.

4.5 School Enterprise Joint Construction of Practical Training Bases, Implementing full Process Workplace Education for Talents

Facing the real production needs of enterprises, combined with the practical training equipment provided and donated by enterprises, schools and enterprises jointly build enterprise studios, technology research and development centers, and practical teaching bases to comprehensively improve practical teaching conditions, jointly carry out high-quality technical skills training for students, and achieve full process workplace education [10]. Utilize the massive and high-quality teaching resources in the resource library to carry out theoretical teaching and vocational skills training, integrate some professional courses with documentary evidence, and effectively enhance students' practical abilities.

4.6 Innovate the Implementation of "Learning, Training, and Creating Production" Education Methods

In the specific teaching process, the "learning, practicing, and creating" education method is adopted, which includes practicing abilities in learning, producing benefits through practice,

creating new ideas through practice, and achieving results through creation. By clarifying the teaching objectives and standards of Ideological affairs, analyzing the Ideological affairs needs of on-site positions in enterprises, aligning teaching content with the requirements of Ideological affairs in positions, implementing Ideological affairs in practical teaching, establishing an evaluation mechanism for Ideological affairs in teaching effectiveness, enhancing teachers' ability in Ideological affairs, and supervising and implementing the evaluation system for Ideological affairs, the quality and effectiveness of Ideological affairs are comprehensively improved, providing strong support for cultivating high-quality talents with both moral integrity and talent[10]. The core of "learning" lies in putting students at the center, constantly updating and optimizing the knowledge system and teaching content and ensuring a solid foundation for students; "Practice" focuses on improving practical and training platforms and mechanisms. Through the close combination of theory and practice, students can consolidate their knowledge and enhance their abilities through operation; "Innovation", as an advanced stage of "learning" and "practice", emphasizes the combination of innovation and entrepreneurship both inside and outside the school, promoting the comprehensive development and growth of students. The ultimate goal of all these links is to achieve "production", with the aim of achieving a close integration of learning and industry, practice and production innovation and output, thereby comprehensively improving the comprehensive quality of students and cultivating high-quality talents that meet social needs. In short, "learning" is the foundation, "practice" is the consolidation, "creation" is the improvement, and "production" is the goal. The four complement each other and together constitute a complete education and teaching system.

5. Conclusions

In the context of the integration of industry and education, the training path for automotive maintenance on-site engineers needs to be constantly innovated and improved. This study proposes a series of training strategies and suggestions, including strengthening school

enterprise cooperation, optimizing curriculum settings, and improving practical training systems, in order to provide strong talent support for the sustainable development of the automotive maintenance industry.

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