

# Discussion on the Practice of Engineering Integration Teaching in Mechanical Equipment Maintenance Specialty

Liang Gao

Hebei Vocational College of Rail Transportation, Shijiazhuang 050051

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**Abstract:** With the rapid development of modern industrial technology, the application of mechanical equipment in all walks of life is gradually extensive, and its repair and maintenance work is also very important. However, the traditional teaching mode of mechanical equipment maintenance usually has some problems, such as disconnection between theory and practice, insufficient practical ability of students, etc., which is difficult to meet the demand for high-quality skilled talents in the industry at this stage. Therefore, the discussion of an efficient and practical teaching mode has become the main topic of educational reform of mechanical equipment maintenance specialty. With its unique advantages, the integrated teaching model provides a new idea for the teaching reform of mechanical equipment maintenance major. This paper will start from the definition and characteristics of the integrated teaching model of engineering and engineering, combined with the actual situation of the mechanical equipment maintenance major, in-depth discussion of its practical application, hoping to provide strong support for improving the teaching quality and training high-quality skilled talents to meet the needs of the industry

**Keywords:** Mechanical equipment maintenance; Engineering integration; Teaching; Practice

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## 1. Definition and characteristics of the teaching model of engineering integration

Engineering integration teaching model is an innovative teaching method, its core idea is to seamlessly integrate engineering practice and theory teaching to form a complementary and mutually promoting whole. This teaching mode abandons the disadvantages of disconnection between theory and practice in traditional education, and emphasizes that during the learning period, students should not only master solid theoretical knowledge, but also apply the theory to solve practical problems through practical operation and project practice. This teaching mode breaks the discipline barrier, encourages interdisciplinary learning and cooperation, and aims at cultivating students' comprehensive quality, practical ability and innovative spirit. Under the integrated teaching model of work and learning, teaching activities take "doing" as the main line and run through the whole learning process. Students are no longer passively receiving knowledge containers, but developing into active discussion and active practice subjects. Under the guidance of teachers, students discuss the mysteries of mechanical equipment maintenance in depth through teamwork and project-driven ways, and constantly improve their practical ability and problem-solving ability. This teaching mode not only focuses on the individual development of students, but also emphasizes the importance of teamwork. Through completing tasks together, students can cultivate their communication skills and teamwork spirit. In addition, the integrated teaching model also has the characteristics of adapting to the needs of modern industry.

## 2. Integrated engineering teaching practice design for mechanical equipment maintenance major

### 2.1 The elaboration of teaching objectives

In order to ensure the concreteness and operability of the teaching objectives, this paper breaks down the engineering integration teaching objectives of the mechanical equipment maintenance major into the following specific aspects: First, students need to master the working principles and structural characteristics of key mechanical components including the engine, transmission system, hydraulic system and electrical control system, which is the basis for subsequent maintenance work. Secondly, students should have

the ability to diagnose and eliminate faults using various maintenance tools, testing equipment and diagnostic software, which is the main criterion to measure their practical skill level. In addition, this paper also emphasizes the cultivation of students' safety awareness, environmental awareness and professional quality, requiring students to strictly abide by the operating procedures during maintenance, ensure personal safety and equipment integrity, and pay attention to energy saving, emission reduction and environmental protection. Finally, through teamwork projects, students can improve their communication and coordination ability, innovative thinking and problem solving ability, so as to adapt to the complex and changeable working environment.

## **2.2 Practical cases of teaching content selection**

In the selection of teaching content, teachers should pay attention to the introduction of practical maintenance cases, so that students can learn in a real situation. For example, the teacher chooses the transmission system fault maintenance of a certain type of machine tool as a teaching case, from describing the fault phenomenon, analyzing the cause of the fault, applying the diagnosis method, making the maintenance plan to the implementation of the maintenance process, the whole process is participated by the students. During this period, teachers should guide students to apply the knowledge they have learned and carry out troubleshooting and maintenance operations in combination with the actual situation on site. At the same time, the school should also invite enterprise experts to teach in the school, share their valuable experience in the field of mechanical equipment maintenance and the latest technological trends, so that students can timely understand the industry's cutting-edge information.

## **2.3 Diversified practice of teaching methods and means**

To stimulate students' learning interest and enthusiasm, teachers should adopt diversified teaching methods and means. In theory teaching, teachers use multimedia teaching resources, combined with animation and video and other visual display methods to help students better understand and master theoretical knowledge. In the experimental training, teachers should be equipped with advanced mechanical equipment maintenance training center to provide real maintenance scenes and tools and equipment, so that students can practice in a simulated real working environment. In addition, teachers should also introduce virtual simulation technology, through the construction of virtual maintenance scenarios, so that students can also carry out simulation training of fault diagnosis and elimination without actual equipment. In the practice of the project, the school should cooperate with the enterprise to jointly develop the actual maintenance project, so that students can participate in the whole process of the project in the form of teamwork, from project planning, program design, implementation and operation to summary and reflection, and the whole process is completed by students. This project-driven teaching method not only improves students' practical ability, but also cultivates their innovative thinking and teamwork ability.

## **2.4 Detailed steps of teaching process design**

In the design of teaching process, teachers should follow the cyclic principle of "theoretical learning - basic skills training - comprehensive project practice - evaluation feedback - continuous improvement". In the theoretical learning stage, teachers should arrange targeted course content and teaching activities according to the teaching plan to ensure that students grasp the necessary theoretical knowledge; At the stage of basic skills training, students should be helped to master basic maintenance skills and methods through experimental and practical training activities; In the practice stage of the comprehensive project, students are arranged to participate in the implementation process of the actual maintenance project, and complete various tasks of the project through teamwork. After the completion of the project, teachers should organize students to display and share their achievements, and invite enterprise experts to give comments and guidance. In the evaluation and feedback stage, teachers should conduct comprehensive evaluation and feedback analysis according to students' performance and project results, find existing problems and deficiencies, and put forward improvement measures. <sup>[1]</sup>.

# **3. Problems and countermeasures during practice**

## **3.1 Problem analysis**

During the promotion of engineering integration teaching practice in mechanical equipment maintenance specialty, some problems will inevitably be encountered. First of all, the integration of theory and practice needs to be improved. Although teachers strive to combine theoretical knowledge with practical operation, they still find that some students are difficult to flexibly apply what they have learned to practice in actual teaching, resulting in a disconnect between theory and practice. Secondly, the distribution of teaching resources is uneven. Due to the limitations of teaching equipment and venues, it is difficult for some students to get sufficient opportunities to practice in the experiment and practical training, which affects the improvement of their skills. In addition, the problem of teamwork in project practice is also worth paying attention to. Some students lack effective communication and

coordination skills in teamwork, which leads to hindered project progress or poor results. Finally, the evaluation feedback mechanism needs to be improved. At present, the evaluation method mainly focuses on the assessment of students' skill level, while the evaluation of students' performance, attitude and innovation ability during learning is relatively insufficient.

### 3.2 Countermeasures

Strengthen the integration of theory and practice, through optimizing the curriculum and teaching content, so that theoretical knowledge and practical operation more closely combined. For example, teachers can intersperse experimental demonstration and case analysis in theory courses, so that students can understand the specific process of practical operation while learning theory. At the same time, strengthen the guidance and management of the experimental and practical training links to ensure that students can fully grasp the skills and apply them to practice.

Optimize the allocation of teaching resources, increase the investment in teaching equipment and venues, and improve the utilization rate of teaching resources. Through the introduction of advanced maintenance equipment and simulation technology, to provide students with a more real and rich practice environment. At the same time, the sharing and coordination of teaching resources should be strengthened to ensure that every student can obtain sufficient opportunities for practice<sup>[2]</sup>.

## 4. Closing remarks

This paper analyzes the engineering integration teaching practice of mechanical equipment maintenance major, and deeply realizes the importance of deep integration of theory and practice, as well as the urgency of cultivating students' comprehensive quality and innovative ability. Through continuous optimization of teaching content, innovation of teaching methods and strengthening of practical links, a set of teaching model that meets the needs of the industry and ADAPTS to the development of students is constructed. In the future, educators will continue to deepen teaching reform, strengthen school-enterprise cooperation, broaden teaching resources, and strive to cultivate more mechanical equipment maintenance talents with solid professional knowledge, superb maintenance skills and noble professional literacy, so as to contribute to the transformation and upgrading of China's manufacturing industry and high-quality development.

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## About the author:

Liang Gao (1979.10- ),male,nationality: han,native place:Shijiazhuang,Hebei.education:aster,research direction:vocational education.