
Innovation for the Lecturing of “Automobile Inspection and Fault Diagnosis” Based on ASIIN Seal Certificate

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Abstract

It's a trend for China to ask for cooperation with the education facilities abroad, which is also a keen need for cultivation of international talents with high quality. ASIIN is a German accreditation agency for study programs in engineering, informatics, natural sciences and mathematics. It could help the customers in a very short time with a high international influence. “Automobile Inspection and Fault Diagnosis” is a special course concentrating on theory and practice. We need to proceed with searching for teaching innovation and improving teaching quality in order to cultivate more qualified talents with applied science and technology. This paper establishes the teaching modules with theory and practice based on the ASIIN certificate seal and the teaching objectives. Then the curriculum system could be established. And the innovation for the teaching result evaluation could also be carried out. Finally, the teaching method is innovated.

Keywords

Automobile Inspection and Fault Diagnosis; ASIIN Seal; Innovation for Teaching Pattern.

1. Introduction

With the trend of globalization of education, strengthening cooperation with foreign educational institutions is not only the need to cultivate Chinese international high-quality talents, but also the need for the modernization of Chinese characteristic socialism [1]. Under the background of globalization, the transnational economy and upsizing engineering have put forward the requirement of educational authenticity certification for the talents from different educational backgrounds. In addition, the project certification system is inevitable under the current development trend[2].

ASIIN is a professional German certification agency for engineering discipline, information science and natural science. Moreover, ASIIN is a nonprofit organization established by the German Institute of Engineers, organized by universities, applied science universities, authoritative technology associations, professional education, training associations, and important industrial and commercial organizations[3]. It was established in 1999, formulated certification guidelines and procedures in 2000, and qualified by the German certification committee. It established an experts library in 2003 and became a reserve organization of the Washington agreement in the international. The general certification standards of ASIIN engineering discipline are drafted by the Engineering and Informatics Certification Committee which is one of the affiliated certification committee of ASIIN. In addition, the relevant engineering standards are developed by the 13 technical committees authorized by the certification committee. The proportion, credits, etc. of the curriculum are further formulated and illustrated according to the nature of the curriculum[4]. ASIIN attaches great importance to the academic and industrial links, it organizes face to face discussion between education service supplier and demander and attaches great importance to peer assessment in the professional assessment process. ASIIN has a peer evaluation expert library that comprises more than 800 experts, in addition, ASIIN has extensive contacts with the international certification institutions

and certification organizations, which ensures that it can complete the customer service in a relatively fast time and has strong international influence[5].

The major of automotive service engineering of Shanghai Dianji University aims to cultivate high-tech talents adapted to the production, construction, management, service needs. Although its theoretical education is almost the same with ordinary undergraduate, it strengthens the practice and application capacity training. The course "Automobile Inspection and Fault Diagnosis" is a main course of this discipline. The purpose of the course is to enable students to master the main methods of vehicle fault diagnosis, to analyze and judge the common faults of automobile and to master the use of major equipment during the maintenance of vehicle at the same time. It's consistent with the concept of ASIIN engineering discipline.

This article will focus on the German ASIIN engineering discipline certification standards to explore and establish an undergraduate course education model of "Automobile Inspection and Fault Diagnosis" according to these standards. In addition, this article also study the modular teaching reform ideas, the establishment of "theory-practice integration" project teaching model curriculum evaluation System and the modular curriculum system with its teaching methods of reform ideas.

2. Course Modules for ASIIN Seal Certificate

There are 4 credits (64 class hours) for "Automobile Inspection and Fault Diagnosis" in the major of Automotive Service Engineering in Shanghai Dian Ji University. According to the requirements of ASIIN seal certificate and characteristics of the course, modular teaching combining theory and practice could be adopted. Consequently, 3 "theory-practice integration" course modules, including "Inspection and Diagnosis of Vehicle Condition", "Inspection and Diagnosis of Engine Technology Condition" and "Inspection and Diagnosis of Chassis Technical Condition", are established.

(1) Inspection and Diagnosis of Vehicle Condition

This module makes sure the students could correctly understand chassis dynamometer, brake test stand, side-slip checking stand, headlamp tester, speedometer tester, non-dispersive infrared analyzer, opacimeter, sound level meter, etc.. Then they can reasonably select the main parameters and relevant standards for the vehicle technical inspection projects. According to the inspection results, the automotive technical characteristics could be analyzed, and vehicle technology status could be correctly evaluated. In this module, there are 16 class hours and 6 experimental hours. 3 teaching contents, including inspection and diagnosis of braking system, inspection of headlamp and inspection of automobile exhaust, are all "theory-practice integration" contents.

(2) Inspection and Diagnosis of Engine Technology Condition

This module makes sure the students could handle various instruments and equipment for testing of the engine performance. Then they could inspect and analyze the performance of engine power, cylinder sealability and engine ignition. And they can inspect and diagnose the engine starting system, fuel supply system, lubrication system and cooling system. Moreover, they could inspect, analyze and diagnose engine electronic control system. In this module, there are 16 class hours and 6 experimental hours. 3 teaching contents, including inspection and diagnosis of cylinder sealability, inspection and diagnosis of ignition system and inspection and diagnosis of gasoline engine supply system, are all "theory-practice integration" contents.

Inspection and Diagnosis of Chassis Technical Condition

This module makes sure the students could manipulate the steering parameter measuring instrument, four-wheel aligner, wheel balancer and suspension measurement stand. They can inspect the glide performance, suspension performance, four-wheel alignment, ABS performance and steering performance. Then they could inspect the common faults of transmission system, steering system, braking system and driving system. Moreover, they could inspect, analyze and diagnose the fault of the chassis electronic control system. In this module, there are 16 class hours and 4 experimental hours. 2 teaching contents, including inspection of wheel dynamic balancing and four-wheel alignment, are both "theory-practice integration" contents.

Table 1 “theory-practice integration” contents

| No. | Name | Module | Theory Hours | Practice Hours |
|-----|---|---|--------------|----------------|
| 1 | Inspection and Diagnosis of Braking System | Inspection and Diagnosis of Vehicle Condition | 1 | 1 |
| 2 | Inspection of Headlamp | | 1 | 1 |
| 3 | Inspection of Automobile Exhaust | | 1 | 1 |
| 4 | Inspection and Diagnosis of Cylinder Sealability | Inspection and Diagnosis of Engine Technology Condition | 1 | 1 |
| 5 | Inspection and Diagnosis of Ignition System | | 1 | 1 |
| 6 | Inspection and Diagnosis of Gasoline Engine Supply System | | 1 | 1 |
| 7 | Inspection of Wheel Dynamic Balancing | Inspection and Diagnosis of Chassis Technical Condition | 1 | 1 |
| 8 | Four-wheel Alignment | | 1 | 1 |

All the “theory-practice integration” contents are listed in Table 1. Every “theory-practice integration” content includes 1 hour of theory teaching accomplished in class and 1 hour of practice teaching accomplished in automobile laboratory. For the theory teaching, its objective is mainly to explain the diagnostic parameters, national standards related to diagnostic parameters and the instruments involved in inspection and diagnosis. During the practice teaching, the teacher tells the students how to experiment, and meanwhile explains to the students the steps of the test and the safety notices. Then the students are grouped to start the experiment. The teacher should instruct when the students are in operation and correct and explain why when the students are doing it improperly so as to make sure the students could learn in practice. Then the course could meet the requirements of ASIIN seal certificate with the combination of teaching, learning and doing.

3. Constructing Curriculum System Based on Course Modules

According to ASIIN seal certificate requirements, the curriculum system should serve the society and be employment-oriented, which could cultivate practical and skilled talents for production, service and management positions with a certain of theoretical knowledge and strong practical ability. The teaching contents should further emphasize the combination of theoretical and applied knowledge, and highlight case study and practical research.

Based on the 64 class hours of the course, the following modular curriculum system is establishment: The course starts from the basis of vehicle inspection with 6 class hours. The main contents of this chapter include the meaning of automobile inspection and fault diagnosis. Then the students could understand the concept and role of diagnostic parameter, diagnostic standard and diagnostic cycle time, and be familiar with the cause of automobile fault, the change of automotive technology status, the composition and principle of automobile inspection system, and the basic methods for automobile fault diagnosis.

The first formal teaching module is “Inspection and Diagnosis of Vehicle Condition” with 20 class hours. The main contents of this chapter are set to explain the main items of vehicle condition and their significance. Then the students could be familiar with the evaluation index and inspection standard of the test items, understand the structure and principle of every inspection instrument for the vehicle condition, and be familiar with the inspection methods for power, economy, braking, side-slip, headlamp, speedometer, exhaust, noise and electromagnetic interference.

The second formal teaching module is “Inspection and Diagnosis of Engine Technology Condition” with 22 class hours. The main contents of this chapter are taught by theory and practice integration. Then the students could understand the inspection principle and method of engine power and each engine system, the structure and instructions of each engine inspection instrument, common faults and fault inspection methods of the engine, and the self-diagnosis principle and inspection method of engine electronic control system.

The third formal teaching module is “Inspection and Diagnosis of Chassis Technical Condition” with 16 class hours. The main contents of this chapter are taught by theory and practice integration. Then the students could be familiar with the diagnostic ideas of the common faults of transmission system, steering system, braking system and driving system, the inspection principle and method of glide performance, moving angle of the powertrain, steering performance, ABS performance and automatic transmission performance, the inspection principles and application methods for four-wheel aligner, wheel balancer and suspension measurement stand, and the self-diagnosis principle and inspection method of chassis electronic control system.

4. Evaluation Methods of Course Contents and Teaching Effects

The evaluation and assessment of teaching effect is the normative guidance document of curriculum development, which is the basic basis of teaching. According to the requirements of ASIIN, the assessment method must be able to guide students to correct the deviation in the direction of learning, to mobilize the enthusiasm of students to learn and develop students' practical ability, thinking ability and innovation ability. To ensure the achievement of these learning results and change the exclusive determination of the final examination, the score is divided into four parts: classroom performance (10%), classwork (10%), practice (20%) and final examination (60%). This requires students to continue thinking during the whole process of this course, and at the same time to stimulate their enthusiasm for learning. The benefits of this flexible assessment is to guide students to pay attention to daily learning, actively participate in the teacher's daily teaching activities, devote themselves to professional skills training.

Classroom performance accounted for 10% that is the main assessment of students' attendance, the usual learning attitude, as well as the completion of classroom questions and so on. Classwork accounted for 10% in the course assesses the understanding of the classroom knowledge. Experimental practice accounted for 20%, which is the main assessment of students' practical ability to experiment, data processing and other capabilities. Final examinations accounted for 60%, mainly to check and urge students to do the review and consolidation, rather than to meet the exam and test, it plays the role of finishing touch in promoting student learning. After reforming assessment methods, a usual learning atmosphere is created, the students' usual learning and ability training is strengthened, a substantial improvement in quality of teaching can be ensured.

5. Conclusion

“Automobile inspection and fault diagnosis” is a theory emphasized, practice oriented course, and develops with the development of automotive technology. We need to continue exploring teaching reform, improving the quality of education and teaching to develop more high-quality application of engineering technical talent.

As the two countries have a large difference in the education system, it also has a greater difficulty in the curriculum reform in China, such as the student's test methods and evaluation criteria are different. China's assessment of students is mainly based on the written test results while ASIIN certification standards focus on the comprehensive ability of students. Students' examination is only a part of student learning in ASIIN standards. In view of the above situations, based on the analysis of ASIIN evaluation criteria and the purpose of curriculum design, the "theory-practice integration" teaching module is established to build the curriculum system, reform the teaching effect evaluation method and the teaching reform practice.

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