



Teaching Research of Power Battery and Its Management System Based on Post Course Certificate

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Abstract. New energy vehicles are entering a new stage of large-scale and rapid development, and are in urgent need of application-oriented, innovative and compound high-quality technical talents to adapt to the construction of modern industrial system and economic and social development. Taking the course power battery and its management system as an example, from the perspective of “post course competition certificate”, integrating information technology, to explore the new form of course teaching system construction ideas, methods and means, can actively promote teachers’ teaching reform, conducive to personalized teaching and application-oriented talent training.

Keywords: Post course competition certificate · Information education · Blended learning · Instructional design

1 Introduction

Actively exploring the integrated education mode of “post course competition certificate”, continuously deepening the “three education reforms” of teachers, textbooks and teaching methods, strengthening the digitalization and fragmentation construction of curriculum resources can improve the universality of curriculum, promote demonstrative teaching, and promote the growth of “double-qualified” teachers who can “speak and do” [5].

In this paper, on the premise of clear professional development direction, through the investigation and analysis of power battery occupation positions, the use of work process-based systematic curriculum development method, construction.

2 Reconstruct the Teaching Content

Power battery and its management system is the core course of higher vocational new energy vehicle technology specialty. When constructing the teaching content, we should first analyze the responsibilities of power battery related positions in enterprises. After investigation and analysis, the positions related to power battery in higher vocational new energy vehicle technology major include technical support, trial production test,

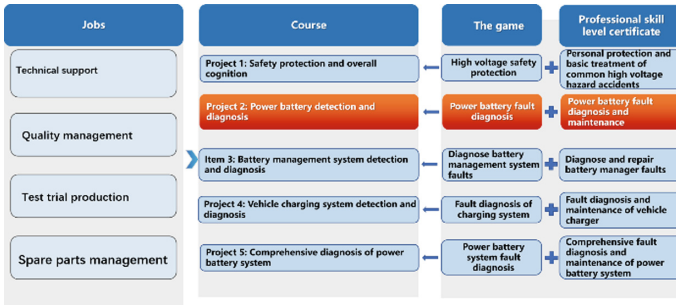


Fig. 1. Highly integrated teaching content of post course competition certificate (self-drawing)

Project II Power battery detection and diagnosis	
Enterprise high frequency work tasks	The teaching task
■ DC/DC converter fault removed	→ 1:Low voltage power system inspection and diagnosis
■ Check the consistency of the battery	→ 2:Power battery conformance detection and diagnosis
■ Replace the power battery module	→ 3:Power battery module testing and diagnosis
■ Sensor fault diagnosis and troubleshooting	→ 4:Sensor detection and diagnosis
■ Replace relay	→ 5:High voltage power-on system detection and diagnosis
■ Interlock fault diagnosis and troubleshooting	→ 6:High and low voltage interlocking detection and diagnosis
■ Fault diagnosis of the hot management system	→ 7:Thermal management system detection and diagnosis
■ Battery performance detection	→ 8:Power battery performance test

Fig. 2. Teaching content design of Project 2 (self-drawing)

quality management, spare parts management, etc. In order to realize “promoting learning through competition and promoting practice through competition”, skills related to student skills competition and vocational skills grading certificate should also be integrated. When reconstructing the teaching content, this paper extracted the power battery match points from the china skills competition - the national new energy vehicle key technical skills competition over the years and the power battery module skill points from the electric vehicle high voltage system evaluation and maintenance vocational skill level standard.

Based on the above ideas, the curriculum system is rebuilt. The course power battery and its management system is divided into five teaching projects, which are sorted according to the logic of whole, part and comprehensive, so as to achieve the high integration of post, course, competition and certificate (Fig. 1).

Taking project 2 as an example, the integration method and follow-up analysis of post course competition certificate in the course are described in detail. There are altogether 8 teaching tasks in project 2, all of which are derived from the high-frequency work tasks of the enterprise. According to the knowledge points in the teaching tasks, the teaching tasks are integrated into the relevant skill points of the skill competition and the vocational skill level certificate, and are redesigned in accordance with the cognitive rules of students and the logic of low pressure, control and high pressure (Fig. 2).



Fig. 3. Teaching objectives of Project 2 (self-drawing)

3 Set Teaching Objectives

In order to clarify the teaching tasks more reasonably, we should first make use of information means such as learning platform to conduct teaching analysis for the teaching objects. This paper takes the new energy vehicle technology major of BEIJING POLYTECHNIC as an example to analyze the second grade students of 2019 higher vocational college, and the learning situation is as follows.

Knowledge base: Students have the basic knowledge of power battery structure, function, principle and so on, but the knowledge of circuit is weak.

Ability foundation: Students are capable of power battery leakage inspection and power battery decomposition and assembly, but lack of power battery detection and diagnostic analysis ability.

Quality foundation: Most students are cheerful and have good communication and expression, but poor teamwork ability and standard consciousness of power battery detection and diagnosis.

According to the responsibilities of power battery related positions, talent training programs, curriculum standards, vocational skill level standards, etc. The teaching objectives of project II are formulated and the teaching focus is determined. Combined with the preliminary learning situation analysis, predict the teaching difficulties (Fig. 3).

4 Innovate Teaching Strategies

The quality control of power battery is very important in the production process. And in the teaching process, we should adhere to teaching and learning, cyclic progressive. Therefore, this paper has studied that the working process is transformed into a data-based and results-oriented teaching process that conforms to the teaching rules and students' cognitive rules by following the principle of PDCA quality management and task-driven teaching method in each middle school.

In order to better achieve the teaching content close to the work content of the enterprise, learning skills close to the work skills, hire enterprise excellent workers, set up a master led, professional and part-time combination of structured teacher team, and jointly enrich the information platform teaching content, and jointly develop information teaching resources for teaching [1].

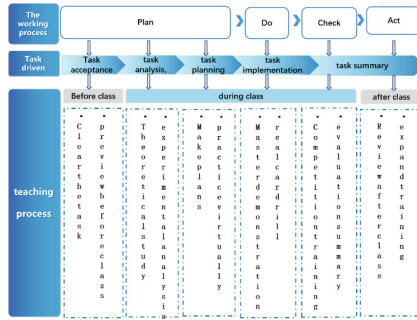


Fig. 4. Teaching Strategies (self-drawing)

Structured teacher team uses information platform and information resources to implement online and offline hybrid teaching integrating teaching, learning, doing, training, evaluation (Fig. 4).

5 Implement Teaching

Taking task 1 of project 2, low-voltage power system detection and diagnosis, as an example, the teaching process studied and implemented in this paper is described.

Before class, clear tasks, stimulate students’ interest in learning. Test the bottom, detailed data analysis of the situation.

In class, the combination of virtual and real, effectively achieve the teaching objectives, ideological and political parallel, morality and technology and training combined. The following details how to use information platform and information resources to implement online and offline mixed teaching [2].

5.1 Theoretical Learning

According to the situation diagnosis report, the teacher carries on the systematic theoretical knowledge analysis pertinently. Due to the danger of DC/DC high voltage in the low-voltage power supply system, the structure is closed. In order to cultivate the safety awareness, the students are guided to use VR to clarify the structure, use interactive games to understand the working principle, and draw the circuit diagram of the system with AUTOCAD to cultivate the students’ awareness of standardization.

5.2 Test Analysis

After mastering the structure, principle and circuit, students use test equipment and power battery test bench for testing. Through the process of experiment, the tool selection, experiment record, 6S management and other links to cultivate students’ labor spirit.

5.3 Planning and Virtual Exercises

Students work as a group to develop a low-voltage power supply system detection and diagnosis plan. The teacher carries out heuristic teaching according to the students' situation, and the students constantly revise the diagnostic ideas and show them. Cultivate students' spirit of excellence and meticulousness. And the use of virtual simulation software, such as virtual practice, to ensure that learning has mastered the learning content.

5.4 Master Demonstration

Due to DC/DC high voltage danger, the master personally demonstrated detection and diagnosis, and appeared to analyze the cause of failure and maintenance precautions with the actual case of personal experience. Business masters teach by word and deed, moisten things silently to cultivate the spirit of student model workers.

5.5 Actual Vehicle Drills and Competition Training

Real car maintenance is a necessary professional skill for students, which requires students to complete 100% of the task. Teachers will make teaching adjustments according to the situation of students completing the task. Students who can complete the detection and diagnosis tasks of low-voltage power supply system will be advanced to the competition training, and those who can't finish the task will watch the master demonstration video, and then conduct real car maintenance until troubleshooting, so as to achieve classified teaching and cultivate the craftsman spirit of students [4].

5.6 Evaluation Summary

Students summarize and report the learning results in class, and teachers analyze the data by using analysis software to make comprehensive evaluation of students' knowledge, ability, accomplishment, classroom participation, learning points and other items.

Finish the review after class to consolidate the knowledge learned in class. Expand vision and guide students to continue studying.

6 Analyze Students' Learning Effect

Through the above teaching, teachers can use software to analyze the students' learning situation. In this paper, after the teacher finishes teaching, the learning data of the teaching object is collected and analyzed. The results are as follows: the pass rate of the 8 teaching tasks of the students in project 2 is 100%, and the overall score is steadily improved. 100% students can tell the structure and principle of the power battery, complete the test and diagnosis of the power battery, and carry out the performance test of the power battery. The learning goal has been achieved and the students are making steady progress [3].

7 Conclusions

On the premise of docking standards, this paper reconstructed the teaching content of power battery and management system after the integration of post course competition certificate by analyzing the power battery job responsibilities, competition points and vocational skill rating certificate skill points. And through data analysis, make teaching objectives, improve online and offline mixed OBE teaching mode. The teaching task is derived from the enterprise power battery production case. The teaching process is student-centered and the master is taken as the example. Two teachers carry out the classroom revolution together, realizing the combination of morality and technology, education and training.

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