

## **Optimization of the Experimental Teaching System of “Vehicle Engineering Specialty” under the Background of New Engineering**

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**Abstract:** This article through to the university vehicle engineering professional analysis of the experimental teaching in combination with the engineering background and engineering education professional certification standards, the professional certification of student-centered core idea, teaching idea and teaching model for the gripper, using experimental projects an elective system, open experiment, virtual simulation experiments, guide encourage students to participate in all kinds of series, fully mobilize graduates feedback mechanism, strengthen the practice teaching link, to reform and innovation of practice teaching security system, to further improve and strengthen the practice teaching quality.

### **1. Introduction**

China is a big manufacturing country, and the automobile industry is the pillar manufacturing industry in China. It is a comprehensive industry developed on the basis of many related industries and advanced manufacturing technologies. As early as 2009, China's automobile production and sales volume had become the world's first, occupying an important position in the national economy.

As a talent base of automobile industry, vehicle engineering major plays an important role.

The six ideas of new engineering construction are: to ask the industry demand to build a major, to ask the content of technological development, to ask the main body of the school to push forward the reform, to ask the students to change their ideas and interests, to ask the internal and external resources to create conditions, to ask the international frontier standards.

### **2. Experimental Teaching of Vehicle Engineering in Hunan Institute of Communications**

At present, the vehicle engineering major of Hunan Institute of Communication Engineering has a laboratory with a construction area of 920 m<sup>2</sup> and teaching equipment with a total value of more than 3.7 million yuan. At present, vehicle engineering experiments are divided into three types: professional basic course, professional experiment course and professional experiment module course. There are 15 experimental courses in total, and the experimental class hours are 220 hours. There are 7 basic professional courses with 130 h of experiment and 6 specialized courses with 52 h of experiment.

### **3. Analysis of Advantages and Disadvantages of Experimental Curriculum Setting for Vehicle Engineering Major**

Vehicle engineering professional experiment project and experiment content they offer the experiment set is based on the theory of curriculum content, more verification on the basis of experiments, and fixed teaching outline, the students have no choice according to the interests and hobbies, all this professional students there is no difference, neglected the student's subjective will, with the student centered core thought is not consistent, professional certification has been unable to meet the demand of students' comprehensive innovation practice ability training.

#### **4. International Engineering Education Certification System Requirements**

The international engineering education certification system, which focuses on students' graduation requirements and index points, uses this system and joins the Washington Agreement, which means that China and other countries can recognize each other's academic qualifications, and Chinese engineering engineers can go abroad and become engineers recognized by foreign countries. Based on the “results-based education” concept of engineering education (OBE), China Association for Certification of Engineering Education proposed the quality standards for professional certification in engineering education, and emphasized three central concepts: output-oriented course design, student-centered, and continuously improved quality assurance system. Continuous improvement is the nuclear psychology of the Washington Agreement on professional certification in engineering education Reading and one of the important links <sup>[1]</sup>.

Higher education should be “student-centered”, adopt new engineering and professional certification concepts to jointly lead the construction of campus majors, and actively explore, practice and innovate in talent cultivation plans, curriculum construction and monitoring systems. Students as the center, give full play to the main role of students in education and teaching activities; To give full play to students' subjective initiative, talent training result-oriented, let students actively and purposefully into learning, cultivate students' self-learning ability, practical ability and pioneering and innovative ability; At the same time, establish a continuous improvement system, the error correction of the teaching process fully monitor the comprehensive evaluation on the quality of teaching, and through the feedback mechanism to improve in time, so as to achieve the realization of training objectives, and sustained and effective improvement of benign cycle, makes the education object more adaptable to the auto electric under the background of new era demand <sup>[2]</sup>. For shaanxi university of science and technology and my major is vehicle engineering international engineering education professional certification, from subject oriented to economic industry demand oriented, considering development foundation, set up curriculum resources meet the need of industry practice, to explore a new energy to adapt to the new national engineering related steam car industry professional innovative talent training effective path <sup>[3]</sup>.

#### **5. The Practice and Reform of Experimental Teaching System of “Vehicle Engineering Specialty” under the Background of Professional Certification**

In view of the practice and Reform of experimental teaching system of “Vehicle Engineering Specialty” under the background of professional certification in view of the current requirements of professional certification, we must start from the teaching concept, teaching mode, open experiment and various competitions to deepen the reform and innovation of practical teaching. In order to reflect the student-centered concept, it is necessary to reform the professional experiment, so that students can have the right to choose within the scope of the existing experimental projects according to their own strengths and interests, as long as the class hours and credits stipulated in the outline can be achieved.

##### **5.1 Thinking on Teaching Concept: the Syllabus is Rigid and Strict**

The traditional teaching concept is quite rigid and tightly around the teaching outline to implement the teaching task, which standardizes the teaching order, but also restricts the teaching concept. Teaching outline is the basis of teaching documents, the formulation should have a certain flexibility, so that students and teachers in the teaching process have a certain degree of selectivity, fully stimulate students' interest in learning, students' learning initiative to improve, learning quality is naturally also fully guaranteed.

##### **5.2 Reform Teaching Mode: the Experiment Project Implements Elective System**

Under the guidance of the student-centered concept, the existing specialized experimental module courses can be divided into two categories for students to choose independently: traditional automobile technology system and new energy automobile technology system. These two

categories only provide reference, specific experimental items can be optional, so as to fully mobilize the subjective initiative of students, achieve the purpose of improving the quality of practical teaching.

**Traditional automobile technology System:** By the traditional automotive engine, chassis, transmission and traditional automotive electrical system based on practical teaching system, combining the latest development of new energy automobile electrical and electronic control technology knowledge, make existing practice teaching course system more hasten is perfect, in order to achieve the teaching content coherent system, learning knowledge, comprehensive training students' ability of analysis, problem solving, research interests and team cooperation ability, promote interdisciplinary communication, let the students can not only knowledge mastering of traditional auto technology, and enrich the new energy and the forefront of intelligent vehicle technology related knowledge, make students professional level and further widen the field of vision.

**New energy automotive technology system:** make full use of the lab in the past two years new vehicles, pure electric vehicles, hybrid system experimental platform, the new energy automotive technology platform, new energy automobile motor experimental platform, experimental apparatus equipment performance, make the student power battery for hybrid electric vehicle technology, motor controller system and its hybrid drive coupling system have a full understanding and the understanding, the pure electric vehicle battery management system, the main components of the structure and working principle of motor performance testing methods such as knowledge to deepen understanding and research, and the trend of the development of new energy vehicles - also dabbled smart car of the latest technology.

There are 12 general education courses in this major, with 756 h(required 38 credits, optional 6 credits).30 courses in professional education, 1 370 h(6 credits required, 23 optional.5 credits);Comprehensive Practice (Required 41.5 credits, 6 credits optional).Experimental items can be offered for 62 class hours in total, and each 14 class hours is 1 credit. Each student can complete the professional experiment with 3 credits Teaching requirements.

### **5.3 Encourage Students to Participate in Open Lab Projects**

Actively develop new experimental projects, open them to students in the form of open experimental projects, and take extracurricular credits as a breakthrough point to further attract students to actively enter the laboratory. Make full use of the experiment center of new equipment, development and analysis of comprehensive experiment research project, and as open experimental project is open to all students, encourage students to participate in the opening experiment project, experiment content of the project task, and form a lab report as a result, can also guide the student to published papers and patents, to cultivate the students' spirit of academic research. Students who meet the requirements of open lab hours and submit lab reports will get the corresponding extracurricular credits.

### **5.4 Make Full Use of Virtual Simulation Experiment Project**

Due to the particularity of vehicle engineering specialty, some testing experiments of vehicles need professional equipment, field and track, which brings challenges and development bottlenecks to the development of the specialty. In order to make up for the deficiency in this aspect, the virtual simulation experiment teaching center platform of school of Mechanics can be used for mechanical supplement, so that students can carry out some experiments on the virtual simulation platform that the existing experimental conditions cannot meet, so as to supplement and strengthen the experimental content in this aspect. Students can participate in the virtual simulation experiment remotely, choose the virtual simulation experiment project independently, complete the experiment task, reach 12 class hours and submit the experiment report, and then get 1 extracurricular credit.

### **5.5 Guide Students to Actively Participate in Various Competitions**

Various competitions are important carriers to promote the reform of engineering practice teaching in colleges and universities as well as the cultivation of students' engineering quality. In

training competition and on the basis of engineering quality, actively promote “to take lessons” “lesson to learn,” “to learn to help the” trinity “of dry middle school” personnel training mode, encourage and strengthen the innovation practice activity, with open comprehensive experimental projects and participate in all kinds of competition as the backing, gradually cultivate and guide the student's interest in automobile new technology. When setting up practice links, the content of practice should be reasonably allocated according to the differences of emphasis between traditional cars and new energy cars<sup>[4]</sup>.

In the school organization for the development of new energy automobile hardware projects, to carry out field automobile energy saving contest, encourage the students to form all kinds of different disciplines background race team, take an active part in the national contest of carbon-free car, Chinese college students electric formula and Chinese college students unmanned formula, the freescale intelligence car series, such as the national challenge cup college students competition national contest. Through the above kinds of projects, competitions, practical innovation activities, improve the practical ability of students, cultivate the ability to analyze and solve practical problems, at the same time, enhance the interdisciplinary academic research and exchange of students.

## **5.6 Establish Graduate Feedback Mechanism**

Off-campus evaluation is a very important part of teaching improvement, which mainly includes former graduates and employers. Each revision of the training program, in the form of discussion, questionnaire survey to the employer for comments and suggestions. The evaluation content can include: recognition of graduation requirements of vehicle engineering major, recognition of training objectives, basic and professional knowledge and ability of graduates, engineering design and engineering practice ability of graduates, curriculum setting of this major, etc.<sup>[5]</sup> Through the feedback of graduates and employers, and continuous improvement in teaching, to further improve the level of training students.

## **6. Innovation and Difficulty of Experimental Teaching Reform**

(1) Experimental teaching content mode: the fixed and unified experimental items should be diversified, and the rigid and fixed experimental teaching mode should be changed to the students' independent choice of experimental items, which will be in conflict with the management of the syllabus and the Office of Academic Affairs, requiring policy support from functional departments.

(2) Experimental teaching: The teaching mode independently chosen by students reflects the core idea of student-centered professional certification, but it also brings challenges to the implementation of experimental teaching. Due to the large number of students and experimental items, it increases the difficulty for students to select courses and teachers to arrange courses.

(3) Evaluation method of experimental results: The new model of academic paper is adopted to evaluate experimental results. Students are asked to summarize the experimental data and conclusions of each experimental item in a report, and to put forward their own views on theoretical knowledge, experimental project setting, experimental instruments and methods through experiments.

## **7. Conclusion:**

Through the system of vehicle engineering professional practice teaching contents and teaching mode to reform the innovation, more greatly improved the students' interest in the practice teaching link, maximally mobilize the students' subjective initiative study, and further perfect the security system of practice teaching, to improve and improve the quality of practice teaching and cultivate the basic engineering accomplishment, make professional certification of “student-centered” core idea fully.

## **8. Acknowledgment**

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