Progressive Project Teaching Reform of Vehicle Engineering Course based on OBE

-- Taking 'Automobile Theory' as an Example

Jiyan Qi*, Fengli Yue, Kaiyan Wang, Ling Cai

School of Automobiles and Transportation, Shenyang Ligong University, Liaoning, China

*Corresponding Author

Abstract

Facing the impact of a new round of scientific and technological revolution and industrial transformation, the automobile industry is undergoing an industrial transformation of intelligence, networking, electrification and opportunities for transformation and upgrading. Under this background, the automobile industry has put forward higher requirements for the quality and ability of practical personnel in engineering and technology. Under the guidance of OBE concept, the course of Automobile Theory is taken as the starting point. The problems existing in the traditional teaching are addressed, the traditional teaching material framework is broken, the teaching content is reconstructed, and the progressive project teaching reform is carried out. The teaching mode focusing on giving play to the students’ initiative and personality ability is constructed, in order to improve the students’ comprehensive quality and professional practice ability, and achieve the training goal of applied talents in vehicle engineering.

Keywords

OBE; Progressive Project Teaching Method; Automobile Theory; Teaching Model.

1. Introduction

As the core course of the vehicle engineering, the teaching quality and teaching effect of the course directly affect the professional quality of students, which is a strong representative of professional course [1]. Automobile theory course is one of the core elements in the training of vehicle engineering professionals [2], as a micro problem of professional education; it restricts the quality of professional training and affects the realization of professional training objectives. It is of great significance to deeply analyze the problems existing in teaching, explore the rules of curriculum construction and promote the reform of curriculum teaching, so as to improve the teaching quality of automotive theoretical courses and meet the requirements of professional training objectives.

2. The Connotation of Progressive Project Teaching Method based OBE

Outcomes based education (OBE) is an educational concept based on learning outcomes. It focuses on the expected outcomes of students' learning process [3]. All segments in education and teaching are organized around the expected outcomes [4]. The OBE educational concept is fully in line with the requirements of the current "New Engineering" construction based on industrial needs [5].

The progressive project teaching method based on OBE is adopted to organize the teaching process. On the basis of the experience of OBE teaching reform in similar universities, combined
with the latest development needs of the automobile industry, with the application ability training as the purpose, the teaching content of the course is inversely designed around the expected learning outcomes, the teaching activities are positively implemented, and the classroom teaching and professional ability training are integrated. The target orientation of application-oriented talent training is met. Taking students as the center, transforming the traditional teaching based on course content into the training based on the needs of learning outcomes. The traditional evaluation of teaching effect is replaced by the evaluation of students’ learning effect. The assessment of knowledge application ability is emphasized, and the students’ ability in engineering practice is cultivated.

The course teaching is carried out in a progressive way according to the hierarchical structure of students’ abilities. The fragmented knowledge is organized into the course knowledge modules, and the course knowledge modules are integrated into the projects at different levels, focusing on cultivating students’ engineering ideas and innovation abilities. Through the reform, students can make preparations before class, improve in class and expand after class. The ability of independent learning can be cultivated, the awareness of independent inquiry can be improved, and the learning methods more suitable for applied undergraduates can be mastered. Through the reform, students can be prepared before class, improve during class and expand after class. Students’ autonomous learning ability has been cultivated, Self-exploration awareness has been improved, and learning methods more suitable for application-oriented undergraduate has been mastered. The students’ ability to understand and apply the knowledge they have learned has been strengthened. The reform results are in line with the talent cultivation concept of student centered, output oriented and continuous improvement. It provides a method and idea to improve the high-level, innovative and challenging degree of vehicle specialized courses.

### 3. Progressive Project Teaching Design based on OBE Concept

#### 3.1. Establishment of Teaching Projects and Modules

1. Investigate the employment position and industry demand, define the training objectives, and determine the teaching projects

   The employment posts of graduates are investigated and analyzed, and typical employment posts are identified. According to the talent training objectives determined by the discipline based on the OBE concept, the graduation requirements are defined, and the curriculum teaching objectives of this course are formulated according to the graduation requirements. The corresponding teaching project is designed for the teaching objectives of the course, and the teaching content is implemented according to the teaching objectives. Finally, the degree of achievement is calculated and the teaching results are evaluated, and the continuous improvement is kept.

2. Progressive Project Teaching Module Design and Teaching stage Arrangement

   The OBE education model focuses on students' expected learning outcomes, the idea of emphasizing progressive teaching cannot be arranged according to the traditional teaching material centered teaching content, and the traditional teaching material framework must be broken. The curriculum system is reconstructed. By integrating and refining the teaching content, the ladder teaching framework is constructed. Under the OBE education concept, the ability training is carried out in a hierarchical and ladder way through progressive modules to complete the course learning achievements. The teaching process is mainly student-centered which focuses on the cultivation of students’ practical ability to apply knowledge

In the process of progressive project teaching, after the project are determined, the key problem is to select the teaching content of project decomposition, the setting of sub-tasks and the teaching content of learning level division, which should have representative and practical...
production significance in accordance with the training objectives of undergraduate students in vehicle related majors. Through the above task decomposition and level division, theoretical teaching is targeted, students' learning is changed from pure rationality to sensibility, theoretical learning is combined with life practice, and students' interest in learning is increased. The teaching project is divided into several modules according to the needs of teaching projects and actual jobs. According to the core competencies and course objectives, the working process of work-integrated learning is taken as the main line; the content of the textbook is re-integrated, the appropriate teaching content is selected, and the corresponding student ability promotion modules are finally set. Different modules correspond to professional core competence, thus forming an advanced teaching mode. Taking the automobile theory as an example, after confirming the teaching project of the whole course according to the OBE concept, the project is divided into horizontal and vertical directions. The vertical is student-centered learning achievement progressive, that is, different levels of learning, through vertical decomposition, the course can be promoted step by step, student team innovation and independent research are encouraged, and the challenges of the course are increased. The horizontal direction is to decompose the project into progressive tasks, so that knowledge can connect the preceding and the following, step by step. The specific teaching project decomposition framework is shown in the figure 1.

![Progressive teaching project task decomposition](image)

**Figure 1.** Progressive teaching project task decomposition

### 3.2. Classroom Teaching Model Reform based on OBE Concept

Sharp tools make good work. The teaching mode in the classroom is the "sword" to ensure the implementation of curriculum reform. The teaching method is the teacher's "tool". What form of knowledge can be presented in order to show incisively and attract students' attention,
which is the "sharp edge". The students' learning situation and the characteristics of the course are analyzed, and the needs of the course teaching are met. The student-centered concept is adhered to; the vigorous classroom is built [6].

3.3. Continuous Improvement of the Overall Closed Loop of the Course

The cultivation of students' ability and quality objectives needs to be improved by progressive training. Only complete and quantifiable process assessment indicators can guide students to transform from passive learning to autonomous learning, so as to develop lifelong learning habits. In order to expand the breadth of course learning, the evaluation of students' offline and offline learning in class has been strengthened. In order to enhance the depth of course learning, project research learning has been strengthened, and evaluation methods such as inquiry and report defense have also been enriched. In order to enhance the challenge of course learning, the non-standardized and comprehensive evaluation is strengthened. The above process evaluation is consistent with the diversified assessment method adopted in the progressive project teaching method. The diversified assessment method is to realize the play of each student's strengths and the implementation of fairness, but also to test the students' learning results and learning wind vane.

In order to improve the course continuously, the evaluation of course achievement is carried out by the relevant responsible organization and person according to the evaluation mechanism documents formulated by the school in three links before, during and after the class. Before the course starts, the evaluation basis for the achievement of the course objectives is proposed by the course teacher, which is reviewed by the school evaluation working group and the Faculty Teaching Steering Committee to ensure that the course can meet the output requirements well at the beginning. The course teacher plays a leading role in the course that follows up the whole course, and comprehensively reflects the achievement of the course through the calculation and evaluation report of the achievement of the course objectives, and makes quantitative analysis. The teacher submits the evaluation report to Faculty Teaching Steering Committee and the school evaluation working group to complete the rationality review of the course objective assessment. Guidance on periodic feedback information about graduates of this major is provided by relevant enterprises (demand side), the degree of course achievement is further analyzed qualitatively, the effect of continuous improvement output is formed.

4. Conclusion

Based on OBE concept and Bloom's taxonomy of educational objectives, With the goal of cultivating high-level applied talents for vehicle engineering, take the "output" quality as the standard, the progressive project teaching is realized. The high-level nature of the course has been improved, the innovation of the course has been highlighted, and the challenge of the course has been improved. Through the progressive project teaching course reform based on OBE, students' autonomous learning ability has been cultivated, their awareness of independent inquiry has been improved, learning methods more suitable for application-oriented undergraduate courses have been mastered, and students' ability to integrate and apply the knowledge they have learned has been strengthened.

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References


