Teaching Reform and Practice of Automobile Structure Course Based on OBE Concept

Peifeng Sun
Zhejiang University of Water Conservancy and Electric Power, Hangzhou, Zhejiang, China
21226206@qq.com
*Corresponding author

Keywords: OBE; Automobile Structure; Teaching Content; Teaching Method; Assessment

Abstract: This paper analyzes the main problems existing in the teaching of automobile structure course, and puts forward the idea of curriculum reform based on OBE. It includes the selection of teaching contents, the design of teaching means and methods, the reform of practical teaching and the optimization of assessment, so as to promote the continuous improvement of the teaching quality of automobile structure course.

1. Introduction

Automobile structure is an important professional course for undergraduate students majoring in vehicle engineering. It mainly provides students with the basic knowledge of the basic components, structural characteristics and working principles of automobile engine and chassis, as well as the basic skills of disassembly and assembly, which lays a foundation for the follow-up professional courses and professional work after graduation. At present, there are many problems in the teaching concept, teaching content, teaching methods and assessment of automobile structure course, which need to be carefully analyzed and solved one by one. The curriculum teaching model based on OBE insists on the three concepts of student-centered, results-oriented, and continuous improvement. It advocates the orientation of learning achievement, focuses on students and highlights the guiding role of teachers. The OBE educational model focuses on cultivating students' abilities, takes students as subjects, adopts heuristic teaching, and emphasizes on stimulating students' interest in learning, so that students can change from the mode of "asking me to learn" to "I want to learn", and then complete the change from "content centered" to "learning-centered". Thus, it is significant to establish the teaching mode of automobile structure course based on OBE concept to cultivate students' comprehensive qualities, improve the teaching effect and better adapt to the future career development.

2. Main Problems Existing in Current Teaching of Automobile Structure Course and Thoughts on Reform

At present, the main problems in the teaching of automobile structure course include the following aspects:

(1) Teaching content is contrary to OBE educational concept
The selection of teaching content is mainly based on the teaching plan and teachers' understanding of individual courses. Teachers take the lead in all aspects of the course and determine the teaching content according to their own wishes. They do not consider whether the teaching content is closely related to the actual production, nor whether the learning content plays a role in the cultivation of students' professional quality, so the selection of teaching content has obvious limitations.

(2) Practical teaching is contrary to OBE educational concept
The course experiment is out of touch with the purpose of cultivating students' practical ability. The course experiment is mainly based on confirmatory experiment. The students complete the
experimental steps according to the experimental content. The experimental process lacks inquiry and innovation, which is not good to the cultivation and improvement of students' practical ability.

3. Teaching evaluation system is contrary to the OBE educational concept

For the assessment of the automobile structure course, it mainly has the following problems. Firstly, the assessment has a single purpose, which focuses only on the assessment of the course content itself, not on the assessment of students' professional quality and future development ability. Secondly, the subject of assessment is single, with only the teacher's evaluation and assessment of students, but no mutual evaluation and assessment among students. Thirdly, the assessment process is insufficient, with only conclusive assessment, but no assessment for students' learning process. Fourthly, the assessment method is single, which focuses only on knowledge assessment, but ignores the assessment of students' practical ability, especially the assessment of students' learning and working attitude.

In response to the above questions, the reform concepts and ideas of this course are:

(1) The objectives of the teaching results based on the principle of “output orientation” in this course are: Students can use the knowledge and operational skills they have mastered to systematically master the overall structure of the automobile engine; Besides, they can master the functions, composition, structural characteristics and working principles of crank-connecting rod mechanism, valve distribution mechanism, fuel supply system, cooling system, lubrication system, etc.; Moreover, they also need to master the functions, composition, structural features and working principles of automotive transmission system, driving system, steering system and braking system.

(2) Guided by the above objectives, it is required to reform practical teaching on the basis of mastering the structure and principle of automobile engine and chassis. The disassembly, assembly and adjustment of the automobile engine and chassis assemblies are conducted, and the ability of using modern automobile technical tools and measuring tools is achieved; It requires teamwork to complete project tasks and improve teamwork abilities; Through the self-solving of various problems in automobile disassembly and assembly and adjustment, the ability to analyze and solve problems is improved.

(3) Reform the assessment. The course assessment should fully reflect the principle of “knowledge + skill + attitude”, especially the process assessment. Knowledge is mainly reflected through final exams and quizzes, while skill is mainly reflected through practical operations and task sheets. Besides, attitude is mainly reflected through students' class performance, communication with teachers at ordinary times, performance in the process of disassembly assembly and adjustment, and the ability to solve practical problems with classmates.

3. Implementation of Teaching Reform Based on OBE Concept

For the teaching reform design of automobile structure course based on OBE concept, the classroom teaching mainly explains the basic structures and principles. It focuses on the application and practice of theory, so that students can better understand the basic knowledge of automobile structure, improve their interest, and preliminarily understand the relevant theoretical systems, thinking modes and research methods. Practical teaching adopts the method of integration of theory and practice, which focuses on enabling students to master the disassembly, assembly and adjustment of automobile engine and chassis. In addition, the query of extracurricular materials is added to cultivate students' ability of literature search and self-learning.

3.1 The Selection of Teaching Content. According to the orientation of OBE engineering education, it needs to construct a more reasonable content system. At present, the contents of automobile structure course often focuses on the comprehensiveness and systematicness of theoretical knowledge. Compared with the development of modern automobile technology, the course content is also relatively outdated and backward. According to the concept of OBE engineering education, we must establish a modern education thought based on people. The selection of course content should follow the principles of necessity, typicality and advancing with the times. Specifically, based on the investigation and study of the corresponding positions of automobile enterprises, the teaching content of the automobile structure course should be sorted out.
and integrated. The whole course should be guided by the project, and the content should be decomposed into several projects to determine the knowledge, ability and quality needed for each project, and form a new curriculum structure system. Taking the driving system as an example, the project decomposition of the teaching content is shown in Table 1.

### Table 1. Project Decomposition and Learning Requirements of the Teaching Content (driving system)

<table>
<thead>
<tr>
<th>Subproject</th>
<th>Knowledge requirement</th>
<th>Skill requirement</th>
<th>Attitude requirement</th>
<th>Class hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 1 frame and axle</td>
<td>Master the structural features of the frame and axle</td>
<td>Learn the adjustment of front wheel alignment, the disassembly, assembly and adjustment of frame and axle</td>
<td>Standardization, cooperation, environmental protection, safety</td>
<td>4</td>
</tr>
<tr>
<td>Item 2 wheel and tire</td>
<td>Understand the function and structural features of the wheel and tire</td>
<td>Learn the disassembly, assembly and maintenance of the wheel and tire</td>
<td>Standardization, cooperation, environmental protection, safety</td>
<td>2</td>
</tr>
<tr>
<td>Item 3 suspension</td>
<td>Master the structural features of non-independent suspension and independent suspension</td>
<td>Learn the disassembly, assembly and maintenance of the suspension system</td>
<td>Standardization, cooperation, environmental protection, safety</td>
<td>4</td>
</tr>
</tbody>
</table>

### 3.2 The Design of Teaching Means and Methods. The innovation of classroom teaching mode is particularly important to achieve the teaching objectives based on OBE. We should insist on the teaching concept of "results-oriented, student-centered, enhancing engineering education and emphasizing ability cultivation", follow the teaching rules, and select suitable teaching methods and means according to specific teaching contents. In the innovation of teaching modes, we can introduce diversified teaching means and methods like research teaching, case teaching and project teaching, and actively guide students to start independent learning, research learning and collaborative learning.

In the specific teaching process, we should make full use of various occasions inside and outside the class, create the actual atmosphere of the project, and use the teaching method combining inspiration, guidance and questioning to stimulate students' desire for knowledge and guide students to think actively. We need to take full advantage of students' experimental classes, extra-curricular scientific and technological activities and opportunities to participate in some scientific research work, and actively promote heuristic, discussing and interactive teaching methods. Interactive teaching is student-centered. It stimulates students' enthusiasm to participate in teaching, cultivates their thinking ability, and improves their ability to analyze and solve problems through the interaction between students and teachers. Discussion-based teaching is usually conducted in the form of group discussions. Teachers put forward the overall requirements, students use the knowledge to analyze, discuss, summarize, and ultimately achieve the teaching objectives.

### 3.3 Reform of Practical Teaching. According to the OBE concept, in order to enable students to comprehensively grasp the structure and form of the automobile, schools should coordinate and establish a long-term relationship with the cooperative enterprises of the vehicle engineering to provide students with a corporate practice base outside the classroom. It is necessary to hire experienced engineers from enterprises as instructors of the practical session to explain the design principles and latest developments of the key components of the automobile to students. The
experiment of the automobile structure is a relatively independent practical teaching link, which complements the classroom teaching. Its overall goal is to cultivate rigorous scientific methods, scientific experimental abilities and creative abilities through experimental teaching. To achieve this goal, we should conduct the overall design of experimental teaching, break the single verification experimental mode, develop from basic verification experiment and self-designed experiment into comprehensive experiment and open self-help experiment.

3.4 Optimization of Assessment. One of the most important aspects of the OBE concept is "assessing learning output". Therefore, rational design and objective evaluation of students' abilities are important content to continuously improve the teaching effect of the course. The reform of the curriculum assessment should be good to diagnose, encourage and guide the assessment; to promote the reform of teaching contents and methods; to cultivate students' abilities to solve practical problems with the knowledge they have learned. Thus, it is necessary to establish a new concept of curriculum assessment, which is "diversified, process-oriented and competence-oriented", and a new model of curriculum assessment, which is "comprehensive assessment content, diversified assessment forms and whole assessment process". The curriculum assessment should change the situation of emphasizing theory over practice and finality over process. It is necessary to implement various forms, stages and types of assessment methods to change the current situation that "a test decides the result" in the final examination.

The assessment of OBE engineering education mode should include all the learning results of this course. The assessment results can fully reflect the individual growth and diversified development of students in the teaching process. The assessment and evaluation methods of automobile structure course must objectively and truly reflect the real level of students. The weight of final examination should be weakened relatively, and the assessment of normal learning process should be increased so as to realize the transformation from "conclusive assessment" to "formative assessment". The specific assessment can be divided into three parts: total score = knowledge score + skill score + attitude score. Among them, the knowledge score accounts for 50% of the total score, which includes the periodical quizzes and examination scores of each project. The skill score accounts for 30% of the total score, which mainly reflects the operating skill level of students in all teaching projects of this course, including teachers' score, students' self-evaluation score and students' mutual evaluation score; The attitude score accounts for 20% of the total score, which mainly includes students' professional ethics, communication and cooperation ability, attendance, classroom performance, attitude to finish homework, etc.

Conclusion

The essence of OBE educational mode is to take what students have learned as the final evaluation results, and the whole teaching process focuses on learning results. During the learning process, students can have a clear understanding of what will be achieved through the study of this course. The concept of OBE is applied to the reform of automobile structure, and the teaching is conducted around the training objectives of students majoring in vehicle engineering. The teaching process focuses on the goals of knowledge, ability and quality, and organizes the teaching around the professional knowledge, core competence and professional quality of the course. Finally, we can achieve the goal of talent training for the society of vehicle engineering. Practice has proved that after the teaching reform of the automobile structure course with the OBE educational mode, students' learning goals are clearer and effectively stimulate their interest in learning. In addition, this also makes up for the shortcomings in traditional teaching, and the efficiency and effectiveness of course teaching are also significantly improved.

References


