

# Automotive Theory Course Based on OBE Concept Research on Hybrid Teaching Innovation

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## Abstract

Automotive theory is typically a fundamental subject in the Vehicle Engineering major. Due to the complexity of their research subject and the uncertainty of the working environment, students often report encountering learning difficulties. With the development of the mobile Internet era, teachers are facing unprecedented challenges in the teaching process. Based on the current educational landscape, this paper extracts insights from the concept of OBE, fully embracing an output-oriented approach to student development. It delves into a comprehensive exploration and implementation of teaching innovations in the automobile theory course. Through the "expected output," the teaching process is designed to integrate cutting-edge applications, social demands, curriculum ideology, and politics. It aims to deepen the organic blend of online and offline teaching modes, optimize the evaluation system for personality and processes, and ultimately achieve a systematic integration of knowledge, abilities, and values in teaching objectives. This approach also fosters positive interactions between high and low-order cognition.

## Keywords

Automobile theory, results-oriented education, teaching innovation

The development of modern higher education is changing to improve the comprehensive ability of students. The traditional teaching mode is obviously difficult to meet the needs of modern education. Under the background of the national innovation and entrepreneurship strategy, the simple dual structure of teachers' active teaching and students' passive learning, and the teaching method of cramming and filling the classroom cannot adapt to the development of the new social situation. It is difficult to achieve the personalized needs of students and cultivate application-oriented talents with innovative spirit. It is of great significance to integrate the concept of OBE into the reform of teaching mode for improving the comprehensive quality of applied talents in colleges and universities.

## 1. OBE concept

The concept of OBE was first proposed in 1981 by American educator William Spady. According to him, results-oriented education means clearly focusing and organizing everything in the education system in order to ensure that learners have the experience to succeed in their future lives. After that, it was quickly valued and recognized by people. After about 10 years of development, a relatively complete theoretical system has been formed. OBE is output-oriented, emphasizing what students learn rather than what teachers teach. Therefore, the concept of OBE emphasizes that the core competence of students should be developed as the center, and the achievement of learning results should be the focused of the process. It emphasizes that the final results should mention the learning process. But the phased results should be evaluated one by one, so as to achieve open evaluation and continuous improvement. OBE means the new direction of the reform of

engineering personnel training in colleges and universities, and triggered the great discussion and new practice of the construction of "new engineering". On the whole, education with the OBE concept is characterized by attaching importance to the definition of Graduate Attributes, carrying out teaching activities around Intended Learning Outcomes, and valuing the assessment of students' learning output (Gu, 2014). From the perspective of the specific implementation process, the concept follows three principles clear focus, expanding opportunities, improving expectations, and reverse design (Li, 2014). It involves three key steps of "defining learning outcomes, realizing learning outcomes and evaluating learning outcomes", with the main purpose of solving five difficult problems in the process of talent training: (1) Objectives: What kind of learning outcomes to achieve; (2) Demand: why students should learn these outcomes; (3) Process: how to help students achieve these learning outcomes; (4) Evaluation: how to effectively measure the students' learning outcomes; (5) Improvement: How to effectively guarantee and continuously improve students' learning outcomes?

### **1.1 Three basic problems concerning the OBE concept**

(1) Focus on student development. OBE emphasizes the learning progress and development of each student and guides students to compare with themselves, so that students can build confidences. This requires educators to accurately grasp the learning state of students and accurate formulation of teaching strategies. This method will expand students' learning opportunities, and provide students with learning and development opportunities based on students' learning outcomes.

(2) Focus on output orientation. Output orientation focuses on students' "what they have learned" and their ability to "carry". OBE focuses on the peak achievements at the end of students' learning and the intermediate learning achievements only as the experience of improving teaching. The core goal of OBE is to guide students to achieve learning outcomes and convert the final learning outcomes (peak outcomes) achieved by students into measurable performance indicators (Feng, 2018).

There are two main methods to evaluate the teaching effect of OBE. Firstly, a self-referential evaluation should be done. OBE emphasizes whether students achieve learning outcomes, and considers their own learning progress. Second, teachers will develop different assessment standards according to the different learning abilities of each student. It comprehensively considers the achievement of learning outcomes of each student in different stages and sets different standards and evaluation systems according to different states of students. This means students with different learning abilities will use different learning methods in different learning periods to achieve learning outcomes.

(3) Focus on continuous improvement. As mentioned above, OBE is output-oriented, emphasizing what students learn rather than what teachers teach. Therefore, the concept of OBE emphasizes that the core competence of students should be developed, and the achievement of learning results should be emphasized in the implementation process. It emphasizes that the final results should be evaluated one by one without regard to the results of the learning process, so as to achieve open evaluation and continuous improvement (Ke, 2018).

### **1.2 Introduction of automobile theory course and analysis of teaching difficulties**

Automobile theory is one of the basic courses of the Vehicle Engineering major. The course of automobile theory embodies the achievements of human beings in the field of automobile for hundreds of years, which makes the teaching and learning of this subject indeed have certain difficulties and challenges, and it needs continuous teaching innovation exploration and practice to respond to the characteristics of the subject.

#### **(1) Students' learning difficulties**

First, curriculum theory is abstract and difficult to understand. Through the survey, we found that students generally reflect that theories related to automobiles are abstract and difficult to understand. It is partly related to the fact that most of the teaching objects are students in school and lack of social experience and field internship opportunities.

Second, it involves multiple disciplines and requires a high knowledge reserve. The complexity of the research object of automobile theory and the uncertainty of the automobile working environment determine the diversification of knowledge and methods. Therefore, the study of automobile theory will involve many subjects, requiring the learners of to have a generous knowledge reserve, in order to better understand the structure and principle of automobiles. Therefore, it is easy for students who just in contact with college life to be afraid of difficulties and have the psychological rejection of the course.

#### **(2) Changes brought about by the implementation of OBE**

The implementation of OBE will bring about changes in teaching. First, the discipline orientation changes to the goal orientation. Teaching evaluation of OBE focuses on students' learning outcomes. It emphasizes students' individual progress. This will encourage teachers to pay more attention to students' individual situations and change the traditional "classroom effect" and "overall situation" into specific results that each student really learns (Wei, 2020).

Additionally, classroom teaching has changed into teacher-student co-construction classroom mode. The goal of OBE is to help students achieve learning outcomes. The role of teachers in the learning process changes from "master" to "guide". Students no longer passively accept the fixed teaching content and form of teachers but achieve the expected learning outcomes under the guidance of teachers' demonstration, diagnosis, evaluation, constructive intervention, and other forms (An Yong, 2018).

### (3) Difficulties of teachers' teaching

First, traditional teaching methods face challenges and pressures. In the information age, information access is more and more convenient. Most teaching contents such as principles, concepts, cases, and even exercises are involved in automotive theory and related courses can be obtained at any time and anywhere online. It impacts the authority of teachers and also poses new challenges and requirements for the organization and integration of teaching content and the diversification of teaching methods.

Second, teaching evaluation is more about the result than the process. The reasons for this problem can be summarized into two aspects. On the one hand, for teaching basic courses, most universities will adopt the large-class teaching mode with a certain number of students, while the traditional teaching mode relies less on information technology. It makes it difficult to carry out large-scale personalized evaluation and process evaluation of students, as well as effective tracking and feedback of students' learning status. On the other hand, the evaluation system of teachers in most colleges and universities lays emphasis on scientific research, and teachers have limited investment in teaching research, teaching design, and teaching evaluation.

Third, integrating ideological and political thinking into the curriculum is crucial. It is necessary to think systematically to truly enable students to combine the study of relevant knowledge with work and life practice and establish correct socialist core values and cultural confidence. This requires teachers to constantly explore innovation in curriculum content design, looking for the right entry point and opportunity.

## **2. Innovative practice of hybrid teaching of automotive theory courses based on the OBE concept**

### **2.1 Innovation of teaching objectives**

The Vehicle Engineering teaching team explores the teaching objectives of the course and refines them into knowledge-ability index points. The teaching objectives of automobile theory are determined as three levels: knowledge level; the level of ability and the level of values (Shen, 2016).

### **2.2 Teaching content innovation**

(1) Focus on teaching content integration and reconstruction. Automobile theory is an application-oriented science focusing on practice, and most students are mainly based on learning experience, and the most familiar is theoretical knowledge. Therefore, students' thinking on the principles of automobiles can be triggered through the topics related to racing cars that they are interested in. The second is to try to restore the real situation of car work. Most automobile theory textbooks set the working process of the automobile as chapters, resulting in a certain disconnect between students' understanding of automobile work and practice, which requires teachers to pay attention to the integration and reconstruction of content in the classroom teaching process, try to restore the real situation of automobile work, and help students reduce the confusion and difficulty of combining theory with practice in learning.

(2) Strengthen localized case teaching. The development history of Chinese automobile enterprises, especially the achievements made by Chinese enterprises in the automobile field, these are not only a good teaching resource, but also an appropriate ideological and political element of the curriculum. Therefore, in the course of teaching, teachers can combine the development cases of China's excellent automobile enterprises to stimulate students' multi-level psychological response and emotional value identification. It can enhance students' learning interest and their perception and experience, realizing the positive interaction between high- and low-level cognition of automobile theory teaching objectives.

(3) Appropriate into the curriculum ideological and political goals. Based on the concept of OBE, with students as the center and moral education as the purpose, it provides students with a variety of learning content choices, and constantly brings the frontier of automotive research. In the teaching process, attention should be paid to guiding students to pay attention to the actual situation of operation and development of the country, society, industry, and local enterprises, leading students to participate in relevant topic research and the development of teaching cases of localized enterprises, introducing entrepreneurs to participate in classroom teaching interaction and discussion, stimulating students' identification of the value applied to their major learning, strengthening students' cognition and understanding of the major, and

realizing the combination of learning and thinking.

### 2.3 Deepening the mixed online and offline teaching model

With the development of the mobile Internet era, it is crucial for teaching models and students' needs.

(1) Online courses focus on static knowledge learning. The online course focuses on static knowledge such as the basic knowledge of automobile theory. Students can break the limitations of time and space, learn more repeatedly, and effectively meet their personalized learning needs of students. Since online courses basically realize the teaching of static knowledge such as basic knowledge of automobile theory, basic principles, and methods, the most important task of offline course teachers is to integrate and reconstruct teaching content, analyze and solve problems, so as to improve students' comprehensive ability.

(2) Classroom courses focus on the integration of teaching content. The main task of offline course teachers is to integrate and reconstruct the teaching content of automobile theory, and to analyze, judge, and comprehensively evaluate the theoretical problems of automobiles in specific situations by adopting various interactive teaching methods such as case analysis, group discussion, and situational simulation. These teaching forms are diversified through teaching activities such as cooperation between the main and auxiliary teachers and collaboration between industry experts.

### 2.4 Emphasize the combination of personality and process evaluation

An effective evaluation method can objectively reflect students' learning results and adjust the teaching process according to students' deficiencies. OBE education concept advocates the use of diverse forms and rich content of multiple evaluation methods to assess students' learning results, breaking through the traditional teaching summative evaluation method, and making the assessment results more objective and three-dimensional. The implementation of the OBE teaching model should be student-centered, meet students' personalized learning needs, develop an evaluation system for each student by understanding different students' different learning abilities and needs, and pay attention to students' final learning outcomes, but cannot be separated from reasonable intervention in their learning process. At present, in the process of automobile theory teaching, relying on modern information technology, the teaching team can realize the supervision of students and encourage students to learn voluntarily.

(1) Online review. The teaching team makes use of modern information technology, closely links with learning activities, designs and releases online teaching tasks and evaluations in a unified way. During and after classes, it makes teaching evaluations more personalized, procedural and rational. Online learning technology platforms can be used to track students' check-in, in-class practice, topic discussion, courseware preview, material reading, homework submission, and other situations in real-time, so as to realize the tracking and grasp of students' learning status and achieve the organic unity of personalized and procedural assessment.

(2) Evaluation in class. Through the design and implementation of the student-development-centered and problem-oriented teaching activities, the students' comprehensive ability is evaluated diagnostically. For example, in class group discussion, the evaluation of members' contribution is carried out through the design of rating table, so as to promote students' active learning and solve the problems of students' less investment in learning and more surprise before the exam. Students are encouraged to conduct self-evaluation and mutual evaluation of teaching activities. After class, students should give timely targeted suggestions and improvement measures for their homework. Combined with online personalized evaluation, classroom evaluation can strengthen the real-time interaction in the teaching process and truly realize the diagnostic evaluation of students' learning process.

(3) Final evaluation. Through the system of online evaluation, classroom evaluation and examination evaluation complementary assessment system, to achieve the diversification of assessment methods, solving the traditional teaching mode of the single form of assessment. The purpose of forming such a set of appraisal combinations is to promote the communication and interaction between teachers and students in the teaching process. By adopting the process examination to highlight the formation process of ability and the method that the final examination fully reflects the teaching objective, the problem of emphasizing knowledge and undervaluing ability in the current assessment can be overcome effectively.

## 3. Conclusion

The aim of OBE philosophy is always to carry out teaching activities to cultivate high-quality talents who can adapt to the continuous development of society. OBE concept is a more powerful driving force and practical operability to promote the innovation of automotive theory teaching. The automobile theory course carries out teaching innovation exploration

from the aspects of determining course teaching concepts, clarifying course objectives, carrying out mixed teaching mode, improving teaching methods, completely changing the traditional single teaching mode, stimulating students' learning interest, and improving students' comprehensive ability and innovative practical ability. The teaching goal has been achieved, and more excellent talents have been cultivated (Hu, 2016).

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