



Exploration of Curriculum Construction Based on OBE Concept

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Abstract. This paper first reviews the basic theory of OBE concept and the logical relationship between its three core elements. On this basis, the paper puts forward the idea of curriculum construction based on OBE, and introduces the curriculum construction process by taking new energy vehicle technology curriculum as an example. The results show that curriculum construction according to OBE concept meets the needs of the industry, is conducive to strengthening students' ability training and improving the quality of education.

Keywords: OBE concept; Curriculum construction; Teaching reform; Online and offline blended teaching.

1 Introduction

The cultivation of students' ability is mainly achieved through curriculums. A curriculum means the curriculum of a certain subject, which cannot be simply understood as a static textbook or teaching material, but should be understood as a dynamic process, and all links in the curriculum should belong to the category of the curriculum [1]. In a narrow sense, curriculum is a certain teaching subject composed of several concrete teaching contents. The curriculum system of a major is formed by the synthesis of all the teaching subjects specially set up to achieve the goal of talent training of the major.

The educational process determines the quality of talent training. The curriculum system, as the blueprint to support the goal of talent training, is the basis of students' knowledge structure and ability structure, which is particularly important in the educational process. There are still some problems between the curriculum and the realization of training goals:

The curriculum system lacks scientific verification.

Some curriculums do not properly deal with the relationship between teaching objectives, teaching content and teaching requirements.

The design concept, methods and means of the teaching process are single, the teaching content is obsolete.

The curriculum assessment is not perfect.

The Outcome-based education (OBE) oriented education concept is a new education model, which is currently vigorously promoted by the United States, Canada, the United Kingdom, and other countries [2]. OBE concept is also the core concept of teacher professional certification and engineering education certification. Therefore, curriculum construction must be based on OBE [3]. This paper aims to clarify a series of problems such as teaching objectives, teaching content, teaching requirements, teaching process and continuous improvement in the curriculum construction process with the guidance of OBE concept, to better serve the curriculum teaching.

2 Theoretical Basis of OBE

2.1 OBE Teaching Concept Definition

OBE is short for output-oriented education, which was first proposed by American scholar Spady in 1981. His definition of OBE is "clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experiences [4].

OBE adheres to the concept of "student-centered", focusing on what students can do and what abilities they can acquire at the end of their studies [5]. In the OBE's education, must answer five questions, namely: the content we want students to learn to master? Why do you need to learn this? How to help students succeed in achieving these learning outcomes? How can students be judged to have achieved these learning outcomes? How can teachers improve to ensure that students effectively achieve the expected learning goals [6]?

2.2 OBE Concept Main Framework

The main framework of OBE concept can be summarized with 1 core objective, 2 important conditions, 5 connotations, 4 implementation principles and 5 implementation points. The relationship between these elements is shown in Fig. 1.

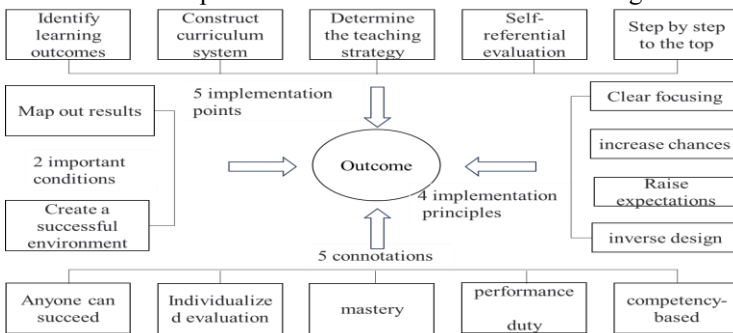


Fig. 1. OBE body framework

2.3 Core Elements of OBE Philosophy

The three core elements of the OBE philosophy are student-centered, output-oriented, and continuous improvement.

The student centered requires the teaching design to be based on students' knowledge, ability and quality, the allocation of teaching resources such as teachers, teaching materials, teaching AIDS, curriculum ware and infrastructure to ensure the achievement of students' learning goals, and the development of assessment and evaluation systems and quality assurance systems based on students' learning results. Reverse design is an output-oriented principle. The reverse design is corresponding to the commonly used forward design, which deduces the talent training objectives from the needs, determines the graduation requirements of students by the talent training objectives, and formulates the curriculum system according to the graduation requirements. The essence of results-oriented concept is reverse design and forward implementation. Under the OBE concept, demand is the starting point of OBE education concept, the source of educational goals, and the end point, corresponding to the educational results. So that the consistency of educational goals and educational results can be guaranteed to the greatest extent. Continuous improvement means that personnel training objectives, graduation requirements, curriculum teaching and other education links and participants should be evaluated, and all evaluation results must be related to improvement measures.

3 Curriculum Construction Thinking Based on OBE Concept

3.1 Set Curriculum Objectives

The professional training programme defines the competencies that students should possess upon graduation and after a period of work experience. According to the OBE education concept, curriculum objectives should be formulated based on the talent training objectives of the major and reverse design should be carried out, avoiding solely relying on subjective experience and relying on the content of the selected teaching materials to formulate teaching objectives. It is necessary to take the curriculum learning output as the guidance and implement the teaching with a clear purpose [7]. Therefore, in the process of formulating curriculum objectives, teachers should determine the expected results that students should achieve after the curriculum according to graduation requirements and knowledge fields of specific curriculums, and use this as curriculum objectives to develop targeted knowledge and skills systems.

Curriculum objectives should be determined based on the characteristics of the subject, combined with social needs and students' specific conditions. Curriculum objectives should be obtained through the decomposition of graduation requirements, which is to say, curriculum objectives should have a clear correspondence with certain graduation requirements indicators in the talent training program. According to the external and internal needs, the teaching steering committee of the secondary college develops graduation requirements and decomposes them into several graduation

requirements indicators. The curriculum teacher will list the graduation requirements supported by the curriculum one by one and discuss with the teaching reference committee of the school, and finally determine the curriculum goal. The overall goal of professional talent training is supported by the curriculum goals of all curriculums in the curriculum system. The curriculum objectives can be set by referring to the process shown in Fig. 2.

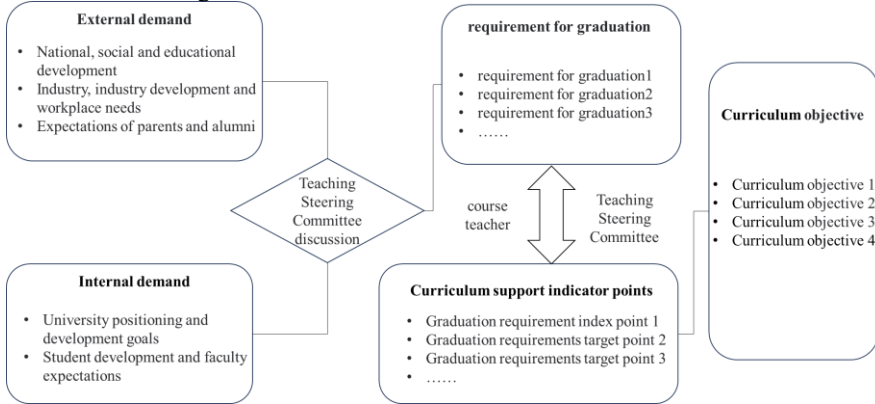


Fig. 2. Curriculum objective formulation process

3.2 Carry Out Instructional Design

After the curriculum objective is determined, it is necessary to refine the curriculum content according to the curriculum objective, ensure that the curriculum content is consistent with the curriculum objective, and the teaching arrangement of the curriculum is clear and the teaching content is reasonably connected to ensure that the curriculum objective is fully achieved. OBE concept emphasizes student-centered. In the actual teaching process, teachers can promote the development of theoretical teaching and practical teaching activities by reasonably setting the expected learning goals of students, and realize the comprehensive education through the integrated teaching method of theory, virtual and real.

To ensure the teaching effect, it is necessary to carry out teaching reform, make full use of Tencent Classroom, cloud class and other information teaching platforms, and do a good job in the management of the three teaching stages before, during and after class, to transform the teacher-lecture-oriented mode into teacher-led and student-dominated online and offline mixed teaching [8]. The teaching content should introduce industry developments and the latest technological progress to expand students' knowledge. The specific process is shown in Fig. 3.

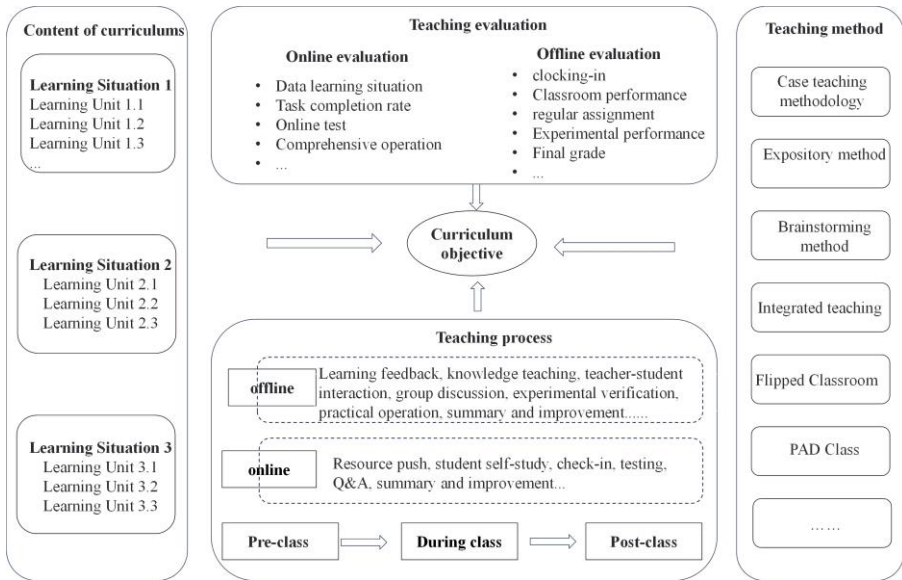


Fig. 3. Curriculum teaching implementation plan

3.3 Establish a Continuous Improvement Mechanism

The continuous improvement mechanism of curriculum teaching consists of teaching activity items, curriculum assessment methods, teaching analysis, evaluation results, improvement measures and responsible persons set up according to teaching requirements [9].

The curriculum teacher or curriculum group leader is the first person responsible for continuous improvement work, and is responsible for determining the basic tasks of teaching activities, including establishing the corresponding relationship between the curriculum teaching content and the curriculum goal, what skills should be cultivated in the teaching process, the implementation steps, and ways to achieve the curriculum goal, and the selection of teaching resources [10]. Based on the curriculum objectives, it extracts the theoretical knowledge points from the perspective of shaping the sustainable development ability of students, organizes teaching, sets up appropriate learning activities according to the corresponding curriculum content and graduation requirements, and achieves the support of the curriculum for the knowledge, ability and quality training goals determined by the talent training program, and promotes the growth of students.

4 OBE Concept Curriculum Reform Practice

The OBE model is adopted in the curriculum of "Electric Vehicle Technology". This curriculum has the characteristics of new technology, strong versatility, and strong practicality.

4.1 Curriculum Goal Setting

According to the requirements of talent training objectives and corresponding graduation requirements, the curriculum objectives of this curriculum are determined according to the characteristics of the technical knowledge system of intelligent networked vehicles:

Curriculum Objective 1. Establish quality awareness, service awareness, responsibility awareness and innovation awareness. Consciously practice the professional spirit of dedication, honesty and trustworthiness, excellence and so on. Carry forward the glory of labor, precious skills, and create a great trend of The Times.

Curriculum Objective 2. Familiar with automotive industry technology frontier, development history and trend. Systematically master the basic theory and knowledge of the new energy vehicle.

Curriculum Objective 3. Master the structure and working principle of the new energy vehicle, and be familiar with the test and evaluation specifications of new energy vehicles.

Curriculum Objective 4. Understand the meaning of learning community, cultivate teamwork spirit through group mutual assistance and cooperative learning, master communication skills and methods with others, and have good communication and cooperation ability.

Curriculum objectives and their supporting relationship to graduation requirements are shown in table 1.

Table 1. Curriculum objectives and their supporting relationship to graduation requirements

Curriculum Objective	requirement for graduation	target points of graduation requirements
Curriculum Objective 1	requirement for graduation 3 [craftsmanship spirit]	3.2 to be able to consciously practice of cherish posts and devote wholeheartedly to work, honest and trustworthy, excellence and professionalism.
Curriculum Objective 2	requirement for graduation 3 [Professional knowledge and competence]	4.1 Master the basic knowledge and principles of new energy vehicles.
Curriculum Objective 3	requirement for graduation 5 [professional practice]	5.2 Deeply understand and master the formation law of new energy vehicle engineering professional technical skills.
Curriculum Objective 4	requirement for graduation 11 [communication and collaboration]	11.1 Understand the connotation of learning community and master its characteristics and functions, have the spirit of teamwork, master listening, expression, communication, cooperation skills, and have group mutual assistance and cooperative learning experience.

4.2 Curriculum Content Reconstruction

According to the requirements of the curriculum objectives, the content of the new energy vehicle technology curriculum is reconstructed. The curriculum team carried out reforms from the three aspects of knowledge, skills, and student experience, sorted out the curriculum knowledge system and revised the curriculum teaching content.

Identify what needs to be taught to students and what students' study on their own or practice.

According to the above methods, new energy vehicle technology is determined to be divided into 5 parts: introduction, Power battery, drive motor, charging system, electric vehicle maintenance. The key points and difficulties of each chapter are indicated, and the corresponding relationship between each knowledge point and the curriculum objective is given.

4.3 Online and Offline Mixed Teaching Model Reform

The principle of new energy vehicle is complicated and difficult to understand. The curriculum is mainly theoretical teaching, and the teaching time is less, the number of teaching AIDS is insufficient, and some functions are difficult to experience in the real car. To solve the above problems, this curriculum carried out the reform of VR+ online and offline mixed teaching mode. Curriculum activities are divided into three stages: before class, during class and after class. Make full use of online teaching platforms such as Rain class to promote students' online learning.

The offline teaching carries out the reform of teaching mode such as flipped classroom and divided classroom, and follows the principle of teacher-led and student-dominated. In the teaching process, the corresponding VR teaching system has been developed for the teaching contents that are difficult to intuitively understand and experience in real vehicles, so that students can get a better immersive experience in the virtual environment, stimulate students' learning interest.

4.4 Achievement Analysis and Continuous Improvement

According to the OBE concept, a curriculum achievement analysis should be carried out after the curriculum. The teaching process is divided into 6 assessment items, and the supporting curriculum objectives and score ratio of each assessment item are determined, as shown in Table 2.

Table 2. Support relationship between assessment items and curriculum objectives

evaluation indicator	Objective 1	Objective 2	Objective 3	Objective 4
prepare lessons	10%			
checking-in	10%			
classroom interaction		10%		
classroom test			10%	
experiment				20%
final assignment			40%	

The achievement degree of each student's score is statistically converted to form the achievement degree of each curriculum goal and the overall achievement degree of the curriculum. Carry out the achievement degree analysis, formulate the improvement measures. Improvements include clarifying learning outcomes, implement-

ing formative assessments, using data to drive decision making, encouraging teacher-student interaction, and periodically reviewing and updating curricula.

4.5 Effect of Teaching Reform

To verify the effect of teaching reform, a survey questionnaire was designed to evaluate the satisfaction of curriculum teaching from eight aspects. A 5-point scale was adopted, with 1-5 points corresponding to very dissatisfied, dissatisfied, medium, satisfied, and very satisfied. The students who take the new energy vehicle technology curriculum in 2022 and 2023 are defined as the reform group and the control group respectively, and the survey results are shown in Table 3.

Table 3. Teaching reform satisfaction questionnaire

Item	Reform group	Control group
curriculum objectives	4.85	4.7
curriculum contents	4.82	4.5
teaching methods	4.72	4.53
teaching materials	4.65	4.46
teacher support	4.54	4.5
learning experience	4.77	4.66
evaluation mode	4.82	4.71
learning outcomes	4.73	4.55

According to the survey and questionnaire feedback, it shows that the reformed new energy vehicle technology course has clearer course objectives, more in line with social needs, more novel teaching methods, more abundant teaching resources, more reasonable assessment methods, more challenging and proactive learning, and learning results are closer to the requirements of the course objectives.

5 Conclusion

Based on the introduction of the OBE concept, this paper further showcases how to integrate the OBE philosophy into curriculum development by establishing clear learning outcomes, modifying teaching methods, and revising assessment systems. Taking the electric vehicle technology course as a case study, this research reveals how curriculum construction grounded in OBE can significantly improve students' comprehensive abilities, especially in innovation, engineering practice, and problem-solving. Practice demonstrates that OBE not only facilitates the alignment of curriculum systems with industry standards and job demands but also enhances the congruence between instructional content and learning outcomes, paving new pathways for elevating educational quality, and fostering holistic student development. Moving forward, deepening the application of OBE in curriculum construction will further enrich the essence of education and instruction, laying a solid foundation for nurturing vocational educators and exceptional engineering talents adept at meeting the demands of societal advancement.

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