

Research on Teaching Reform of Algorithm Analysis and Design Based on Obe

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ABSTRACT. *The OBE teaching theory is the core theory of international engineering education. Algorithm analysis and design is one of the core courses of computer science. According to the main problems in teaching, the teaching objectives, teaching resource, assessment methods and curriculum attainment of the course under the OBE model were reformed to further improve the quality of the course and the quality of talent training.*

KEYWORDS: *Obe, Process assessment, Curriculum reform, New engineering construction*

1. Introduction

Outcome-oriented education (OBE) is a kind of educational concept oriented by students' learning outcomes. It holds that the goal of teaching design and implementation is the final learning outcomes achieved by students through the educational process. The implementation of OBE should follow four principles: 1). Teaching should clearly focus on the final learning results that students can achieve after completing the learning process, and let students focus their learning goals on these learning results. 2). Teaching should fully consider the individual differences of each student, and ensure that every student has the opportunity to achieve learning results in terms of time and resources. 3). Teaching should set challenging standards to encourage students to study in depth and promote more successful learning. 4). Take the ultimate goal as the starting point, reverse design and carry out teaching activities.

OBE is one of the important choices for the development of Engineering specialty, the certification of engineering education and the reform of personnel training mode in China[1-3]. Widely practicing OBE education concept in curriculum teaching is conducive to speeding up the transformation and upgrading of specialties and promoting the construction of new subjects. In the teaching mode based on OBE, teachers need to set goals (final learning results or peak results) according to the content of the curriculum, and then improve teaching methods, build curriculum resources, reform students' performance assessment methods and introduce curriculum achievement evaluation system.

2. Analysis of Current Teaching Situation

Algorithmic Analysis and Design is a major course in computer science. It mainly introduces the classical algorithm design strategies and complexity analysis methods to cultivate students' ability to analyze and solve problems. It lays a solid foundation for algorithm design, research and efficient development of related software. At present, in the course of teaching, there are some problems as follows.

2.1 Lack of Accuracy in Teaching Objectives

The existing curriculum teaching objectives start from the knowledge points of the curriculum, and require students to master the algorithm complexity calculation method, the evaluation method of the algorithm's advantages and disadvantages, and the classical algorithm design strategy, rather than what the students can do. In the course of teaching for many years, it often happens that teachers explain a lot of knowledge points carefully, and most students also study these contents seriously, but the general result is that students do not know what kind of problems they want to solve. Therefore, the teaching objectives need to be adjusted to support the graduation requirements, and to formulate the final learning results that students can achieve.

2.2 Teacher-Centered Teaching Model

In the process of teaching, the teacher-centered classroom teaching is beneficial to the teacher's leading role, and the classroom effect is controllable, but the students are in a passive position. In addition, due to the difference of student's individual situation, the time and energy devoted to the curriculum are uneven and even polarized. Therefore, we should reform the existing teaching mode, improve the construction of supporting teaching resources, make students become passive and active, and ensure that every student has the opportunity to achieve learning results in terms of time and resources.

2.3 Single Way of Students' Achievement Assessment

The total score of the course includes 30% of the average time score and 70% of the paper score, which is calculated by attendance records and daily homework results. The paper score is the actual score of the final examination. This kind of assessment method and calculation proportion can only focus on the performance of students in the final examination, which has certain one-sidedness and limitations.

2.4 Lack of Evaluation of Curriculum Achievement

At present, after the end of the course, a test paper analysis is generated according to the student's score sheet. The analysis results only include the

distribution of the students' score on the paper. According to the analysis of the test paper, the teacher draws a conclusion about the students' learning effect and puts forward corresponding improvement measures. It is obviously unscientific to simply rely on students' final exam results to determine learning outcomes or teaching effectiveness.

3. Teaching Reform Based on Obe Model

According to the core concepts of student-centered, achievement-oriented and continuous improvement of OBE, curriculum reform needs to accomplish curriculum goal setting, teaching method improvement, curriculum resources construction, student assessment methods, etc., and introduce curriculum achievement evaluation..

3.1 Curriculum Goal Setting

According to the requirements of OBE teaching objectives, the undergraduate algorithmic analysis and design teaching in our university should achieve the following three objectives:

Goal 1: Grasp the analysis method of algorithm complexity, and be able to analyze the algorithm complexity of complex engineering problems.

Goal 2: Grasp common algorithms and be able to analyze the nature of the problem and build models.

Goal 3: To identify the computable parts of complex engineering problems and their key operations by consulting literature.

The support of the course to the graduation requirements is shown in Table 1.

Table 1 the Support Of Courses to Graduation Requirements

Course Goals	Graduation Requirements Indicator Point
Goal 1	(1)Master the professional theory of computer science and technology, can be used to explain, verify and analyze computer systems.
Goal 2	(2)Ability to abstract complex engineering problems in the field of computer engineering using basic principles of mathematics, natural science and Computer Engineering Science.
Goal 3	(3)It can identify the computable parts of complex engineering problems, divide functional boundaries and identify key factors in combination with literature research.

3.2 Reform of Teaching Methods

According to the characteristics of OBE teaching mode, the teaching mode should be student-centered. Teachers use demonstration, diagnosis, feedback and intervention to guide students to achieve the desired learning effect. Specific teaching methods can integrate case teaching method [4] and flip classroom, watch teaching videos after class, consult relevant materials, and discuss cases in groups in class. Students must pay enough time and energy after class to ensure the effect of group discussion and the quality of finished homework. Transforming the teaching mode to the learning mode and giving full play to the value of teacher-student interaction in the whole teaching process.

3.3 Course Resources Construction

In order to fit in with the teaching mode of flipping classroom and adapt to students' self-study after class and discussion in class, curriculum resources should be built from three aspects: the construction of teaching case base, the recording of teaching video and the introduction of teaching platform system. Teaching cases are used for discussion in group classes, teaching videos are used for preview and review after class, teaching platforms are used for communication between students and students, between students and teachers, the issuance of teaching resources, as well as for daily or final online assessment system.

3.4 Reform of Student Assessment Method

Achievement-oriented education needs to change the traditional way of assessment, replace the traditional pattern of 37 points of ordinary performance and final assessment with process-based comprehensive assessment, and change the status of final assessment results close to "one-stroke finalization". Examination results are composed of homework, practice, stage test and final test, accounting for 25%, 25%, 25% and 25% respectively.

(1)Homework Achievements: The submission of assignments in group discussions is used to evaluate the effectiveness of group discussions. It is recommended that the scores be set at least twice, each time according to the number of assignments and the degree of difficulty. The total score is 100 points.

(2)Practical Achievements: The goal of students' practice on the computer has been achieved. The report is submitted at least twice. Each score is based on the number of reports and the degree of difficulty. The total score is 100.

(3)Stage test results: Stage test, as a means of reflecting the results of stage learning, is recommended not less than two times, with a full score of 100 points.

(4)Final test results: Final test after class, for the comprehensive examination of the knowledge points of the course, the full score is 100..

These methods are helpful to change the distinctive evaluation among students in the final exam [5], emphasizing the self-comparison of a series of personal achievements in the process of students' learning, and gradually exploring students'

learning potential through the process of assessment.

3.5 Evaluation of Course Achievement Degree

Whether the evaluation system of course achievement degree has been applied to the teaching of courses has achieved the expected goals, the specific contents are as follows:

(1) Four scores were obtained by multiplying the corresponding percentage data in Table 2 with the scores of assignments, practice, stage and final tests, respectively.

(2) By calculating the score of each course goal and comparing with the standard of achieving the goal, the evaluation result of each course goal is obtained. The result is used to calculate the degree of achievement of the graduation requirement index point and to improve the teaching quality.

Table 2 Evaluation of Course Achievement Degree

Course Goals	Graduation Requirements Indicator Point	Homework Achievements	Practical Achievements	Stage test results	Final test results	Total	Goal Achievement Criteria
1	(1)			10%	10%	20%	≥ 0.6
2	(2)		15%	15%	15%	45%	≥ 0.6
3	(3)	25%	10%			35%	≥ 0.6
	Total	25%	25%	25%	25%	100%	

4. Conclusion

The reform of OBE-oriented curriculum model takes the teaching objectives as the starting point to reverse design and carry out teaching activities, stimulate students' interest in exploring and creating, and promote teachers to better build rich teaching resources and integrate more advanced teaching methods. Applying OBE teaching mode to the teaching of algorithm analysis and design is a beneficial teaching reform practice. From the feedback of students, the teaching process can mobilize students' initiative more effectively, and the assessment results can reflect students' learning results more accurately. The evaluation results of curriculum achievement degree reflect the achievement degree of different curriculum objectives, and can be used as a scientific basis for curriculum arrangement in the next semester.

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