



Research on Sustainable Improvement of Computer Courses Teaching Based on OBE

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Abstract. OBE (Outcomes-Based Education) requires that the course teaching focus on the final learning outcomes that students can achieve after completing the learning process. Therefore, in the teaching of computer course, through expanding the teaching content and modifying the teaching methods, the students' learning objectives are finally achieved. Using the problem as the driving force, students carry on the creative divergent thinking to solve the problem with interest. Finally students achieve the goal of knowledge learning and ability training. The students can analyse, design and solve complex engineering problems after learning.

Keywords: OBE (Outcomes-Based Education) · Learning Outcomes · Problem Driving

1 Introduction

OBE (outcomes based education) was first proposed by Spady, an American scholar, in 1981. From the 1980s to the 1990s, OBE has been rapidly promoted and developed [1, 2]. The American Association for Engineering Education Accreditation (ABET) has fully accepted the concept of OBE and has implemented it throughout the certification standard of engineering education. In the OBE education mode, what is important is what students have learned. Teachers must have a clear idea of the ability and level that students should achieve when they graduate, and then design an appropriate training system to ensure that students achieve these expected goals.

In 2016, China joined the Washington Agreement [3], which means that Chinese colleges and universities have also begun to carry out engineering education certification, and graduates who pass the certification will be internationally recognized. This is a great advantage for students. Because of this, all courses of all majors also need to keep up with the international situation, adapt to international needs, and carry out OBE based reform and innovation [4–7].

2 Improvement of Computer Courses Teaching Based on OBE

In traditional teaching, the knowledge point is explained one by one, so that students can master the knowledge. In this way, students do not know what they can do with this

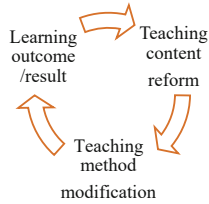


Fig. 1. The Education Program Based on Learning Outcome

knowledge in the end of the course learning. The OBE teaching model can really measure what students can do and what abilities they can have after learning. This requires that the teaching should be reformed, and the focus of teaching design should be on the final learning results that students can achieve after completing the learning process. It means to determine the teaching objectives of the course, reform the teaching content and teaching methods, and gradually promote the teaching process of result driven teaching from the back to the front, as shown in Fig. 1.

The following takes software courses teaching reform based on OBE as an example.

2.1 Reform of Teaching Objectives

Most of the traditional teaching goal is to master basic knowledge, understand basic theories, and know the application of theories. In order to meet the needs of OBE, the teaching goal of the software courses should be to cultivate students to solve specific problems with the knowledge they have learned. In the teaching of software courses, it can be embodied as the following goals.

- (1) Be able to abstract and design problems by analysing, and have the ability to learn and use basic knowledge.
- (2) Be able to use books, networks and other resources to conduct literature research, analyse problems and design schemes, and have the ability to analyse and evaluate the design schemes.
- (3) Be able to establish a reasonable software architecture and program structure according to specific software requirements and corresponding algorithms, and realize the development capabilities of coding, running, debugging.
- (4) Be able to analyse the characteristics of problems, comprehensively use the knowledge learned, design experimental schemes, and have the ability to solve practical problems.

These four goals are progressive, as shown in Fig. 2.

2.2 Reform and Innovation of Teaching Content and Teaching Methods

In order to achieve the learning results of the course, it is necessary to improve the teaching content and teaching methods of the course in reverse from the learning results.

In terms of teaching content, the ultimate goal of the course is to solve engineering problems. Therefore, we should introduce “problems” into the course teaching and

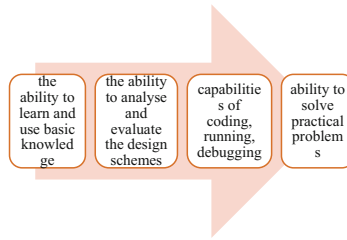


Fig. 2. The four objects of software courses

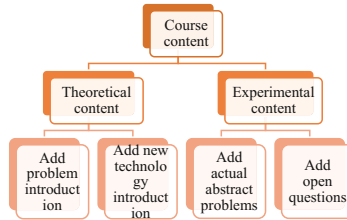


Fig. 3. The Reform and Innovation of the Course Content

introduce new technologies in engineering into the course teaching content. The reform of specific teaching content is divided into the following two aspects.

- (1) In addition to the basic content of the course, the theoretical teaching part of the course teaching actively introduces new knowledge to enrich the learning content and strengthen the learning effect. For example, in today's rapid development of the Internet, web search engines are widely used, and how do search engines achieve it? Based on the introduction of the principle of search engine, students can be guided to analyse and design the solution of problems.
- (2) In the experimental teaching part of the course teaching, the weight of the practice link should be increased and the effect of solving problems with computers is emphasized. In the experiment teaching, how to analyse, program and realize the different types of problems is the main content. Also some open questions is given to guide students to design the overall experimental scheme, complete coding and testing it, and finally solve the problem.

The contents reform is shown in Fig. 3.

In terms of teaching methods, the traditional cramming teaching method is no longer suitable for the new OBE teaching requirements so it also needs to be reformed and innovated. OBE emphasizes learning outcomes. Therefore, how to achieve this outcome should be considered in teaching, that is, how to enable students to solve practical problems. Therefore, we should not blindly teach in teaching, but should guide and open the combination of teaching and learning, so that students can learn actively and consciously, and learn with the goal of solving practical problems. The specific method of problem driven teaching is adopted, as shown in Fig. 4.

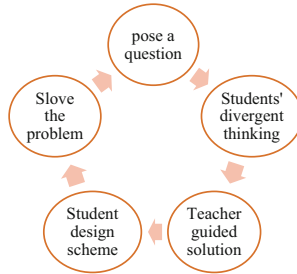


Fig. 4. Problem Driving Education



Fig. 5. The Diversified Assessment Methods

In problem driven teaching, we should first ask questions to arouse students’ interest in learning. Then, students should think divergently, try to solve problems, and mobilize students’ enthusiasm for learning. After students put forward various solutions to the problem, guide students to use the learned data structure to solve the organization and storage of data in the problem, and use the learned algorithm to design the steps and processes of problem solving. After that, students design and implement by themselves, and solve this problem by themselves. At this point, students really learned the methods to solve problems and gained the ability to solve problems.

2.3 Diversified Assessment and Evaluation Based on OBE

OBE based teaching should not only be reflected in teaching content and teaching methods, but also be reformed in assessment and evaluation.

In the course assessment, multiple assessment methods are adopted. The assessment method include daily homework, class performance, experimental performance, report writing, final examination and other aspects, as shown in Fig. 5.

The assessment of practice and daily performance is added to evaluate whether students can have the ability to solve problems.

3 Sustainable Improvement

Now, many scholars are studied the OBE reform of data structure course, such as articles [8–10]. In this paper we also take the data structure course as an example. After

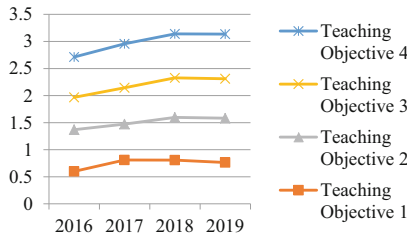


Fig. 6. The Comparison of achievement Degree

Table 1. The Analyze of achievement Degree for Data Structure’s objectives in 2016–2019

Grade	Teaching Objective 1	Teaching Objective 2	Teaching Objective 3	Teaching Objective 4
2016	0.599	0.771	0.598	0.744
2017	0.810	0.663	0.672	0.811
2018	0.807	0.791	0.729	0.812
2019	0.764	0.818	0.729	0.825

the teaching reform and innovation based on OBE, the learning effect and academic performance of previous students are measured and compared, and it is found that the achievement effect of the teaching objectives of the course is improving year by year.

For more intuitive comparison, make the data in Table 1 into a line chart, as shown in Fig. 6.

Comparing the achievement degree of the four teaching objectives of the students in 4 grades from 2016 to 2019, horizontally, the achievement degree of the objectives fluctuates. But on the whole, the achievement degree of the objective 3, which is the capabilities of coding, running, debugging, is not good enough. Base on this situation, we should continue to improve strategies in course teaching, increase the proportion of experimental parts, and guide students to analyse and design with cases. Vertically, the achievement degrees have generally increased year by year, but there has also been a decline in individual years. For example, there has been a slight decline in the achievement degree of objective 1 in 2019. This indicates that the ability to learn and use basic knowledge needs to be improved.

4 Conclusion

After analysing a series of data, this paper finds that the teaching based on OBE is helpful to students. It can make students get the real learning results they want, and students’ learning enthusiasm has also been greatly improved. However, in the practice results, it is also found that the degree of achievement sometimes fluctuates, which requires continuous and sustainable improvement to ensure that the overall situation of students’ learning outcomes is getting better and better.

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