Discussion on the Reform of University Teaching Mode Based on OBE Engineering Education Concept

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ABSTRACT

At present, the professional certification of Engineering Education in colleges and universities in China is a concrete embodiment of the application of OBE engineering education concept. First of all, the paper enumerates the current situation and problems of the traditional higher education. From the OBE engineering concept, "education evaluation is based on learning output" and "educational flexibility", the university teaching mode is reformed: on the one hand, we carry out the construction of the course team, carrying out the flexible and diverse classroom teaching mode; on the other hand, we carry out the practice on scientific research training and the guidance of practice on scientific and technological innovation in an all-round way. We have applied it in the actual teaching process of energy and power engineering specialty in our school, which achieved good teaching results.¹

KEYWORDS

OBE engineering education concept; undergraduate teaching; teaching quality; classroom teaching; innovation ability

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INTRODUCTION

The engineering education concept which is based on the "learning output" (outcome-based education, OBE), originated in the United States, is a widely recognized model of Higher Engineering Education in the world. Since the formal implementation of the OBE education concept in the United States in 1994, many countries have carried out and experimented it in various aspects and levels of education system around the world. The certification of Engineering Education in colleges and universities is also a certification standard based on this education concept. The OBE concept emphasizes that educational evaluation is based on learning output, focusing on whether the training objectives and graduation requirements are clear, and whether the goals set are met. It pays attention to how students learn, in order to ensure that the learners are able to acquire the knowledge, abilities and qualities needed to enter the society. Secondly, the OBE concept emphasizes the flexibility of education. On the basis of a clear target on output, OBE is not confined to specific guidance, and teachers can use different teaching methods and different evaluation methods according to different types of learners [1].

Based on the concept of this engineering education, college students are required not only to have a solid theoretical basis and professional knowledge, but also to use professional knowledge and modern tools to analyze problems, solve complex problems and study problems, paying attention to factors such as engineering and society, environment, safety, health, law and sustainable development. At the same time, college students must comply with the professional norms and they should have the abilities of communication, team cooperation and project management, even the awareness and ability of self-learning and lifelong learning and so on [2]. For the students, these abilities and qualities make them a clear goal for their study and growth in school, laying a solid foundation for their development after graduate and long-term development. However, most of our college graduates are difficult to meet this international demand and are more difficult to fill the changing demand for talents in current society and times. The main reason is that most universities in our country adopts traditional teaching methods, such as knowledge inculcation, cramming teaching, lack of ability training and so on [3] [4]. This education mode can no longer meet the requirements of graduates in the development of modern society technique. This paper analyzes the main problems in the traditional teaching mode of most universities in China. Based on the concept of OBE engineering education, the reform of teaching mode is put forward. The classroom teaching mode adopts various teaching modes such as discussion, case, process assessment and so on. Ability training adopts the teaching mode of guidance on comprehensive scientific research training and scientific and technological innovation. The mode is applied in the teaching of energy and power engineering specialty to explore the methods of university teaching mode reform and the improvement of college students' comprehensive quality and ability.
PROBLEMS AND ANALYSIS OF TRADITIONAL EDUCATION

The traditional teaching mode is mainly manifested in the following forms: the first is cramming classroom teaching mode. Teachers teach students mainly according to the contents and progress of the syllabus, and less attention is paid to the students' reaction, effect and question during the course of the lecture, which easily leads to students' lack of understanding and absorption of knowledge, causing "camp". This mode will restrict students' thinking and makes students' learning enthusiasm and initiative be greatly affected [5]; the second is a closed classroom teaching mode [6]: teaching content is only limited to textbooks or courseware, rarely extended and updated in combination with the production practice and the frontier of international technology development, so that students less learn new knowledge. In this teaching method, teachers speak the fixed form of students listening, students are always in a passive state. It lacks of communication between teachers and students, or students and students, so that students can't give full play to initiative and inquiry, losing interest in learning; the third is the teaching model based on knowledge. Teachers are the main body of teaching activities, who only instills the theoretical knowledge in textbook to students. The students' thinking goes forward along the "route", which is determined in advance. Thus they lack of inquiry and understanding of the theoretical problems in class, so that the students can't make good use of the theoretical knowledge they have learned to analyze and solve practical problems. It is easy to appear "high score, low energy" or "nerd" phenomenon. The fourth is the pattern teaching model [7]: the main manifestation is that the teacher seldom guides the students to think positively after class. The course experiment is only based on the verifying experiment, which lacks attention to the training of the students' practical ability and creative thinking ability. The students' comprehensive application ability and innovation ability are insufficient.

The above traditional teaching mode is common in most colleges and universities’ teaching, which seriously affects the quality of our college students' training quality to a certain extent. OBE engineering education concept emphasizes that education is based on learning output and emphasizes the flexibility of education. Therefore, the reform of university teaching mode should be "centered on students". In the course of specific teaching, teachers can use different teaching methods and different evaluation methods according to different types of learners. Our school teachers have carried out a series of teaching reforms in the teaching of energy and power engineering specialty based on the concept of OBE engineering education.

EXPLORATION OF TEACHING MODE REFORM

The energy and power engineering specialty of our school has a class of students each year, and the number of students in each grade is 30 to 40. There are 11 teachers in the energy and power engineering department, of which 6 are young
teachers. According to our teaching tasks and teachers' expertise, 2-3 teachers form a curriculum development team in each course. One of them is the head of curriculum team building. In addition, the professional tutor system is implied, which means that each teacher guide 2 or 3 students in each class to carry out scientific research training and scientific and technological activities.

The reform of teaching mode is mainly from three aspects: the first is to adopt a variety of classroom teaching modes to explore ways on improving the effect of classroom teaching; the second is to pay attention to science and technology and innovation practice teaching, to cultivate students' comprehensive application ability and scientific and technological innovation ability; the third is to pay attention to the teaching discussion and improvement on teachers' teaching ability and guidance ability.

Explore Ways to Improve Classroom Teaching Effect

Based on OBE engineering teaching concept, we adopted a variety of classroom teaching modes to explore the ways to improve classroom teaching effectiveness, which are mainly divided into three parts. First, every teacher listened to the class in depth to understand the teacher's lecture and the idea of the students; second, the teaching discussion were carried out to improve the teaching ability and level of teachers; third, a variety of teaching modes were also actively carry out, and improved the teaching practice in the classroom teaching practice according to the feedback from students' learning effect.

FIND OUT THE PROBLEM OF CLASSROOM TEACHING

In order to grasp the first-hand information of classroom teaching, we started from two aspects: teachers and students. Our department have set up a plan for teachers to listen to each other in class. On the one hand, the plan asks each teacher to listen to the class at random more than three times. They also should communicate with the teachers and discuss the problems found in the teaching. On the other hand, teachers should communicate with the students to understand the ideas of them in the classroom.

In this process, every teacher participated actively, accumulating 42 lectures in one semester, covering all the teachers of our department. Before the communication with the students, we carried out the discussion about the feedback of the lectures in advance and put forward 12 questions to communicate with the students. We selected 32 students in the four grades of the specialty. After the meeting, 32 students responded to the proposed 12 questions. Through listening to the class and the communication with students, we have mastered first-hand classroom teaching and found many problems in classroom teaching.
OBSERVE THE ART OF CLASSROOM TEACHING

In view of various problems in teaching, teachers of the whole department classified and sorted out these problems. Individual problems were fed back to teachers in a way of individual communication; common problems were discussed in the teaching conference. At the same time, we organized teachers to carry out a series of teaching and research activities: observed the teaching of excellent teachers; discussed with outstanding teachers in foreign schools; communicated with teachers in the steering group. In these series of teaching activities, all the teachers have shown great enthusiasm and gained great inspiration and harvest. On these basis, several teachers in the same course discussed the details of the teaching process and the corresponding classroom teaching mode. In the process of discussion, several teachers demonstrated in the same part of the teaching content. The young teachers are deeply affected by the teaching demonstration of excellent teachers. The parts where the young teachers were not in place in the teaching were also solved by the help of old teachers. Teaching is an art, and every teacher should have his own teaching style. Through the discussion, many young teachers have trained their own teaching style and their teaching level were greatly improved. They said, "this kind of communication is very good, no embarrassment. I can feel the sincerity and love of everyone, and the inaccurate and unhandled teaching problems were easily solved."

ACTIVELY CARRY OUT VARIOUS TEACHING MODES

In addition, in the process of classroom teaching, teachers have attempted a variety of classroom teaching models, such as case class, discussion class, overturn class, problem class and other classroom teaching. The department often carried out various teaching modes to observe and made discussion. We actively listened to the feedback of students and constantly improved in the teaching process. We achieved a better teaching results when the class hours were reduced.

Attach Importance on Innovative Practice Teaching

Based on OBE engineering education concept, innovative practice teaching in colleges and universities is an indispensable part of university education to educate college students, which is also an important means of quality education for them. It is rich in content, diverse in form, and the students are willing to participate actively. As an extension of classroom teaching, it is beneficial to supplement the content of classroom education and provide any more broad space for cultivating the personality and all-round development of talents [8]. With the development of economic society and the deepening of the reform of college students' quality education in university education, the unique role of innovative practice teaching in colleges and universities is playing an increasingly prominent role in the classroom teaching. In the process of carrying out quality education, classroom teaching is the
main position, but the innovation and practice teaching is also significant for the colleges and universities to accomplish the goal of talent training. Especially the innovative practical activities such as academic competition, scientific research training, skill training and so on, is of great significance for cultivating students' innovative ability. But this activity needs the teacher's careful guidance to achieve good results.

While carrying out the work of improving classroom teaching effect, our department also actively explore innovative practice teaching. This activity is mainly based on the students' professional tutor system. Each teacher guides 2 or 3 students in each grade. Each student can participate in the teacher's scientific research project or participate in the scientific and technological innovation project guided by the teacher. In order to ensure the sustainable development of this activity, three provisions are formulated: the first is to require each student to participate in scientific research or scientific and technological innovation over 2 hours per week; the second is to organize exchange of experience in scientific research training and innovation practice teaching every semester in the department, and each teacher will share their experience on scientific research training and innovation practice teaching; the third is to organize each student to make a report for their own scientific research training or scientific and technological innovation practice every semester in the department. When the answer is passed, it can be counted into the achievement of innovative credits. The development of this activity has greatly aroused the students' keen interest in science and enthusiasm for innovative practice. In the last three years, we have been instructing undergraduates' scientific and technological works to obtain 4 second prize and 10 third prize in national science and technology competition, 4 first prize, 6 second prize and 10 third prize awards for provincial science and technology competition. More than 20 research papers published by the instructing students.

THE EFFECT OF TEACHING REFORM

The teaching reform based on OBE engineering education concept has achieved several results:

(1) Through the discussion and research of education and teaching, the teachers have built a harmonious working platform. With the link of the curriculum, many teaching teams have been created, and a working atmosphere of unity and harmony is created.

(2) The training of young teachers has a positive effect on improving the overall teaching level and teaching quality. In the competition of basic skills for young teachers organized by the college, 4 young teachers of our department participated in the competition and won three first prize and all the excellent awards for teaching plan. In order to test the real teaching effect, we had a return visit to students in the class with more concentrated problems on classroom teaching. Most students feel that the teaching mode and teaching method of teachers have been improved.
obviously, and the teaching effect has been improved remarkably. Some students said, "the teacher's teaching content is vivid, teaching mode is diverse, classroom atmosphere is active, and courses are more attractive."

(3) In the process of instructing students to carry out scientific research training and scientific and technological innovation activities, teachers have strengthened their interaction with students. On the one hand, they have established long-term communication channels with students to enhance understanding and mutual understanding between teachers and students. On the other hand, teachers cultivate students' learning ability, innovation ability, management ability and guidance ability in activities. They instructed students to educate and manage each other. In the process of communication with students, a positive interaction between teachers and students is achieved.

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