Exploration and Research on Classroom Teaching Reform under the Concept of Engineering Education Professional Certification

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ABSTRACT
The core concept of engineering education professional certification is student-centered, results-oriented, and continuous improvement. The core link to realize the concepts is classroom teaching. The two main subjects of classroom teaching are teachers and students. Based on the starting point of teachers and students, the paper aims to explore the specific methods and measures of classroom teaching reform under the concept of engineering education professional certification. This paper first analysed the status of classroom teaching and the significance of reform, then pointed out the key points of classroom teaching reform under the concept of OBE, at last, proposed specific measures of reform from three aspects. Through a series of research and exploration, the paper explores a strategy for classroom teaching platform construction, forms a closed-loop mechanism to ensure continuous improvement of classroom teaching and provides a theoretical basis for student training and the output of results.
Keywords*: Engineering education, OBE education, Classroom teaching, Teachers and students.*

1. INTRODUCTION

Classroom teaching is the main battlefield and channel of higher education teaching. "Who to train, how to train and for whom to train" is the fundamental issue of education[1]. In order to realize whole-process and all-round education, "classroom teaching" must be made good use of as the main channel[2]. The course content update should be promoted, the difficulty of the course should be reasonably increased, the depth and option of the course should be expanded, the classroom revolution should be promoted, and then a good quality culture should be built. Only by laying a solid foundation for the construction of the curriculum system, the talents that social development really needs can be cultivated[3]. The core connotation of engineering professional certification: based on the concept of OBE (Outcomes-based Education-OBE), taking students as the center, output-oriented education, building a talent training system, and continuous improvement, thus confirming that engineering graduates reach the established quality recognized by the industry-standard requirement[4]. This article starts with the two main subjects of classroom teaching: teachers and students, t, the key points and specific measures of classroom teaching reform are expounded. Using the OBE concept as the starting point, a closed-loop mechanism is formed to ensure the continuous improvement of classroom teaching[5].

2. THE SIGNIFICANCE AND PROBLEMS IN CLASSROOM TEACHING AT PRESENT

2.1. The significance in classroom teaching at present

In early 2020, COVID-19 broke out in Wuhan and spread rapidly across China. The Ministry of Education issued a notice requesting that the spring semester of 2020 be postponed[6]. At the same time, the Ministry of Education issued Guidance on The Organization and Management of Online Education in Institutions of Higher Learning during the Epidemic Prevention and Control period[7]. They demanded a government-led, college-based, and socially-participated approach to jointly implement and guarantee colleges' online teaching during epidemic prevention and control to achieve "suspension of classes without stop teaching and stop learning". Through the online teaching for nearly two months, the author took 4 classes and a total of 187 classmates as the object, and conducted a questionnaire survey through the class WeChat group. The survey results are shown in Figure 1.

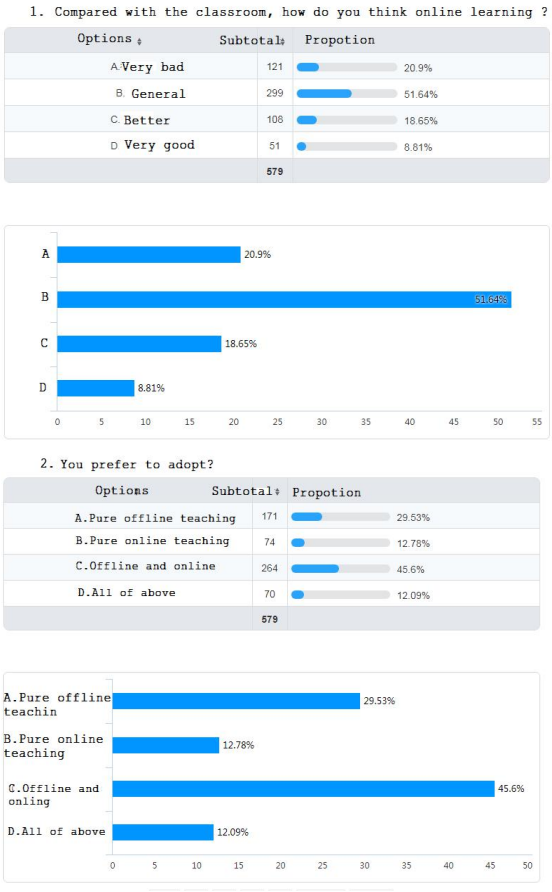

Figure 1. Statistics of the questionnaire survey

The results of the questionnaire showed that more than 50% of the students thought that the effect of online learning was generalized, and more than 60% of the students thought that the reason influencing the effect of online learning was that they could not communicate with teachers face to face. That is to say, the classroom teaching without sharing by teachers and students is not enough to be recognized by students. Students hope to see teachers. Through eye contact and interaction, teachers can grasp students' learning situation and adjust the teaching process at any time, so as to optimize the teaching output. From the above, it can be concluded: Classroom teaching in the classroom is essential, and the interaction between teachers and students is the catalyst for the output of classroom teaching results.

2.2. The problems in classroom teaching at present

The water courses and low-level courses in the past have seriously affected the quality of classroom teaching[8]. Teachers do not set teaching goals, design teaching methods, and do not verify the degree of achievement in a class. Teachers do not pay attention to the feedback of students, but just fill the knowledge according to the teaching arrangement set by themselves[9]. The survey results show that 45% of the students hope to adopt a mixed online and offline teaching mode after the epidemic. Students are a group of younger generations, and they have a stronger ability to accept new knowledge and new things. They also hope to use richer network technology resources in classroom teaching to help them learn and improve better.

OBE is an outcome-oriented teaching model. The core of OBE concept is student center, output orientation and continuous improvement. The course construction aims to eliminate "water course" and build high-quality courses with high-level, innovative and challenging degree. The OBE concept should be implemented and completed through the core link of classroom teaching. The ultimate goal of first-class course construction is to realize the OBE concept and truly cultivate students.

3. THE KEY POINTS OF CLASSROOM TEACHING REFORM UNDER THE CONCEPT OF OBE EDUCATION

In the context of engineering education certification, the entire talent training process is designed in reverse based on the concept of OBE. The flow chart is shown in Figure 2.

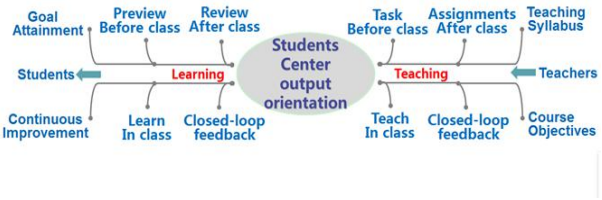

Figure 2. Production-oriented design

It can be seen that teachers are the contributors of students' output and ability cultivation. At the same time, through a series of mechanisms and measures, they are subject to the supervision and constraint of output results, forming a closed-loop mechanism to encourage teachers to make continuous improvement and achieve the purpose of building golden lessons. Students are the force of classroom teaching by teachers, and also the object of output. By receiving classroom teaching and teachers' tasks, the students output results

and achieve ability cultivation, so as to effectively achieve graduation requirements and training objectives. Therefore, the teachers and students who are the direct contributors to the course teaching are the key points in the course construction and the direct determinants of the course quality.

3.1. Teachers must reform themselves in this revolution of classroom teaching reform

To carry out the reform for teachers, firstly the education of teachers' moral in ideology must be strengthen which should be the first lesson that new teachers must accept after their entry and every teacher must accept before the beginning of each semester. Only by accepting baptism in ideology, actions can be positive, active and effective. College teachers especially non-normal professional college teachers, have not received systematic vocational education during their study, and their vocational consciousness is relatively weak. However, teachers are the shaper of students' professional ability cultivation and noble personality formation, and how can teachers without noble character cultivate students with all-round development of morality, intelligence, physique, aesthetics and labor. Secondly, reasonable and effective curriculum implementation and constraint supervision mechanism should be established, and a quality monitoring platform for teacher curriculum construction should be developed with professional certification as the starting point. A curriculum construction system is formed with continuous implementation, feedback, improvement and goal achievement in pre-class, in-class and after-class teaching. This system not only ensures the quality of curriculum construction, but also effectively restricts and supervises teachers, forming a virtuous circle, so as to truly realize the cultivation of students.

3.2. Students must be reformed too in this revolution of classroom teaching reform

Students mainly accept the passive, cramming teaching before university which is affected by the existing education system and their autonomous learning ability is weak. Once in colleges and universities, suddenly relaxed learning environment caused many students could not adapt to the relatively free learning state and caused many students could not know how to learn. Some students even take no notes, no homework, no planning in the whole classroom learning. Four years down, there is no outcome and capacity to achieve, so students can not directly adapt to social needs. Therefore, students should be reformed. First, the construction of study style in the thoughts must be strengthen, students in the school and the first class of each course offered the first lesson should receive professional training and professional education. The professional courses, education courses, vocational employment ability training courses are integrated into the curriculum system construction. The classroom teaching cultivates students' ability of active learning under the premise of clearly understanding the professional training objectives and graduation requirements. Baptism in thought, action will be positive, active, effective. Of course, the students' ideological baptism and progress have to be completed by teachers to promote curriculum construction. Secondly, a reasonable and effective curriculum implementation and constraint supervision mechanism should be established. A curriculum learning quality monitoring platform for students should be developed with professional certification as the starting point. To form a curriculum learning system of continuous implementation, feedback and output of learning before, during and after class, students must complete the course tasks of three links to form a closed loop of continuous improvement and achieve the outcome. This system not only guarantees the quality of students' course learning, but also lays a foundation for cultivating students' knowledge, ability and quality.

4. SPECIFIC MEASURES OF CLASSROOM TEACHING REFORM UNDER THE CONCEPT OF OBE EDUCATION

On the basis of professional certification, graduation requirements are set according to professional training objectives in the talent cultivation system, professional curriculum system is set according to graduation requirements index point decomposition. After curriculum system construction is completed, the course syllabus and curriculum goals that can effectively achieve graduation requirements are set by each course teacher’s team. [6][7]The course outline and the target is the course of the construction master plan. Teachers teach the teaching content to students by formulating teaching strategies, breaking down teaching means and other carriers. Teachers teach the teaching content to students by formulating teaching strategies, breaking down teaching means and other carriers. Through classroom teaching, students can master, possess and

form the knowledge, ability and accomplishment required in the course objectives, and at last students can meet the graduation requirements and complete the cultivation of professional talents. The most critical part of the whole process is how teachers transform the written expression of curriculum knowledge, ability and accomplishment into skills that students actually master through classroom teaching, and use these skills to realize their value in the professional field. Therefore, classroom teaching is divided into three links; before class, during class and after class which is constructed respectively. The specific measures are as follows.

4.1. Pre-class construction plan

Whether a class is good or not depends largely on the quality of lesson preparation before class. For teachers, before the class, the course outline of this class should be written, including course objectives, teaching means adopted, teaching strategies designed, teaching contents displayed, and the system of the teacher course construction quality monitoring platform should be entered and be filled. Only after the system filling is successful, the next class can be conducted. Whether a class can learn well or not depends largely on the quality of preview before class. For students, before the class, they must enter the students learning quality monitoring platform, and complete the course review homework assigned by the teacher, and fill in the system. Operation knowledge corresponds to the objective. According to the students' homework scores, the achievement of the goals of the pre-class preview is calculated by the calculation formula of the achievement of the goals of the course. Then the goals are given feedback to teachers, and corresponding improvement in the classroom are made to form a closed-loop mechanism of continuous improvement.

4.2. In-class construction plan

Interaction in class is the most important part of the "three activities". The interaction between teachers and students is the catalyst for the output of classroom teaching and the guarantee of classroom teaching quality. The key to the success of gold class construction is the quality of the links in the course. For teachers, in the whole course, they should complete the closed loop including goal setting task-implement the teaching process-target achievement detection. For students, in the whole course, they also should complete the closed loop including receiving target task-the learning process in the class-completing target achievement. Finally, through the course construction of quality monitoring the course platform is completing.

4.3. After-class construction plan

After-class is the last barrier to achieve closed-loop continuous improvement and is the controller to ensure continuous improvement quality. For teachers, they should correct students' homework after class, answer students' doubts, check the achievement of goals, analyze existing problems, design solutions to problems, fill in teaching reflection, so as to release the next course preview homework, and at last enter the filling system of teacher curriculum construction quality monitoring platform. Only after the completion of the system application, it means that the closed loop of this course is completed. For students, they should complete homework after class according to what they have learned in this course, fill in learning questions, and enter the filling system of the learning quality monitoring platform for students. Only after the completion of the system application, it means that the closed loop of this course is completed before the next course.

5. CONCLUSION

The author's university is a provincial, general, comprehensive, application-oriented university. [8]At present, the author's major is in the certification and application stage of engineering education. The curriculum construction is the basic link of professional certification, course construction quality monitoring platform is developed in order to make curriculum construction. [9]At present the platform has entered the implementation stage, all teachers must construct syllabus and curriculum outline, design curriculum concept and goal, earnestly complete three steps of classroom teaching which are based on training target and graduation requirements. The three cores of the OBE concept including students center, results oriented education, continuous improvement mechanism should be implemented and reflected through curriculum construction. The two ends of the curriculum balance are teachers and students. Teachers are power givers. Only when teachers move first curriculum construction can be effectively implemented and improved. Also only with the help of the benefactor teachers students can be active, and even surpass the benefactors, it can realize talent cultivation in a true sense, which is also the fundamental purpose of education.

REFERENCES

[1] Yu Xinjie. Two boundaries of a first-class curriculum [J]. China University Teaching, 2019, (3): 45-47. DOI: 10.3969/j.issn.1005-0450.2019.03.011. (In Chinese)

[2] Wang Qiang. Research on the Integrated Innovation Strategy of "Golden course" construction [J]. China University Teaching, 2019, (7): 67-71. (In Chinese)

[3] YangXinying, Deng Hongbao. Research on the Curriculum Reform of Application-oriented Universities based on the integration of industry and Education [J]. Journal of Vocational Education, 2020, (1): 56-62. (In Chinese)

[4] Zhou Chao. The exploration of optimizing university classroom teaching by using "double helix" model [J]. Higher Education Exploration, 2019, (10): 78-81. DOI: CNKI:SUN: GJTA.0.2019-10-013. (In Chinese)

[5] Xie Debo. How to build "Golden curriculum System": Framework design and Institutional Innovation of University Curriculum Reform[J]. Journal of Sichuan Normal University(Social Science Edition), 2020, (1): 96-101. (In Chinese)

[6]The General Office of the Ministry of Education. The Ministry of Education should respond to the guidance of novel Coronavirus Outbreak Leading Group Office on how to organize and manage online education in common institutions of higher learning during the epidemic prevention and control period [Z]. 2020-02-04. http://www.moe.gov.cn/srcsite/A08/s7056/202002/t20200205_418138.html. (In Chinese)

[7] Ministry of Education of the People's Republic of China. Opinions of the Ministry of Education of the People's Republic of China on the Implementation of first-class Undergraduate Course Construction [Z]. 2019-10-30. http://www.moe.gov.cn/srcsite/A08/s7056/201910/t20191031_406269.html. (In Chinese)

[8] Zhou Xu. On the Direction of "Classroom Revolution" in universities [J]. Journal of Higher Education Management, 2019, (10): 88-92. (In Chinese)

[9] Dong Birong, Liu Haiyan. Thinking and Practice of first-class course construction of Accounting [J]. China University Teaching, 2019, (10): 75-79. (In Chinese)