

Exploration of Online Teaching Mode Based on OBE Mode under Background of Emerging Engineering

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Abstract: Based on the requirements of emerging engineering construction, combined with OBE education mode, a new idea of online teaching of oil and gas storage and transportation engineering was provided on teaching mode construction, organization and implementation. A new teaching mode that combined with theory-practice-experience and theoretical explanation-case analysis was constructed for guaranteeing and improving the teaching effect of online courses. It could make graduates achieve the requirement of engineering talents and application-oriented talent training, and improve the students' innovation ability and application ability.

Key-Words: Emerging Engineering, OBE Mode, Online Teaching

1. Introduction

Reform is the first driving force; innovation is the first engine. Innovation and development requires us to innovate thinking, diversify development and take multiple ways forward [1].

With the development of education concept and network technology, online teaching has completed the "second revolution" from "early flipped classroom" to "massive open online courses" (MOOCs) [2]. The teaching content and teaching methods have changed obviously. Compared with the pre-edited courseware and recorded lecture video, "MOOC" advocates the construction of "sub group" online learning community by strengthening "interactive feedback". It highlights the "immersion" and "whole process participation" of learning and cultivates students' "deep-seated cognitive ability", which is achieved in specific teaching practice as an auxiliary means of traditional offline teaching. The certain results have been achieved which is favored

by teachers and students in colleges and universities. Through MOOC, the open and sharing of high-quality resources are promoted, and the education and teaching form is reshaped through smart classroom.

In special period in 2020, Ministry of Education encourages teachers to actively invest in online teaching, that suggestions have been offered, and teaching research has been carried out. The universities are adapted to the new teaching environment and overcomes technical and psychological obstacles. The traditional offline teaching methods were adjusted. The teachers of national university also launched a series of "big discussions" for online teaching, which provided new historical opportunities for the combination of theoretical research and innovation practice of higher education. The "in-depth" development of higher education in China has been promoted in further [3].

The organization, implementation and evaluation of teaching activities should be carried out around students' expected learning results to cultivate students' ability of design, management and solving practical problems through practice. According to the concept of

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education reform and construction under the background of emerging engineering and Outcomes Based Education (OBE) mode, the organization, construction and implementation of online teaching mode was promoted, the student-centered teaching theory, the teaching content and teaching organization strategy of oil and gas storage and transportation engineering are studied respectively. New scheme of online teaching is designed, and the implementation effect of online teaching is stated.

2. The concept of “Emerging Engineering”

The emerging engineering course embodies new engineering education concept, new major structure, new talent training mode, new education development system and new quality of education and teach [4]. The emerging engineering course puts forward new requirements for students' core competence from technical ability, knowledge ability, academic ability, personal efficiency and social ability, which requires them to successfully apply the learned knowledge, mastered skills and personal behavior for the planning work [5]. In this paper, the traditional teaching methods have been unable to meet the basic requirements of innovative engineering education. Therefore, it is urgent to reform and innovate the engineering education in colleges and universities. It should pay more attention to the organic combination of new technology, traditional technology, pay more attention to the interdisciplinary and practicability of subject education by emerging engineering courses.

3. OBE education mode

The OBE education mode which is based on learning-outcome education mode is different from the education of traditional content driven and stressing investment [6]. By OBE education mode, the education

system is driven by students' learning output. What students learn and whether they succeed is far more important than how and when to learn. In the OBE education system, educators must have a clear idea of the abilities and levels that students should achieve at the end of their studies, that is, what students could do after completing their studies. The appropriate education structure and teaching methods are designed to ensure that students achieve these expected goals [7]. Taking students as the main body, the key is to set up learning tasks according to students' learning basis, ability and interest, so as to improve the students' enthusiasm and initiative in learning. Focusing on achievements, the motivation of teachers' teaching and students' learning should be stimulated, and the traditional teaching mode is abandoned. The teaching process and teaching links are reversely designed and constructed through the expected results, so that students could learn around the expected goals.

4. Implementation of online teaching mode by OBE mode

Compared with the traditional teaching methods, the interaction between teachers and students and students' learning initiative by online teaching mode are enhanced. Setting learning objectives, students preview the course online. Based on the orientation of achievement goal, multiple learning objectives and assessment objectives are set up, and students' learning effect and application ability are assessed by multiple ways.

4.1 Organization and management of teaching mode

For online learning, teachers should not completely leave it to students to deal with freely, but should guide and direct students to learn with problems, and take the online learning content to offline appropriate

organization for discussion, so as to test the effect of online learning. Taking training of ability as the main line to innovate the organization of curriculum content, based on the requirements of emerging engineering, the ability line is the most important in the two lines of learning knowledge and cultivating ability. The relationship between the logic of knowledge system and the progressive nature of ability training is deal for the organization of subject content. Highlighting the ability training, outstanding results in teaching could be achieved. The teaching content is mainly organized according to the knowledge line, which is conducive to knowledge transfer and ability cultivation. But the good results in the ability training could not be achieved by arrangement and organization of knowledge. From the perspective of cultivating the application ability of design methods such as pipelines and oil depots, the combination of design theoretical knowledge and case analysis is helpful to understand and establish logical thinking for students, and the progressive training effect of application ability could be obtained.

(1) Teachers need to design courses, issue exercises, guide and supervise students' learning, and assess courses in line with their own course contents, characteristics and students' training objectives. The diversified design, assessment, management and evaluation of subject should be conducted.

(2) In order to achieve better results of the implementation of online teaching reform subject, the online course is evaluated with multi-agent. The evaluation index includes quantitative and qualitative part for ensuring the objectivity, impartiality and scientificity of the evaluation. The first-class courses are created by improving teaching efficiency, teaching level and students' satisfaction.

4.2 Construction of new mode of online teaching

4.2.1 Combination of theory, practice and experience

The students' understanding of basic engineering design principles could be deepened by the teaching mode of combination with theory, practice and experience. The courses of oil and gas storage and transportation engineering are practical and comprehensive, covering a wide range of subjects. There are some problems that overall understanding is lack of the basic design method existed in the course design, test examination and graduation design results of students. Theoretical knowledge could not be effectively used for design guidance. In the process of teaching, when the explanation of design principles of certain basic types is completed, the design of the preferred engineering cases is analyzed, the design steps and related knowledge points are carefully explained, and the prone mistakes, causes and correction methods are summarized. Students could be divided into 4-5 groups, and online case analysis could be organized in the form of group discussion after class. For difficult problems, students could firstly conduct group discussion. If they could not get a satisfactory answer, they could ask the teacher. Attaching importance to case analysis, combining theoretical explanation with case analysis could make up for the deficiency of students' engineering design experience.

Connecting various professional courses organically could promote students to form systematic logical thinking, and cultivate their ability to analyze and think about problems. In the course of oil and gas gathering and transportation, the knowledge of oilfield production and oil and gas gathering and transportation process need to be systematized, the relationship between knowledge points and knowledge points should be well handled. It is paid to students to

consolidate knowledge, flexibly use knowledge, form systematic knowledge, cultivate new talents with “new engineering” concept, and improve students’ imagination and creativity.

4.2.2 Decomposition of teaching objectives and organization of teaching contents based on OBE concept

Guiding by OBE, the subject objective is decomposed and the content is reorganized. In the process of goal decomposition and task reorganization, many teaching methods are used, such as comparative teaching method, problem teaching method, case teaching method and group discussion teaching method. These methods should be fully used to decompose the objectives, and effective methods are selected according to the objectives. The teaching contents and cases are set on

the basis of the decomposed objectives. Combined with all kinds of offline teaching software platforms, the learning unit tasks are arranged by using the platform’s free function decomposition objectives. Combined with the functions of task reminder, real-time question answering, multi-screen interaction, group discussion and data statistics, the corresponding task unit module is developed to stimulate students’ communication, discussion, cooperation and innovation. Considering the differences of learning objectives and learning methods of students with different types, the differentiated assessment is carried out on the basis of the learning objectives, and the subject content reorganization is promoted comprehensively using the assessment, as shown in Fig.1.

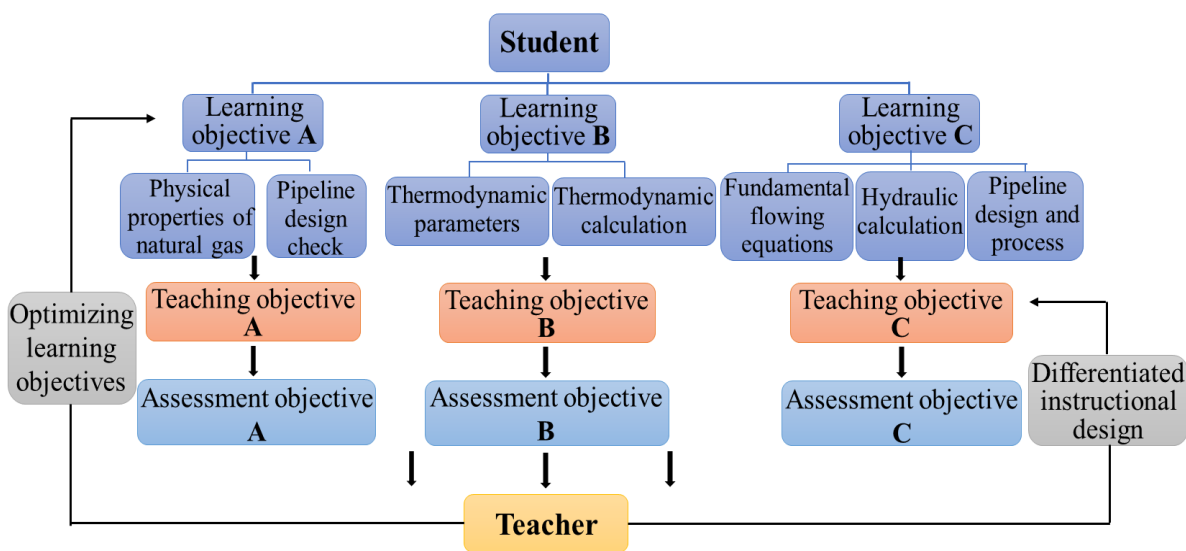


Fig.1 Teaching reform scheme of “design and management of gas transmission pipeline” based on OBE mode

5. Implementation effect of online teaching

The engineering education system plays an important role in cultivating the engineering concept of science and engineering students and improving their ability to solve practical engineering problems [8]. Through linking the courses in the curriculum system with

engineering, it could strengthen students’ awareness of large-scale engineering, cultivate students’ engineering practice ability, let students directly face complex engineering practical problems. It can make them have the preliminary experience of analyzing and solving problems [9]. According to the training objectives and graduation requirements of students, the training

program of oil and gas storage and transportation engineering has been set up combining theory and practice such as professional subject design, and adjusting the guidance methods and graduation design methods. Using the online teaching mode, based on OBE mode, a new teaching scheme could be designed, a variety of assessment methods was added, increasing the cultivation of students' innovative spirit and practical ability to analyze and solve the complex engineering problems independently.

5.1 Teaching method of online case of gas pipeline design and management

Through online teaching and students' online learning achievements display, it is found that students could avoid simple piling up of a large number of scattered knowledge points by arranging pipeline design cases and group discussion, organically combine various knowledge points, principles and analysis methods into a complete system, which significantly improves students' learning interest and broadens their horizons. Online teaching makes the course teaching more diversified and more novel. It cultivates the students' ability of understanding the engineering imperceptibly and gives full play to the advantages of case teaching.

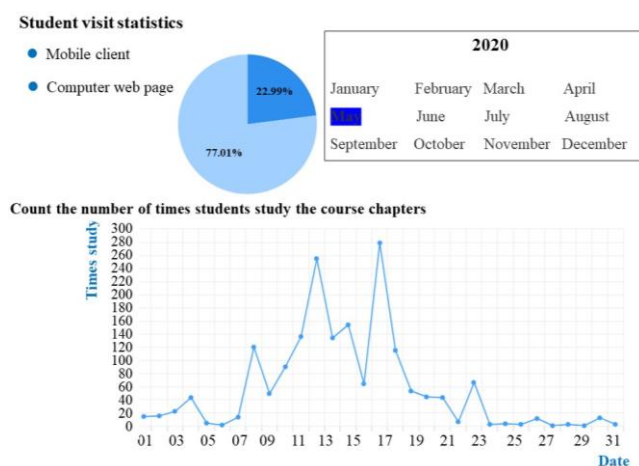


Fig. 2 Online learning data of students of gas pipeline design and management

5.2 Online teaching and practice of oil and gas storage and transportation engineering course design

After the completion of the course design, a complete and systematic summary from the design situation should be made and the teacher's guidance and the students' completion should be achieved. The good and the insufficient parts is analyzed and the improvement suggestions are put forward, which could be implemented in the next grade, so as to achieve the purpose of continuous improvement and truly achieve the original intention of setting professional comprehensive course design.

(1) Strengthening course discussion and improving the quality of comprehensive design

Strengthening the research and analysis of the nature of the course, the purpose of setting up the course of comprehensive design of oil and gas storage and transportation engineering and the requirements of students are analyzed. The topic of comprehensive curriculum design is studied. From the perspective of engineering application, the topic should not only reflect the comprehensiveness but also reflect the specialty. From the topic, the students could make clear which major professional knowledge and ability are assessed to cultivate in the comprehensive design. Taking the real engineering case as the background, the comprehensive design topic is summarized.

(2) Discussion of the teaching methods and improvement of the guidance methods

By online teaching, increasing students' homework consciously, let students complete the discussion and analysis of some problems in long-distance transportation, oil and gas gathering and transportation and storage of oil and gas storage and transportation specialty by consulting relevant materials. The supervision and inspection are conducted in the form of online questions and reports, and the content is

summarized appropriately, so as to improve students' ability of consulting and analyzing literature. By online course design, students' initiative and creativity are realized [10]. Through the establishment of a group of teachers, the content of course design requirements is guided, what the best at teacher is presented to the students, so as to give the students confidence and motivation. Through conducting course design by steps, discussion in groups for student is guided, the design ideas are sort out, and the design content is clarified.

different knowledge points are cut to design and produce teaching micro video by teachers. The micro video focused on knowledge point is relatively independent, complete and fragmented. It is conducive to students' digestion and absorption. By online learning platform, online Q & A and case demonstration are conducted, which the classroom atmosphere is activated and the effect of heuristic learning is improved. Setting up design mutual aid group, the effective communication and learning are promoted.

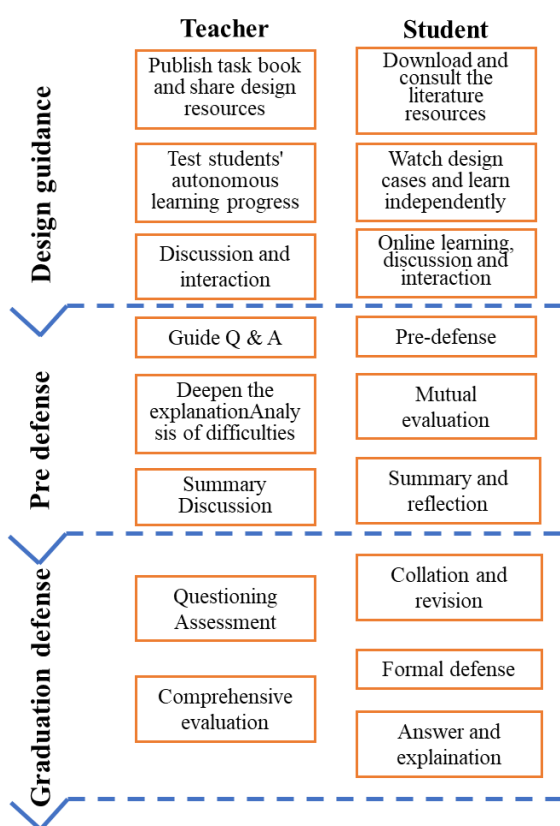


Fig.3 Online teaching mode of graduation design guidance

(3) Online practice of graduation design course for Oil and Gas Storage and Transportation Engineering

In the process of teaching reform, the hybrid teaching mode of discussion, participation, heuristic and project driven is gradually implemented. For the construction of data structure online learning resources, thematic teaching of each teaching unit is designed,

6. Conclusion

How to make students deeply understand and master the basic knowledge of professional theoretical courses and the application methods of design courses through the limited class hours online teaching. The innovation ability, application ability and comprehensive quality of the students majoring in oil and gas storage and transportation engineering have been improved. There is a great practical significance to explore the new online teaching mode under the background of emerging engineering. Based on the OBE teaching mode, a new teaching mode combining theory, practice and experience highlights the characteristics of strong practicality and comprehensiveness of the course is formed and developed. It is conducive to improving the learning effect of professional courses and cultivating students' ability to comprehensively use multi-disciplinary knowledge to analyze and grasp problems.

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