The Application and Research of Mixed Teaching in the Classroom Teaching of Building Interior Water Supply and Drainage

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Abstract. The course Building Interior Water Supply and Drainage is an elective course in the building environment direction of the building environment and energy application engineering major. With the continuous improvement of online course resources, the organic integration of online and offline teaching has been promoted. On the basis of summarizing the use of Superstar Learning platform to carry out online teaching, this paper combined the online and offline mixed teaching mode to carry out classroom teaching reform, in order to improve students' learning autonomy, consolidate basic theoretical knowledge, and enhance students' ability to analyze and solve problems. To better promote students' scientific thinking ability, professional application ability, teamwork ability and energy saving and emission reduction, safety and environmental protection responsibility awareness.

Keywords: Mixed teaching; Building Interior Water Supply and Drainage; Reform of classroom teaching.

1 Introduction

In the course of "Building Interior Water Supply and Drainage", there are many basic theories, engineering design principles and methods, and the knowledge is broad, and involves installation, management, economy and other fields of technology, which needs to assist engineering case analysis, which is relatively complicated. With the rapid development of economy and society, in order to cultivate applied talents who meet the demand of water supply and drainage industry, the single traditional offline teaching method can no longer meet the teaching demand. Therefore, the teaching reform of "Indoor Water Supply and Drainage in Buildings" course is carried out through the mixed teaching mode of online and offline.

The object of classroom teaching reform for the course "Building Interior Water Supply and Drainage" in this semester is the junior undergraduate student majoring in building environment and energy Application engineering. This student has completed the basic courses of Fluid Mechanics, Fluid Transmission and Distribution Pipe Network and other professional courses, and has certain basic knowledge of fluid mechanics analysis and hydraulic calculation methods. But for professional knowledge and professional related engineering issues have not been involved. Students in the third stage of college have certain learning goals, and some students have formed good learning habits, but at this stage of thinking, emotion and will still have a certain degree of instability, plasticity and variability

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are strong, learning interest and autonomy need to be further improved. At the same time, most of the students at this stage are optimistic and cheerful, active communication with teachers, concerned about novelty and challenges, and learning attitude is positive. Therefore, through the analysis of students' learning situation, using the online-offline hybrid teaching model, project-based teaching, task-driven teaching and other methods can stimulate students' learning interest and improve students' learning effectiveness, to cultivate students' ability of finding, analyzing and solving problems, and to increase students' extra-curricular study time, to realize learning, thinking, practicing and doing four comprehensive studies.

2 The application of on-line and off-line mixed teaching mode

In combination with students' individuality and differences, students can arrange the learning content and time reasonably according to the basic situation of their personal knowledge during online teaching, can make full use of spare time to grasp the weak knowledge of the links for learning consolidation; the use of online interaction, interaction between teachers and students more closely, efficient [1,2] . At the same time, online teaching requires students to have higher self-discipline and learning initiative, and then through the use of online self-learning interaction and offline classroom to consolidate key points, solve difficult problems and classroom display, supervision and management and timely feedback, the "online" and "offline" teaching process will be effectively unified.

In the major of Building Environment and Energy Application engineering in our school, the course "Building Interior Water Supply and Drainage" has 24 class hours, with fewer class hours but more content, and involves more design analysis and case calculation. The online course content and resources are open and shared, which effectively supplements the offline course teaching and improves the teaching effect and quality.

2.1 Optimize online and offline teaching content

The online teaching content is mainly based on basic theories and concepts, and makes full use of the online teaching platform to create an independent learning environment for students. Online resources mainly include teaching calendar, teaching plans, courseware, teaching videos, chapter tests, question bank, etc. Offline teaching content mainly focuses on confusing content and key points, design analysis and engineering case calculation. Meanwhile, offline teaching mainly explains the after-school tasks of the previous class and the key and difficult points of the new teaching content, and the important and difficult points are clear and prominent in the teaching process. By complementing online content and offline knowledge, and arranging two flipped classes, students' learning initiative is effectively mobilized, and students themselves can grasp the learning focus of online courses and enter the class with difficult problems.

2.2 Construct a "diversified" teaching evaluation system

The assessment of the course is to evaluate the degree of students' learning to achieve the course objectives. The assessment of this course consists of formative assessment and result assessment. Formative assessment includes online learning, daily work, periodic test results and group tasks, which are counted in the usual results, covering the whole process of student

learning, accounting for 40% of the total score; The result test (final exam) accounts for 60%. Formative assessment can fully mobilize the initiative of students. Through group cooperation, students can use their spare time to investigate the water supply and drainage system of the school teaching building or dormitory building, form report materials, and display them in groups in the next offline class[7],As shown in Figure 1 below.Scores are assigned according to the completion degree of the group task and the excellence of the display, in which teacher evaluation accounts for 40%, intra-group mutual evaluation accounts for 30%, inter-group mutual evaluation accounts for 20%, and individual self-evaluation accounts for 10%, so as to mobilize the enthusiasm and participation of every student in the class.

Fig. 1. Some group task report picture.

2.3 Create diverse and interactive classroom teaching

It adopts project-based teaching method, task-driven method, group discussion method and other teaching methods, actively guides students to participate in the class, and focuses on the cultivation of students' comprehensive ability. Through discussion, communication, online response and other methods in classroom teaching, heuristic and discussion teaching methods are used to enhance the interaction between teachers and students in teaching and learning, active classroom teaching and learning atmosphere, and promote students to actively grasp the learning content and analyze and apply theoretical knowledge.

2.4 Integrate the education elements such as typical cases

In the offline teaching, the ideological and political elements of the course are organically integrated. By showing some typical building water system projects and "super projects" in building water supply and drainage projects, students are encouraged to look at problems from the perspective of development, and constantly learn new knowledge, new theories and new technologies to improve their knowledge structure and enhance their comprehensive ability. In the teaching of the chapter of water system in buildings, education on water saving, energy saving and environmental protection is carried out through specific material analysis, so as to enhance students' understanding of the concept of sustainable development, improve their understanding of establishing a resource-saving and environment-friendly society, and promote the construction of ecological civilization. At the same time, we will assist the online course resources of China MOOC "Building Water Supply and Drainage" and the website of China National Knowledge Network to mine the materials on the topics of cutting-edge technologies, latest design methods and standardization of industry leaders in the water supply and drainage industry, and timely push them to students for analysis and discussion, so as to reduce the lag between course teaching and industry development[3]. Through the combination of online and offline, typical cases of building energy conservation and emission reduction are integrated to achieve the effect of educating people and improving students' understanding and

development significance of the application of energy conservation technology in the water supply and drainage system of building engineering.

3 Mixed teaching teaching ideas

Based on the network teaching platform of Shandong Huayu Institute of Technology, this course adopts the three modules of "pre-class + in-class + after-class" and adopts the mixed teaching method of online and offline, which carries out online preview, online and offline discussion and interaction, analysis and explanation of key and difficult points, engineering case design analysis, homework and chapter test consolidation and review. At the same time, through offline classroom interaction, teachers can understand students' grasp of basic knowledge points in online learning, sort out the major and difficult points in learning modules and tasks, explain them in detail, and help students solve problems and puzzles encountered in the process of online learning. Its hybrid teaching idea is shown in Figure 2 below.

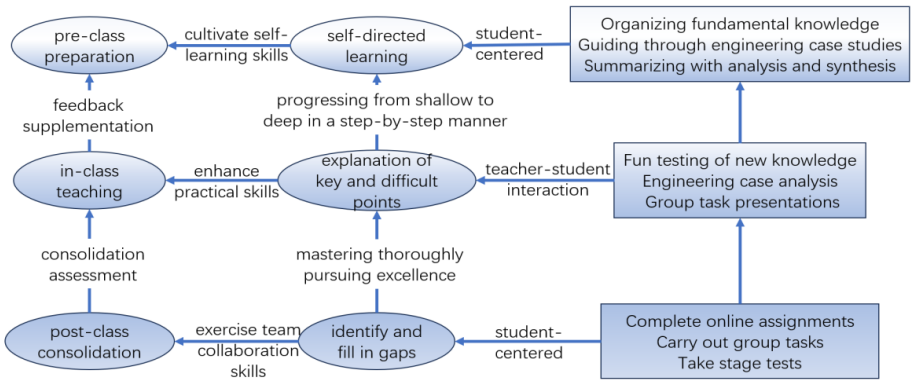

Fig. 2. Hybrid teaching ideas diagram.

3.1 Preview before class

The content of the course "Building Interior Water Supply and Drainage" is divided into several learning modules, the basic concepts and basic theoretical knowledge points are planned and organized, and students are guided to learn independently, and the teaching objectives, key and difficult points of each module are clarified. In each learning module, practical engineering case studies are introduced. Discussion sessions are set up according to the contents of engineering cases, with students as the center, students summarize and analyze the learning content, seriously think and put forward personal views [4]. At the same time, teachers and students can interact and discuss online, and promote students' independent learning and development through guidance.

3.2 Teaching in class

For basic concepts and basic theoretical knowledge points, online selection, quick answer and voting are set up, which not only increases the interest but also tests the students' mastery of

online learning. The major and difficult points of the learning modules are sorted out, with emphasis on the analysis and explanation of the after-class tasks of online learning, the errors of online testing, and the calculation and analysis of the engineering case of "Indoor Water Supply and Drainage of Buildings". In addition, in the form of flipped classroom, students fully demonstrate the results of the group tasks completed by online learning and research in spare time.

3.3 Consolidation after class

With the help of the learning network teaching platform to publish online homework, consolidate students' course learning, timely feedback and analysis of students' weak knowledge points, to check the gaps. Combined with the implementation of group tasks, improve students' teamwork ability and cultivate students' practical ability. After the completion of each learning module task, a phased test is arranged to assess and consolidate the comprehensive effect of students' phased learning.

4 Implementation effect evaluation

In order to further analyze and improve the implementation effect of online and offline mixed teaching of "Building Interior Water Supply and Drainage" course, a questionnaire survey was conducted among 106 students majoring in building environment and energy application engineering. It mainly focuses on the willingness to participate in blended teaching, satisfaction with blended teaching, favorite classroom links, advantages and disadvantages of blended teaching, and improvement of personal learning ability [5]. According to the results of the questionnaire, 97% of the students are willing to participate in the blended teaching, and 87% of the students are satisfied with the implementation of the blended teaching of the course. In the classroom links of the blended teaching design, the top five favorite teaching activities are voting, selection, quick answer, class discussion and group task. Through the investigation of online and offline hybrid teaching courses of "Indoor Water Supply and Drainage of Buildings", it is found that the hybrid teaching mode can provide students with diversified learning experience in learning the course of "Indoor Water supply and Drainage of Buildings", fully scheduling their learning enthusiasm, carrying out personalized and flexible learning arrangements, and increasing the time for effective classroom interaction and communication. The main disadvantage is that there is a small amount of brushing in online classes, and students' after-school tasks increase and their spare time occupation increases. Overall, 94% of students felt that their personal learning ability had improved.

5 Teaching reflection

The blended teaching mode of "Building Interior Water Supply and Drainage" gives full play to the advantages of online teaching and original classroom teaching, can meet the personalized learning needs of the majority of learners in the information age, fully reflects the teaching concept of "student-centered", extends the teaching time and space, and promotes the depth and expansion of independent learning[6]. However, compared with offline teaching, Online teaching is still in the stage of exploration and optimization, and the teaching team

needs to further improve and enrich online teaching resources and strengthen process assessment methods. When making the course video, you can add some more interesting and enlightening materials according to the current preferences of students to enhance students' interest. In course assessment, questionnaire survey is added to evaluate teachers' teaching methods and teaching design, so as to further collect students' opinions and suggestions and further improve them in subsequent teaching.

6 Conclusion

The course "Building Interior Water Supply and Drainage" uses the Super Star learning platform to carry out mixed online and offline teaching, which effectively solves the problem of less class time and more content in this course, and improves students' ability to analyze and solve problems independently in learning. It is suitable for application in engineering analysis, design and calculation courses, and enhances the cultivation of practical ability. In line with the requirements of application-oriented undergraduate college personnel training program. At the same time, the exploration of the online and offline mixed teaching of "Indoor Water Supply and Drainage in Buildings" provides a reference for improving the quality of classroom teaching, and also lays a good foundation for promoting the reform of classroom teaching in the later period.

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