"Student-Centered" Teaching Reform of Building Environment Control System

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Abstract. Building environment control system is the core course of building environment and energy application engineering. It not only covers the main knowledge of heating engineering, air conditioning and industrial ventilation, but also focuses on the comprehensive application ability of knowledge in engineering. In the face of the new requirements of integrating the training of new engineering talents with industrial development, emphasizing the application of cutting-edge technologies, adopting interactive teaching and paying attention to ability training, this course carries out the teaching reform of "student-centered" course. While imparting knowledge and cultivating ability, it combines ideological and political training with professional development education to realize the transformation from traditional classroom to ability classroom. Through teamwork, collaborative learning and other means, To meet the individual needs of students at different levels and improve their comprehensive ability.

Keywords: Student centered · Content of teaching reform · Reform effect analysis · The bright spot of teaching

1 Introduction

"Building Environment Control System" is the core course of building environment and energy application engineering, which not only covers the main knowledge content of heating engineering, air conditioning and industrial ventilation, but also focuses on the comprehensive application ability of knowledge in engineering. At present, classroom teaching still adopts the traditional instillation teaching, the classroom is almost all explained by the teacher, and the students just passively listen to the lecture. For typical examples, most of them are answered by teachers themselves, and directly teach students the methods and steps of doing problems. Although it seems that teachers are skilled in lectures and students are easy to listen to lectures, this teaching method does not use students' brains, and cannot cultivate students' ability to analyze and solve problems independently. Face up to the new engineering talents cultivation and industrial development, emphasizes the application of cutting-edge technology, combining with interactive teaching and pay attention to the ability training of the new requirements, combined with the actual situation of our university, to carry out the "student-centered"

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online hybrid course teaching reform, in order to improve the students' interest in learning, independent working ability, engineering practice ability and innovation ability [1].

2 Content of Teaching Reform

2.1 Realize the Transformation of Teaching Concept

Set up the "student-centered" teaching philosophy, adhere to the students as the main body, teacher as the organizer and guide of students learning activities, from the simple teaching knowledge into teaching designer, director of student activities, guide the student to obtain knowledge, to mobilize the students' learning enthusiasm, initiative, participation and creativity [2].

In accordance with the basic law of students' vocational ability training, the design of teaching objectives pays more attention to the design of students' requirements of "analysis, synthesis and evaluation". Based on the actual work tasks and working process of construction environment posts, the integration and sequence of teaching content make the teaching of professional courses more closely meet the needs of the industry and enterprises. In order to train students to solve complex problems of comprehensive ability and advanced thinking, play the role of training application-oriented talents.

2.2 To Construct and Implement the "Five Pairs" Course Teaching Mode of School and Enterprise Integration

Facing the training needs of local HVAC talents, relying on the characteristic economic development of Dezhou local "central air conditioning city" and the advantages of industry, University and research of large central air conditioning enterprises in running schools, the "five double" curriculum teaching mode of school enterprise integration is implemented [1], that is, the "double content" of the combination of curriculum content and enterprise technology, the "Double Teachers" of the combination of school teachers and enterprise engineers, the "double platform" of the combination of school laboratories and enterprise workshops, the "double evaluation" of the combination of process evaluation and enterprise result evaluation in the school and the "double results" of the combination of curriculum works in the school and enterprise engineering design have realized the organic integration of knowledge, ability and quality training objectives, and effectively improved students' understanding of the industry and their ability to solve complex problems (Fig. 1).

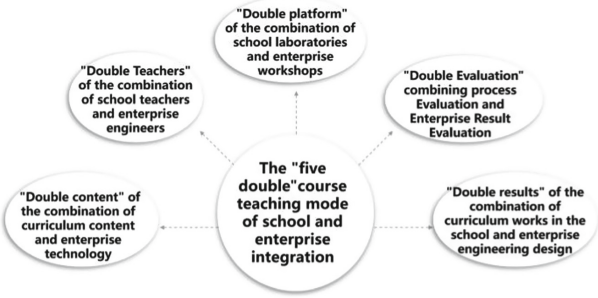

Fig. 1. The "five pairs" course teaching mode of school and enterprise integration.

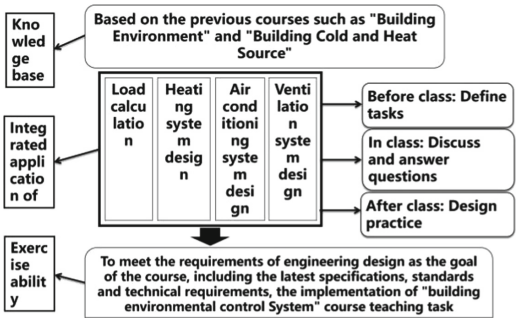

Fig. 2. Course content.

2.3 Optimize and Adjust Curriculum Content with the Goal of Professional Ability Cultivation

In the classroom teaching reform, teachers establish the concept that the specific curriculum content itself is not invariable, should keep up with the needs of The Times, and put the training of students' professional ability in an important teaching position. In HVAC and new energy industry demand as the basis, closely around the HVAC professional applied talents training target, integrating students' general ability, professional basis, professional development ability as a whole, the introduction of industry and post technical standard, the latest research results at home and abroad, cutting-edge knowledge, enterprise real case, advanced production technology, according to the knowledge structure of hierarchy, adjust the order of the traditional teaching contents in the past, according to the basic process of HVAC system design, formed a new, more scientific and practical system of curriculum knowledge, revised the course syllabus, the building load calculation, heating system design, design of air conditioning system, ventilation system design four modular curriculum content [4], which has some advanced and practical (Fig. 2).

2.4 Use Flexible and Diversified Teaching Methods to Arouse Students' Learning Initiative

Combined with the characteristics of contemporary college students, they are averse to indoctrination of theoretical knowledge blindly, like network communication, and have mastered the use of network platform. This course adopts the teaching mode of combining online and offline teaching. Teachers upload course-related news or literature materials to the learning center through mobile learning APP and course network learning platform. On the one hand, they can expand disciplinary knowledge and understand industry trends. On the other hand, they can understand current news and policies, pay attention to social development, and enhance students' industry awareness and social responsibility.

In the teaching process, passive teaching is difficult to let students really into the classroom, so in the course teaching, according to the current hot topics, appropriate organization of discussion, let students take the initiative to participate in the teaching. Before the discussion, for example, selected a type construction, requests the student to group as the unit, collect data, put forward suitable for this type of architecture form of HVAC, students in class organization of various schemes were analyzed, and the timely introduction of new technology, broaden the students way of thinking, to explore a better design scheme and realization ways. The discussion enlivens the classroom atmosphere, broadens students' vision and cultivates students' innovation ability (Fig. 3).

2.5 The Implementation of "Plane + Three-Dimensional" Teaching Means to Stimulate Students' Learning Enthusiasm

Due to the limited ability of students to comprehensively apply the knowledge of various courses, and the huge HVAC system, students can not fully and deeply contact the whole system in practice, and their understanding of HVAC system is still relatively abstract. Therefore, the original traditional teaching method is changed, and the teaching method of "plane + three-dimensional" is implemented. Give full play to the biggest advantages of each teaching method (project-oriented teaching method, case teaching method, task-driven teaching method, etc.), and strive to provide a more informative, more vivid, better interactive teaching platform. In the courseware, the collection and production of a large number of pictures and animation, truly reflect the shape of equipment and the

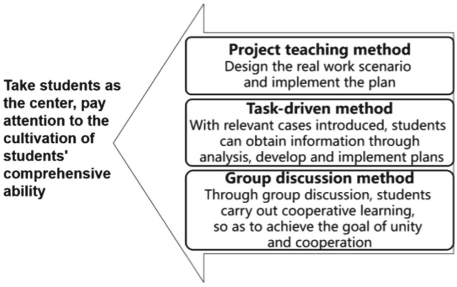

Fig. 3. The teaching method.

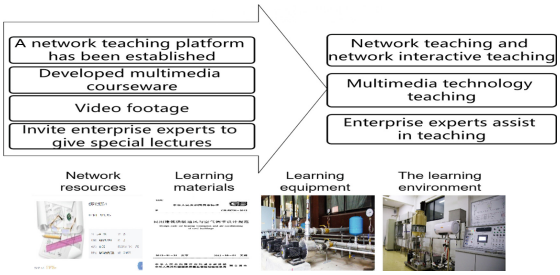

Fig. 4. Teaching means.

whole work process, so that students can be clear about the relevant knowledge, not only shorten the distance between teaching and actual engineering, save the teaching time, but also improve the enthusiasm of students to learn, improve the quality of teaching (Fig. 4).

Secondly, this course was started in 2020 in super star platform for online teaching resource construction, perfecting construction in use process, put forward to construction projects in succession, norms, ideological, database library, library, etc., to facilitate students before class, after class to use super star online courses to prepare, review, self-directed learning classes used in the learning platform to carry out the diversity of classroom teaching activities, up to now, the online resources of the course have been viewed more than 600,000 times.

2.6 Implement "Peacetime + Project" Diversified Assessment to Improve Students' Practical Ability

In order to deepen students' understanding of basic knowledge of building environment control and design and application, this course adopts the diversified assessment method of "peacetime + project", grades according to students' classroom performance situation, the network platform learning participation, stage examination, chapter quizzes constitute, project performance consists of the design result and reply result, a comprehensive evaluation of the two. Realize the change of course evaluation from rote learning and final exam results to independent thinking and "whole process academic evaluation - non-standard answer test". Adopt the evaluation methods of students, teachers and students, on campus and off campus, strengthen the interaction between teachers and students, students and students, realize the evaluation of students' learning inside and outside the classroom, strengthen their practical ability and innovation ability, and improve the breadth, depth and challenge of course learning (Fig. 5).

2.7 Give Full Play to the Ideological and Political Education Function of Professional Courses

According to the gold class "high order, innovative and challenges" request, will be the talented person's view of "six quality ability" in our school, HVAC working characteristics, the combination of condensed out of the "rigorous truth-seeking, unity and cooperation, not afraid of challenges, patriotic dedication, pursuit of excellence" education key

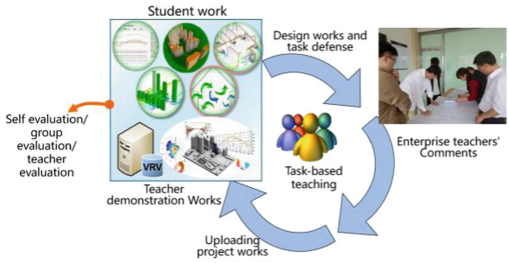

Fig. 5. Course assessment.

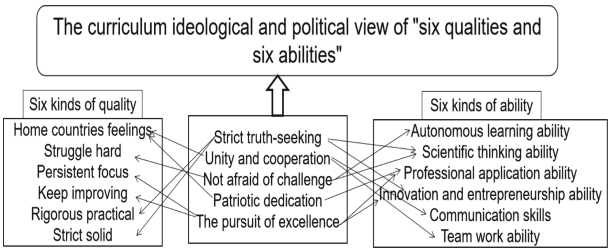

Fig. 6. Course education.

elements such as course, throughout the course of teaching, cultivating students' patriotic feelings, dedication, diligence and enterprising home countries Strives for perfection, the pursuit of excellence of scientific spirit, professional attitude, rigorous practical, not afraid of the challenge with the core values consistent, forming "value guidance, knowledge and ability training" course education new mode of the trinity, so that the students have good quality, safety and energy conservation and environmental protection consciousness, and to undertake corresponding social responsibility consciously (Fig. 6).

3 Analysis on the Effect of Teaching Reform

3.1 The Teaching Quality Has Been Improved Obviously After the Classroom Teaching Reform

In the course of professional learning, we insist on "not armchair strategist" and apply profound theory and solid engineering knowledge. Through multiple project curriculum design to develop the student apply this course and the course knowledge solution actual problem ability, training the students' correct calculation, drawing, and using the basic specifications, data access skills, be familiar with HVAC design, content, procedure and basic principle, in-depth study the HVAC design calculation methods and steps, consolidate the theoretical knowledge and practical knowledge, from shallow to deep to realize the training of students' comprehensive ability, for the graduation project and future work to lay a good foundation.

3.2 Teaching Resources Are Further Enriched

This course has a lot of content, strong narrative, all kinds of materials are self-contained, and its logicality is poor, which makes it easy for teachers to follow the script in teaching and difficult to stimulate students' learning initiative and creativity. Through the use of superstar learning platform to build courses, to provide students with rich course learning resources, the use of online and offline hybrid teaching, task-driven method, group discussion method and other teaching methods, combined with engineering examples for teaching, through classroom teaching, case study, group discussion to achieve knowledge objectives; cultivate students' ability goals through group cooperation and integrated teaching; Through the infiltration of ideological and political elements such as craftsman spirit, consciousness of energy conservation and emission reduction and environmental protection in the teaching links, the quality goal is achieved and the organic unity of knowledge, skills and quality is promoted. Built Environment Control System curriculum website and Built Environment Control System Curriculum Resource database (curriculum standards, teaching plans, learning task design schemes, teaching plans, teaching courseware, ideological and political case database and other complete curriculum resources required for teaching) has been established, which has been promoted and shared in the whole university and other universities in China.

3.3 Students' Comprehensive Quality and Scientific Research Ability Has Been Comprehensively Improved

According to the findings of the implementation of the curriculum reform among the five classes of students majoring in Built Environment and Energy Application Engineering from 2016 to 2018, curriculum reform has effectively improved the students' cognition of the industry and their ability to solve complex problems. Students have won 23 national and provincial awards in the National BIM Graduation Design Innovation Competition for College Students, National College Students Energy Conservation and Emission Reduction Competition, China Refrigeration and Air Conditioning Industry College Students Science and Technology Competition, Shandong Province College Students Science and Technology Festival and other competitions, with more than 100 winners. Officially published 14 professional papers, has been authorized patents and submitted to the National Patent Office through novelty search 19 patents. The time for students to be qualified for the post is greatly shortened, which makes the graduates of 2019, 2020 and 2021 of the construction and Environment major of our school highly praised and recognized by many employers in the employment competition, and provides a large number of high-quality talents for the economic construction of Dezhou and surrounding areas.

4 The Bright Spot of Teaching Reform

4.1 "Project Driven", Integrating Theoretical Knowledge with Practical Application

Make full use of enterprise resource, to extend the classroom to the enterprise, into the production practice, through linking theory and practice of "the last kilometre", and

adopted different difficulty level of the enterprise actual project to train the students to deepen students understanding of enterprise production process, procedure, process, and encourage students to discover and solve problems in the process of application, students can integrate theoretical knowledge with practical engineering application, directly face various technical problems encountered in the production process, and improve practical ability and innovation and entrepreneurship ability in practice.

4.2 The Combination of "Online + Offline" Enables Students to Study Independently

Offline classroom teaching takes practical engineering tasks as the main course line and adopts the forms of flipped classroom and group discussion to carry out teaching. Students can actively participate in classroom teaching interaction according to the online preview before class to strengthen their understanding and mastery of knowledge. After class, students can learn online at any time according to their own learning situation and needs. They can obtain the required knowledge and ability through repeated reading, listening to lectures and studying the problems encountered in offline learning, so as to achieve specific learning objectives and achieve independent learning. So as to cultivate students' ability to collect and process information, acquire new knowledge, analyze and solve problems, and communicate and cooperate, which fully embodies the "student-centered" teaching concept.

4.3 Form a Cooperative Mode of Benign Interaction Between Industry and Education and Complementary Advantages Between Schools and Enterprises

Good use of advantages of the enterprise, use professing advantage, according to the curriculum requirements, under the enterprise project as a teaching task will be distributed to students, through the students' design, simulation, to help enterprises solve the problem of engineering practice, improve the level of enterprise technology, formed the enterprise project student participation, student achievement of enterprise application and mutual benefit between colleges characteristics, the cooperative mode of school-enterprise co-promoting industrial development, school-enterprise co-educating elite craftsmen, benign interaction between industry and education, and complementary advantages of school-enterprise [5].

5 Conclusions

The building environment control system for applied undergraduate course colleges and universities the students' ability of knowledge application ability and the enterprise needs a gap problem, follow the standard of gold class once "gender" will be of high quality applied talents training target combined with HVAC position requirements, the implementation of "student-centered" online hybrid classroom teaching reform, Build between each other in harmony "five pairs of" teaching mode, energy conservation and emissions reduction, spirit and innovation consciousness content is introduced into teaching,

strengthen the pertinence, practicability and effectiveness of the course content, mobilize students' participation, strengthening students' autonomous learning ability and the ability to analyze, the integrated use of knowledge to solve the problem, the implementation of "five changes" class. Through the implementation of the nearly three years, found that students' learning status improved, generally set up independent learning, active practice, innovation awareness, participation and practice ability are increased significantly, clearly show the the highly comprehensive comprehensive quality, engineering, applied the characteristics of strong innovation ability, practical strong, effectively improve the students' ability of six qualities.

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Authors' Contributions. The author is the principal of the curriculum reform of "Building Environment Control System", mainly studying the curriculum content, teaching methods, curriculum assessment, curriculum ideology and politics.

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