



Based on the Information Technology Means Application-oriented Undergraduate University “Cognition Practice” Curriculum Teaching Method Exploration

Chunhua Liu^{1*} and Yulei Zhao² and Fengjun Wei¹

¹Shandong Province First-class Undergraduate Major Construction Point in Colleges of Shandong; Shandong Huayu University of Technology, Shandong Dezhou 253034, China

²Jiangsu Four Seasons Muge Co., LTD, Jangsu Lianyungang 222000, China

*Corresponding author's e-mail: 274466502@qq.com

Abstract. Based on the Objective positioning of talent training of Shandong Huayu University of Technology , combined with the reality cases of new energy science and engineering students of 2018 , the practical implementation model of the integration production and education, school-enterprise cooperation in education, full-time and part-time teachers draw on the industry enterprise expert resources, surrounding the industry development status, the joint construction of online resources of the cognition practice course, by means of information technology, through multiple level management, scientific assessment, question classification, pieces of teaching methods such as achieving the course objectives, a new way has been explored for the opening of online practice training courses.

Keywords: cognition practice, information technology, online teaching, multiple level management.

1 Introduction

The major of building environment and energy application engineering is one of the related majors of the country to achieve the goal of "double carbon" and develop strategic emerging industries. Based on the needs of local regional economic development, and according to the development trend of the energy field and the development needs of the national economy, the major of Built environment and Energy Application Engineering of Shandong Huayu Institute of Technology was approved to set up in 2014, and successfully enrolled students in that year, and was successfully approved as a first-class undergraduate professional construction point in Shandong Province in 2021. According to the implementation of the teaching plan in the professional personnel training program, the course of "Understanding Practice" includes 30 class hours. As a window for students to directly contact the major and deeply understand the major, this course needs to enable students to master the principles of new energy

© The Author(s) 2024

D. Hu et al. (eds.), *Proceedings of the 2024 5th International Conference on Modern Education and Information Management (ICMEIM 2024)*, Atlantis Highlights in Social Sciences, Education and Humanities 29,

https://doi.org/10.2991/978-94-6463-568-3_15

conversion and utilization and the operation technology of new energy devices and systems. During the period of COVID-19, students could not return to school in time. In order to ensure the teaching effect, we carried out reforms and explorations in the construction of course teams, selection of internship units, arrangement of internship contents, forms of internship and assessment, which effectively mobilized students' interest in learning and improved their love for majors. Thus, it lays a solid foundation for students to learn professional courses, participate in big innovation projects, choose employment directions, and solve complex engineering problems^[1].

2 Basic Situation and Construction Ideas

2.1 Conduct Comprehensive Research and Timely Adjust the Teaching Implementation Plan

In order to ensure the effect of online teaching, before the preparation of teaching resources and teaching organization, the teachers of the curriculum team conducted a comprehensive survey on 38 students in Class 1 of 2018 building environment and energy Application Engineering major, and investigated some teachers who were responsible for the teaching tasks of the class, so as to ensure the substantive equivalence of online and offline teaching. The findings and analysis are as follows:

Learning basis: 33 students volunteered to apply for the first choice of this major, 3 students were transferred, and 2 students changed majors. All of them are science students, and most of the admission scores are concentrated between 441-443 points, which has a big gap with the admission scores of the built environment and energy application engineering major of other universities, and the students' learning foundation is weak.

Online listening: The survey found that the class online learning situation, attentively listening to take notes accounted for 37%; 32% were basically able to concentrate; Often absent-minded 26%; 5 percent do other things. It can be seen that students adapt to the management and learning mode of the university, and there is a general situation of learning burnout ^[2].

Focusing on the talent training goals and requirements of the major of building environment and energy application engineering in our school, the course team determined the 18-word teaching policy of "Understanding Practice" course by analyzing the characteristics of students and combining the current situation of online and offline teaching resources, namely "understand, learn; Department frontier, heavy application; Analyze the industry and promote employment "and adjust the original teaching program in time.

2.2 Set up a Teaching Team and Implement the Education Model of Integrating Production and Education with School-enterprise Cooperation

1) Building a teaching team: After receiving the teaching task in January 2020, in order to give full play to the role of this course as a window and platform for students to learn knowledge, understand the industry and plan employment, after consultation,

research and thinking, the teaching idea of "Please come in and go out" is determined, and engineers and technicians in the new energy industry are selected as part-time teachers of this course. Finally, three part-time teachers were determined, and the course content and class hours taught were shown in Table 1 below.

Table 1. Course content and class time allocation table

Practical project	content	Practical hours	Part-time teacher teaching time
Item 1	Course overview	4	
Item 2	Low temperature heat utilization of solar energy	8	6
Item 3	Medium and high temperature utilization of solar energy	5	4
Item 4	Photovoltaic power generation	7	6
Item 5	Biomass and wind power	6	

2) Clarify specific requirements: Due to the impact of the novel coronavirus epidemic, the course teaching which should focus on classroom teaching and going out to visit has been changed to online teaching. According to the requirements of the school for online teaching and the characteristics of online course construction, we will communicate with part-time teachers in time to clarify the specific requirements: Full content, clear organization, focus, beautiful picture, each class consists of a number of short videos, the total length of not less than 20 minutes. Teachers need to modify courseware, record videos, compile teaching plans and question banks according to the characteristics of short, precise and lively online courses.

3) To carry out special training: In order to ensure the quality of online course construction for part-time teachers, a special training group for part-time teachers has been established, and teachers with rich experience in video recording have been invited to conduct special training to guide part-time teachers to successfully complete online course video recording. Organize teachers with rich teaching experience to comment on the teaching videos of part-time teachers, evaluate them from the aspects of course content, course system, teaching method and teaching effect, and timely feedback the evaluation results to part-time teachers, improve the teaching videos, and ensure that students can understand and learn well in online learning.

2.3 Student-centered, Exploring Output-oriented Teaching Methods

1) To expand resources by means of special lectures by well-known experts and scholars at home and abroad: The network resources were extensively collected, and the lecture contents of well-known scholars and experts at home and abroad were recorded in the whole process of the 16th Tsinghua University Building Energy Conservation Academic Week Public Forum in 2020, and then edited and sorted into modular resources suitable for this course. The lecture contents are shown in Table 2.

Let the students understand the profession, understand the industry and know the industry by listening to the experts, that is, see the gap, set the goal, broaden the horizon, and improve the confidence and pride of professional learning.

Table 2. Contents of expert lectures.

Name	Title/position	Work unit	Content
Jangyi	Academician	Tsinghua University	Building a new energy system in rural areas
Yangxudong	Professor	Tsinghua University	Current situation of clean heating utilization in China
Dingxingli	Learned scholar	Tsinghua University	The introduction of economic insulation technology of farm house in north China
Lizhong	Senior engineer	China Academy of Building Science	Technology and application of fabricated solar heating
Mazhilin	Deputy general manager	Lanzhou Longxing heat energy	Integrated technology and application of household photovoltaic power generation and photothermal heating

2) Construction of teaching resources in combination with the current situation of industrial development: Whether it is traditional teaching or network teaching, the main body of teaching is students^[3]. The construction of teaching resources takes full account of students' knowledge, acceptance and age characteristics, and adopts the way of "two directions".

Modular, according to the solar low temperature heat utilization, medium and high temperature heat utilization (power generation), photovoltaic power generation, biomass and wind power generation several modules, each class hour to teach 1-3 knowledge points.

Systematized, each module first introduces the basic knowledge, then the main products and typical systems, and finally introduces the industry status.

Employment-oriented, according to the medium term enterprise personnel needs in Shandong Province and the surrounding areas, combined with the students' hometown, focus on low-temperature solar thermal utilization and photovoltaic application, brief introduction of biomass, solar thermal power generation and wind power generation, and reasonable arrangement of class hours.

Market-oriented, each specific technical point corresponds to the actual project, explaining in detail the investment, income, difficulties, industrialization and the next development trend of the project. At the same time, the leading enterprises in the industry are introduced to enhance the students' understanding of the industry, industry and enterprise.

2.4 We should Pay Attention to the Cultivation of Students' Application Ability and Reform the Way of Curriculum Assessment and Evaluation

1) Multi-level management: The innovation of student management mode should adapt to the characteristics of students' online learning^[4]. Considering the psychological problems of students' slack after long-term online learning, this course adopts the mode of pre-grouping and teamwork, giving full play to the supervision of class cadres and the supervision of classmates.

Considering that the most accepted method is "systematic random grouping"^[5], the 38 students in the class are divided into four groups, and each group selects a leader who is responsible for organizing, counting and guiding the students in the group to learn on time.

The monitor and the student committee serve as the online learning supervisor, each supervising two groups and reviewing the learning situation of each group.

Since each person's learning effect not only affects the individual, but also affects the performance of the whole group, students will also supervise each other and study together.

Through the three-level management structure, as shown in Figure 1, the role of group leader organization, class committee supervision, teacher management and mutual supervision among students in the same group is given full play. Meanwhile, the online teaching management of this course is carried out with the help of counselors under special circumstances.

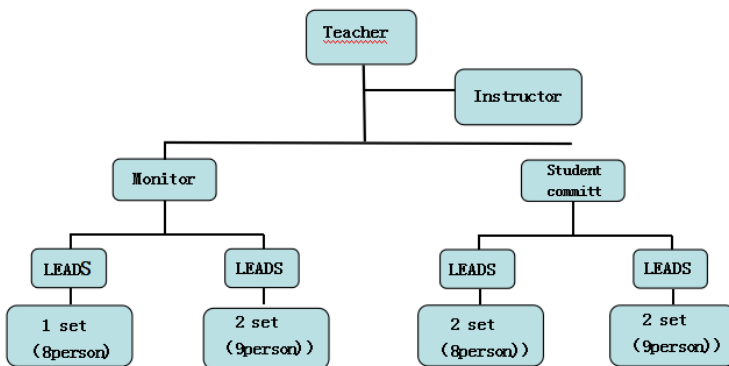


Fig. 1. Student management architecture diagram.

2) Scientific assessment: This course is an examination course, the usual score is 50%, and the big homework is 50%. The big assignment is to complete a research paper for each student, so that students can understand the topic formulation method, content writing ideas, format and layout requirements of the paper through writing the paper, and lay a foundation for the future course design and graduation design (thesis). Peacetime score is composed of four parts: online course learning, test score, peacetime performance and group score. The method of addition and subtraction is adopted. All

plus or minus points and points are posted daily in the learning group. The scoring criteria are as follows:

(1) Online course learning accounts for 20%, using the reduction system, full score of 20 points, the day can not complete the learning task on time deducted 4 points/time.

(2) 30% of the test score, 100 points.

(3) The usual performance accounted for 20%, using the bonus system, full score 20 points, four discussion questions, each answer is correct 1-10 points plus 5 points, 11-20 points plus 4 points, the rest plus 3 points, the answer is not correct will not be given points.

(4) Group performance accounts for 30%, using the plus or minus score system, full score 100. It includes three parts: attendance, study notes and answer questions. See Table 3 for details.

Table 3. Group performance assessment scheme.

Assessment item	Examination regulation	Management mode
Sign-in	Sign in the QQ group before 8:00 every day, according to the order of the group to complete the sign in, the first group will add 3 points, the second will add 2 points, the third and fourth will add 1 point, if there is a student who has not completed the sign in, this group will not add points.	Group leader collection Supervisory review Teacher test
Study notes	Each student completes a study note on the day, 2 points will be added for completion, and no points will be deducted for failure.	Group leader collection Supervisory review Teacher test
Classroom questioning	For basic questions, one or two students in each group will lose 2 points if they answer wrong. No extra points will be given if they answer correctly. For complex questions, the team will receive 3/2/1 points for the top three correct answers. No points will be deducted for incorrect answers.	Teacher's question

3) Classroom review: the teacher uploads the course teaching video to the learning platform in the form of task points in time, stipulates the learning completion time of each task point, monitors the students to complete the learning task of the online video of each project, and carries out a concentrated time knowledge review, and helps the students to review the content and grasp the knowledge structure.

4) Fragmented teaching: the topic stem of each question is related to national policies, industrial development status, and product technology development bottlenecks, so that students can understand national policies and industry status when reading questions, and continue to absorb fragmented knowledge.

2.5 Effect and Summary Reflection

1) Learning effect

Completed 180 times of video learning on the same day, accounting for 95%;

On that day, 178 notes were completed, accounting for 94%;

Questions were asked 40 times in class, and answers were correct 38 times, accounting for 95%;

4 discussion topics were submitted by 139 people, accounting for 91%;

The average score of the exam was 92.8, with an excellence rate of 89%.

2) Summary and reflection

During the class, opinions and suggestions of students were solicited through QQ group, learning platform, individual communication and other means. After the class, 38 questionnaires were distributed and 36 points were recovered, accounting for 94.7%. The questions were summarized, as shown in Table 4 below.

Table 4. Statistical table of the questionnaire.

Problem	Options (proportion)			
Part-time teachers teaching effect rating	100 points (64%)	90 points (28%)	80 points (3%)	70 points (3%)
Evaluation of expert resources	100 points (89%)	90 points (11%)	80 points	70 points
Video duration	Longish (18%)	Too short (18%)	Happen to (64%)	
Evaluation of this course	Very useful (53%)	Of great use (44%)	Receptiveness (3%)	Unlike
Management style evaluation	Strict, don't like (3%)	Strict, like (97%)	Acceptability	It doesn't matter.

3 Conclusion

Through the co-construction of the school and enterprise, the selection of excellent network resources, by means of information technology, the use of scientific assessment methods, 30 hours a week of online course learning, the students have a better grasp of knowledge, to achieve the expected effect.

The teaching method of this course has gone through four rounds of practice, through continuous improvement of online teaching resources, adjust teaching methods, course construction results are remarkable. At the same time, it is popularized and applied in the new energy science and Engineering, energy and power engineering and so on, have achieved the expected results.

Acknowledgment

This paper takes Shandong Huayu Institute of Technology building environment and energy application engineering as the support of Shandong Province's first-class undergraduate major construction.

Reference

1. Nie Jinna, Shen Juanjuan, Gao Ling, Xu Fangyi, Wang Lifeng, Hu Yanan. To follow the gender one-degree standard to deepen the construction of on-line and off-line mixed first-class courses in selected reading [J]. *Chinese Medicine Modern Distance Education of China*, (15), 39-41 (2024).
2. Cao Xianye. Current situation and countermeasures of undergraduate learning burnout: A case study of Southwest China [J]. *Logistics Engineering and Management*, (06), 122-124+118 (2024).
3. An Xiaojuan, Guo Zhigang, Wang Hongming, Shi Haiyan. The teaching reform and practice of “Guide to innovation and entrepreneurship” for different majors based on on-line and off-line hybrid teaching [J]. *Journal of Chengde Petroleum College*, (06), 65-70 (2024).
4. Cao Xianye. Current situation and countermeasures of undergraduate learning burnout: A case study of Southwest China [J]. *Ability and Wisdom*, (16), 77-80 (2024).
5. Guo Xiangwei, Guo Jianfeng, Wang Chen, Wang Yun Jian. The application research and practice of on-line teaching tool in the process of mould electricity teaching [J]. *China Modern Educational Equipment*, (09), 12-15 (2024).

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

