

Reform and Exploration of the Teaching Mode of Experiment of Chemical Engineering Principles of Online and Offline Integration

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Abstract: In order to improve students' comprehensive ability and engineering practice ability, it has been reformed that the teaching mode of experiment course of chemical engineering principle. Through optimizing the teaching content of experiment course of chemical engineering principle, a new students-centered teaching mode has been formed with pre-class preview, online learning and classroom learning. And reforming the way to assess the experiment of chemical engineering principle is the realization of online and offline integration of teaching evaluation system. The practice shows that the new teaching mode improves students' enthusiasm, initiative and innovation in learning, enhances students' interest in experiment course of chemical engineering principle, and improves students' engineering practice ability.

Keywords: Online and offline teaching; Experiment of chemical engineering principle; Reform and exploration of teaching mode

1. Optimization Design of Curriculum System

The traditional experiment course of chemical engineering principle is mainly based on verification experiment, which mainly includes the basic operation of experiment and the performance index of test equipment, and the operation process of the experiment that the teacher explains and demonstrates. Students follow the experimental steps and record, analyze and summarize the experimental results. Students acquire knowledge by consulting books and the Internet, and summarize and analyze their own experimental results in the form of experimental reports, so they can have strong knowledge application ability. However, the traditional experimental course of chemical engineering principle lacks innovation and involves less engineering practice, so students can't apply what they have learned to practice. In view of the above problems, we have optimized the design of experimental course of chemical engineering principle, changed the verification experiment to design oriented, innovative, and comprehensive experiments and paid attention to training students' engineering consciousness and innovation ability in the teaching process. The experimental course system of chemical engineering principle is composed of three parts of verification and comprehensiveness. In the traditional teaching process, teachers explain each knowledge point in detail, but students can only passively accept the knowledge, cannot grasp the knowledge point well. The design oriented and comprehensive experiment part are added to the curriculum system, and the teaching mode of pre-class preview, online learning and classroom learning is combined to fully mobilize students' learning enthusiasm and initiative.

2. Preview Before Class to Master the Basic Knowledge

Through the pre-class preview, students can understand the basic knowledge of experimental principles, experimental steps and experimental equipment in advance, master the relevant data processing methods, and lay a good foundation for classroom learning. Teachers can optimize the content of chemical Engineering principal experiment course, and divide the teaching content of chemical Engineering principal experiment course into two parts: the first part is the basic operation skill training of experiment of chemical engineering principle, and the second part is the principle learning of chemical engineering principal experiment. The basic operation skills training of chemical engineering principal experiment is carried out before class. By learning relevant videos, demonstrating operations from teachers, and equipment operation training to guide students, students can master relevant knowledge. The basic operation

skills training of chemical engineering principal experiment is completed before class. Students can learn related videos, demonstrating operations from teachers, and equipment operation training to guide students on the Internet according to what they have learned. Learning principles of Chemical Engineering experiment is completed before class, and students can learn by watching related videos and teachers' demonstration operations.

According to the requirements of the course syllabus, students must first complete the basic operation skills training of chemical engineering principal experiments, the basic structure and working principle of equipment, and the common fault treatment of equipment. Secondly, completing the basic theoretical study of chemical engineering principal experiments includes the basic concept of fluid flow, state analysis of fluid flow, resistance loss calculation of fluid flow and so on. Finally, by watching videos on the Internet and teachers' demonstration operation and equipment operation training to guide students, students can master the structure and working principle of related equipment, basic operation skills and troubleshooting knowledge.

3. Enrich Experimental Content by Online learning

Before the beginning of the course, the teacher prepared an online teaching video, including five aspects: the basic operation of chemical engineering principal experiment, basic unit operation, experimental equipment and equipment maintenance, experimental data collection and analysis, and experimental report writing. Among them, the basic operation of the experiment is the content that students need to master, and the experimental equipment and equipment maintenance and data collection and analysis are the key content that students need to learn. Through online learning, students can better understand and master the operation points and points for attention of basic unit operation. For example, when conducting heat transfer unit operation experiments, students need to understand the structure and points for attention in installation of heat exchangers; When conducting the operation experiment of the distillation unit, students need to understand the structure of the distillation tower and the points for attention in installation of the top condenser.

In addition, the teacher also prepared the experimental report template of chemical engineering principles for students' reference. For example, when carrying out the distillation unit operation, the teacher should remind the students to pay attention to the safe distance between the internal components of distillation tower and the heat exchanger, the safe distance between the return pipe and the packing, the safe distance between the condenser and the distillation tower, and the safe distance between the top of filling layer and the condenser. Through online learning, students' learning initiative and enthusiasm are improved.

4. Master Key Skills by Classroom Learning

Heuristic teaching is a kind of "student-centered" teaching mode, which means that according to the characteristics of students and different teaching contents, teachers use a variety of inspiring means to make students think actively and master knowledge actively. In the experiment course of chemical engineering principals, teachers can design and assign questions carefully for different experiment contents and students at different levels. For example, in the distillation tower experiment, teachers can ask students to read textbooks, consult literature and refer to their actual life to propose common problems in the operation of the distillation tower. Teachers can inspire students to think about how to solve these problems by asking questions. In the experimental design stage, teachers can ask students to read some literature or consult relevant literature and refer to their actual life to put forward some improvement methods and suggestions. In the experimental operation stage, teachers can ask students to read and discuss relevant content in the preview stage and demonstrate before the experimental operation.

Case analysis teaching refers to a new teaching method used by teachers in teaching design for some typical chemical production processes. For example, in the distillation tower experiment, teachers can ask students to understand some problems in the operation of the distillation tower and the solutions and measures to solve these problems. In the process of experimental operation, teachers can set some "traps" to remind students to pay attention to safety, standardized operation, standardized record, standardized report. Through the application of these case analysis teaching methods, students can effectively improve the understanding and mastery of the experimental principle and operation process.

5. Teaching Evaluation System of Online and Offline Integration

The reform of the teaching quality evaluation system of experimental courses should not only assess students' experimental results, but also assess students' learning attitude, learning ability and comprehensive application of knowledge. Applying the teaching mode of online and offline integration to the assessment of chemical Engineering principal experiment course can realize the transformation from the result assessment to the process assessment. Combining with the characteristics of chemical Engineering principal experiment course, the construction of online and offline integration of teaching evaluation system can not only help teachers timely understand the learning effect of students, but also encourage students to actively participate in classroom interaction. Through this diversified, multi-level and multi-dimensional course assessment method, it can not only test students' mastery of the knowledge, but

also stimulate students' independent learning ability and innovation ability. At the same time, it can also guide students to develop a good habit of preview before class, review after class and summary and reflection, and cultivate students' ability to analyze and solve problems and innovative consciousness.

6. Conclusion

The reform and exploration of the experimental teaching mode of chemical engineering principles of online and offline integration aims to improve the pre class preview effect of students, enrich online learning content, strengthen classroom key skill training, and establish a teaching evaluation system that integrates online and offline to comprehensively improve the teaching effectiveness and efficiency of chemical engineering principle experiment by optimizing the design of the course system. The reform of teaching mode not only helps to improve students' experimental skills, cultivate their innovative thinking and problem-solving ability, but also helps teachers to better understand students' learning status, optimize teaching methods and improve teaching level. However, the reform of teaching mode also faces some challenges, such as how to better integrate online and offline resources, and how to ensure the quality of teaching. Therefore, we need to continuously conduct in-depth research and explore more scientific and reasonable teaching methods and strategies to promote the teaching development of experiment of chemical engineering principles.

In the future, we need to further optimize the online and offline education resources, realize the sharing and complementation of resources, and provide students with more abundant and diverse learning materials. Combined with new educational concepts and technical means, we actively explore more diversified teaching methods, such as virtual reality and augmented reality, so that students can feel the charm of chemical engineering principles in practice and improve their experimental skills. Strengthening teacher training can improve teachers' education and teaching ability, and enable them to better adapt to the needs of online and offline integration of teaching mode. A more scientific and reasonable evaluation system should be established to fully reflect students' learning results and teachers' teaching effects, and provide strong support for education reform.

References:

- [1]Yinan Tang,Hanjing Sheng,Yiting Wang et al.Application of Intelligent+Virtual-Real Teaching Model in the Teaching of Experiment of Chemical Engineering Principles[J].Chemical Enterprise Management,2023(19):51-55.
- [2]Wei Xu,Yao Wang,Lu Yu et al.Reform and Exploration of Teaching Model of Experiment of Chemical Engineering Principles of Online and Offline Integration[J].Higher Education in Chemical Engineering,2022,39(04):60-63+132.
- [3]Fen Liu,Ling Bo,Tao Yang et al.Exploration on Teaching Reform of Experiment Course of Chemical Engineering Principles under the Background of Digital Transformation[J].Guangdong Chemical Industry,2023,50(20):184-186.