

Pedagogical Reform in Applied Chemical Technology in Shaanxi Province, China

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Abstract: China is vigorously developing higher vocational education, and cultivating high-skilled and high-quality compound talents is the goal of higher vocational education. The Applied Chemical Technology major offered by Shaanxi Polytechnic Institute is a typical three-year higher vocational major. In order to better achieve the goal of professional talent training, it is necessary to carry out pedagogical reform for the major of Applied Chemical Technology. Therefore, the pedagogical reform of Applied Chemical Technology needs to explore a suitable teaching mode according to the characteristics of vocational education itself, according to the teaching content, teaching resources, teaching objectives and teaching effects to be achieved in each course.

Keywords: Pedagogical Reform, Applied Chemical Technology, Higher Vocational Education.

1. Introduction

Higher vocational education, that is, higher vocational education, refers to the form of education that cultivates senior technical personnel with certain professional qualities and practical ability in order to meet the society's demand for various technical skills. Compared with general higher education, higher vocational education pays more attention to the cultivation of practical ability, emphasizes the application of learning, and cultivates students with the skills and knowledge required for practical work.

2. The Characteristics of the Applied Chemical Technology

Applied Chemical Technology is a subject field with remarkable characteristics, which focuses on engineering application in the field of chemistry and integrates the knowledge of multiple disciplines. Here are some of the major features of the major:

(1) Strong comprehensive

Applied Chemical Technology is a highly comprehensive specialty, which involves the knowledge of chemistry, engineering, computer and other disciplines. This interdisciplinary nature enables students to obtain a wider and in-depth knowledge system, so as to have a stronger comprehensive quality and problem-solving ability.

(2) Strong practicality

This major attaches great importance to the cultivation of practical operation ability. Students not only need to master the basic knowledge and experimental skills of chemistry, but also need to understand the knowledge and skills in engineering design, production and operation, quality management and other aspects. This practice-oriented teaching method helps students to apply theoretical knowledge to practical production and improve their ability to solve practical problems.

(3) Focus on sustainable development

Under the background of increasing environmental awareness, the major of Applied Chemical Technology also pays great attention to the sustainability of chemical process.

It is committed to cultivating students with environmental awareness and the ability to apply green chemical technology to promote the sustainable development of the chemical industry.

(4) Employment prospects are broad

Graduates majoring in Applied Chemical Technology have a wide range of employment prospects in chemical industry, petroleum, metallurgy, energy and other industries. They can be engaged in production operation, technology development, engineering design, inspection and analysis and other aspects of the work, to contribute to the development of the country's chemical industry.

Applied Chemical Technology has attracted more and more students to choose this major for its comprehensive, practical, focus on sustainable development and broad employment prospects. At the same time, with the continuous progress of science and technology and the continuous development of the chemical industry, the characteristics of the Applied Chemical Technology specialty will be continuously strengthened and developed.

3. The Pedagogical Reform Method of the Applied Chemical Technology

China is vigorously developing higher vocational education, and cultivating high-skilled and high-quality compound talents is the goal of higher vocational education. The Applied Chemical Technology major offered by Shaanxi Polytechnic Institute is a typical three-year higher vocational major. In order to better achieve the goal of professional talent training, it is necessary to carry out pedagogical reform for the major of Applied Chemical Technology.

At present, the professional reform of the courses offered by the major of Applied Chemical Technology is mainly about teaching methods. The commonly used teaching methods are:

(1) LBL

LBL teaching method (Lecture based learning), teacher-centered, strengthen the teacher's "teaching" function, focus on the completion of the set teaching goals, the teacher leads the entire teaching process, and students only learn passively.

Yu Shuwei et al. applied LBL pedagogy to the teaching of analytical chemistry, and concluded that the single use of LBL pedagogy will lead to low learning efficiency and lack of learning initiative, which is not conducive to the cultivation of high-quality talents.

(2) PBL

In the 60s of the 20th century, American neurology professor Barrows proposed the PBL teaching method (Problem based learning), which was first implemented at McMaster University in Canada. At present, the world's top universities including Maastricht University in the Netherlands and undergraduate colleges such as Shanghai Second Military Medical University in China have introduced PBL teaching methods, and have achieved good teaching results. In 2003, Yang Mingfu and Wang Yunxia applied the PBL teaching method to the reform of undergraduate analytical chemistry teaching in medical laboratory science, believing that the PBL teaching method changed the traditional LBL teaching method to be teacher-led, and its obvious advantage was to mobilize students' learning enthusiasm and teamwork spirit.

(3) TBL

In the 70s of the 20th century, Professor Michaelsen of Oklahoma State University proposed TBL (Team Based Learning). This method has been rapidly promoted and applied in the teaching of analytical chemistry courses in undergraduate colleges and universities in the United States, Canada, South Korea, Australia, China and other countries. In 2019, Yang Haiyan et al. applied the TBL teaching method to the experimental teaching of analytical chemistry, and the teaching effect was remarkable, which made up for the shortcomings of the traditional LBL experimental teaching mode, and the teaching effect was significantly enhanced: the group experimental mode enhanced students' sense of teamwork and improved students' ability to collaborate and help each other; The mode of student lecture stimulated students' enthusiasm for participating in experiments, and exercised students' ability of data review, program design, and comprehensive language expression. The students' fault picking session mobilized the enthusiasm of all students to prepare and participate in the experiment; The summary and presentation session deepened students' understanding of experiments and improved students' ability to analyze and solve problems. The course assessment method, which pays equal attention to process and result, greatly cultivates students' confidence in experiments and scientific attitude of seeking truth from facts. TBL teaching method has good effect in the cultivation of medical talents, and has strong reference significance for the cultivation of talents in experimental and applied disciplines such as chemistry and biology.

(4) Flipped classroom

In 2007, two chemistry teachers from Rocky Mountain "Woodland Park" High School in Colorado, USA, first proposed the concept of "flipped classroom", which combined real-time explanations and PPT demonstration videos to the network to help absentee students make up classes. Therefore, flipped classroom, which can also be translated as "upside down classroom", refers to readjusting time inside and outside the classroom, shifting the decision on learning from the teacher to the student. In 2011, Salman Khan founded Khan Academy, making the flipped classroom familiar to many teachers and becoming a teaching model of interest in the global education community.

4. Existing Problems in the Teaching of Applied Chemical Technology

(1) More teaching content, less teaching hours.

In China, higher vocational education is a three-year system, of which students spend two years in school and one year in enterprise practice. At the same time, the characteristics of higher vocational education are to master a skill, and in accordance with the requirements of the Ministry of Education on the training of higher vocational professionals, the curriculum of the major must have more than 50% practical courses. Therefore, in order to complete the training program in a short period of time, the teaching hours of each course are compressed, especially the theoretical courses. Therefore, in the teaching process, there is a contradiction that there is more content but less teaching hours in professional courses.

(2) The classroom teaching effect is not satisfactory

Due to the courses offered by the Applied Chemical Technology major, the teaching content is large and wide, and the teaching hours are too small. In order to complete the teaching content, teachers can only lecture from beginning to end according to traditional teaching methods. Teachers only focus on the completion of the set goals of classroom teaching, and are accustomed to explaining according to their own teaching design and ideas, while ignoring the acceptance process of students. This kind of teaching process is not conducive to teacher-student interaction, and teachers tend to ignore students' classroom response and acceptance, resulting in low learning efficiency of students, failure to fully understand and master knowledge, and difficulty in achieving the expected teaching effect.

(3) There are large differences in student levels

At present, the source of students in China's vocational colleges mainly includes three types: independent enrollment, general college entrance examination, and 3+2 segmented training, so the students' chemistry foundation is uneven. Most students have a weak chemical foundation, low acceptance of teaching content, "can't understand class, can't use it after listening", and some students enter "empty mode" after frustrated understanding of course content, and their enthusiasm for learning is not high.

Therefore, the application of chemical technology needs to reform the teaching according to the characteristics of vocational education itself, and explore a teaching mode suitable for Shaanxi, China.

5. Pedagogical Reform of Applied Chemical Technology in Shaanxi, China

In order to adapt to the unique educational characteristics of Shaanxi province, China, the major of Applied Chemical Technology needs to fully consider the teaching content, teaching resources, teaching purpose and the teaching effect of each course in the teaching process, so as to explore the pedagogical reform method suitable for this major.

(1) The Teaching Content

The major of Applied Chemical Technology needs to closely combine the industrial characteristics and development needs of Shaanxi region, and formulate a curriculum system in line with the local characteristics. Specifically, relevant courses, such as chemical technology, chemical equipment and chemical safety, can be set up

according to the current situation and development trend of the chemical industry in Shaanxi province, so as to cultivate students' professional quality and practical ability. At the same time, some cutting-edge technologies and innovative ideas can also be introduced to broaden students' vision and knowledge.

(2) The Teaching Objective

The major of Applied Chemical Technology needs to clearly cultivate students' comprehensive quality and innovation ability. In addition to imparting basic knowledge and skills, attention should also be paid to cultivating students' thinking ability, practical ability, teamwork ability and other abilities. Through project drive, case study and experimental training, students can learn and grow in practice, and improve their comprehensive quality and innovation ability.

(3) The Teaching Methods

Applied Chemical Technology major needs to make full use of modern scientific and technological means to improve the teaching effect and quality. For example, modern teaching methods such as multimedia teaching and network teaching can be used to enrich teaching content and forms, and introduce virtual simulation technology to practice students in virtual environment and improve their practical ability and safety awareness.

(4) The Teaching Evaluation

The application of chemical technology needs to establish a scientific, fair and comprehensive evaluation system. In addition to the traditional examination evaluation, attention should also be paid to the process evaluation and comprehensive evaluation, focusing on the performance and progress of students in the learning process, as well as their performance in project practice, teamwork and other aspects. This allows the students' learning outcomes and ability level to be more comprehensively evaluated.

(5) The Teaching Resources

The major of Applied Chemical Technology needs to actively strive for and integrate all kinds of teaching resources to provide strong support for teaching. We can cooperate with enterprises to establish practical teaching base and university-enterprise cooperation platform to provide more practical opportunities and employment channels for students, and strengthen exchanges and cooperation with other universities and research institutions to share quality teaching resources and research achievements.

6. The Significance of the Applied Chemical Technology Pedagogical Reform

As one of the first batch of majors approved as vocational undergraduate majors in Shaanxi Polytechnic Institute, the pedagogical reform research of Applied Chemical Technology is particularly important, which is not only related to the sustainable development of the major itself, but also has far-reaching significance to improve the quality and level of the whole vocational undergraduate education.

(1) The pedagogical reform research of Applied Chemical Technology is helpful to promote the close combination of professional education and social needs. With the continuous progress of science and technology and the continuous adjustment of industrial structure, the demand for talents in the chemical industry is also undergoing profound changes. Traditional professional education of Applied Chemical

Technology often pays attention to the teaching of theoretical knowledge, but ignores the cultivation of practical ability. Therefore, the research on pedagogical reform needs to be deeply discussed on how to better combine theoretical knowledge with practical skills, so that graduates can better adapt to the market demand and meet the needs of the development of the industry.

(2) The pedagogical reform research of Applied Chemical Technology is helpful to improve the pertinency and effectiveness of professional education. In the teaching process, teachers should pay attention to teaching students in accordance with their aptitude, and develop personalized teaching plans according to students' learning characteristics and interests. At the same time, it is also necessary to strengthen the design and implementation of practical teaching links, and improve students' practical ability and innovative consciousness through experiments, practical training, practice and other ways. This can not only stimulate students' interest and enthusiasm in learning, but also cultivate their team spirit and problem-solving ability.

(3) The pedagogical reform and research of the Applied Chemical Technology can also promote the construction of the teaching staff and the improvement of the teaching level. Teachers are the core force of education and teaching. Their teaching ideas, teaching methods and teaching effects directly affect the quality of professional education. Therefore, the research of pedagogical reform needs to strengthen the training and guidance of teachers, and improve their professional quality and teaching ability. At the same time, it is also necessary to establish a perfect teacher evaluation and incentive mechanism to stimulate teachers' innovative spirit and teaching enthusiasm.

7. Conclusion

To sum up, the pedagogical reform research of the Applied Chemical Technology is of great significance to improve the quality and level of professional education. Through the in-depth discussion of educational concepts and training methods, as well as the continuous optimization of teaching practice and teachers, we can promote the application of chemical technology professional education to a higher level and a wider field, and cultivate more high-quality talents with professional skills and practical experience for the society.

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