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Exploration of Teaching Reform of Food Machinery and Equipment Course Based on New Engineering Concept

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Abstract The new engineering concept aims to train high-quality engineering talents to meet the needs of future science and technology and industrial development through the reform of education and teaching. Under the background of "new engineering", by introducing cutting-edge knowledge of the industry and interdisciplinary integration, adopting innovative teaching methods such as project-driven teaching and flipped classroom, strengthening experimental teaching and school-enterprise cooperation, and establishing comprehensive evaluation and feedback mechanism, Food Machinery and Equipment course is reformed to improve the teaching quality and train high-quality engineering talents to meet the needs of modern food processing industry.

Key words Teaching reform, Food machinery and equipment, Teaching innovation, Teaching method

1 Introduction

The new engineering concept is put forward and developed to meet the new demand of engineering talents for the progress of modern science and technology and industrial change. With the rapid development of new technologies such as artificial intelligence, big data and the Internet of Things, the traditional engineering education model cannot meet the requirements of the society for talent quality. In 2017, China's Ministry of Education launched a new engineering research and practice project to promote engineering education reform, emphasizing interdisciplinary integration, the combination of enterprises, universities, and scientific research institutions, innovation and entrepreneurship education and an international perspective. The new engineering department advocates a project-driven and problem-oriented education model, and cultivates high-level engineering talents with innovative and practical abilities through curriculum system reform, teaching method innovation and school-enterprise cooperation[1].

Food Machinery and Equipment is one of the core courses of food related majors, and is also an important assessment course in engineering certification. This course mainly introduces the structural composition, working principle, performance parameters and design content of various mechanical equipment used in food processing. In recent years, with the continuous improvement of food processing technology, the deepening of industrialization and the wide application of new technologies, materials and concepts, new food processing equipment has emerged constantly, which put forward new requirements for course teaching[2]. In recent years, the expansion of undergraduate education and the increasing number of students have brought new challenges to the teaching of this course.

The teachers of this course must change the traditional teaching mode, adopt new teaching methods, keep up with the development of the times, stimulate students' enthusiasm for learning, and improve the teaching effect. In this paper, based on the teaching practice experience, current teaching problems were analyzed, and reform measures were put forward to comprehensively improve the teaching quality of Food Machinery and Equipment by updating the course content, innovating teaching methods, strengthening practical teaching links and improving assessment methods, and cultivate engineering talents with innovative ability and practical problem-solving ability.

2 Teaching status

Food Machinery and Equipment is an important core course of food science, and is set up on the basis of courses such as food technology, principles of food engineering, mechanical drawing CAD, *etc.* Due to the lack of theoretical knowledge reserve, students learning this course, do not have a thorough understanding of relevant mechanical principles and lose their interest in learning[3]. The current teaching situation faces multiple challenges, such as the shortage of teaching resources and the limitation of traditional teaching methods, and the teaching effect is not ideal. Therefore, the course content needs to be constantly updated with the development of food technology to keep pace with the industry. As the current teaching mainly relies on traditional classroom teaching, practice teaching links are weak, and experimental conditions and equipment are limited. As a result, students' enthusiasm in the learning process is not high, and their practical ability and innovative thinking are difficult to be effectively cultivated. The large-scale expansion of undergraduate education and the increase in the number of students further aggravate the tension of teaching resources. Although some universities are trying to adopt new teaching methods such as flipped classroom, blended teaching and

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school-enterprise cooperation, the overall teaching effect still needs to be further optimized. In experimental teaching, due to the limitation of concepts and conditions, students usually learn passively and have little enthusiasm, which affects the reform process of experimental teaching and the cultivation of innovative talents.

3 Teaching reform scheme based on new engineering concept

3.1 Update and optimization of teaching content The updating and optimization of teaching content is undoubtedly the key link in teaching reform. In the teaching process, through course teaching, teachers deeply analyze the basic structure, operation principle and specific operation methods of food machinery and equipment, and strive to let students fully understand and master these core knowledge points[4]. In addition, they are committed to developing students' practical application skills, especially in process design and equipment selection in the food industry. Through the teaching method of combining theoretical learning and practical operation, students are guided to apply their knowledge to practical scenarios to improve their practical operation and problem solving ability.

Through this series of teaching reform measures, the aim is to cultivate food industry talents with solid theoretical foundation and excellent practical ability, and contribute to the development of food industry.

The optimization of the course content should also include the analysis and discussion of practical cases. The typical cases, successful experiences and failure lessons in the current industry are introduced into the classroom. Through the case teaching method, students can connect theory with practice and enhance their practical and problem solving ability. Besides, the course design should be more flexible and modular, and allows students to choose the corresponding modules according to their own interests and career planning, so as to improve students' independent learning ability. The updating and optimization of the course content should be student-centered, pay attention to practicability and forward-looking, and ensure that students have a solid theoretical foundation and strong practical ability when they graduate and can quickly adapt to the needs of industry development.

3.2 Innovation and diversification of teaching methods Under the new engineering concept, the innovation and diversification of teaching methods is an important means to improve teaching effect[5]. Through the introduction of practical projects, project-driven pedagogy provides students with a practical learning environment, so that students are able to deeply understand and master theoretical knowledge in the process of problem solving, and simultaneously improve practical skills. Through personal participation in a project, students can not only fully experience the entire project process, but also continuously exercise and improve their teamwork and project management ability in practice. Meanwhile, this teaching method also helps to cultivate students' innovative thinking and practical problem-solving ability, so that they can more calmly face the complex and changeable challenges in the future.

Flipped classroom, as a new teaching model, has also been widely concerned and applied. Compared with the traditional teacher-centered model in which students passively accept knowledge in class, flipped classroom pays more attention to students' initiative and participation. It puts the study of theoretical knowledge before class, and encourages students to preview through online resources, self-learning videos, *etc.*, so that they can better participate in discussions, ask questions, and do practical operations in class. This teaching mode can not only mobilize the initiative and enthusiasm of students, but also improve the pertinence and effectiveness of classroom teaching, so that students can understand and master the knowledge more deeply.

3.3 Strengthening of practice teaching link Practical teaching plays an important role in the course Food Machinery and Equipment and is an indispensable and important part. Strengthening practical teaching link is of vital significance to improving students' practical skills and stimulating their innovative thinking and ability. Thus, deepening the reform of experimental teaching is one of the key ways to promote the strengthening of practical teaching. Traditional experimental teaching often focuses on confirmatory experiments, and students operate under the established experimental steps and lack the space for independent play, so it is difficult to truly stimulate students' innovative thinking and challenging spirit[6]. This teaching mode often leads to the lack of independent thinking and problem-solving ability of students, and they are difficult to adapt to the rapid development and changes of the future society. Therefore, it is needed to deeply reform and innovate the traditional experimental teaching, introduce more innovative and challenging experimental projects, encourage students to independently design experimental schemes, and cultivate their innovative thinking and practical ability. In addition, it is necessary to strengthen the management and evaluation of experimental teaching to ensure that the quality and effect of experimental teaching are effectively improved, and provide strong support for the improvement of the teaching quality of the course Food Machinery and Equipment.

3.4 Improvement of teaching evaluation system The perfection of teaching evaluation system is an important guarantee for improving teaching quality. The current teaching evaluation system is usually based on final exams, and there is a lack of comprehensive evaluation of students' practical and innovative ability[7]. Under the new engineering concept, an important way to improve teaching quality is to establish a diversified teaching evaluation system, and the comprehensive evaluation mechanism is an important part of the diversified teaching evaluation system. It is necessary to comprehensively use the diversified evaluation mechanism to fully evaluate students' learning level and ability. A diversified teaching evaluation system should not only cover the final exam results, but also pay more attention to the assessment of classroom perform-

ance, experimental reports and project results, so as to ensure the accurate reflection of students' learning results. Process evaluation plays a pivotal role. It emphasizes the continuous tracking and evaluation of the specific performance and progress of students in the learning process. By paying close attention to the learning dynamics of students, it can timely find and solve the difficulties they encounter in the learning process, so as to improve the pertinence and effectiveness of teaching. This kind of evaluation also helps to cultivate students' comprehensive qualities such as independent learning ability, critical thinking and teamwork spirit. Student feedback mechanism is an indispensable part of the diversified teaching evaluation system. By the extensive collection of students' opinions and suggestions on the curriculum, teachers can timely understand the problems and shortcomings in teaching. Through the establishment of multiple feedback channels such as student evaluation, classroom feedback and questionnaire survey, students' learning needs and expectations can be more deeply understood, and the teaching plan can be optimized.

3.5 Training and promotion of teaching staff The training and promotion of teaching staff is an important guarantee for teaching reform. In order to meet the teaching needs under the new engineering concept, it is necessary to strengthen the teaching training and professional development of teachers and improve their teaching level and teaching ability. Teacher training and development is an important way to cultivate and improve the team of teachers. Teachers should regularly participate in teaching training, academic exchanges, seminars and other activities to improve their teaching level and professional quality. In addition, teachers can be organized to conduct field visits and practice in enterprises to understand the actual needs and development trends of the industry and enhance their practical operation ability and professional quality[8]. The introduction of excellent teachers is an important part of the training and promotion of teaching team. Excellent teachers with rich teaching experience and practical experience should be introduced to improve the overall level of teaching team and provide students with higher quality teaching services. The teacher evaluation mechanism is also an important guarantee for the training and promotion of teachers. A scientific and reasonable teacher evaluation mechanism should be established to encourage teachers to continuously improve their teaching level and teaching ability.

4 Conclusions

To sum up, the teaching reform of Food Machinery and Equipment based on the new engineering concept is the only way to improve the teaching quality and train high-quality engineering talents. In terms of updating and optimizing of the teaching content, the cutting-edge knowledge of the industry and interdisciplinary integration can be introduced to ensure that the course content keeps up with the development of the industry and expands the scope of students' knowledge. In terms of innovation and diversification of teaching methods, project-driven teaching, flipped classroom and blended teaching are adopted to stimulate students' learning enthusiasm and innovation ability. In the aspect of strengthening practical teaching, through reforming experimental teaching, introducing virtual simulation experiment and school-enterprise cooperation, students' practical operation ability and professional quality are enhanced. In the aspect of perfecting the teaching evaluation system, a diversified comprehensive evaluation mechanism and feedback mechanism should be established to comprehensively evaluate students' learning level and ability. In the training and promotion of teachers, the overall level of teachers is improved through teacher training, introducing excellent teachers and establishing a scientific and reasonable teacher evaluation mechanism. These reform measures complement each other and jointly build a student-centered diversified teaching system with theoretical and practical combination, aimed at training high-quality engineering personnel with a solid theoretical foundation and strong practical ability to meet the development needs of modern food processing industry. This not only improves the teaching quality of Food Machinery and Equipment, but also provides a reference for the reform of other related courses. The future teaching reform should be be further promoted to adapt to the rapid development of scientific and technological progress and industry changes, and make greater contributions to the development of China's food engineering education and food industry.

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