

Exploration on the Training Mode of Applied Talents in Chemical Engineering Based on Discipline Competition

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Abstract:

With the transition of China's economy to a high-quality development stage, the chemical industry has a growing demand for innovative capabilities and applied talents. The traditional training mode of chemical talents emphasizes the teaching of theoretical knowledge, but neglects the training of practice and innovation ability. This paper demonstrates the positive role of discipline competition in stimulating students' practical interest, cultivating practical skills, improving innovation ability, training team cooperation and career development planning. Through curriculum setting and teaching reform, discipline competition organization and participation, school-enterprise cooperation and industry-university-research combination, and teacher team construction, as well as the improvement of the practical teaching evaluation system, the implementation of this training model has significantly improved students' participation rate, award rate, comprehensive quality, and innovation ability, and has also increased the employment rate. This paper also puts forward the prospect of deepening the teaching reform and school-enterprise cooperation in the future, so as to cultivate more high-quality talents in the chemical industry.

Keywords:

Discipline Competition, Chemical Engineering and Technology Specialty, Application-Oriented, Talent Training Mode

1. Introduction

As China's economy shifts from the stage of high-speed growth to the stage of high-quality development, China's new economy, represented by new technologies, new formats, new models and new industries, is developing vigorously. As the pillar industry of the national economy, the cultivation of its innovation ability and applied talents is particularly important. The traditional cultivation mode of chemical engineering talents often focuses on the teaching of theoretical knowledge, but neglects the cultivation of practical ability and innovation ability. It plays an important role in enhancing students' innovation ability and application ability to

carry out discipline competition and enhance students' comprehensive quality from multiple dimensions and levels [1]. Therefore, it is of great significance to explore a training mode for chemical applied talents based on discipline competition to improve the comprehensive quality and innovation ability of chemical talents.

2. Role of Discipline Competition in the Training of Chemical Talents

2.1. Stimulate students' practical interest and innovation enthusiasm

Discipline competition is not only a contest of knowledge and skills, but also a comprehensive display of personal ability. It stimulates students' inner curiosity and spirit of exploration through the intense and stimulating competition environment. In preparation for the competition, students must actively absorb interdisciplinary knowledge, develop problem-solving skills, and also practice teamwork and communication skills. This self-driven learning mode can effectively stimulate students' enthusiasm for learning [2]. At the same time, the feedback mechanism of competition results can also make students feel the sense of achievement in learning, and further enhance their learning motivation.

2.2. Training of practical skills

Chemical engineering discipline competition is a comprehensive academic arena, which not only requires students to have solid theoretical knowledge, but also pays more attention to training students' practical ability and innovative thinking. In the experimental design process, students need to use chemical principles and engineering knowledge to design a scientific and feasible experimental scheme. This not only tests the students' mastery of chemical knowledge, but also exercises their innovative design ability.

In the data analysis section, students need to process and interpret large amounts of experimental data, and use statistical methods and software tools to organize and analyze the data. This process helps them improve their data processing skills, develop their sensitivity to data and analytical skills, and train them to use scientific methods to test hypotheses and draw conclusions.

Process optimization requires students to improve and optimize the chemical production process according to the experimental results to improve production efficiency and product quality. These can not only deepen students' understanding of chemical production process, but also exercise their ability of system thinking and optimization.

By participating in the chemical science competition, students are able to practice their practical skills in a high-pressure atmosphere close to the real work environment. They need to complete a series of complex tasks such as experimental design, operation, data analysis and process optimization in a limited time. By participating in the competition, students can find and solve problems in practice, and exercise their practical ability and problem-solving ability.

2.3. Improvement of innovation ability

The innovation of the discipline competition encourages students to think outside the traditional mode and challenge the established theory and practice. In the competition, students are encouraged to adopt a multi-angle, interdisciplinary

approach to analyzing problems, which not only broadens their horizons, but also promotes their in-depth understanding and comprehensive application of knowledge. In this way, students are able to discover new perspectives on problems and come up with creative solutions. In the process of competition, students need to constantly think, explore and try, and this exploratory learning mode can help them develop innovative thinking and innovative ability [3]. At the same time, the communication and cooperation in the competition, as well as the high-level judges and experts' comments and guidance during the defense process, can provide valuable opportunities for students to learn and grow. The discipline competition provides an environment that encourages innovation, promotes communication and emphasizes practice, effectively stimulates students' innovation potential and cultivates their innovative thinking and ability.

2.4. Team work

Team cooperation mode in discipline competition is an important way to cultivate students' comprehensive ability. In a team, each member has his or her own strengths and advantages. Through a clear division of labor, students can better play their strengths and learn the professional skills and knowledge of other team members. This complementarity can not only improve the overall efficiency of the team, but also help students realize the importance of teamwork. Discipline competitions often require students to form teams to participate in, and can exercise students' teamwork ability. In a team, students need to clearly divide the division of labor, cooperate with each other and complete tasks together. This process can help students develop team spirit, communication skills and collaboration skills. At the same time, students can also learn the advantages and experiences of others and constantly improve themselves.

2.5. Career development planning

Participating in the discipline competition enables students to have a deeper understanding of the current situation and development trend of the chemical engineering and technology, which helps them to make a clear career development plan. Through the learning and practice in the competition, students can better understand their interests and abilities, so as to choose a suitable career direction. At the same time, the results and honors in the competition can also add a bright resume for students in the future job search and study [4].

2.6. Improve the comprehensive quality of students

The comprehensive characteristics of discipline competitions require students to have various abilities and qualities, such as innovative thinking, practical ability, teamwork ability, communication ability, and etc. By participating in the competition, students can exercise and improve these abilities and qualities in practice, and further improve their comprehensive quality. At the same time, the competition and challenges in the competition can also exercise students' willpower and anti-pressure ability, so that they can better adapt to the future social competition environment.

3. Construction of Applied Talent Training Mode Based on Discipline Competition

3.1. Curriculum and teaching reform

Practical links teaching should be added curricula, including more independent practical courses, such as chemical experiment, chemical practice, chemical design, and etc., increasing the opportunity of internships and internships in enterprises, adding coal-to-ethanol practical training courses, and etc., to improve students' practical ability [5].

Carry out “student-centered” classroom teaching reform, and stimulate students' curiosity and thirst for knowledge through questions, discussions, case studies, project learning, etc. Use multimedia, network, artificial intelligence and other modern technological methods to enrich teaching means and resources, encourage students to use digital tools for independent learning and cooperative learning, and improve their information literacy. Students are encouraged to explore independently and develop their critical thinking and problem-solving skills. Students are encouraged to put forward new ideas and methods to cultivate their innovative awareness and ability.

Project teaching is introduced into the classroom teaching, so that students can learn and apply knowledge in the project, which could improve their practical ability and innovation ability. In the teaching process, the introduction of industry cases, the latest scientific research results or industry information enables students to have access to cutting-edge chemical technology; In the course design process, such as chemical equipment design, chemical principle and chemical design, and other course design cases closely combined with the development of the industry are selected to cultivate students' engineering thinking and the ability to solve problems with the knowledge of multiple courses. Collect feedback from students on a regular basis to understand their needs and expectations for classroom instruction. According to students' feedback and teaching effect, timely adjust teaching strategies and methods to make classroom teaching more in line with students' needs.

3.2. Discipline competition organization and participation

Build the discipline competition platforms, equipped with fixed places and required hardware facilities, to provide convenient places and facilities for discipline competitions. At the same time, we will actively contact relevant enterprises or institutions to obtain more sponsorship and support, and provide more high-quality resources for the competition [6].

The undergraduate tutorial system is set up, with about 6 students assigned to each tutor, and all-round help is given to students in aspects of thought, study and life. Under the leadership and guidance of their tutors, undergraduates conduct research and development of relevant scientific research projects. Under the active organization of the school, they apply for college students' innovation and entrepreneurship projects, “Internet +” innovation and entrepreneurship competition, “Challenge Cup” national college students' extracurricular academic science and technology works competition, and National college students' chemical experiment innovation design competition. For the chemical design competition, the college, the teaching and research office and the head teacher actively encourage students to participate in the competition. In the selection of participating teams, combined with the situation of students' own teams, the teaching and research office comprehensively considers the students' disciplinary basis, practical ability and innovative spirit and other factors to select a team with potential. The professional teacher team of the teaching and research office provides necessary support and guidance to the participating teams, and helps the students better prepare for the

competition through group meetings, large group meetings, and the way of senior and junior grades.

In order to improve the competition level of the participating teams, the teaching and research office organizes experts or teachers in related fields to provide training and guidance for the participating teams. The training content includes the in-depth analysis of competition content, the teaching of competition skills and methods, and the sharing of competition experience. Through the training and guidance, the participating teams could have a deeper understanding of the competition requirements, master the competition skills and methods, and improve the competition level.

3.3. University-enterprise cooperation combined with industry-university-research

To establish a close cooperative relationship with enterprises, enterprises provide internship and training places for colleges and universities, so that students can master professional knowledge and skills in practice. Teachers pay attention to students' learning and practice, give timely guidance and help, and strengthen teacher-student interaction. Build a design platform and research platform with enterprises, design targeted training courses according to the requirements of competition projects and the characteristics of team members, and actively guide students to carry out related business activities and scientific research on the platform, build a team, simulate enterprise operations, and understand various business relations. The integration and utilization of industry-university-research resources inside and outside the university will achieve the construction of a high-level resource sharing platform, which is convenient for students to carry out project scientific research and practical tasks [7].

Cooperate with enterprises to develop and promote project achievements through technology development and achievement transfer, including publishing papers, applying for patents, holding exhibitions, etc., to improve the visibility and influence of project achievements. For project results with commercial value, actively seek business cooperation with enterprises to promote the commercialization process of project results.

3.4. Construction of teaching staff

Employ enterprise mentors, who provide students with innovative and feasible project selection suggestions according to competition requirements and market demand, to avoid students blindly following the trend and improve the quality and competitiveness of competition projects. From time to time, the enterprise mentor will hold lectures and meetings related to the competition to help students get familiar with the latest industry information and development trends, which help grasp the direction of the competition, choose projects closely related to the development of the industry, and improve the practicality and foresight of the competition projects. By guiding students to practice and apply what they have learned in competition projects, corporate tutors can cultivate students' practical skills and innovation ability. They can put forward specific suggestions for students' shortcomings, which can help students better understand the practical application of theoretical knowledge, avoid the dilemma of "talking on paper", help students constantly improve their ability, better cope with competition challenges, adapt to the pace of competition faster, and improve their ability to solve problems [8].

Accelerate the transformation of teachers, encourage teachers to participate in industry training and practical activities, improve teachers' practical ability and teaching level, regularly organize teachers to participate in teaching skills training and teaching methods seminars, and improve teachers' teaching level and innovation ability. At the same time, we should strengthen the participation of enterprise experts in teaching and integrate practical experience into teaching. Provide sufficient scientific research funds and academic resources for teachers, and encourage teachers to carry out academic research and innovative activities. At the same time, strengthen cooperation and exchanges with enterprises to jointly carry out scientific research projects and technological innovation. Teachers are encouraged to form teaching and research teams through collective lesson preparation. Teaching seminars and other ways to improve teachers' teaching level and teaching quality, through teamwork and communication, improve teachers' scientific research ability and innovation level.

3.5. Improve the practical teaching evaluation system

The scientific research activities, published papers, applied patents and other achievements of students are quantified into course credits into the comprehensive evaluation system of students, and students are encouraged to actively participate in various competitions. The contribution degree and award level of teachers in discipline competitions are included in the assessment and professional title evaluation of teachers, which not only improves the sense of honor of teachers, but also increases the enthusiasm of teachers to guide discipline competitions [9]. And with the introduction of competition to teaching and constantly improve their own scientific research strength, so as to further improve the proportion of double-qualified teachers in the teaching team.

4. Implementation Effect and Evaluation

Through the implementation of the chemical application-oriented talent training model based on discipline competition, the participation rate and award rate of students have been improved, the award level has achieved a qualitative breakthrough, and the practical ability and innovation ability have been significantly improved, and the employment rate of students has been increased. Through the display of competition results and enterprises' evaluation of graduates, it can be seen that this model has achieved remarkable results in improving students' comprehensive quality and innovative ability. At the same time, through regular teaching evaluation and feedback mechanism, the model is constantly optimized and improved to meet the needs of industry development and students' personal development needs.

5. Conclusion and Prospect

Discipline competition plays an important role in the training of applied talents in the chemical engineering major. It not only stimulates students' interest in practice and enthusiasm for innovation, but also improves their comprehensive quality through practical skills cultivation, innovation ability enhancement, teamwork exercise and career development planning. The applied talent training model of chemical Engineering major based on discipline competition has achieved remarkable results in practice, with the participation rate and award rate of students being improved, and the award level achieving a qualitative breakthrough. In the future, we will continue to deepen teaching reform, strengthen school-enterprise cooperation, and constantly improve and optimize the model to meet the development needs of the chemical

industry, and train more outstanding chemical talents with innovative spirit and practical ability. At the same time, through the regular teaching evaluation and feedback mechanism, the teaching contents and methods are constantly optimized to ensure the continuous effectiveness and adaptability of the training model.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Author Contributions

Conceptualization: Wenwen Gao; Methodology: Wenwen Gao; Software: Xiaoping Guo; Validation: Wenwen Gao; Formal analysis: Rui Bai; Investigation: Xiaoping Guo; Resources: Wenwen Gao; Data Curation: Wenwen Gao; Writing – original draft preparation: Wenwen Gao; Writing – review and editing: Bo Lv; Visualization: Bo Lv; Supervision: Wenwen Gao; Project administration: Rui Bai; Funding acquisition: Bo Lv.

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