ISSN 2522-6398 Vol. 5, Issue 17: 104-108, DOI: 10.25236/FER.2022.051719

Study on the influence of chemical training and competition on the professional ability of students majoring in environmental engineering

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Abstract: *Inspired by the excellent engineer training program proposed by the Ministry of Education of the People's Republic of China, practical teaching in chemical engineering has been paid more and more attention in recent years. As a subject with strong engineering and application, Environmental Engineering requires students of this major to have certain practical operation ability, engineering design and management ability. Have a solid grasp of the basic theory, basic knowledge and basic skills of chemistry and chemical engineering, and have a certain preliminary ability to design and simulate the production process and equipment. In order to achieve this training goal, it is very important to cultivate students' experimental ability. Arrange different types of practical training projects, such as basic experiment, comprehensive experiment, self designed experiment, innovative experiment, self design of simple equipment and disassembly experiment of chemical pipeline, to effectively improve students' practical ability. Through the chemical design competition, students' engineering ability has been trained and improved. At the same time, relying on the chemical design competition, actively promote the reform of teaching content and teaching methods, strengthen the infiltration and connection between disciplines, strengthen practical teaching, and promote the cultivation of students' engineering ability. During the integration period of engineering certification and new engineering construction, the students trained by engineering majors should not only have the ability to identify, analyze, design, develop, research, communicate and cooperate in the process of solving complex engineering problems, but also have the ability to innovate in scientific research.*

Keywords: *Chemical training and competition, Environmental engineering major, Students' professional ability*

1. Introduction

With the rapid development of society and science and technology, the chemical industry requires higher and higher engineering ability of engineering technicians. How to promote teaching reform, stimulate students' innovation potential and enthusiasm, and highlight the cultivation of students' engineering practice ability based on the chemical design competition is a problem worthy of discussion [1]. It is required that colleges and universities should make appropriate adjustments and changes in the training of engineering talents. The core of the reform is to enable students to have, in fact, the law of engineering talents training, and implement some successful models of engineering talents training that have been abandoned by some domestic colleges and universities [2]. Engineering ability of students in engineering education refers to the practical ability and energy of students' comprehensive quality in engineering practice activities, mainly including the ability to learn and apply knowledge, engineering design ability, post operation skills, process development and innovation ability, production fault judgment and elimination and other comprehensive abilities to solve engineering problems [3]. It mainly includes the comprehensive practice platform built for the cultivation of practice and innovation ability of chemical engineering professionals, and the relevant adjustment of various measures and training programs taken to cultivate students' core engineering ability [4]. As the awareness of environmental protection is increasingly accepted by the whole society, the rapid development of environmental protection industry has been promoted, and the demand for environmental engineering professionals has also increased rapidly [5].

The carrying capacity of the environment has reached its limit. Development urgently needs to rely on scientific and technological innovation to break through the bottleneck of resources and environment, and there is a strong demand for high-level talents in ecological environment protection and governance [6]. The professional certification of engineering education focuses on the standardized

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cultivation of students' ability and quality, with the aim of cultivating compound talents with solid professional engineering ability and able to solve complex engineering problems [7]. In order to further enhance the practical innovation ability and core engineering ability of students majoring in chemical engineering, we have conducted a pilot project in our department. In recent years, we have carried out continuous reform, practice and exploration in these aspects [8]. As environmental engineering is a comprehensive and highly engineering discipline, in order to cultivate talents with comprehensive analysis ability, engineering design ability and certain innovation ability, we need to have a high-quality teacher team. In addition to strengthening and improving classroom teaching, we also need to strengthen and improve the experimental practice teaching link [9]. Through practical teaching, students can not only deepen the study of theoretical knowledge, but also cultivate their ability to analyze and solve problems and practical work ability.

2. The role of chemical competition in the cultivation of students' engineering ability

2.1. Improve students' ability to learn and apply knowledge independently

Students should make full use of our spare time to work overtime to complete the design of works. A large number of design software and drawing software used in the design process have never been contacted by some students, which requires students to give full play to their learning initiative and stimulate their strong self-learning ability. The purpose of basic experimental training is not only to impart chemical knowledge, but also to cultivate students' ability and good quality. Through this stage of training, students should acquire the ability to master the basic operation, correctly use instruments, obtain correct experimental data, correctly record, process data and express experimental results. As shown in Figure 1, the role of chemical design competition:

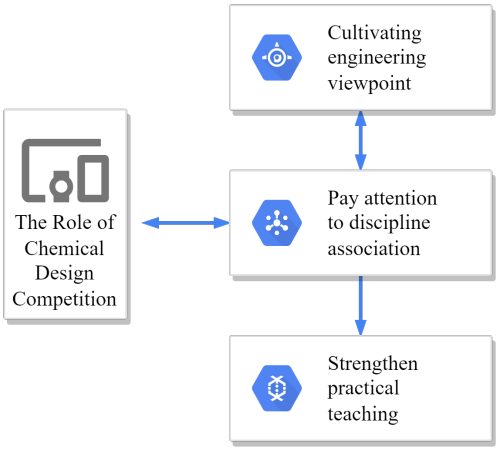

Figure 1: Role of Chemical Design Competition

Through the project training, the application level, design specifications, design procedures and design methods of the software have been improved in many aspects. The topic of chemical design comes from the actual production and is closely related to the current situation of the chemical industry. This requires consulting a large number of relevant materials, fully understanding the market supply status of raw materials and the domestic and international development prospects of products, and finally determining the materials and products that are considered feasible. Comprehensively use the theoretical knowledge learned, and combine the actual production to think, design and solve problems, systematically integrate the previous knowledge of individual disciplines, and complete the design of the entire project. At the same time, in the process of design, various problems will constantly arise and be solved, and the overall engineering design ability has been most strongly trained and improved in practice.

2.2. Improve students' team spirit

The chemical design competition is a team competition. Because the completion of a complete design project requires the comprehensive application of multidisciplinary knowledge, and the design involves many aspects of knowledge, all aspects are closely related to each other. After the issue of the

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topic, the team students should gather together, consult the data, actively discuss the design idea, and determine the design scheme and design route. In the process of design, under the mutual encouragement and influence of team members, the team gave full play to the spirit of hard work and tenacity. In order to overcome a difficult problem, it often happens overnight. Therefore, participating in the chemical design competition is a great test and exercise for students' learning will, psychological quality and team coordination and cooperation ability, and also cultivates students' high sense of responsibility and self-confidence. Teaching aims at acquiring basic knowledge and improving scientific thinking ability of students. Scientific research can cultivate students' ability to explore the frontiers of disciplines. Emphasizing the proportion of technological innovation in the score, encouraging students to integrate innovative ideas into all aspects of the design work, greatly stimulating the innovative potential of students. Using the theoretical knowledge learned, we carefully studied each link, repeatedly discussed, demonstrated the feasibility of innovation, and explored as many innovative points as possible. Through the chemical design competition, we explored the innovative potential of students. It enhances students' innovation ability, their ability to analyze scientific research and solve problems comprehensively, and their engineering practice ability.

3. Environmental engineering major

3.1 Strengthen the connection of environmental professional experiments

The emergence of environmental problems is often the result of the interaction of multiple factors, which also determines that environmental engineering is a highly integrated interdisciplinary science with the characteristics of integrity and comprehensiveness. Using network resources to build multimedia teaching environment has gradually become an important teaching method in modern education. Strengthening the cultivation of innovative ability of environmental engineering professionals is a supplement to the cultivation of the ability and quality of students certified in environmental engineering education. This characteristic of environmental engineering determines the necessity of increasing the proportion of comprehensive professional experiments in its teaching process. Master the basic environmental chemical analysis methods, and lay a good foundation for further environmental engineering experiments. As shown in Figure 2, the process of strengthening environmental discipline:

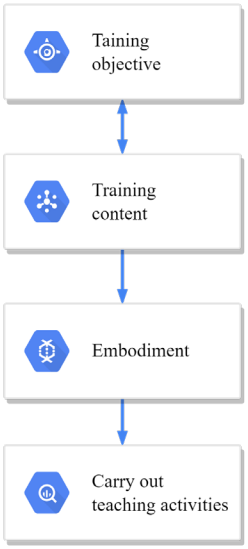

Figure 2: Process of strengthening environmental discipline

The professional training plan also reflects the strengthening of experiment and practice teaching. The four chemical experiments, namely inorganic chemistry experiment, analytical chemistry experiment, organic chemistry experiment and physical chemistry experiment, are optimized and integrated according to the content, arranged uniformly, required uniformly and assessed strictly. This comprehensive experiment cultivates the students' comprehensive analysis ability, experimental hands-on ability, data processing ability, as well as the ability to master the operating technology of various experimental equipment, which can quickly adapt to the needs of work in the future. It is necessary to

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design reasonable experimental programs according to the existing conditions of each major of our college, or make reasonable improvements to the existing experiments in the teaching materials, to ensure the smooth progress of students' experimental classes.

3.2 Cultivating students' engineering practice ability

Through the combination of comprehensive design experiment and scientific research, scientific research is introduced into experimental teaching. Find and solve problems in engineering practice. This kind of training mode makes students' knowledge sources multi-channel and diversified, broadens their horizons, makes them understand the current situation and development trend of the discipline, and points out the direction of their efforts in the future practical work. Students use their spare time to participate in scientific research with their teachers. Through systematic training of students' scientific research ability and practical ability, students can learn professional research methods and experimental operation skills. Environmental engineering is a subject with strong practicality and engineering. Its main task is to prevent, control and solve environmental pollution problems by engineering means. As shown in Figure 3, the training method of environmental engineering professional ability:

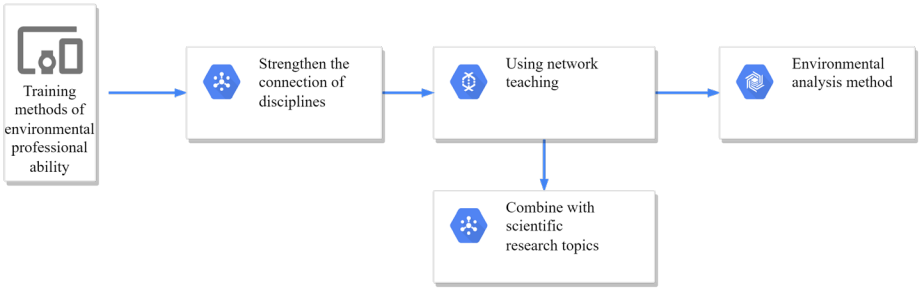

Figure 3: Training Method of Environmental Engineering Professional Ability

The training objectives of undergraduate students of environmental engineering involve the planning, engineering design, operation management, etc. of water supply treatment plants, sewage treatment plants, various dust removal equipment and devices, garbage treatment plants, etc., which are highly practical and engineering. Through students' participation in teachers' research projects, a new engineering oriented practical teaching method is formed, and students are trained in basic engineering skills, which enhances their engineering practice ability and adaptability to future work. After closely linking the specialized experimental courses with the actual project, the students can get in touch with the actual project earlier, understand and be familiar with the work they may be engaged in in the future, so that they can be competent for the work soon after they take up the post. The teaching methods for students to participate in research projects also have higher requirements. They need to plan research programs, apply for projects, contact enterprises, etc., so as to promote the improvement of scientific research and engineering development. At the same time, their own practical experience will help update the experimental teaching content.

4. Conclusion

Through the construction of the comprehensive practice platform, students in senior grades have reduced their confusion about professional cognition and enhanced their recognition of the major. In the design competition, it was found that the students' engineering design potential is great, and they need to constantly learn and improve in practice. The professional certification of engineering education focuses on the standardized cultivation of students' ability and quality, aiming to cultivate compound talents who can solve complex engineering problems. In the process of certification, it also promotes the improvement of students' scientific research and innovation ability. The professional certification of engineering education is a systematic project to cultivate students in an all-round way. It will not only not erase the students' innovation ability, but also bring about quality and quantity improvement from courses, platforms, teachers, concepts and other aspects. Provide students with more abundant scientific research innovation training courses, teachers and platforms, and encourage students to carry out innovation ability training; At the student level, more active and enthusiastic participation. According to the professional requirements and the needs of social and economic development, the practical teaching of environmental engineering specialty also needs to be innovated from all aspects, constantly explore new experimental projects, improve the old experimental methods,

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constantly summarize and improve the experimental practical teaching experience in practice, and improve the teaching quality. In a word, the experimental practice teaching research of environmental engineering specialty still needs to continue to explore and promote, so as to build a practical teaching system of environmental engineering that serves the development, encourage and mobilize students to actively participate in the chemical design competition, so that students' comprehensive engineering ability can be trained and improved in the competition.

Acknowledgements

This work was financially supported by Education Department of Hubei Province (Cell surface display of enamel matrix protein-derived polypeptides and their effects on the synthesis of stannic oxide, B2021306), and Wuhan Technology and Business University (2021CJ02, D2021001, and 2019Y10).

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