



Training Engineering Concepts during the Teaching Process of Unit of Chemical Principles

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Abstract

Unit of Chemical Principles is a bridge linking theoretic study to practical application, which emphasizes practice and engineering. During the teaching process of this course, it should be particularly emphasized that how to cultivate the students' engineering thoughts and ideas so as to improve the ability of how to analyze and solve the engineering problems. In this paper, four important aspects are elaborated about how to enhance students' interest in learning and engineering consciousness.

Subject Areas

Education

Keywords

Engineering Concepts, Unit of Chemical Principles, Engineering Design

1. Introduction

For engineering students, it is necessary to be able to carry out engineering and equipment design, and to be able to manage production technology and adjust production, which is the basic requirement of modern industry. The training target of chemical engineering specialty is to cultivate students' comprehensive use of science, methods and techniques, which can be applied to solve engineering problems effectively [1] [2] [3]. Chemical engineering principle course deals with chemical unit operation as the main content, whose basic research methodology is based on "three kinds of transmission process" course of engineering technology. It seems like a bridge linked theory teaching and practical application. This subject should face the actual complex engineering problems, in addition, there are many factors affecting the production process, such as huge differences in the material system and different operating conditions. Therefore,

students should be able to establish technical and economic thinking as early as possible in undergraduate teaching and to cultivate engineering thinking mode and set up engineering concept and engineering consciousness. In this way, the employment of college students is difficult, but the enterprises cannot recruit satisfactory engineering talents. This situation must change especially to the university; chemical engineering teaching mode proposes the reform.

The authors combine with teaching experience of the principles of chemical engineering curriculum for many years, to consciously reveal characteristics of principles of chemical engineering curriculum content in the teaching process, to undertake the student of cultivating the ability of engineering practice and understanding.

2. Discussion

2.1. Existing Typical Problems of Present Teaching Process

Nowadays, There are some deficiencies in the experimental teaching of chemical principles in our school [4].

1) Students are always used to passively learning, the subjective status of active learning is not obvious.

2) During the teaching process, when the teacher teach something, the students copy simply. It has formed the students' inertia, not to cultivate students' practical ability and observe the ability of discovering and thinking ability.

3) The principles of chemical engineering is a practical course, and students' engineering ideas are weak, and they can't solve practical problems in the real world with the knowledge they have learned, and they can't reach the theoretical guidance practice and need to be further strengthened.

4) Students lack interest in the principles of chemical engineering, and know little about the chemical knowledge around them.

In order to solve these problems and shortcomings in the teaching, I want to elaborate how to enhance students' interest in learning and engineering consciousness in four aspects.

2.2. To Realize Engineering Consciousness Cultivation and Thinking Transformation in Theoretical Teaching

Although the derivation of basic equations of various units is very important, the application should be used as a key point to cultivate students' engineering ideas so that students can combine theory with practical problems. The starting point of case teaching in process analysis is the physical chemistry principle or physics of unit operation, while the end point is engineering application. At the time of analysis, we can get rid of the constraints of various formulas, and find problems, raise questions, discuss and solve problems through reasoning and logical thinking.

Thus, the function of unit equipment should be compared and analyzed in

detail according to the engineering application, and much more energy and teaching time place emphasis on the engineering application in class teaching. It is strongly suggested to use case method in classroom teaching to discover problems, raise questions, discuss and solve problems.

2.3. To Highlight the Practical Role of Experimental Courses in the Teaching of Chemical Principles

The chemical engineering experiments are an important part of research and learning, which are not only an important method to train students' theory and practice, but also to train students' practical ability and experimental skills [5]. In order to stimulate students' learning interest and enhance engineering practice ability, strengthening experimental teaching is an important entry point for the reform of chemical principle teaching. During the experiment of chemical engineering, students are able to reach the engineering experiment equipment which is the same as the actual production equipment, which can improve the engineering consciousness of students. It is also an effective way to establish the engineering idea in the process of experiment.

Let students find and think in experiments. At the same time, the experimental teacher did not have to perform "rehearsals". As it turns out, the teacher's demonstration teaches students to imitate, not to cultivate students' practical ability, to observe the ability of discovery and thinking creation ability. The teachers shall grasp the key problems on the basis of the students' pre-training and grasp the key problems, meanwhile, remind the students to pay attention to the safety of the experiment, and then let the students go through the problems, think and go about, and allow the students to make mistakes. For example, in the chemical principle of centrifugal pump experiment, students tend to forget the "pump", when the pump is started, the water will not be out. There are many reasons for this phenomenon, such as "gas bound", pipe blockage and valve not open. Thus, the students will have a deeper understanding and memory of the "gas bound" phenomenon of the pump.

2.4. To Emphasize the Connection between Theoretical Teaching and Engineering Designing

The course design of chemical engineering principle is a comprehensive practical teaching link, which can improve students' comprehensive application ability. The practical application of it can improve the engineering consciousness and practical application ability. Students can master the training of mechanical design and related process of unit equipment, so that the concept of engineering can be improved through this study [6].

It is necessary for teachers to remind students that engineering problems are often affected by many factors. The answer to engineering is often more than one. Therefore, it is necessary to compare and select the reliability, advancement and economy of each feasible scheme, and finally choose a reliable implementation plan. It should be pointed out that the purpose of curriculum design is not to

design for design, but to cultivate students' comprehensive ability to solve problems and analyze problems.

2.5. To Be an Intelligent Guide in the Teaching Process

In the course of the principles of chemical engineering, there is a rich example of human technology in the course of science, and the teachers want to understand that the students can actually understand it [7]. However, young students are more childish in their thinking and knowledge, so chemical engineering teachers are willing to be an intelligent guide in the teaching process to make students first understand the nature and characteristics of the course and the status and function of it. Teaching in each unit operation engineering problems, it is necessary to cultivate the students how to analyze problems, to capture the essence of the problem, to find out the methods and steps of solving the problem fundamentally [8].

3. Conclusion

As a result, the teaching content of the principle course of chemical engineering is the excellent carrier for the theoretical connection of education and the cultivation of practical engineering ability. The viewpoint of teaching content of principles of chemical engineering course is about engineering treatment method and engineering question classification methods, such as strengthening research engineering problems of scientific methodology, ideology and education; furthermore, it would achieve a good effect to cultivate the students' engineering ability and quality.

References

- [1] Jiao, W.Z., Liu, Y.Z., Yuan, Z.G., *et al.* (2014) Research and Exploration on Experimental Teaching Mode of Chemical Engineering Based on Engineering Practice Ability. *Experimental Technology and Management*, **31**, 165-168.
- [2] Jia, S.Y., Xia, Q., Wu, S.H., *et al.* (2010) The Application of Engineering Case Studies in the Teaching of Unit Operations of Chemical Engineering. *Higher Education in Chemical Engineering*, No. 3, 78-81.
- [3] Yuan, J. and Zhang, J.-S. (2017) Paying Attention to the Cultivation of Basic Qualities of Chemical Engineers in the Teaching Process of Chemical Engineering Principle. *Education Teaching Forum*, No. 19, 98-199.
- [4] Guo, R.L., Yuan, J. and Zhang, J.S. (2013) The National Chemical Design Competition Inspired the Teaching of Chemical Engineering and Technology. *Higher Education Forum*, **169**, 59-60.
- [5] Ni, X.Z. (2007) Engineering Viewpoint and Method Education in the Course Teaching of Chemical Engineering. *Higher Education in Chemical Engineering*, **95**, 79-82.
- [6] Liu, Z.H., Li, Z.Q., Tan, S., *et al.* (2008) On the Teaching of Chemical Principles and the Cultivation of Students' Engineering Consciousness. *Guangdong Chemical Engineering*, **35**, 147-150.
- [7] Yuan, Z.G., Liu, Y.Z. and Li, T.C. (2010) Open Experimental Teaching Exploration

and Practice of Chemical Principle Experiment. *Guangdong Chemical Engineering*, **38**, 207-208.

- [8] Hu, B., Fan, M.X., Long, Y., *et al.* (2011) Thinking and Practice of the Construction of Chemical Principle Laboratory in Local Universities. *Experimental Technology and Management*, **28**, 189-191.