The Construction of Practice Teaching System with Innovation Ability Training as the Guide

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Abstract: Practice teaching system, in which course experiment, research and creative activity take the major part, campus culture activity and social practice are as complement, has been established. Three-tier experiment has been completed, including verification, design and exploration; the system of continuously improvement of practice teaching contents has been set up as well, the improvement can be realized via interaction of science research, engineering practice and social practice. The dual subject interactive practice teaching scheme and diversified examination method are explored and practiced, which are driven by course design, research project, practical problem, application project, and cultural theme.

Key words: Practice teaching, Quality education, Innovation ability.

1 Introduction

Practice teaching is an important link for realizing training target of quality education and innovation talents in teaching process of colleges and universities, and plays a very important role in training student’s ability of discovering, analyzing and solving problem, and in student’s innovation ability and innovation spirit. Practice teaching and classroom teaching are two different links and styles, but they are inter-connecting, inter-supporting, and inter-depending. They can not be to take one thing into consideration to the neglect of the other, and can not be replaced mutually. High quality innovation talents should not only have solid basic theoretical knowledge and wide knowledge range, but also have perfect practice skills. So, strengthening practice teaching is a necessary requirement to cultivate innovation talents, and an urgent task to improve the quality of talent cultivation. After years of exploration and practice, we construct distinctive characteristic practice teaching system with innovation ability training as the guide.

2 Construction of Practical Teaching System

In the period of cultivating innovation talents, we insist on the coordinated development principle of knowledge, ability, quality and personality, stick closely to specialty training target and talent training specifications, aim at improving student’s comprehensive quality, developing innovation spirit and practice skills. Combining with specialty characteristics, we designed the whole process of talent training to integrate classroom teaching, practice teaching and scientific and technological innovation activity, according to the role, function and internal relations of the links of practice teaching system. With innovation ability training as the guide, practice teaching system, in which course experiment, research and creative activity take the major part, campus culture activity and social practice are as complement, has been established, as shown in Figure 1. With stressing both basic experiment and subject frontier, both ability training and quality promotion, the system not only achieves a good interaction between theory teaching and practice teaching, but also realizes a mixture of the in-class and after-class, in-school and out-school.

(1) Course experiment, which stresses the specification, and puts the emphasis on the cultivation of practice skills, rigour and scientific method, includes basic skill training and professional skill training. Directed mainly at verification experiment in common core course and specialized core course, basic skill training can help student to understand the basic concepts and master the basic skills. Otherwise, professional skill training, directed mainly at teaching content of specialized courses, is helpful to the
professional skills cultivation of student’s analyzing and solving problems, via style of course design or comprehensive/design experiment.

![Practice Teaching System with Innovation Ability Training as the Guide](image)

(2) With carrying out exploration experiment and innovation skills training, research and creative activity requires student to master the skills of solving the scientific research and application problems, stresses the cultivation of students' technical application ability, and improves the scientific literacy, innovation consciousness and ability.

(3) The practice in practical base not only requires student to understand the development and current application of professional technology, and to comprehend the requirement and expectation of present economic and social situation to talent knowledge structure and quality, but also requires student to directly involve into the project development, so as to train the ability of applying knowledge to solve practical problems, and improve the engineering quality.

(4) Campus culture activity puts the emphasis on the cultivation of student’s innovation motivation, confidence and will-power. It also stresses to broaden student’s horizon, inspire their passion, enrich themselves, nurture their soul, improve the comprehensive quality, and mold the innovation personality.

3 Design of practice teaching content

Innovation calls for personality development, and ability needs practice transformation. The ability is formed from the dynamic process, in which knowledge and skill are applied actively and effectively. So, the cultivation of student’s innovation spirit, ability and comprehensive quality, not only need the solid base knowledge, but also need the comprehensive practice opportunity of applying the knowledge. After years of exploration and reform, three-tier experiment has been gradually completed, including verification, design and exploration; system of continuously improvement of practice teaching contents has been set up as well, the improvement can be realized via interaction of science research, engineering practice and social practice.

3.1 Three-tier experiment of verification, design and exploration

According to the inherent law of practice teaching, the three-tier experiment of verification, design and exploration is formed which stress not only the mastery of basic knowledge, but also the improvement of ability, as shown in Figure 2.

(1) Verification experiment, namely computer experiment in-class, put the emphasis on the cultivation of student’s basic skills, based on the experiment handbook.

(2) Design experiment, namely the project-based course design, stresses the ability cultivation of student’s analyzing and solving problems, and strengthens the innovation consciousness.

(3) Exploration experiment, namely student activities, such as scientific research team, discipline competition, innovation design game, etc, put the emphasis on the ability cultivation of student’s
discovering, analyzing and solving problems, and on the molding student's innovative character.

3.2 Combination of science research, engineering practice and social practice
Dynamic generation of experiment contents depends on the combination of science research, engineering practice and social practice.
(1) It is attached great importance to the service of research results to practice teaching, and to the introduction of latest research results to practice teaching contents.
(2) After the investigation, the problems in the practical teaching contents is discovered, and the practical problem-oriented teaching cases and materials are supplied in time, which make the practice teaching meet the demands of the social development.
(3) The activities of practice teaching discussion are arranged periodically. In these activities, experience of practical teaching is summarized and exchanged, the law of practical teaching is explored, and the reform of practical teaching content and method is discussed as well.

4 Reform of practical teaching method and means
Practice teaching is an indispensable part in colleges and universities. Its importance role for the cultivation of student’s comprehensive quality and innovation ability cannot be replaced by any other teaching form. Otherwise, the continuous reform of teaching method and means also ensures the practice teaching quality. After years of exploration and practice, the dual subject interactive practice teaching scheme is gradually formed, which are driven by course design, research project, practical problem, application project, and cultural theme, and diversified examination methods are established step by step, which is characterized by course design report, class speech report, mathematical modeling, practice report, and self-evaluation report, etc.

4.1 Three-dimensional Practice Teaching Platform
The three-dimensional practice teaching platform, including course teaching laboratory, innovation laboratory, diploma project laboratory, practice base, all-purpose activity room, etc, is constructed.

4.2 Dual subject interactive practice teaching scheme
Teacher is the provider of practice activity resource, the designer and the organizer of application project, also the assessor and the provider of feedback. According to character and difference of student’s specialty and level, he/she makes the claim, gives corresponding instruction, introduces student to discover and solve the problems in the process of finishing the application project, arouses the student’s interest, and cultivates the student’s creative ability. Under teacher’s instruction, student completes every teaching link from requirement analysis of application project, market research, project design, team splitting, to project implementation, becomes the subject of learning, understanding, practice and development to reveal problem, explore method, discover rule, acquire knowledge and master skill.
4.3 Modern experimental teaching technology and advanced experimental teaching means
According to the difference of different experiment course and teaching content, experimental means, such as virtual, simulation, etc, are used to improve the teaching effect and efficiency greatly.

4.4 Diversified examination method
In the examination process, experiment process and specification is stressed, so does experiment result and analysis. The multi-link, multi-mode and whole process examination is carried out with the combination of oral examination, speech and oral defense. Diversified examination method arouses student’s learning interest greatly, and increases student’s desire to take part in the experiment.

5 Conclusion
The cultivation of innovation talents in colleges and universities is complex system engineering. Practice teaching activity is a very important channel to improve the student’s overall quality and innovation ability, and to cultivate the student’s innovation spirit. To realize the goal of practice teaching, the scientific practice teaching system must be established, practice teaching model must be innovated, and practice teaching content, means and method must be reformed as well. Through years of exploration and practice, we cultivate student’s comprehensive quality through the combination of knowledge, ability and quality, with sticking to melt the reform of practice teaching into the reform of overall teaching: we establish and improve the system of continuously improvement of practice teaching content, strengthen the links of practice content to scientific achievements, optimize and combine practice instruction with system concept; finally, we also change the traditional practice teaching method to transform the traditional teacher-oriented to dual subject interactive method, arouse student’s innovation consciousness and make the practice teaching to become an efficient ways for student’s self-learning, the cultivation of creative thinking and innovative, and mastering scientific research method.

References