

Strengthen Practical Teaching and Cultivate Students' Ability of Application and Innovation

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ABSTRACT

In view of the main problems existing in the training and practical teaching of applied and innovative talents in China, it is studied in the paper that the construction of practical teaching system for applied undergraduate talents. It is explored the reform of practical teaching contents and methods, and the optimization of teaching methods. This paper expounds how to build up a team of experimental teaching instructors to ensure the quality and level of experimental teaching. It is emphasized to improve the management system of experimental teaching system and the monitoring and evaluation mechanism of experimental teaching quality.

Keywords: *Practical teaching, Talent cultivation, Application ability, Methods and means*

1. INTRODUCTION

China is a country that attaches great importance to education. In history, it is said that "all things are inferior, only reading is high", reading Four Books and Five Classics, and Writing eight-legged essays. For a long time, the concept of emphasizing theory over practice, academic over technology and knowledge over ability has not been fundamentally changed, which has led to the unclear characteristics of applied undergraduate, weak innovation and entrepreneurship ability.

At present, the traditional practice teaching mode in many colleges and universities is still that students complete the practice teaching step by step under the guidance of teachers, according to the experiment scheme customized by teachers, ignoring the cultivation of students' individuality and innovation. At the same time, with the advent of the intelligent era, the demand of social and economic development for engineering talents has changed from simple knowledge-based to innovative application-oriented ^[1]. Therefore, in the process of designing and implementing the practical teaching system, we must liberate the students from the traditional closed and indoctrinated teaching mode. Reform the practical teaching system, and establish an open practical education system that is not only interrelated but also relatively independent of the theoretical education system among the practical links such as in-class experiment and extracurricular practice, On-campus practice and out of school practice, course project and technological innovation, production practice and graduation design. To provide students with more experimental content of thinking space, and to give full play to the independent and creative learning environment ^[2].

2. WE SHOULD CHANGE THE CONCEPT OF EDUCATION AND TEACHING, REFORM THE MODE OF PERSONNEL TRAINING, AND EXPLORE THE CONSTRUCTION OF EXPERIMENTAL TEACHING SYSTEM TO STRENGTHEN THE TRAINING OF APPLICATION ABILITY

First of all, we should start from exploring and constructing the application ability training mode, integrate and optimize teaching resources, and improve the specialty cultivation scheme. On the premise of ensuring the learning of basic theory, we should focus on students' solving the complex engineering ability, and strengthen the cultivation of students' practical ability, knowledge application ability and pioneering spirit.

Guided by the market demand, aimed at the cultivation of post ability, and focused on the cultivation of technical application ability, we should build an organic and unified teaching system of theoretical teaching and practical teaching, and highlight the position and role of experimental teaching in the reform of undergraduate practical teaching and the cultivation of applied talents.

- (1) Set up the specialized direction with industry as the background -- the specialized direction of marketization;
- (2) According to the ability requirements of post or post group, the overall requirements of vocational ability training and curriculum system setting -- modular curriculum system are determined.
- (3) Strengthen the training of individual skills with the ability of post or post group as the center, and reasonably

set up curriculum content, experiment, practice and training project -- applied curriculum content;

(4) On the basis of single skill training, we should take the professional ability of post or post group as the goal, strengthen the comprehensive skill training and compound ability training, and take solving complex engineering problems as the goal;

(5) Through discipline competition, participation in Teachers' scientific research activities, and students' scientific and technological communities, we should strengthen the cultivation of scientific research and innovation ability.

2.1. Build a Practice Oriented and Project Oriented Training Mode Integrating Theory Teaching and Practice Teaching

In the experimental environment construction, experimental equipment design, purchase and experimental teaching mode of the experimental center, the idea of integration of theory and experimental teaching should be embodied. To establish an engineering education concept with professional post ability as a reference, practical and exploratory engineering design and implementation as a carrier, and personal ability, team ability and system regulation ability as the goal^[3].

2.2. Build Scientific Research Experiment Projects of "Independent Research and Learning" with Students' Self Selected Projects, Free Groups and Independent Research in Class Inside and Outside

"Independent study" is an effective teaching form to cultivate students' innovative spirit and practical ability. The construction of experimental teaching center and practice base inside and outside the college should be carried out around the needs of students to carry out "independent research and learning".

The experimental teaching center should follow up the reform in the aspects of experimental teaching contents, experimental teaching methods and means, experimental assessment methods and experimental technology innovation, so that the experimental teaching resources can become the base for cultivating students' independent learning interests, developing students' personality potential and stimulating students' practical innovation, so as to broaden students' knowledge vision, cultivate students' ideological sentiment, develop students' physical and mental soundness and cultivate students' team spirit.

2.3. Strengthen the Construction of Comprehensive and Design Experimental Projects to Provide Excellent Environment and Conditions for the Cultivation of Students' Innovation Ability

We should optimize the talent cultivating program with ability training as the main line, increase the credits of practical research and learning, increase and refine comprehensive and design experiments, and provide special management methods to make the experiment content rich and colorful; We should build system cognitive experiment, system and common equipment installation and debugging training, virtual simulation experiment, comprehensive design experiment, function module development experiment, and independent design type experiment, research exploratory experiment, innovative development experiment, etc. Through a variety of experimental teaching types, students can gradually construct their own knowledge, ability and quality system from cognitive practice. Provide space for students to develop their professional ability.

2.4. Introduce a Certain Number of Engineering Training Projects through the Combination of Production, Learning and Research to Improve the Comprehensive Quality and Engineering Ability of Students

The off campus practice base should be established through work closely with enterprises. On the basis of basic practical ability and professional practical ability, the students are able to strengthen their professional post ability and social adaptability, which promotes the improvement of comprehensive quality and engineering application ability. It will be Enhanced the engineering connotation of experimental teaching.

2.5. Through the "Internal and External Combination" of Experimental Teaching Teachers, We Can Realize the Organic Integration of Theoretical Teaching Teachers and Experimental Teaching Teachers, Experimental Teaching and Scientific Research

We will introduce the front-line engineering and technical personnel from off-campus industries and enterprises into the experimental center, so that it can play a leading role in the planning and construction of the laboratory; At the same time, it will be encouraged that the professional teachers and experimental technical personnel to exercise in the enterprise, participate in scientific and technological development and service, and improve the application

ability of the experimental instructor. To achieve the organic integration of theoretical teaching and experimental teaching teachers, as well as the organic integration of experimental teaching and scientific research, product research and development, it will greatly improve the level of experimental teaching, and improve the overall ability of the teaching staff. It is an important prerequisite for training applied talents to strive to form a teaching staff with the quality of "Double Teachers".

3. REFORM THE CONTENT AND METHOD OF EXPERIMENT TEACHING

3.1. Design and Implementation of Diversified Experimental Teaching Methods

Project Teaching Method: A task should be completed by students independently, from the collection of information, scheme design and implementation, to the evaluation after completion. Students are specifically responsible; Teachers play the role of consultation, guidance and troubleshooting only.

Group Teaching Method: According to the teaching task and purpose, combined with the characteristics of students, students are divided into groups, under the guidance of teachers, to study, discuss and practice, reflecting the characteristics of each group.

Case Teaching Method: also known as Product Teaching Method, It is to make actual products as the teaching content. Under the guidance of teachers, students can use the theoretical knowledge and process operation ability they have mastered, analyze, think, discuss and design all links, and gradually form processing schemes with their own characteristics.

Simulation Teaching Method: It aims to create an artificial environment or situation, so that students can learn the necessary knowledge, skills and abilities in a simulated real professional atmosphere. Based on this, there are also opportunities for repetitive training and the possibility of evaluation at any time.

In terms of experimental teaching methods, it embodies "Three Changes", namely, changing experimental tutorship to experimental guidance; changing static experimental content to dynamic experimental content; changing result oriented to process oriented. It emphasizes the process of practice, desalinates the results of practice, advocates independent experiment and group experiment, and cultivates the spirit of innovation, unity and cooperation of students. By introducing experimental teaching courseware and changing the traditional experimental methods, the teaching mode of combining in class and out of class, in school and out of school is formed.

3.2. Implementation of Hierarchical Experimental Teaching Content Design

Experimental teaching center and teachers should design the contents of experimental teaching in a hierarchical way. Experimental projects can be divided into basic experiment layer, comprehensive application experiment layer, design and improvement experiment layer, and scientific and technological innovation experiment layer.

Basic experiment layer: basic knowledge and basic experiment. The teaching mode is still dominated by the traditional teaching mode. The main teaching mode is explanation, teaching and demonstration. In the examination of students, it also focuses on the examination of students' mastery of basic knowledge, methods and skills.

Comprehensive application experiment layer: comprehensive experiment. It aims to train students to use various types of instruments, methods and experimental skills to analyze and deal with problems, so as to achieve the comprehensive use and mastery of knowledge, instruments and skills, and to cultivate the thinking mode of comprehensive consideration of problems.

Design and improve the experiment layer: design experiment. some experimental subjects should be put forward which are helpful to enlighten thinking and have application value, and let students design and complete the experiment. Students are systematically trained in the consideration of experimental methods, the selection of measuring instruments and the determination of measuring conditions by using the experimental knowledge and skills they have learned, so as to cultivate students' strong ability to engage in scientific experiments.

Science and technology innovation experiment layer: research experiment. It involves the design of new experiment and the renewal and transformation of traditional experiment, and design the experiment scheme by oneself, completing the research content, cultivating the consciousness of scientific research and innovation, understanding the frontier field of discipline development and scientific and technological innovation. These experimental layers are related to each other step by step, and gradually promote students from the stage of mastering professional engineering skills to the stage of engineering application and technological innovation. The implementation of such experimental teaching methods can effectively guarantee the completion of the teaching objectives of application ability training.

3.3. Design and Implementation of Diversified Experimental Teaching Mode

The experimental teaching method is designed to form the teaching and learning style of teachers' on-site teaching and experimental guidance, open students' autonomous experiment and learning, students' autonomous research and innovative experimental teaching. This diversified experimental teaching method effectively forms the

teaching and learning style of conscious communication and interaction between teachers and students, students and students, and active research and discussion in the experimental process, so that students can get to a full range of exercise and improvement.

4. OPTIMIZE EXPERIMENTAL TEACHING METHODS

4.1. Absorb the Concept of CDIO Modern Engineering Education, and Carry out Comprehensive Design-based Experiments by Means of Conception, Design, Implementation and Operation

For example, in the comprehensive design experiment of the Building intelligent experimental teaching center, the CDIO modern engineering education concept is adopted to break the traditional experimental teaching mode. The role of teachers and students in the experimental teaching changes greatly, requiring students to design and complete the experimental content independently, and realizing the transformation from passive education to students' independent innovation, design and implementation. Turn "knowledge-based students" into "creative students", and then cultivate innovative graduates with certain professional knowledge and skills and better comprehensive quality, so that they have strong team spirit and multi-disciplinary, building intelligent large-scale system control ability.

4.2. Various Forms of Online Learning Aid Facilitate Students' Independent Learning

Based on the open experimental teaching management system, the multi-level open management mode is realized. Students of different disciplines and specialties can reserve the time, place and project of the experiment online according to the experimental requirements, and choose the instructor. The experimental teaching mode is realized with students as the main body and students' self-training as the main body.

(1) Time and space are open. According to the teaching plan, the laboratory is open all day. Students can choose the right time to get familiar with all kinds of instruments or complete the relevant experiments according to their own specific conditions. The laboratory provides students with greater selectivity in time and space, which can greatly stimulate students' enthusiasm and initiative in learning.

(2) Open teaching content. The experimental items should be reasonably integrated, selected and updated, and the required or elective experimental requirements should be made for students of different majors, foundations and abilities. According to the different interests and abilities

of students, basic verification, comprehensive design and research-based experiments can be selected respectively.

(3) Open teaching methods. The mode that students are the main body and students' learning is combined with teachers' teaching and guidance is implemented. The teacher only focuses on the relevant experimental knowledge, operating procedures and the use of main instruments, and then lets the students consult the literature, supplement the relevant knowledge, understand the principle, purpose, steps and data processing methods of the experiment, write the preview report, decide the experiment time by themselves, and complete all the experiments independently.

(4) Opening of experimental equipment. Students can apply for the required equipment from the laboratory according to the selected experimental items and build their own experimental platform.

(5) Opening of experimental projects. Students can choose comprehensive and innovative experimental projects or design experimental projects by themselves after completing the routine basic experiments. At the beginning of each semester, students are required to know which experiments of this course are necessary, which are optional, which are basic experiments, which are comprehensive experiments. With the help of teachers, students can choose experiments according to their own interests. For comprehensive experiments, students can experiment in groups, which help to cultivate students' cooperation ability and team spirit.

4.3. Establish Experiment Teaching Website and Network Experiment Teaching Platform

The laboratory open management system realizes the teaching management in the process of laboratory opening through the campus network resource platform

(1) Through online appointment, the workload of experiment appointment between teachers and students is greatly reduced.

(2) Scientific and reasonable arrangement of laboratory opening time.

(3) Accurately count the workload of teachers' laboratory opening and students' choosing to do experiments in a certain period of time.

(4) In order to avoid the phenomenon of "traffic jam" and "vacuum" in the process of students choosing to do experiments.

(5) It has pertinence and timeliness for students to choose experimental items, planning for teachers to attend classes and scientific for laboratory utilization.

The development and application of the laboratory open management system can make use of the campus network resource platform to establish instant contact among students, experimental teachers and laboratories, and realize the teaching management in the process of laboratory opening.

5. TAKE EFFECTIVE MEASURES TO BUILD UP THE TEACHING STAFF OF EXPERIMENTAL TEACHING AND ENSURE THE QUALITY AND LEVEL OF EXPERIMENTAL TEACHING

The high-quality teacher resources of the college, especially the young and middle-aged professional course teachers, have been led to the experimental teaching team, which has initially been established an experimental teaching team with the discipline, the specialty leader, the professional course teachers as the main body, the professionals from related industries as the living force, and the excellent experimental personnel as the auxiliary, providing the most important guarantee for the improvement of the quality and level of experimental teaching.

Actively introduce professionals with rich practical work experience to enhance the relevance between experimental teaching and industry practice; Strengthen the training of experimental skills of professional teachers; Encourage teachers to carry out experimental teaching reform research, and support teachers to prepare experimental teaching materials and guidance books. We have built a "double type teacher" team with a strong professional practice ability and a combination of full-time and part-time work^[4].

6. IMPROVE THE MONITORING AND EVALUATION MECHANISM OF EXPERIMENTAL TEACHING QUALITY

The organization and management of open experimental teaching in the process of open experimental teaching, not only adhere to the students as the main independent learning, to meet the requirements of students in and out of class, but also timely provide students with correct guidance. For the experiments specified to be completed in the course, the way of centralized teaching in advance is adopted to let students reserve the experiment time on the Internet after completing the preview.

The practical teaching management information system should be able to assign students positions in time, and record various relevant information according to students' experiments for teachers and students to inquire. In view of the inevitable problems of students' plagiarism of experimental data and experimental reports after the open experiment, the monitoring and evaluation mechanism of experimental teaching quality will be established^[5].

The specific methods are as follows: when students enter the laboratory for in class experiment, they must pass the preview inspection; The basic experiment teaching process realizes the network management; The teacher on duty carries on the random spot check to the students' experiment quality, increases the proportion of the experiment report; adopts the examination method of combining the reply and the centralized operation

examination to ensure the quality of the open experiment teaching. For the basic experimental course, the test question bank is established for the examination of the students.

7. IMPROVE THE MANAGEMENT SYSTEM OF EXPERIMENTAL TEACHING SYSTEM

The innovation of open experiment management refers to the optimization of open experiment management by using new ideas, new systems, new technologies and new methods, including the innovation of management concept, management mode, management technology means and management system, among which the innovation of management mode is the core. According to certain relationship and interaction, each element of management activity forms the mode of management activity^[6]. In the same way, each element of open experiment management also forms the model of open experiment management according to certain relationship, and this management model should be improved with the emergence of new management concepts and means.

The management elements of open experiment include management organization, management system, management object and management goal. According to certain relationship and interaction, the management mode of open experiment is formed, that is, open experiment organization manages the objects of open experiment through a series of open experiment management systems and methods to achieve the goal of open experiment management.

8. CONCLUSION

Building teaching system with integrated theory teaching and practice teaching, reform the experimental teaching contents and methods, establish diversified experiment teaching methods, the implementation of the hierarchical experimental teaching content design, build the network experimental teaching platform, forging a experimental teaching teacher team, perfect the system of experimental teaching management system, improve the experiment teaching quality monitoring and evaluation mechanism, etc., all of them are the important measures to improve students' application ability and innovation ability.

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