Students Hands-on Ability and Innovative Spirit Training  
Mechanism Research and Practice

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Abstract. How to improve students' practical ability and innovative spirit in universities has become the focus of attention recently. In the training of the students' practical ability, the electronic information majors have achieved significant achievements. However, due to the complexity of the practice teaching reform and training, university must take some measures to reform the teaching practice, strengthen students' practical ability and innovation spirit. In this paper, the research and practice project of the students hands-on ability and innovative training completed six aspects of the work, made four aspects of the results, put forward three innovative points. It is significance to improve the quality of higher education and to train the qualified talents of high quality. Accordingly, there is no reason to believe that the method proposed in this paper will not be the defining trend for higher education in the 21st century.

Introduction

After entering into the new century, how to improve the teaching quality of higher education, especially how to heighten students' practical ability and innovative spirit has become the focus of international, domestic colleges and universities concerned. In such a new development situation, all universities carry out substantial investigate in this area. The government, continuously, augment the quality of teaching supervision and evaluation. Along with the speedy development of market economy, the deepening of teaching reform, it becomes precisely that the high education must increase the construction of lab hardware. Simultaneously, the teaching practice should be altered as well. It is hinge to establish corresponding teaching management mechanism as soon as possible and take concrete measures to enhance teaching quality. Furthermore, the students can adapt to expand of society economic, and it provides a thorough benefit for socialist modernization construction. Meanwhile, higher institutions themselves have been swift advanced.

Data show that China presents the last place in the ranks of Engineers among the world's 49 countries. It is incredible for such large population country. Consequently, it is an imminence task to enhance the quality of teaching and accommodate to the requirements of modernization. High qualified engineering and technical personnel have become particularly critical element in the higher education reform. Years of experience has proved that electronic information specialty in the Forestry College, it is extremely difficult to be highly recognized by the society and the market. To this end, university explored a long time in the practical ability cultivation for electronic information specialty students. Thereby, a good foundation, gratifying achievements, and some features of their own can be formed. However, owing to the actual situation of education and social practice, it is recognized how to reform the teaching practice, enhance students' practical ability and innovation spirit need a deeper debated. To raise the quality of higher education, the employment rate, training qualified talents are of great significance too. Owing to the combination of curricular and extra-curricular activities, the combination of theory and practice and combination of inheritance and innovation, a new idea of teaching reformation is proposed. After decades of exploration, the institute has obtained gratifying achievements, and gradually shaped the teaching characteristics. The aim of this project is to improve
the practical ability and innovative spirit of electronic information major. According to plenty of investigation and feedback of graduates, the theoretical and practical teaching arrangement can be upgraded. It is put forward that students' ability and innovative spirit can be improved by a great quantity of participating teachers' scientific research work, participating in the research and some products in extracurricular activities. Moreover, with regard to electronic and information engineering, computer science and technology professional, the experiment curriculum module should be established, the experimental course system may be planned, and the experimental teaching method must be reformed.

The project strengthens the laboratory management, it enhances the efficiency of laboratory operation, reduces the consumption of low consumables, and provides the students with excellent experimental conditions. By the quality supervision of the open experimental, it ensures that the students fulfill the experimental tasks on time and achieve the experiment objective, which can promote the students' ability of discovering new problems and solving problems in the process of experiment. Based on experimental process, the evaluation and assessment can be gained which also results in improvement of students enthusiasm.

Students take part in teachers research projects, some involved in the whole process of product development, which realized the interaction between teachers and students. Students participate in the national and provincial competitions, and other ways to rise students' practical ability and creative spirit. It enhanced the connection of practice and production practice to meet the demands of social and economic. Students learn the basic theory of the professional at the same time, master one or several basic skills, consequently, the overall design ability of graduates can be comprehensive raised. Not only the ability becomes a student's occupation, the core competition ability of student employment is also greatly hoisted. In addition, it shaped the innovative talents training system model of 21st Century.

The research of this project also changed the role of teachers and made a conscious attempt to change the role of teachers in the teaching process. The majority teachers and educators take that foster high-quality personnel training as their noble duty. The project mainly stressed on how to cultivate students practical ability, the innovation ability, and the comprehensive ability to handle the problem. It tries to explore the talent training mode which can conform to the requirements of social development, and students can master one or several basic skills. The application of the project greatly advanced the quality of school teaching, accordingly, students can be easily adapt to the environment. In brief, students can shorten the distance from the school to the actual work.

1. Six Aspects of the Work

1.1 Standardized Laboratory Management System

It formulated a series of management rules and regulations, such as “Electrical and electronic technology laboratory management measures”, "Electrical and Electronic Technology Laboratory Experimental Code".

Enhancing laboratory construction through the management of the low consumption of components, the management mainly takes the following measures: actualize specially-assigned person computer management responsible for components library, component classification box for easy access, each experimental group of components in a unified standard, establish the student experimental card system each semester. The major registration content is students’ project in the experimental, and its main circumstance.

The employ of modern management tools is to promote the management level and efficiency of the laboratory. For the convenience of management, the teachers developed the student management software, which mean teachers can monitor the student register and left. In order to facilitate the opening experimental course, the online course selection system is supplied. While to cultivate students' consciousness of their own management during the experiment, the high grade students help the laboratory experimental teachers completed the experiment instruction. It requires senior students
have a strong sense of responsibility. Thereby the students gradually formed a conscious, positive, active consciousness. Good results have been achieved after years of trial.

The evaluation system of open experiment teaching was established. The full credit system leaves much room for students to study independently. Consistent with the score of College Students' electronic competition, therefore, each course of experimental project has a scoring rubric.

The preview report and the report of the experiment are both equal, prompting the students to understand the experiment before the experiment, in the course of the experiment is to find the problem and solve the problem. Increasing defense link, in the experimental process and the completion, which is necessary for the comprehensive research of the experimental project. Not only can understand the completion of the design of students, but also discover new problems.

Laboratory opening is mainly reflected in: object, time, experimental project. Laboratory open for graduate design students, participate competitions and training students, the corresponding experimental class preview or redo the students, which means any time, any place, any experimental equipment can be used. For each course experiment, except the compulsory experiment, set up a number of experiments for students elective, students can also solve their own problems.

1.2 How to Achieve Open Experimental Teaching Methods

Pay attention to the experiment teaching content and system reform. According to the professional training goal, take the students' professional system knowledge integrity seriously. The basic experiment and comprehensive, design of the system make up experimental teaching, all of them implement open teaching.

The basic course emphasizes the students' phase of consciousness, which results in to value the design and the experiment of the course knowledge. After the completion of the provided experimental project, students may choose the experimental items provided by the teachers or the students themselves, but experimental project must be audited by the teacher.

In the comprehensive innovative experiment, the course Electronic Circuit trains the student's basic circuit design, the debugging ability, it is suitable for sophomore students. Electronic circuit automation course train students practical, the system design, the use of new technologies, new devices using, which is helpful for students to solve practical problems, suitable for Junior. The digital signal processing used in many digital information fields, it is valuable for training student's scientific research innovation ability and the ability to accept continuing education. After this set of experimental training program, students can have a certain practical application system capabilities, it can be a good transition to the graduation design.

1.3 Reform Experiment Teaching Content and Method

Students play the main role in the process of exploring and developing experiment, the teacher's guidance on the instructive teaching of exploratory experiment. The exploratory experiment does not lose its own characteristics. Supervisor encourages students to explore boldly, adhere the scientific attitude to seek truth from facts, and guide students to analyze the different technologies may bring problems and explore ways of solving the problem. Focus on training students use knowledge and innovative design capabilities. Students' ability and innovative spirit of Electronic Information Engineering can be improved due to the replacement between original verification experiment and design experiment process. After the implementation of the project, freshman can be familiar with the common electronic components, the production of electronic circuit boards and components assembly process, sophomore can design some simple electronic circuits and control the electronic parameters. junior can design and produce a more complex electronic system, senior can independently complete a practical project design.

In a word, the interest and enthusiasm of the students' experiment has been raised, and realized the change of passive acceptance to active thinking.
1.4 School Enterprise Cooperation

Through the visit, let the students have a new understanding of what they have learned, combined with books, classroom knowledge and specific production practice, and finally let the students complete a paper. Different from production practice, in visit the production process, they have a preliminary understanding of the work after graduation. Thereby students confirm the direction, no longer in a state of loss. In order to ensure the normal students practice, Central South University Of Forestry and Technology has signed a long-term contract practice with the Shanghai new equipment Co. Ltd., Changsha automobile electric appliance factory. Two weeks of production and knowledge practice has been carried out since 1999.

1.5 Participate in the Teacher's Research Projects

Teachers' research projects as a platform to stimulate students' strong desire for innovation. Students through the following design and construction: music broadcasting system for teaching main building, the digital reconstruction of the tension and compression testing machine in the mechanics laboratory, zhuzhou electric locomotive plant technical transformation project "electric locomotive screen cabinet automatic monitoring system" and other horizontal topics, to establish a bridge between teachers and students.

Students participate in the procedure of products, hence students can achieve the combination of theory and practice, teaching and production. According to the Internet downloaded information, collective discussion of design, design circuit, common welding, testing completed the production of samples, after the sample success, students actualize large-scale production of products. In the production process, the students' practical ability and innovative spirit can be reinforce, what’s more, deepen the students' knowledge point, open up the students' thinking, and lay the theoretical and practical foundation for the students' graduation design.

1.6 Experimental Teaching Methods

Three teaching methods: Combined with the multimedia of large capacity, organizing the course group of teachers to make multimedia course-ware manufacturing experiment course. In order to complete the experiment course study advanced simulation software must be connected. Combined with experimental teaching, curriculum design can improve students' learning consciousness and enthusiasm.

Five interactive teaching methods: the theoretical teaching and experimental teaching interaction, experimental teaching and curriculum design interaction, classroom teaching and class tutoring interaction, multimedia projection teaching and interaction with chalk on the blackboard, curriculum assessment team evaluation and student feedback interaction.

2. Four Aspects of the Project Results

The establishment of a laboratory management is for open teaching. It intensified the open experimental teaching quality supervision system, the examination system, implementation and examination of the experimental evaluation in the course of the experiment. Large scale adjustment of the experiment teaching content, according to the situation of using a variety of experimental methods, strengthen their basic knowledge, cultivate students' practical ability and innovative spirit training objectives. The employment rate increased from 88% to 95%.

Established conception of modern education, discusses the transformation under the new environment of teachers' roles and responsibilities, the establishment of a high-quality experimental teachers; the interaction and innovation mechanism into the process of teaching; pay attention to the reform of teaching methods, to promote and encourage teachers to use modern teaching methods to improve teaching quality and efficiency. Therefore, the implementation of the project has played an important role for our academy to establish a high quality, high level, high responsibility sense experimental teachers team.
University actively encourages students to participate in various national and provincial competitions, which can test the results of teaching reform. By allow students to participate in scientific research projects and subject teachers, it realized the interaction between teachers and students, not only improve the students' practical ability, but also greatly stimulate students' innovative consciousness.

3. Three Innovative Ideas

First of all, the laboratory management system is suitable for the open experiment teaching, the experiment teaching quality supervision system and the examination system. The experiment content is designed into three levels, the basic text, improve articles, comprehensive articles, which make teaching methods diversified. Afterwards, Students make full use of extra-curricular activities, strengthen practical ability and innovative spirit. Students participate in the National Undergraduate Electronic Design Contest, the national college challenge cup competition, participate in the whole process of some product development, it cultivate students' practical ability and innovative spirit, the students' comprehensive quality and ability. Finally, the interaction between teachers and students is realized on the platform of scientific research, the innovation consciousness of students is stimulated, and the understanding of knowledge is deepened on the basis of practice.

Summary

The research of this project, insist on the reform and development of higher education in our country. Staffs of this research project have the following trait, clear division of labor and cooperation, mutual communication of information during the work performance. Through improve practical teaching plan, reform the teaching practice, optimize the realization scheme, test the effectiveness of the scheme, to achieve the desired objectives. Specifically, this project accomplished six aspect work, achieved four harvest, proposed three innovations view. It also changes the role of teachers, and mainly stressed on how to cultivate students’ practical ability, the innovation ability, and comprehensive ability. It explored the talent training mode which can conform to the requirements of social development, and students can master one or several basic skills. The teaching quality has been greatly advanced the quality. Accordingly, students can be easily adapted to the environment, that is, students can shorten the distance from the school to the actual work.

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