

Research on Independent Teaching Operation Mechanism for Agricultural Electrification and Automation Experimental Teaching Center

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Abstract—University laboratory is an important base for cultivating high quality innovative talents. The construction of experimental teaching demonstration center plays an important role in improving the level of experimental teaching and personnel training quality, enhancing undergraduates' practical ability and innovative spirit, and improving laboratory construction and management level. Experimental teaching is an important part of the construction of national experimental teaching demonstration center. The reform must aim at improving undergraduates' ability. How to construct scientific reasonable experimental curriculum teaching with independent operation mechanism, break the situation that the experiment (practice) curriculums are too much attached on theory curriculums, promote the harmonious development of the experimental teaching quality and scale, have become the core problem of the construction of experimental teaching demonstration center. The purpose of this independent teaching operation mechanism is to improve the undergraduates' innovation ability and engineering practice ability, so that undergraduates have enough competitiveness in employment in the future.

Keywords—*Experimental Teaching Demonstration Center, Independent Operation Mechanism, Experimental Curriculum, Experimental Teaching, Management System*

I. INTRODUCTION

University laboratory is an important base for cultivating high quality innovative talents. It is an important place for inheriting culture and innovative knowledge, and also an important part of national innovation system, which is responsible for the construction of innovative country[1]. In order to promote the undergraduates' practical ability and innovation ability, accelerate the reform of practical teaching reform and laboratory construction, promote the integration

and sharing of high quality resources, improve the level of running school and education quality, the Ministry of Education has started the construction of experimental teaching demonstration center of higher education in China since 2005. In 2007, with the implementation of "quality engineering", the Ministry of Education further perfected the construction plan and layout of the national experimental teaching demonstration center, and enriched the construction connotation and specific requirements. The construction of experimental teaching demonstration center plays a full role in promoting which could improve the level of experimental teaching and personnel training quality, enhance undergraduates' practical ability and innovative spirit, and improve laboratory construction and management level[2].

Experimental teaching is an important part of cultivating undergraduates' practical ability and innovative thinking, and it is an important part of the training system. Introduce the experimental teaching in the teaching, we can make up for the deficiencies in the current theoretical teaching, improve undergraduates' initiative and enthusiasm in study, cultivate undergraduates' operational ability, comprehensive use of multi subject knowledge analysis and problem-solving skills, as well as theoretical innovation[3]. But the experimental project have been repeated set in the traditional experimental teaching, the experimental teaching methods are single, the experiment content lags behind the development of new knowledge and new technology, the quality of the experimental teaching is not well.

The agricultural electrification and automation experimental teaching demonstration center of Tianjin Agricultural University is one of the construction units as experimental teaching demonstration center of common colleges in Tianjin in 2012, experimental teaching is an important part of the construction of national experimental

1. Educational Reform project for the Experimental Teaching Center of Tianjin Agricultural University (2015SY018).

2. Science Development Funds of Tianjin Agricultural University (2013S06).

teaching demonstration center, the reform must aim at improving undergraduates' ability. How to construct scientific reasonable experimental curriculum teaching with independent operation mechanism, break the situation that the experiment (practice) curriculums are too much attached on theory curriculums, promote the harmonious development of the experimental teaching quality and scale, have become the core problem of the construction of experimental teaching demonstration center.

II. TEACHING OPERATION MECHANISM REFORM OF EXPERIMENTAL TEACHING DEMONSTRATION CENTER

Establish of independent teaching operation mechanism for experimental teaching demonstration center, the experiment will be separated from the original curriculums teaching as separate curriculum[4]. Increase or add the experimental course for comprehensive design and capacity development which could be selected by the undergraduates. Every experimental course is under unified management of the experimental teaching demonstration center.

- 1) According to the requirements of undergraduate training program, review the training program for each profession, the experimental curriculums will be separated from the original curriculums as separate curriculum, whose credit could be calculated separately. Each experimental course is managed by the experimental teaching demonstration center, and the teaching task of the laboratory is assigned according to the experimental equipment and teaching resources of every laboratory.
- 2) The experimental course in program offering in each laboratory, should include the compulsory basic validation experimental project and the elective designing, comprehensive and innovative experimental project. Each laboratory adds capacity development experimental project as the elective experimental project.
- 3) For the experimental course in each laboratory, the experimental teaching demonstration center will specify teaching candidates who should be the experiment teachers of the center. Such teachers write experimental guide books and experimental teaching syllabus.
- 4) To establish network platform of the experimental teaching demonstration center and the experimental course selection system.
- 5) To set up laboratory reservation opening system.
- 6) To establish a scientific evaluation method for undergraduates' experimental results and evaluation method for the effect of experimental teaching.

III. CONSTRUCTION OF THE INDEPENDENT TEACHING OPERATION MECHANISM

A. Experiment Teaching Management

The management system for agricultural electrification and automation experiment teaching demonstration center is as shown in Fig. 1. Relying on the discipline advantage and resource advantages of the experimental teaching demonstration center, combine with the professional training program requirements, coordinate experimental and theoretical teaching content, and the course of experimental teaching and theoretical teaching independent design, separate assessment, separate calculation. At the same time, according to the nature and content of the experimental course, the experimental curriculums are integrated, optimized. Expand and innovate experimental teaching content, experiment teaching content is established, organize disciplinary and interdisciplinary comprehensive experimental course which is based on comprehensive and designed experiments. Focus on the organic combination and application of the relevant experimental skills; strengthen the status and role of the experimental teaching demonstration center in innovative talent training; cultivate undergraduates' autonomous learning, research learning habits and teamwork spirit. All the experimental courses are unified management of the experimental teaching demonstration center, and the laboratories, teaching resources and experiment teachers will be integrated management by the center. And also, the teaching center should assign the teaching task according to the experiment equipment and teaching resources of the affiliated laboratories [5].

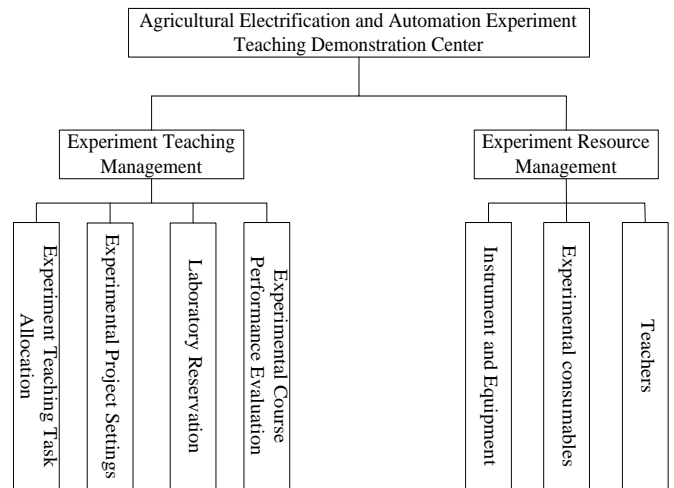


Fig. 1. The Management System for Agricultural Electrification and Automation Experiment Teaching Demonstration Center

B. Experimental Project Settings

Taking "basic, professional, comprehensive and application" as the main line [6], the experimental project settings in each experiment course should highlight the role of the curriculum in the professional system, and the experiment

content is in the principle of professional extension. As shown in Fig. 2, the planned experimental project each laboratory opened should include the required basic validation experiments and the elective comprehensive design experiments. Undergraduates must complete the required experimental project and certain number of elective experimental project, and then, they can obtain the experimental curriculum credits.

At the same time, each laboratory adds capacity development experiments as the elective experimental project, which are choose through the elective course system by the undergraduates each semester before school starts. The credits are separately calculated.

The performance of capacity development experimental project will become an important basis for the selection of undergraduates to participate in all kinds of disciplines competition.

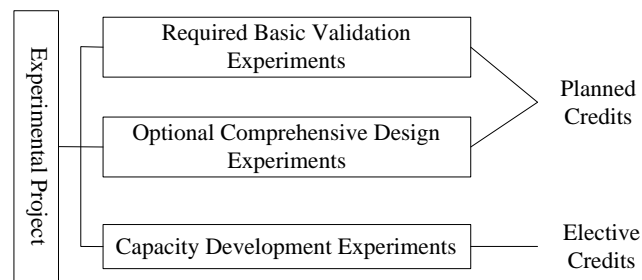


Fig. 2. Experiment project classification in each laboratory

According to the development of science and technology and the needs of enterprises, the experimental project of the experimental curriculum, which are opened in each laboratory belongs to the experimental teaching demonstration center, should be updated and adjusted continually. The experimental project with updated experiment content in each laboratory should be no less than 5% of the total number of experimental project in this laboratory per year.

C. Assigning teaching task

The experimental curriculums opened in the laboratory each semester are set by the center based on the elective

results of the selection system and professional training program. The experimental teaching demonstration center designates teachers of the center to undertake the experimental teaching task, and calculate the teaching workload by the periods. The teachers are responsible for writing experiment instruction and teaching syllabus. Such as the teachers of the central experimental cannot afford an experimental curriculum teaching task, experimental teaching demonstration center can hire theory curriculum teachers to undertake such experiment course.

D. Construct management platform

As shown in Fig. 3, it is the construction for the network management platform for the experimental teaching demonstration center.

Undergraduates can query all the experimental courses and experimental projects which could opened in the affiliated laboratories of the experimental center each semester through the network management platform of the experimental teaching demonstration center, including the application of the grade and specialty, experimental equipment and experimental hours, curriculum arrangement and teacher situation of such experimental course. All the experimental instruction, the experimental teaching outline, the experimental report format, the experimental class exercises and other materials can be downloaded from the network platform of the center, which is easy for undergraduates to study independently. According to their own interests and hobbies and time arrangement, the undergraduates can select the optional experimental course through the experimental course selection system.

E. Establish open reservation system of the laboratories

The fixed laboratories of experimental teaching demonstration center implement reservation to open. The center network platform will publish the name of the open laboratories, open period, available equipment and other information every term. The undergraduates can make an real-name appointment with the equipment in the fixed laboratories through the experimental course selection system, which can effectively improve the sharing efficiency of the equipment.

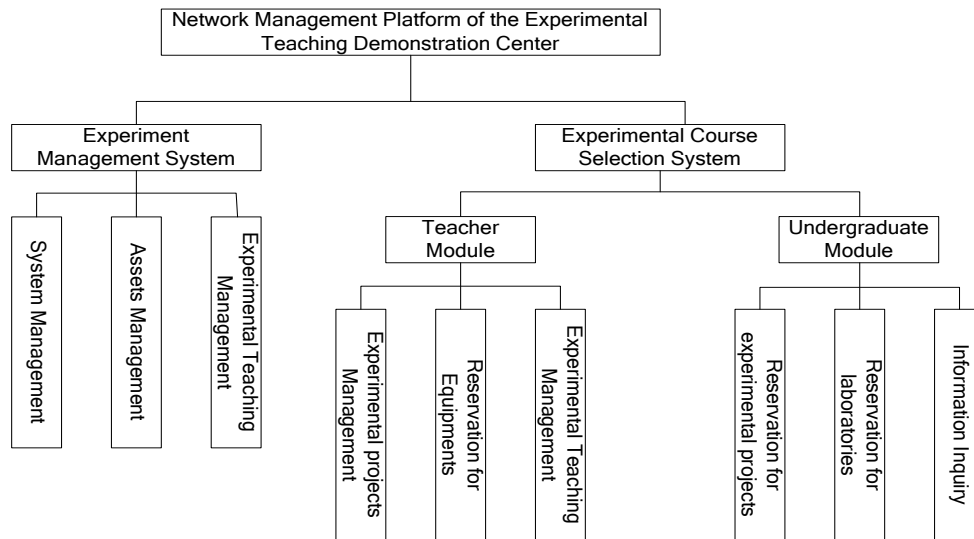


Fig. 3. Network management platform for the experimental teaching demonstration center

F. Establish open reservation system of the laboratories

The fixed laboratories of experimental teaching demonstration center implement reservation to open. The center network platform will publish the name of the open laboratories, open period, available equipment and other information every term. The undergraduates can make an real-name appointment with the equipment in the fixed laboratories through the experimental course selection system, which can effectively improve the sharing efficiency of the equipment.

G. Establish scientific calculation method of the experimental results and the evaluation method of the experimental teaching effect

The assessment method shows basic operation skills first, establish experimental habits (20 points), the experimental process (20 points), the experimental results (20 points) and the experimental test (40 points). All above could provide a comprehensive evaluation for the undergraduates' experimental results. Take the undergraduates and teachers' comprehensive questionnaire, discussion and teaching inspection to evaluate the effect of experimental teaching, in order to ensure the quality of experimental teaching.

H. To stabilize talent team and prove teaching level

Make full use of the multidisciplinary advantages of the school, relying on the master's degree, the center mainly realize the planning principle on "combination of center construction and discipline construction", which could form the benign interaction for discipline construction and the construction. Discipline construction is effective in attracting the construction and development of young teachers in the center, which also guarantee the mechanism of teaching team. The discipline construction ensures the development of advanced technology.

IV. SIGNIFICANT EXPERIMENT TEACHING EFFECT AND DISTINCT CHARACTERISTICS

After years of the reform and practice for experimental teaching, teachers' education idea has been changed obviously, and the system of experimental curriculum has been improved. The experimental teaching method and teaching means are constantly updated. Undergraduates' practical ability, innovation ability and engineering application ability were significantly improved.

Students have obtained 40 items of agricultural science and technology projects, published more than 20 papers; have achieved excellent results in all competitions such as the national electronic design contest, Undergraduate Mathematical Contest in modeling, college physics competition and other relative competitions, who obtained more than 20 items of national awards and more than 50 items of provincial and ministerial level awards.

V. CONCLUSIONS

The independent teaching operation mechanism based on the agricultural electrification and automation experimental teaching demonstration center platform, integrated decentralized construction, decentralized management of the laboratories and experimental teaching resources, forming a teaching system of experimental curriculum which could meet the specialized teaching requirements for postgraduates and undergraduates.

Establish the teaching, scientific research platform incorporating rural power system and automation technology, automation technology of agricultural equipment and industrial technology, agricultural information and network technology, agricultural environment detection and control technology, agricultural product quality detection technology.

The center takes on the experimental teaching tasks for more than five thousand undergraduates each year, which

involving major as Agricultural Mechanization and Automation, Measurement and Control Technology and Instrument, New Energy Science and Engineering and Electrical Engineering and Automation and other related major in Tianjin Agricultural University. The purpose of this independent teaching operation mechanism is to improve the undergraduates' innovation ability and engineering practice ability, so that undergraduates have enough competitiveness in employment in the future.

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