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Exploring of practice teaching mode of electrical engineering major

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ABSTRACT

Because of the systematicness, engineering and practicality of electrical engineering major, the existing practical method was reformed, and a new practical system including four modules was established, in which the transition from theory to practice was gradually realized, through the practical system the integrated development of knowledge, ability and quality were promoted.

KEYWORDS

Practical teaching; Module; Electrical engineer; Exploring.

INTRODUCTION

The aim of electrical engineering major is training of electrical engineer, in order to complete it, engineer practicing should be intend for, so in the process of teaching the practical teaching is more important than the basic theory teaching, then the systematicness, engineering and practicality of the major can be stressed. Considering of the basic characteristic of electrical power industry, and according to the feature of major, a practical teaching mode was set up, in which the practical teaching process was divided into four module. The first module is experiment assorted the courses, the second is comprehensive design, the third is physical simulation and digital simulation, the fourth is graduation project and engineering practice outside school. On the basis of the different stage of ability formation, the transition from theory to practice is gradually actualized according to "the master of theory- formation of basic experimental ability- practice in simulating circumstance- exercise in practical condition". In each of the teaching module, a corresponding practical teaching session was set up, which accomplish the aim of that stage coordinating with the theory teaching.

AIM OF EACH MODULE

Basic experiment teaching module

The teaching is accomplished in the basic laboratory and major laboratory in schools. The task of the experiment is promoting student to comprehend the basic principle of the course and master essential experimental skill. In this process, the students will elementary have the ability to analyze and solve the problems combined with theory teaching.

Comprehensive design module

This module is carried on in the electrics and electronics laboratory in schools, aiming to bring up the practical ability on electrics and electronics and basic design technique.

Physical and digital simulation module

The simulation location is dynamic simulation laboratory, power system operation simulation center and transmission and distribution simulation center. The real situation of the power system including power generation, power transmission and power distribution was simulated, so a practical environment closing the actual production process was provided.

Comprehensive practice training module

Through the graduation project and engineering practice outside school, finding and solving problem were really done, the students can be exercised comprehensively, and because the problem close to the actual production process, preliminary engineering exercise will be got.

TEACHING METHOD OF EACH MODULE

Basic experiment module

To provide more exercise chance, the laboratory using pattern was changed, before only at the course teaching time it can be used by the students, now it is opened all day. To do which experiment is decided by the student himself, and the experiment was done in the spare time. In this pattern, the utilization factor of the laboratory was increased substantially, and a exercising chance were provided to those who want to do more practical exercise.

The traditional experiment pattern is simple verification of theorems in the textbook, is not good for the cultivation of innovation ability. In view of this disadvantage, the experiment was classified into demonstration experiment, must done experiment, select to do experiment and comprehensive

experiment, the different organizational form of the experiment course was adopted according to type of the experiment.

The main teachers explain and students begin to do for demonstration experiments. Teachers and students in the form of interaction, mainly is the students' do, the teacher to do tutoring, for the experiment must be done and the experiment chosento be done. Before the test, no detailed explanation and demonstration of experimental content to students, experiments carried out entirely by the students themselves in the study on the basis of experimental guidance, but in the course of the experiment, students should be strictly managed, such as student can conduct an experiment until the teacher to check the wiring to pass up to compulsorily exercise the student’s picture stories and practical ability. For example, in the circuit and the electronic test, designed by the students to develop experimental program and circuit wiring diagram according to the given topic, teachers to review only those who pass can make official test. Doing so can cultivate self-learning ability and the ability to access data and effectively put an end to the phenomenon just look at the instructions before the experiment to do some experiments and record several data.

Conceived entirely by the students themselves, and hands, and finally come to a certain conclusion, teachers organize students to discuss and judge for the comprehensive experiments. That is, in some courses, select those close to production practices, practical content, gives comprehensive and designed experiments, experimental program designed by the students themselves and their own analysis of the experimental results, the teacher just check and complement the experimental program deficiencies,analyze and check the correctness of the results, while guiding students to find a representative experiment phenomenon. In this way, students can develop rigorous scientific attitude of students’ ability to innovate. In view of most comprehensive experiments’ design, experiment and analysis workload is difficult to single man, allow three to four students who form a group; each group selected a team leader, team leader in charge of the implementation of the system. Requires an understanding of the basic theory and experimental prep instructions and be familiar with laboratory equipment, as a team to propose experimental program conducted experiments.

No matter what is in these four types of experiments are students’ hands mainly reflects its initiative.

Courses which have experiment, experimental results should occupy a certain proportion in the total score. Previous experimental class student achievement assessment is mainly based on usual experimental conditions and ab report which is difficult to fully understand each student, so the test results are not very accurate. In order to change this phenomenon, the experimental part of the course taken by way of a separate examination and have some credits, such as circuit class experiment now as a “comprehensive experimental circuit," directly into the rebuilt if not through, This increases the emphasis on the experimental class students also forces them to improve their practical ability.

Curriculum design module

The traditional curriculum design belongs to professional courses, such as power flow calculation or fault calculation, main part of the design of electrical substations and relaying curriculum design. These designs are difficult for students to learn the complete system of knowledge because of poor articulation between them and utilization rate of hours is not high, and commonly used mode is “class-based reference guide book - consult the manual - to imitate the design ", which is not conducive to mobilize the students' initiative, enthusiasm and creativity.

To overcome this deficiency, we propose a new comprehensive, open curriculum design model whose purpose of fostering “one practice two innovation ".

The basic idea is to integrate the past several course designs to become an open and comprehensive curriculum which enable students to get a systematic and comprehensive knowledge of the various professional courses through learning the practical applications of exercise. For example, the power flow calculation, fault calculation integrated into the course teaching, the planning and operation

of a power grid analysis throughout the design process of classroom teaching, curriculum design will focus on the distribution of two semesters. This comprehensive curriculum design is different not only from both traditional curriculum design, but also from the graduate design because of special consideration of topics and based of teaching platform. This design is conducive to mastery of knowledge, consolidates and integrated application of knowledge because of its comprehensiveness, diversity, practicalness and openness. In practicing process, it gets students' active participation and praise, and achieved good results. Students not only thorough understand the theory, but also adapt to the needs of practical work as soon as possible. Initial teaching practice shows the necessity and effectiveness of specialized courses reform, also gain experience for future work.

Simulation module

As we all know, the power system is a large dynamic system with large units, large power, high voltage and high degree of automation features, and the production, transmission and use of electricity is at the same time, the security of on-site production operation and reliability is particularly important, unlikely to experiment in a real system, for example: short-circuit and stability testing, adjusting the frequency and voltage adjustment experiments. In addition students graduate with little or no practical hands-on opportunity to either gain practical operating experience, or the most basic operation.

Physical dynamic simulation laboratory and digital computer simulation provides an effective means for it. The dynamic simulation laboratory is a microcosm of large power systems, and certain characteristics of the power system can be carried out by practical experiments through it, which deepened awareness and enhancement of knowledge. Digital computer simulation system allows students to integrate the knowledge of multi-professional course systematically, to improve the understanding of the basic principles of the power system.

There are two physical simulation resources, the first is power system dynamic simulation laboratory, who have four sets of generation units, including the prime mover, generator, control cabinet and transformer, two infinite system, three sets of load transformers, load, twenty groups lines; Educational customizable real-time sampling curve, real-time digital instrument functions and flexible configuration are all developed, and then successfully converted to teaching resources. Monitoring and analysis of dynamic simulation system and comprehensive experiment can be conducted in the dynamic simulation system. For example, the characteristics of generators and transformers, generators combining to the grid operation, power system short-circuit, stability, etc. can be conduct for practical experiments; and the WAMS system on the basis of dynamic simulation of power systems which can represent the latest technology will be established to realize the dynamic security monitoring of grid.

The second is power transformation and operation simulation center. The center is established fully in accordance with the actual outdoor 220kV substation, including the control room, outdoor electrical equipment and power lines, etc. The simulation substation students can familiar with the main primary electrical equipment, conduct a variety of practical operations, such as opening and closing of the circuit breaker, which is helpful to master the process of electrical operation.

Digital analysis of power system operation can be done through digital platform for system-level simulation of digital platforms and station -level digital simulation platform. A variety of advanced power system analysis software are used in teaching of course of power system analysis and other professional courses, provide a platform for students to carry out large-scale correlation analysis of the actual power systems, such as power flow analysis, fault calculation, reactive power optimization, and relay setting calculation.

Another practice teaching base of our school is a center of power operation simulation which can carry out numerical simulation; the center has several sets of simulation software, including the 135MW, 300MW, 600MW thermal power generation systems and multi-level grid and substation simulation systems. The main content includes power plant unit start-stop, electrical equipments’ normal operation and accident handling. When an electrical switching operation was done, the students themselves fill in

an operation ticket according to the basis of every link on the analysis of electrical primary and secondary operation.

Through physical and digital simulation training not only enable students to understand the operation of the power system, familiarize them with energy production, transportation of the whole process, and conducte a systematic review and revise of relevant expertise, strengthen theoretical understanding of the basics thereby and improve the knowledge structure; but also enable students to master the professional knowledge, moreover obtain the operation skills training, can apply theoretical knowledge into practice operation, so that the theoretical knowledge is no longer remain on paper, reach the practical application level. Then the overall quality was improved, the students can quickly adapt to the needs of the production site after graduation. While mastering judgment and treatment of common fault, and complex fault site, accumulating experience for the actual operation of the process of dealing with such problems.

Graduation practice and graduation design module

By graduation practice and graduation design module, the basic theory and professional expertise were deepened, students' comprehensive analysis of the problem and independent problem-solving skills were trained, so enable students to master the general methods and procedures for field work; while develop their serious working attitude, a wide range of quality high sense of responsibility, ability to work independently, and teaming and collaboration ability, and lay a solid foundation for a better future to work.

Purposes of graduation practice include not only a comprehensive understanding of work content and work processes of the various types of power units, but also the close combination of basic theory and professional knowledge with field practice, so that the organic combine of basal and rational knowledge become the prepare for graduation design.

The current existing problems in the graduation practice are: 1, Inadequate funding, training environment is not ideal and the time is short. Due to the special nature of the electric power industry, practicing place mainly are various types of power plants, substations and dispatch departments. The geographical scope and time of practice is greatly limited by funding, participating in the operation of large-scale power plants in the past have been converted to a short time visit. And most of the visited plants are old power plant or a small plant, which has small-scale and outdated equipment, in additon the students are required to conduct internships electrical, boiler, turbine three parts in a short period of time, which is not enough. 2, it is not associated with graduation. Graduation practice and graduation project should be inextricably linked. However, the current lack of on-site student perceptual awareness because of the bad effects of graduation practice, it can not rise to rational knowledge when it is made with the actual graduation is closely related to subject, when the graduation project was be done, the link of "basis of graduation practice, consolidation be graduation project"can not realized.

Solution of the problem: the previous practice mode was breaked, a new mode which have two kinds of practical ways was coexist: One of them is " unified organization, decentralized practice, in job practice, mutual management " mode, through which a stable off-campus practice teaching based on the basis of the original which solved the internship " cursory " passive situation was established, enable students to appreciate the complexity of the real field environment (hydropower plant, thermal power plants, regional dispatch center); It can help students sort out the main theory, technology, engineering, etc., so that students can really see a problem in practice and to solve problems and get a preliminary labor training. The second one is: Some students may choose a combination of employment practice sites and content which combine the business needs and student graduation practice. The way is: Contecting with the professional and business -related companies and investigate students' needs and establish the cooperative relations and determine the location of practice; then the students choose according to the wishes. In order to ensure the quality of practice, practices are required to develop appropriate training programs and content based on the outline and requires schools to provide practices,

instructor of both sides complement with each other, internships strict management, control of school internships content specific circumstances. Internships should be strictly managed, specific circumstances practices content is controlled by school. But the instructor was asked to do the management and supervision work. Such practical way not only get welcomed by employers, but also saves limited practice funding, so that the students generally get better practice opportunities. In addition, after the end of the practice, there may be some students to choose practical engineering practices for graduate design topics.

Graduation design was strictly managed throughout the entire process of graduation project. Firstly a series of rules and regulations is formulated: Relevant professional practical thesis organization and management procedures, topics requirements and implementation measures, respondent conditions, grading standards and assessment. Secondly: Strengthen students' ideological education and improve student understanding of importance of teaching of graduation project; the third one, three aspects of topics, guidance and answer must be emphasized: "One person, one question" is guaranteed, topics should be closely combined with professional training objectives and teaching basic requirements and reflect the professional features. The difficulty of the task and the amount of topics should be combined with the specific circumstances of undergraduate and capabilities and focus on the principles of theory and practice. Instructor should propose graduate design topics in the seventh semester, then two-way choosing between teachers and students can mobilize the enthusiasm of the students' work which will help improve the quality of design; in guidance process, instructors should be dutiful and guiding model should be modified reference postgraduate training of " opening report ", " mid- checking " and " graduation reply " model to provide a equal exploring environment to teachers and students; at last,teachers are asked to answer a fair, just and serious, good in the final assessment with the score.

CONCLUSION

The practicing results show that, practice teaching reform has played an important role in fostering applied talents. In the combining system of campus and off-campus practice teaching, students get a higher level of knowledge and ability with good results. New mode of practice teaching is a systematic project which requires incessant improvement, innovation and development, the need for a full range of three-dimensional model of reform in order to adapt to the modern teaching of higher education preferably and it trains more social needed electrical engineering and automation talents.

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