

## The Study on Teaching Method of Power Supply Technology

Zhan Shuguang, Shi Diancai, Liu Xiao, Xu Haihang, Jin Dai, Wang Shuai, Tong Xin, Shi Boyu, Zhang Lei

Fushun Power Supply Company, Liaoning Electric Power Company Limited, State Grid, China

**Keywords:** power supply technology, teaching methods, classroom teaching, practice teaching, curriculum design

**Abstract:** In order to improve the comprehensive quality of the students, through the rational organization of the teaching content, the new teaching method, the rich classroom teaching mode and the use of a variety of examination methods, the theoretical contact practice, the exploration and practice of the teaching method and the means, and the good teaching effect have been achieved. The teaching practice has proved that the implementation of these teaching reform has played an important role in improving the students' learning effect and innovation ability.

### 1. Introduction

Power supply technology is the main content of electrical engineering and its automation specialty. The course content is closely related to the actual situation, the practice is strong, the content is complex and the knowledge is updated quickly. In recent years, on the basis of using traditional teaching methods, aiming at improving the comprehensive quality of the students, reasonably organizing teaching contents, adopting new teaching methods, enriching classroom teaching modes and adopting various assessment methods, so as to combine theory with practice, explore and practice teaching methods and means, and obtain good teaching results.

### 2. Reasonable organization and addition of teaching content

Power supply technology course includes the contents of load calculation, short-circuit calculation, equipment selection, relay protection, high voltage technology, operation and maintenance of power supply system and power quality. Therefore, the course has higher organizational requirements for teaching, and the handling of the lecture is not good, which makes the students feel tedious and boring, and the students are more difficult to accept. The cultivation of the practical application ability of the students is focused on, and a series of integration and optimization of the course content is carried out, the unnecessary theoretical deduction is simplified, and the application practice is increased. For example, the derivation of the physical process of three-phase short-circuit and the three-phase short-circuit impulse current during the power supply of the infinite capacity system relates to the basic theory and application of a large number of mathematical and circuit aspects, and in practice, the three-phase short-circuit current and the three-phase short-circuit impulse current can be calculated, so that, The derivation of the formula is simplified, and only the students remember the size of the impact coefficient and the relation between the impact current and the short-circuit current period component, so that the focus is facilitated, and the exercise of the practical application capability is enhanced.

With the rapid development of the power industry, especially the application of the computer technology in the power system, a large number of new intelligent switches and microcomputer relay protection devices have emerged in the power system. These new technical achievements need to be introduced to engineers and engineers who are engaged in and are about to work in the power system. There is no such new content in the currently used teaching materials. Some of the electrical equipment introduced in the book have been phased out in the power system and the industrial and mining enterprises, which inevitably leads to a serious disconnect between the school education and the social demand of the students, and cannot fully meet the social development and

the employment demand. In that end, we insert the new knowledge in the power distribution field, the teaching content of the new technology, such as the new type of high and low voltage electrical equipment, the comprehensive automation of the microcomputer relay protection device, etc. So that the students can understand the relevant knowledge of the development front of the power system, and the learning interest of the students is improved.

### **3. Enrich classroom teaching**

#### **3.1 Combination of classroom teaching, multimedia teaching and practice**

The content of power supply technology course is more and the class hours are few, only rely on the traditional classroom teaching to explain, the teaching mode is too single, which cannot complete the prescribed teaching tasks. It is not conducive to improving students' interest in learning. Therefore, a variety of teaching methods are closely linked and arranged as a whole, which has played a better teaching effect. For the basic calculation of power engineering, such as power load calculation, power network parameter calculation, short circuit current calculation, electrical equipment selection and calibration and relay protection setting calculation, the traditional teaching method is still adopted to teach its basic calculation method in class, so that students can digest and expand through homework and curriculum design after class. For transformer, high and low voltage electrical equipment and so on, only its functions and characteristics are taught in class, so that students can deepen their understanding of its structure and principle by visiting power plants or substations in the process of production practice, while the structure and laying mode of cable lines and the improvement of power factor are used to enhance perceptual understanding by means of audio-visual teaching. Facts have proved that this trinity teaching mode of classroom teaching, audio-visual teaching and production practice can not only improve the teaching efficiency, but also stimulate students' interest in learning, broaden students' horizons, and play a teaching effect with twice the result with half the effort.

#### **3.2 Combination of multimedia and traditional teaching**

Because some of the contents in this course are more abstract, such as the working principle of relay and low voltage circuit breaker, the action process of secondary loop and so on, the teaching effect is very little on the blackboard, and the modern multimedia teaching means can make the image, vivid and intuitionistic picture, set text, image, animation and sound as one, which makes some abstract and incomprehensible concepts intuitionistic and vivid. It is easy for students to accept. Therefore, it is helpful for students to understand abstract knowledge by using Flash, PowerPoint and other software to animate these contents and teach them in multimedia teaching with both pictures and texts. In addition, the new teaching content also needs to be taught to students in the form of multimedia courseware. Although multimedia teaching has the characteristics of vivid image, vivid picture and text, bright color and large classroom information, it can only be used as a teaching auxiliary means, and cannot completely replace teachers' progressive logical reasoning and flexible classroom regulation and control in the traditional teaching method. Teachers must adapt themselves to the teaching process and combine the two effectively in order to improve the teaching effect.

### **4. Variety of teaching methods**

The practice of the factory power supply course is strong, the content is complex, and the new content is still increasing. The teaching method of various forms can be applied according to the actual situation. So as to fully arouse the enthusiasm of the students to study. In order to provide a large amount of information to students in class, it is possible to use the form of multimedia courseware, to speed up the teaching progress, to improve the learning efficiency, and to make the classroom teaching lively and lively. For example, through the multimedia, the students can visually see the system wiring, the working process of the electrical equipment, etc, which can help the students to understand.

#### **4.1 Course method**

A clear and concise guide can effectively stimulate students' interest in learning and desire for knowledge and cohesion attention. It will help to complete the task of teaching and create a good atmosphere and conditions.

##### **1) Refresher**

Adding new courses can be based on the review, and the conclusion of the old classes. For example, in review of learned load calculations and knowledge with reactive power compensation, compensation can be naturally introduced into the distribution network load calculation methods.

##### **2) Suspense doubts**

Teachers can leave suspense to students before teaching them a new concept. This method can help them to form a complete concept in brain. For example, before explaining the concept of grounding and protection of ground, teachers can leave students with real life "protective earth" concept to cause the interest of students.

##### **3) Link the past and the future**

Teachers can use the previous chapter (or in the previous section) to bring out new content of courses. For example, after short-circuit current calculation has been taught, teacher can reiterate the purpose and role of short-circuit calculations to inspire students' transition to a stable thermal stability and electric power parity concept.

##### **4) Based on the basic concept**

Teachers can use students' basic course content to bring out new courses. For example, before you teach the power line and transformer losses, you can review the circuit in the power circuit components. It will be natural to teach new courses.

#### **4.2 Guide teaching method**

Teachers should be fully prepared and proficient in their subject knowledge, and strive to be considerate of others, from the view of students learning, carefully designed; at the same time, they should have rich practical experience and should not talk about it on paper. For example, when explaining relay protection, teachers can take the actual fault of power supply system as an example to explain the cause and harm of the accident, and then explain the theoretical content of protection.

#### **4.3 Heuristic teaching method**

Teachers can sometimes use enlightening and induced teaching methods when teaching. To achieve good teaching results. The way of asking questions can stimulate students thinking and improve students interest and enthusiasm in learning. For example, when learning how to ensure selectivity in distribution network overcurrent protection, students are inspired to use the principle of time ladder to realize.

#### **4.4 Discussion teaching method**

When organizing classroom discussions, teachers can ask questions, encourage students to ask questions, dare to express their own views, and broaden their knowledge. For example, when learning the sensitivity check of current protection, organize the students to discuss which type of protection needs sensitivity check and which type of protection does not need to be checked, which can make students understand deeply and remember not to forget.

### **5. Practice-oriented teaching, foster innovation**

Practice teaching plays an important role in cultivating students practical ability, analyzing problems and solving problems. The certification experiment provided by the course is able to train the basic operating skills of the students. In the lab, the students are able to do their own work and make a deeper understanding of the electrical equipment they have learned. The students can master the structure, setting and test of the circuit breaker, the mutual inductor, the isolating switch, the relay, the protection device and the automatic device, and the computer application, etc., to consolidate and deepen the knowledge of the classroom teaching and to develop the hands-on

ability; and during the practice, through the on-site explanation, Visit and practice to further understand and master the structure, operation and maintenance of the power supply system. By increasing the proportion of practical teaching, the theory and practice are achieved, and the comprehensive ability of the students is improved. The design type and the comprehensive experiment are put in the process of production practice, and the students in the practice base in the school are designed, and the production practice mode combined with the outside-of-school modernization enterprise production line visit is made. The practice has proved that this kind of practice has greatly aroused the students enthusiasm to study, and has made remarkable achievements in cultivating students ability to find problems, analyze problems and solve problems.

## **6. Strengthen curriculum design and enhance the training of the project**

Curriculum design is another important practical teaching link after theoretical teaching and experimental teaching. Its purpose requires students to master the basic design content and design method of power supply and distribution system. It is an effective way to test students learning effect and cultivate students ability to do a good job in curriculum design, and to add new teaching contents to perfect curriculum design and strengthen the cultivation of students ability. The design content mainly focuses on the preliminary design of power supply and distribution system in small and medium-sized factories. Usually, the calculation load of each workshop is given directly, and the students complete the transformer capacity selection, the main wiring diagram design, the short-circuit current calculation, the electrical equipment and current-carrying conductor selection, the relay protection configuration and setting calculation, and compiles the design specification, draws the electrical main wiring diagram and the transformer protection schematic diagram (or expansion diagram). In the curriculum design, let the students think independently, design independently, encourage the students to consult the data more, allow many kinds of design schemes to exist on the same subject, make full use of the modern means to carry on the power supply design, encourage the students to make use of AutoCAD drawing, in order to connect with the actual project. The evaluation of curriculum design performance is composed of design specification quality, drawing quality, tutoring question answering record and design progress, so as to ensure that the curriculum design performance is reasonable, fair and fair. Through curriculum design, students can deepen and consolidate the main contents of each chapter in the textbook, help students to establish a complete concept of power supply and distribution system, improve students ability to apply the knowledge they have learned to analyze problems and solve problems, and achieve the purpose of cultivating engineering consciousness, innovation consciousness and engineering practice training.

## **7. Variety assessment methods for improve learning initiative of student**

As an important means of teaching evaluation, the test plays an important role in the study of the students and the teaching of teachers. The main form of the traditional examination is the one-time-time closed-volume test, which is not conducive to the full and thorough examination of the ability of the students to comprehensively use the knowledge to solve the problem. The results of the power supply technology course include four parts: the final exam results, the post-class work scores, the experimental results and the comprehensive practice achievements, which account for a certain proportion of the total score, respectively.

The final exam results students can be obtained from two paths: take part in the traditional final exam or apply for exemption. In addition to the achievements of teaching links such as after-school operation, experimental and comprehensive practice, and thematic discussion, the students who apply for exemption should also choose to do the test-free test of the training of innovative design ability. Students who apply for exemption do not have to take part in the final exam of the course as long as these subjects are completed and the results are satisfactory. The above-mentioned evaluation and evaluation scheme enables the students to evaluate the whole teaching process, to promote the students to attach importance to each teaching link, to make the students study actively, to avoid the phenomenon that the students do not rush before the examination, and to improve the

self-consciousness of the students in the ordinary times.

## **8. Conclusions**

Power supply technology plays an important role in electrical specialty. The reform and practice of its teaching method is beneficial to students' mastery and application of professional knowledge, as well as to the cultivation of more innovative electrical technical personnel with high quality.

## **References**

- [1] Zhiping Tang. Power Supply and Distribution Technology[M]. Beijing: Publishing House of Electronics Industry, 2005.
- [2] Huagang Chen. The methods of introduction of new lessons in power supply technology course[J]. ChangJiang Water Education,1998,15(4): 46.
- [3] Meilei Lv. The research and exploration of curriculum reform for power supply technology course[J]. Journal of Electrical & Electronic Education, 2003,(2): 15-17.