

Research on Experimental Training System Based on Problem-oriented Method

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Abstract: This paper introduces the situation of electronic process practice in Shaanxi University of Science and Technology (SUST), pointing out the contradiction between the electronic process practice process and effect, developing investigation on current situation of electronic process practice by anglicizing education policy in our university and other university. There are many problems after the investigation, including the backward teaching mode, the obsolete teaching content, the single evaluation system, the inadequate environment support, and the insufficient teacher strength. According to these practical problems, this paper proposes the whole reform that concern changing the teaching mode, revising the existing teaching materials, updating the teaching contents, improving the quality of evaluation, updating the practice environment, and raining teachers' practical teaching ability. Finally, the reform will discover and educate students' innovative ability, improving the comprehensive quality of teachers and students.

1. Introduction

Electronic Process Practice Base is a part of Provincial Electrical and Electronic Experimental Teaching Demonstration Center in SUST. At present, it covers an area of 570m², which has 6 laboratory including welding-process laboratory, multi-media laboratory, PCB production laboratory, debug laboratory and etc., and has a few more than 300 pieces of equipment and total prices of the equipment more than 1 million Yuan. It can accommodate 4 classes of nearly 120 students to participate in electronic process practice at the same time, equipped with 6 teachers who are mainly responsible for theoretical teaching and practical guidance, such as guiding students to learn safe use of electricity, to practice wilding basic operation, to train common components cognition and simple measurement, to learn the principles, assembly, debug, maintenance, and test of electronic products, to complete curriculum design, graduation design and the other aspects of the coaching students work. But, there are many contradictions between the current electronic process practice process and effect, which cannot effectively solve the needs of training engineering talents and lack of innovation ability. Therefore, we start to investigate and study the current situation of electronic process practice in our university to explore the contradictions between the process and effect of electronic process practice, and accurately implement the reform and innovation of electronic process practice.

2. Investigations on electronic process practice

2.1 Investigations on policy

Practice teaching is more important in the process of personnel training in colleges and universities. It is also more important that strengthen the practice teaching is the content of strengthen the reform of Higher Education^[1-4]. After investigation of access to information, we have known that the ministry of education attaches great importance to the reform of practical teaching in colleges and universities. In the second national college teaching work conference in China, they say that, "We should strengthen practice teaching and improve students' practical ability. Universities of Higher Education should strengthen the awareness of the practice of educating people, distinguish different

disciplines on the requirements of practice teaching, formulate reasonable practical teaching programs, and improve the practical teaching system. To effectively strengthen the experiment, practice, social practice, graduation design (Thesis) and other practical aspects of teaching, to protect the time and effect of each link, and do not reduce the requirements. "Electronic process practice is a compulsory course in the practice of science and engineering colleges, and it is evident that practice teaching is very important in colleges and universities^[5-7].

2.2 Investigations in our university

In order to find the problems, we designed a questionnaire about electronic process practice in our university. The questionnaire of electronic process practice has three parts. The first part mainly aims at the investigation of the students; the second part mainly aims at the investigation of teachers; the third part mainly aims at the investigation of leaders.

We analyze the questionnaire survey and get the following results.

(1) Although the students of non- electrical think that the current situation of electronic process practice is more satisfactory in our university, but the students of mechanical-electrical do not think so. They worry about the current situation of electronic process practice in our university, think there are some problems to be improved in the future.

(2) The teachers in our university think that the current situation of electronic process practice is general state, only adapt to the basic practice teaching, lack of innovation training, and also to be improved in the future.

(3) The leaders of our university think that there are many problems in electronic process practice at this stage. It is necessary to reform comprehensively, to introduce the new ideas and teaching methods, to emphasize the practical teaching process.

2.3 Investigations outside our university

Through visiting to other colleges and universities and reading the relevant electronic process practice teaching reform, we find that other colleges and universities have begun to reform according to their own actual situation by finding insufficient and mining potential. The reform including new ideas, for example, CDIO (Conceive Design Implement Operate)^[8], including new teaching method, for example, task driven and project guided teaching, including new measures in practice, for example, scientific research project and project training. Those new ideas, new methods and new measures can be applied in the teaching reform of electronic process practice in our university^[9-10].

3. Problems of electronic process practice

3.1 Problems of policy guidance

At present, the students who do not take part in the electronic process practice know little about electronic process practice; even some students do not know the electronic process practice is a link of practice teaching and a compulsory course in our university. Form the propaganda of the policy, our university is not enough, do not guide the students know more about propose, significance and content of the electronic process practice.

3.2 Problems of instrument and equipment

According to the interview and field investigate, electronic process practice has a few more than 300 pieces of equipment, and total prices of the equipment more than 1millionYuan in our university. It is enough for students to practice base learning, but there are some quality problems by using the instrument and equipment.

3.3 Problems of textbook guarantee

The current textbook of electronic process practice is "circuit, electronic technology experiment and electronic process practice training" (Second Edition) which edited by professor Dang Hong-she and published by Electronic Industry Publishing House. The textbook is mainly significant with

non-electrical students when they participate in electronic process practice. However, it is not significant with mechanical-electrical students who want to learn more about electronic process practice.

3.4 Problems of practice contents

As far as the content of current electronic process practice is concerned, we offer different contents between mechanical-electrical and non-electrical students. According to the investigation, the students of non-electrical think that it is satisfied with contents of electronic process practice that connected with each other, but the students of mechanical-electrical do not think so. They think that the contents of electronic process practice are not connected with each other.

3.5 Problems of teaching methods

Current teaching methods of electronic process practice mainly include teachers' class telling and students' verification practice, one-to-one solving the practice difficulty, and one-to-many communicating the practice difficulty each other. Under those teaching methods, students is more to learn to solve the difficulty with mathematical model, not creative model, in which students' active learning ability and creative learning ability is not improved.

3.6 Problems of student leaning methods

From the current student learning methods, many students like follow the teacher do what do mechanically, and they have not their own thinking. They are familiar with the contents that teacher has been told or the teacher has been demonstrated, and better to do. But, the students are very difficult in learning the contents that teacher has not been told or the teacher has not been demonstrated. It is easy to see that those students lack of active learning ability.

3.7 Problems of teachers teaching level

At present, there are six teachers of electronic process practice in our university. Some teachers have long been engaged in the practice teaching of electronic process practice, have very rich experience in practical teaching, and teaching level is very good at guiding students to master more practical learning knowledge. However, there are another part of the teachers who are young teacher, which they lack experience in going out for training and social practice, grasp the breadth and depth of knowledge is not enough.

3.8 Problems of evaluation system

Evaluation method of electronic process practice enhances the result in our university, for instance, the score high or low does not matter with the process of students' practical products, but close to the result of students' practical products. Similarly, the evaluation method of teachers enhances the students' result too, and ignores the teachers' participation in the whole process.

4. Reform of electronic process practice

4.1 Reform of practice teaching idea

There are some new ideas in the reform of collages and universities, including CDIO teaching idea, task driven teaching idea, and project guided teaching idea, witch have achieved good results. So we should consist on CDIO teaching idea as our practical theoretical direction, begin to let task driven teaching idea and project guided teaching idea in our daily teaching practice by Conceive-Design-Implement-Operate. Those teaching ideas will promote the students' practice ability and innovation ability.

4.2 Reform of hardware environment

We need to expand the practice area, add practical classroom, multi-media classroom, and PCB board room. Moreover, we need to support new good quality and high precision of instruments and equipments, to entrainment the requests of students using the instruments and equipments, to improve

our hardware environment of electronic process practice.

4.3 Reform of textbooks guarantee

There are some contents should be adjusted and modified by adding dominical and comprehensive experiment. Such as adding the contents of circuit simulation software and latest industrial circuit board marking, modifying the contents of electronic products installation, commissioning, maintenance, etc. Moreover, we should expand the contents of textbook, and promote some other useful reference book to the students.

4.4 Reform of practice contents

We should add some creative experiments that students not only complete a single AM radio from assembly, debug, maintenance, and test, but also practice other electrical products. The new items including FM radio, simple MultiMate, DC regulated power supply, fixed-line telephone, calculator etc. Meanwhile, we can arrange some design practice, such as motor control circuit, amplifier circuit, audio power amplifier, water level monitoring and control circuit, responder etc.

4.5 Reform of teaching methods

We can design a variety of electronic process practice subjects by using the task driven and project guided teaching methods, allow the students to complete the task requirements under the specified conditions. At the same time, we can adjust the guidance strength by observing the student who understands the theoretical knowledge and emphasizes the practical process or the student who deeply learns the process of knowledge innovation practice.

4.6 Reform of leaning methods

When you are not clear about the theoretical knowledge, you can practice at first, then understanding the theoretical process in the process of practice. It is useful to deep learn the theoretical knowledge and flexible apply the theoretical knowledge when you complete the practice and turn your back on the principle. Meanwhile, you can also exercise your cooperative spirit by talking with your partners or teachers in a small group when you have some doubts.

4.7 Reform of teaching level

It is very important to pay attention to training teachers when the teacher lacks experience in guiding students. So, we must reform the situation by organizing the young teachers to participate in the Electronic Design Competition in China, sending young teachers to outside our university to train their ability and open their eye, giving easy promotion opportunity and other policy support. Moreover, we can invite more rich experience teacher to guide young teacher by hand in hand.

4.8 Reform of evaluation methods

we should add the practice attitude assessment which accounted for 10% of the total score; the process of welding, product assembly, debugging, testing, maintenance and PCB board design and production which accounted for 60% of the total score; the spirit of teamwork accounted for 10% of the total score; the final report of electronic process practice accounted for 20% of the total score. Meanwhile, we should focus on the evaluation of teachers' teaching process.

5. Conclusions

We begin to analysis the confusion of the electronic process practice teaching in SUST. By investigating relevant literature, analyzing the questionnaire and communicating with each other, we sort out eight aspects of problem that is problems of policy guidance, problems of instrument and equipment, problems of textbook guarantee, problems of practice contents, problems of teaching methods, problems of leaning methods, problems of teaching level and problems of evaluation methods. Then, according to those eight problems, we propose eight reform methods that is reform of practice teaching idea, reform of hardware environment, reform of textbooks guarantee, reform of

practice contents, reform of teaching methods, reform of leaning methods, reform of teaching level and reform of evaluation methods. Those reform methods come from the current situation of our university and the good reform ideas of other colleges and universities. We firmly believe that those reform methods will promote the practice teaching of electronic process practice in our university to a new level.

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