

Problems and solving measures in PLC teaching

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Abstract. PLC has been used more and more widely in the field of industrial control, as the cradle of talent, most universities offers PLC courses. In order to let the students learn the related knowledge of PLC, and to improve the creating ability and the practical ability of students, but there are also some problems in the teaching process, this article has carried on the analysis to the existing problems in the teaching of PLC, and put forward relevant solving measures.

Keywords: PLC; teaching; problems; measures.

1. Introduction

The PLC (Programmable Logic Controller) is a new type of industrial automatic control device based on microprocessor, it integrates computer technology, communication technology, processing and manufacturing technology, automation technology together [1]. PLC has advantages of good reliability, small volume and strong anti-interference ability [2]. With the development of science and technology, industrial automation degree is increasing continuously, new products continue to emerge, updating becomes more quickly, in recent years and PLC has been applied widely in the field of industrial control [3]. University as the cradle of talent, is an important place to train the students' theory and practical ability, PLC is more and more valued in the field of industrial control of attention, so universities must also carry out PLC teaching to the student, and make it a basic course in the field of industrial control. PLC integrates curriculum theory and practice together, it not only can cultivate students' creative thinking, but also can improve the students' ability to solve practical problems [4]. Now on the market, PLC products are various, type is complex, and updating is rapid, some students will feel some difficulties in the course of study, so it brings the teacher a lot of problems [5]. This paper will analyze the problems commonly existing in the process of teaching in PLC now, and put forward relevant solving measures. In order to make some contribution to the development of PLC teaching.

2. The questions existing in PLC teaching

Basic knowledge is not clear. PLC is a comprehensive curriculum, it relates to the automatic control, microcomputer principle, programming language, embedded system and so on. In the process of learning PLC, students may not learn all these courses, so it is difficult to learn PLC. Because the foundation is not enough, in the teaching process, students will be unable to fully understand the content that teacher speaks. Including the most basic hardware structure and working principle. And the teacher only teaches the contents of textbooks in a simple way, which is not able to arise students' interests in learning, the classroom atmosphere is not active, the interaction is very poor. PLC curriculum involves many kinds of knowledge, for example, the PLC instruction has many kinds, the students are hard to understand all in the limited time, in the course of time the students accumulate more and more problems of this course, so they will lose interest. Basic knowledge is not clear enough, which adds a lot of obstacles to subsequent learning and applications.

Lack of understanding of the practical application. In the teaching process, teachers generally carry out according to textbook content. Students can only learn the basic knowledge, it is difficult to recognize the importance of this course. They do not know the actual application of PLC in the study,

and do not know the important role of PLC in the field of industrial control. Because they do not know the important functions of PLC, they are unable to understand the important position of PLC occupied in the future work. Only the most basic knowledge of PLC is expounded in a general textbook, and there is no description of its application in industry deeply, and there may be some simple experiments, the students do experiments are also in accordance with the instructions step, which does not exist the creativity, Teaching method that the teacher teaches what the books say cannot let students understand the important role of PLC, and also cannot arise students interest in learning, which will bring important influence the follow-up of the learning effect.

The experimental course is not prominent. Now in the PLC course of study, the experiment course is generally carried out after theory class, and in experiment course, there are also the verification experiments. The teacher will explain the experimental process in detail before the experiment, the students completes the experimental task in the lab according to the teacher explained the content of the operation, students lack thinking and design in the whole process, after the completion of the experiment, students also just verify the content learning before, it cannot stimulate the creativity of students, and does not have the challenges. This will cause the students lose interest in the experimental courses, what is more serious is that some students just take the experiment data simply, but they do not know the contents and significance of the experiment. The purpose of the experiment is to let students apply the learning content, rather than take the class content to the laboratory to relearn again, now the PLC experiment course teaching role is not prominent.

3. Solving measures

Pay attention to the basic knowledge. PLC is a comprehensive curriculum, students do not have learnt all the basics, to understand and grasp the basic knowledge of PLC will have difficulty. Teachers should pay attention to the method in the teaching process, and explain profound theories in simple language. The necessary knowledge can be explained in detail, other knowledge can be simple to explain, otherwise, students may have more difficulty to understand. As shown in Figure 1, the PLC's basic structure includes CPU, a storage unit, a power supply unit, interface unit, a peripheral unit and an input and output unit, teachers need to explain this part in detail, this part is the foundation for subsequent learning. The PLC work process is shown in Figure 2, students should know PLC works in circular scanning mode, which includes three phases, respectively they are the input sampling stage, the program execution stage and output refresh stage. These knowledge are the foundation for subsequent learning, students through these knowledge can have a simple understanding of the principle and working mode of PLC, which will lay the foundation for follow-up study.

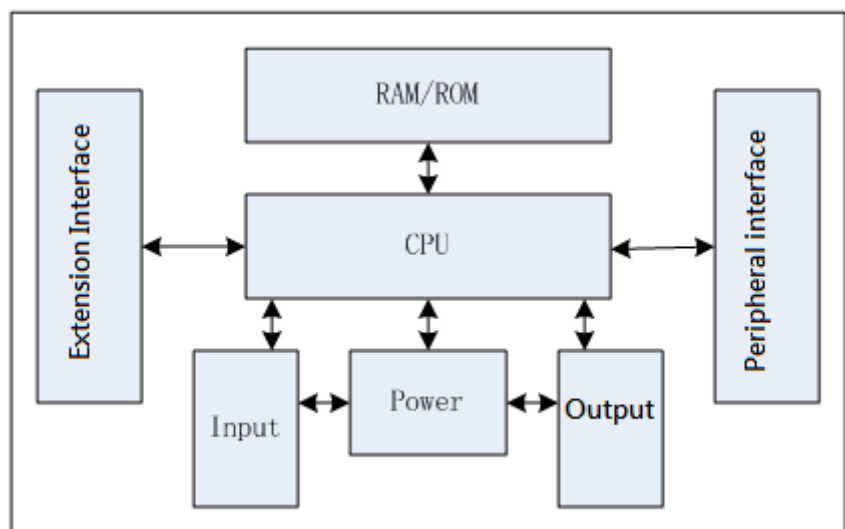


Figure1. PLC's basic structure

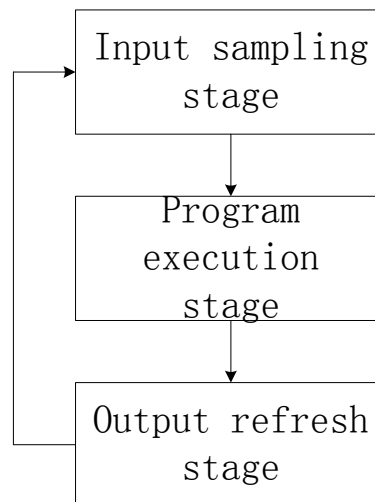


Figure2. PLC work process

Pay attention to the actual application. There is still a big gap between the content and the practical application, students do not understand the actual application, so they do not know they should learn what knowledge in this course, and how to apply in the practical work. In order to solve this problem, the universities should increase the PLC curriculum hardware investment, establish the special room for PLC course and build the experimental platform to simulate the actual application. In the classroom, teachers should make full use of multimedia teaching, not just follow the books, the actual application should be introduced and the combination of curriculum and the actual use should be done. If universities have the conditions, they can move the classroom into the enterprise, and students can understand the practical application of PLC better in enterprises. It can improve students' interest in learning, and students' learning objectives can become clear.

Hierarchical Design of experimental course. The original experimental course is boring, just repeat the text content on mechanical property, it cannot stimulate students' interest in learning and exploring spirit, which will lose the experiment class itself significance. The experimental course serves as the textbook knowledge supplement, which is mainly to improve students' interest in learning, train students' practical ability, and improve the analysis of issues of students and the ability to solve problems in the process of experiment. In order to improve the students' interest in the experimental class, hierarchical design of experimental course can be done. The first stage is verification experiment. During this stage, students experiment on the application case of the textbook, to verify the knowledge, master the most basic instructions, and deepen the understanding of the knowledge, which will lay the foundation for the application of the next stage. The second stage is designing experiment. Before the stage the students already have a certain foundation. Teachers can put forward some design issues, experiments should be designed by students according to the requirements of the subject. The design difficulty of this stage cannot be too big, such as to control the traffic signal lamp shown in Figure 3, the main purpose is to let the students according to the knowledge to do programming and debugging independently, solve simple problems, and no longer confine to the simple knowledge on the textbooks. This stage, the teacher play a role to guide students, but students can give full play to their creative ability, simple guidance by teachers just for students' problems encountered. Students can improve their ability of innovation and practical ability in the process of design. The third stage is the application experiment. In the first two stages, students have laid a solid theoretical foundation, and improved their creativity and practical ability. But the gap between study and practical application in industry control still exists in this stage, teachers can use practical application for the subject, and let the student carry on design. If the universities have the conditions, they can let the student go to the enterprise to practice, the application of design can be better. This stage is the subject of the students, all the work is done independently by the student, the teachers will conduct at the key point. In this way, students can learn practical application of PLC in

industrial control field, which can apply the learning of the real knowledge to solve practical problems, it will lay a good foundation for future work.

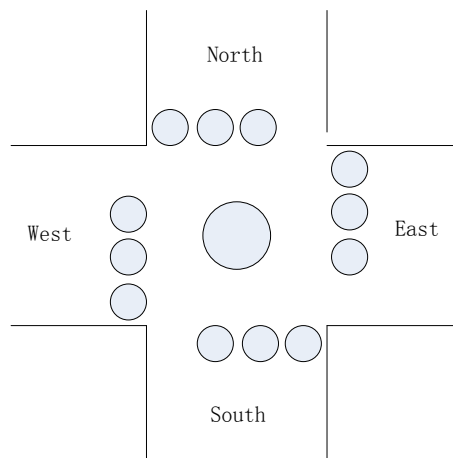


Figure3. The traffic signal lamp control

4. Summary

The purpose of PLC teaching is to make students grasp the basic knowledge, to lay the foundation for future work. Now there are some problems in PLC teaching, including that the teaching of basic knowledge is not clear enough, the students lack understanding of the practical application and experimental curriculum cannot be good to play a role. In order to improve the students' interest in learning, stimulate students' creative ability, the specific reform should be done according to the above problems, and ultimately achieve the purpose of unity of theory and practice, and realize the effect of PLC teaching.

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