

Promote the Reform of PLC Comprehensive Training and Enhance the Core Employment Competitiveness of Students

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Abstract. In view of the current teaching situation of the programmable controller course and the different demands for graduates' abilities in jobs, in order to reduce the time for graduates to adapt to jobs, a project teaching design aiming at employability is put forward. Through the whole process of project design, implementation and summary, stimulate the enthusiasm of students to participate, and combine with future employment, design different job tasks and implement them in groups, cultivate students' social, technical and methodological abilities in the process of project implementation.

Keywords: PLC, Comprehensive Training, Engineering capability

Introduction

The principle of PLC is the main course of automation related major in our college. Through the analysis of Tianjin talent demand data, it is found that many work contents require students to master certain PLC knowledge and application ability. However, the production practice and engineering application of this course are strong. Some traditional experimental training projects are separated from the modern intelligent production process. The enterprise reflects that the students' PLC application ability is poor.[1] On the other hand, for many students with poor foundation, it is difficult to master, and their enthusiasm and learning effect are relatively poor. In order to improve the students' application ability of PLC, our college has set up a centralized comprehensive experiment after the teaching of PLC, aiming to consolidate the students' grasp and application of PLC basic knowledge in a short period of time, while focusing on improving the students' comprehensive application ability of using PLC to solve engineering problems. In order to achieve the purpose of promoting the students' PLC application ability and improving their employment competitiveness, the practical teaching reform of PLC was carried out, including adjusting the course content and improving the assessment method.[2]

Employment Status Analysis

Take the students majoring in electricity of Tianjin Agricultural College as an example. After graduation, the students we trained can be engaged in the research and development of equipment, electrical installation, debugging, maintenance, etc.[3] According to the analysis of employment data of coastal city enterprises in Tianjin, most of the electrical Posts require students to master PLC related abilities. The positions to be engaged and related requirements of students are shown in Table 1.[4]

Table 1 The Data of Enterprise Position

Responsibility description	Job requirements
Be responsible for the technical support and coordination of the electronic and electrical system assembly project of the product, and participate in the project management	Have the design and development ability of relevant electronic products and hardware, Be proficient in the use of relevant design software
Be responsible for the electrical design of the product, including the preparation of electrical drawings and the selection of electrical components	Have all technical work abilities, such as technical disclosure, design change, debug and test
Evaluate the suppliers of the electrical outsourcing part and the introduction and transformation of the outsourcing part	Have the experience of non-standard automation equipment design and debug
Provide technical support on the project installation site to solve the technical problems of the electrical system	
Cooperate with project management team to complete new product development and project installation	

From the above simple data, we can see that enterprises require students to have engineering practice ability; at the same time, students are also required to have the ability of team cooperation and management team. Moreover, the enterprise feedback information reflects that if students have a certain comprehensive application ability, the future salary level will be higher and the opportunity for post promotion will be greater.[5]

Practical Training Reform

Taking students as the center and improving engineering practice ability

The amount of PLC practical training guidance is relatively large, and most of the students do not grasp the theory well, and their practical ability is poor. In the process of practice, they are afraid of difficulties, and their participation is low, which eventually leads to poor effect of the practical training course. The basic object of teaching is students. The goal of teaching is to let students master the corresponding knowledge and skills. In order to adjust and solve these problems, we should pay attention to the following aspects[6]:

First, we must firmly establish the education concept of "student-centered", fully consider the mastery of students, and reasonably match team members;

Second, teachers should pay attention to changing their roles. In the process of experiment, from the perspective of "enterprise", they should try their best to find and find the flash point of "employees", so as to improve students' sense of participation and achievement.

Third, we should reform the traditional assessment method of success or failure based on results, encourage students to break the traditional design method, and strengthen the assessment of students' engineering practice process.

Do a good job in the training of employment projects and improve the practice link

According to the guidance of enterprise guidance teachers and the needs of enterprise employment, the general process of a PLC project is as follows:

- Be familiar with the site environment and process flow
- Design a safe and reliable control scheme
- Draw the electrical control schematic diagram
- Determine the materials and make the list of materials
- Compile PLC program, configure monitoring screen, design PLC cabinet wiring diagram, and make PLC cabinet at the same time
- Communication with Party A and on-site construction
- On site commissioning and improvement of process control scheme.

- Organize Party A to accept the project
- Handover of completion data. (information includes: drawings, debugging documents, PLC programs and upper computer programs)

Establish a scientific assessment method suitable for engineering practice

The traditional way of assessment focuses on whether students have made experimental results, which often leads to many students' plagiarism or not. Therefore, we must reform the way of assessment and evaluation, and change the "assessment result" to "assessment process". Take students as the center, according to the students' existing knowledge and skills, as well as their performance in the whole training process, carry out assessment. For example, for students with poor foundation, students can complete basic training requirements through internship and answer relevant questions raised by teachers. The assessment can also be good, encouraging students not to be embarrassed and dare to try; in addition, the assessment of students' self-learning ability is introduced, encouraging students to solve problems by consulting manuals, networks or discussions.

Implementation

Engineering design

According to the design process of PLC, the work details of the project are improved, which is also convenient for students in grouping and task division. The specific work links are shown in Figure 2 below:

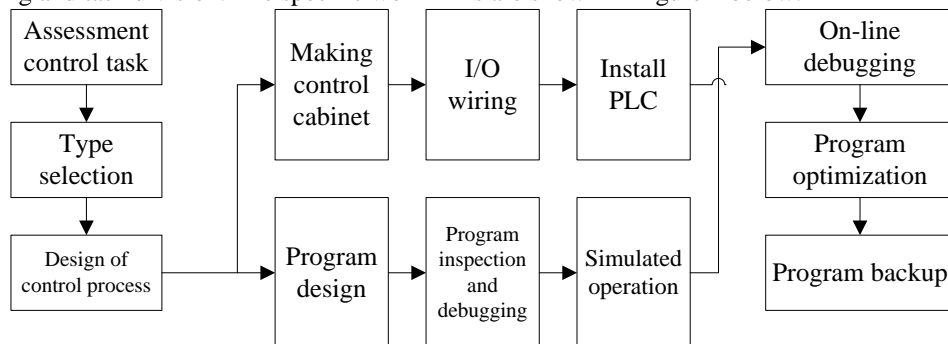


Figure 1 Process of PLC Project Design

It can be seen that the tasks of team members mainly include engineering management, software design, hardware design, system production and debugging, system optimization, document writing and sorting, etc., which should be fully grasped in the process of team members composition and task assessment.

Engineering design

In order to prevent plagiarism or inaction, each group of tasks of this project is not repeated. It mainly includes several aspects:

- Production process control: such as mushroom automatic production line;
- Life products: such as coffee robot;
- Traffic control: such as elevator and traffic light;
- Agricultural production: such as automatic water-saving sprinkler system;
- Children's entertainment: such as carousel.

Assessment method

Scientific assessment method is very important to improve students' learning interest and engineering literacy, and to assess the actual teaching effect. The main assessment contents and standards of this reform are shown in Table 2.

Table 2 Project assessment form		
Examination contents	Assessment standard	Assessment method
Completion status	Demonstration training results	Site process
Related knowledge	Answer teachers' questions correctly	questions
Related skills	Solve the problems encountered in the commissioning, and the wiring conforms to the specifications	scene
Teamwork	Reasonable division of labor and joint completion of the project	Site process
Personal promotion	On the basis of the original, the individual has grown in methods, knowledge, skills, communication, expression, etc	Site process
Professional accomplishment	Develop good engineering habits	Site process

Summary

After two rounds of teaching implementation, students generally reflect that they have consolidated the PLC knowledge they have learned before through the PLC training, and indeed improved their hands-on ability, especially those students with poor foundation can actively participate in the training, find their interest and confidence in learning, and improve their management level of engineering, especially those words expression. Bad students, through this training, master the basic structure of engineering documents. In the process of project management, the trust, cooperation and coordination of the team are the basis for the continuous operation of the project. The student's response is very good, and the employer's recognition of the student's ability to participate in the teaching reform is also very high.

Through the examination of 100 students' engineering practice ability before and after the teaching reform, we can see clearly that students' system management ability, team management ability, project management ability and document management ability have been well exercised. The comparison data is shown in Figure 3.

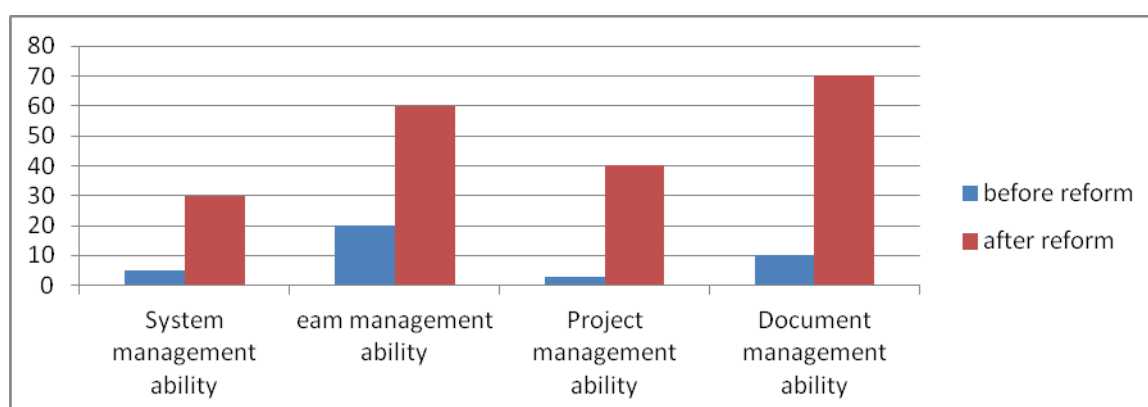


Figure 2 Improvements of Students' Ability

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