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Discussion on the Teaching Reform of PLC against the Backdrop of Engineering Certification

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***Abstract*—Under the background of international engineering certification assessment, in accordance with the standards of engineering certification, in view of the PLC program, we performed a series of teaching reform, including the teaching content, design of experiment, teaching method and examination way, etc., in order to achieve certification standards, so as to cultivate enterprise needs that having solid professional knowledge, strong practical ability and innovative spirit of the new forces.**

Keywords—Engineering certification Teaching methods; PLC; Curriculum assessment method

I. INTRODUCTION

PLC control technology and its application is a professional course which emphasizes both theory and practice, it has strong engineering practice. It is a wide coverage of knowledge, involving more content, update fast development, both theory and Practice on the application of the course, combined with the actual production and engineering application, It is a professional knowledge that can be applied directly to students when they go to work. It is also a specialized course which is highly valued by employers at the annual double election [1].

To this end, we carry out PLC curriculum reform according to the education professional certification model, focusing on the training of engineering technical ability [2]. Break the PLC program, students heavy theory, light practice problems, in order to improve the students' interest in learning, we adopted by engineering practice to carry out the course of the project type, the method of different examination methods for different tasks, carrying out responsibility system of team, urge the student positive initiative in training course. To apply, for the purpose of enhancing university-enterprise cooperation, in order to will cultivate students to be able to solve the problem of PLC control system in the scene, to satisfy the needs of the social and economic development, has the high professional accomplishment, wide knowledge, practice ability, high moral character, with the characteristics of age and innovative entrepreneurial spirit of excellence applied PLC [3].

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II. UPDATE THE TEACHING CONTENT OF THE COURSE

At present, the PLC course experiment teaching of the general train of thought is based on the system control requirements to choose PLC hardware configuration, and then write the ladder diagram and input to the PLC, the final output in the experimental observation results on board. Due to the lack of variability to hardware configuration and software programming, so the experimenter can't observe the middle variable, not understand the change process, so the result of the experiment, students can only have a perceptual knowledge, passive acceptance.

In addition, because the operation effect of the experimental plate is simulated by light-emitting diode, the experimental operation state is very abstract, unintuitive and difficult to feel the state of reality.

As computer and network system consisting of PLC control is widely used in production, it makes the students should not only have PLC programming knowledge ,also have calculated unit configuration, hardware, networking, remote communication and monitoring configuration design system related to practical knowledge, in order to meet the needs of practical work in the future [4]. On PLC experiment teaching project, therefore, need to design a simulation experiment demonstration system of the real environment, the system should can realize different hardware of PLC networking, communications and multiple functions such as monitoring, so as to realize the experimental teaching of visual, flexibility, and participation.

We declare the experimental teaching reform project "SIEMENS S7 series PLC networking demo system based on PROFIBUS design", the research goal is to build three-dimensional S7 series PLC network simulation demonstration system based on PROFIBUS, logistics sorting process to simulate scene, mainly adopts SIEMENS PLC as the main controller, S7-300 to monitor the sorting process of headquarters, and SIEMENS S7-200/300 as sorting area controller respectively, at the same time sorting process monitoring region. In this way, we can monitor the sorting process of the headquarters and the district on a computer and monitor the sorting situation in each region to achieve better monitoring purposes [5]. Such as Figure 1.

Fig. 1. PLC simulation demonstration system

The demonstration system introduces the content of MCGS configuration, which shows that the dynamic process of monitoring experiment can reflect the intuitiveness, flexibility and participation of experimental teaching. The system simulates the actual production control process, which enables students to contact the whole process of the actual configuration through different hardware and network communication modes. The system adopts three-dimensional simulation system, which is more dynamic and close to the actual control scene than the original plane control system. The construction of the system gives students a deeper understanding and understanding of the application of PLC in actual production [5].

III. Improve Classroom Teaching Methods

Since this course is composed of two parts: theoretical teaching and experimental teaching, and the allocation of class hours is in accordance with the ratio of 1:1. Therefore, in theory teaching, we change the teacher as the main body, and the students are the auxiliary mode. In class the teacher now will introduce the basic theoretical knowledge and basic instruction has been completed, is to take the student as the main body of the study, want to learn the contents of the first concrete method is the teacher according to design good so it is difficult to a number of small, team by freedom of students, selected topic, in a set of time to complete the task, there needs to be the team with the division of labor, and the problem solving problems encountered in the core knowledge in practice [6]. This task-driven approach, the teacher is just the synergy, in each group encounters the problem, appropriate explanation instruction [7]. Finally, each group of students will make a slide show in class to explain their topic, other groups will ask questions as experts, or propose Suggestions for improvement. Finally, the teacher explained the whole task, and summarized and summarized the problems. This helps to cultivate students' ability to correct error and play the main role of students. Such as Figure 2.

We carry out student-centered, experimental teaching to focus on integrated design, which is of great significance to improve students' flexible use of theoretical knowledge analysis, problem solving and training of engineering design and creativity. In order to improve the ability of practical and practical ability to solve the problem, we have increased the proportion of comprehensive experiment and design experiment, designed the experimental question of different degree of difficulty, each comprehensive design consists of three parts, which are basic task items, development task projects and innovative task projects. Students can choose the content of the experiment after completing the basic task experiment. After doing the experiment, choose to do the contents of the experiment. In the limited laboratory on the machine as much time as possible to complete the task, the teacher will add points in the assessment to encourage. So as to solve some students eat enough, some students eat too support the problem.

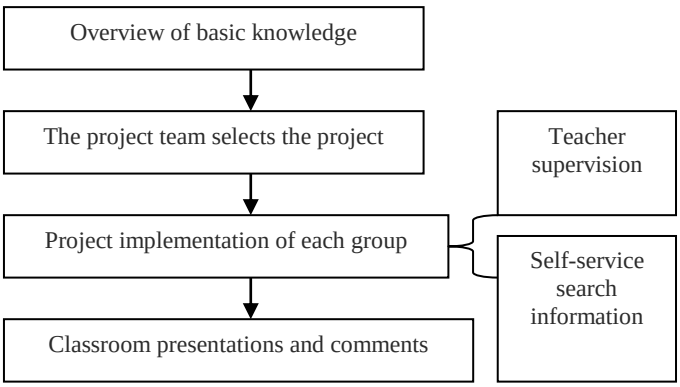

Fig. 2. Task-driven pedagogy process

IV. Reform Curriculum Assessment Method Conclusions

Refer to the competition rules for the assembly and debugging of mechanical and electrical integration equipment of national skill competition in recent years. The grading standard is 20% of theoretical achievements and 80% of skills. Among them, the theoretical examination adopts the choice and the question form. The skills are divided into two categories: the electric schematic drawing takes up 10%, the equipment assembly, programming, and debugging account for 70% [3].

This kind of evaluation method is based on the students' practical ability as the main assessment content, the theoretical knowledge is the auxiliary assessment content. Students who can pass the project assessment have strong practical skills and better theoretical knowledge.

We can master the course assessment method according to the students' learning situation. In accordance with the principle of outstanding practical ability as purpose of assessment, the student to study the effect of open-book examination evaluate the adoption comparative economics, among them, an open-book section is according to project evaluation, comprehensive experiment in the last examination, adopt the method of the random question investigation practice. Mainly assess the completion status of student projects, including whether the operation process is standardized, whether the program is correct, and whether the drawings and technical documentation are accurate and complete. Assessment of basic theoretical knowledge by way of

comparative economics, students to master basic theoretical knowledge, try using fills up the topic, the choice and judgment to change wrong topic form, mainly aimed at the specific practice project often appear mistake, and must master the basic knowledge as the content of the assessment points. The sum of the two is the final exam result of the course, accounting for 60% of the total score. In addition, teachers can also assess students' creative ability, classroom performance and attendance during the project, and give a certain percentage of their scores. That was 40% of the grade. Did well in the project practice of the students' innovation team can choose to attend college, can a team for field skills competition and city and even the national skills competition, thus further improving the students' interest in learning to inspire learning enthusiasm. The contents of PLC course assessment are shown in Figure 3.

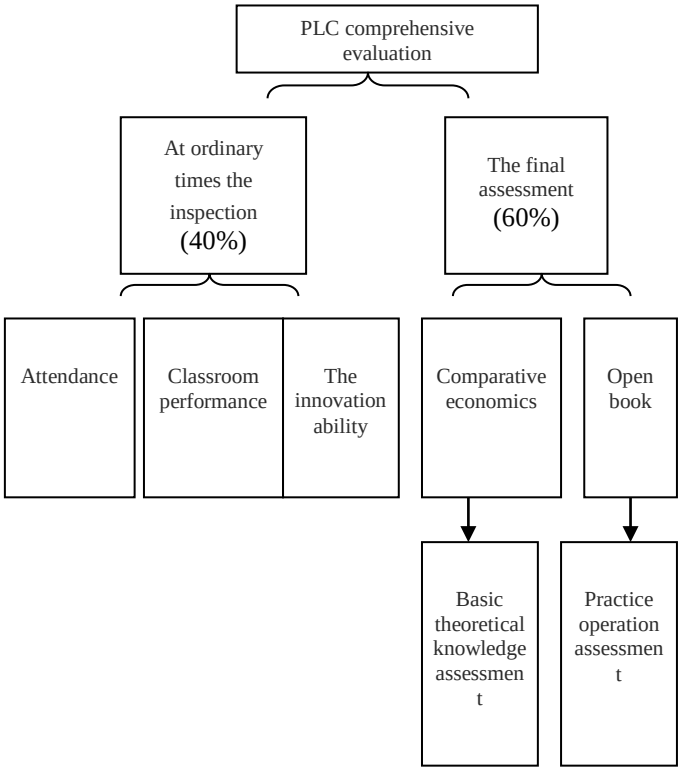

Fig. 3. The content of PLC course assessment

V. CONCLUSION

The curriculum reform of PLC control system designed with education professional certification model is under way, which is taken a concrete implementation method and process of the actual project of PLC control system as the background, the engineering technology as the main line, to break the traditional thousand times of experiment content and experiment method, based on student interest and ability, we develop basic project objectives, project goals and develop project innovation goals, requests the student to the brain in the process of experiment design, operate, which has a certain development, gradually achieve by cultivating students' practical ability, logical thinking, innovative spirit and innovative ability to complete the campus docking with the enterprise production of the best. This reform will greatly stimulate students' enthusiasm for learning, so as to develop the PLC engineering application talents that meet the standard of electrical system control industry through PLC curriculum reform.

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