

# The Application and Practice of Informationization Virtual Teaching Factory in Professional Course Teaching

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## Abstract

With the rapid development of the electronic information age, modern teaching methods mainly based on multi computer assisted teaching and virtual simulation technology have emerged, and are being applied in education and teaching in full swing. The teaching of "Programmable Controller Application Technology" is no exception. The virtual teaching factory environment constructed by computer configuration technology has increasingly become an important development tool for the electromechanical integration industry, and network platform resource library teaching has also become one of the most widely used forms of computer-aided teaching. Based on the analysis of the characteristics of PLC courses and the current situation of PLC teaching in the college, a plan is proposed to construct a fully virtual PLC experimental control system based on easy to control configuration software. Through teaching practice, it has greatly changed the limitations of traditional PLC experimental control systems and can be widely applied in experimental teaching processes.

## Keywords

Programmablecontroller application technology, Modern educational technology, Configuration technology, Virtual Teaching Factory.

## 1. Introduction

Programmable Logic Controller Application Technology (PLC) is an important compulsory core course in the field of mechatronics and electronics, and it is also an organic combination that can integrate new science and technology practice. With the rapid development of the electronic information age, modern teaching methods mainly based on multimedia computer-aided teaching and virtual simulation technology have emerged, and are being applied in education and teaching in full swing, including the teaching of PLC courses. The application of these teaching forms is a challenge to traditional teaching, a reform of traditional teaching, and a continuation and development of traditional teaching.

## 2. The current status of PLC teaching

The PLC course focuses on cultivating students' practical operational abilities, mainly through modular teaching activities, combining the needs of actual industrial production with relevant knowledge modules. According to the requirements of work tasks, on top of the project-based course content, the goal is to enhance students' skill training and promote the improvement of their professional abilities. The implementation process of project-based teaching method is shown in Figure 1.

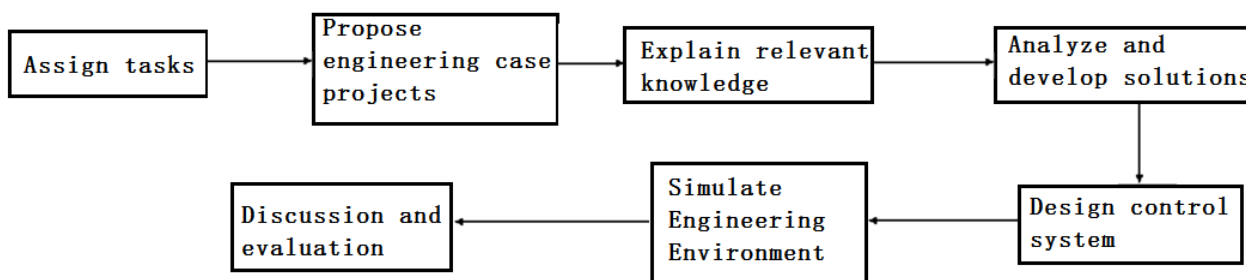


Figure 1: Implementation process of project-based teaching method

Despite adopting a modular teaching organization model, experimental teaching still lacks intuition. Students cannot observe intermediate variables, experience the changing process of the experiment, and only have a perceptual understanding of the experimental results, passively accepting them, resulting in weak student participation.

### 3. The idea of constructing a fully virtual teaching factory environment based on easy to control configuration software

The Application of Virtual Simulation Technology in Teaching In recent years, with the development of computer technology, computer configuration technology has become an important development tool in the electromechanical integration industry. The concept of configuration first appeared in industrial computer control [2], such as DCS (Distributed Control System) configuration and PLC (Programmable Controller) ladder diagram configuration; The human-machine interface generation software is called industrial control configuration software. There are also concepts of configuration in other industries, such as AutoCAD, PhotoShop, etc. The difference is that the configuration results formed in industrial control are used for real-time monitoring. On the surface, the running program of a configuration tool is to execute its own specific tasks. Industrial control configuration software also provides programming tools, usually with built-in compilation systems and a BASIC like language. Some support VB, and now some configuration software even supports C# high-level language. When teaching, if there are no relevant automation hardware facilities, configuration software can be used for simulation, and actual control operations can also be simulated. Compared with other simulation software, it has the advantages of intuitive interface and convenient operation. The use of configuration technology as an auxiliary teaching method for the course of programmable controller application technology not only solves the limitations of venue, equipment, funding, and other factors, but also avoids damage to instruments caused by misoperation. Moreover, for some phenomena that are difficult to observe in experiments, they can also be simulated. In addition, through simulation, it can deepen students' understanding of the course content, help them master the use and measurement methods of automation, enhance learning interest, and cultivate the ability to analyze and solve problems. Taking the industrial automation production line as an example, this is a practical experimental equipment designed and produced to improve students' hands-on ability and practical skills. This device consists of multiple independent and closely connected workstations. These stations are: loading detection and handling station, processing transmission and assembly station, assembly and handling classification station, etc. Realize networked control through IO networks, RS485 networks, or CC-LINK networks, and learn control, programming, assembly, and debugging techniques for complex systems. This system includes various technologies involved in the study of mechatronics integration, such as pneumatic, PLC (programmable logic controller), sensors, AC/DC motors, stepper motors, frequency converters, servo control, touch screen, RS485, CC-LINK, and other technologies (some optional). It is an ideal equipment for cultivating mechatronics integration talents. However, due to its high price, most hospitals only

have one set or do not have such hardware equipment, It can be produced using configuration simulation software for teaching purposes, as shown in Figure 2.

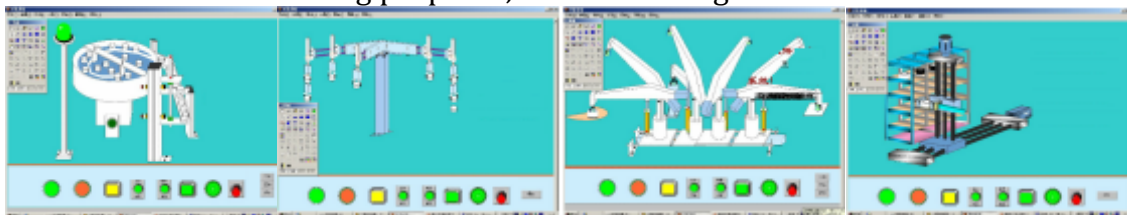


Figure 2: Simulation Screen

The programs and data obtained from simulation operations visualize abstract theories, greatly enhancing students' understanding of theoretical knowledge and understanding of mechanical structures, and enhancing their interest and enthusiasm for learning.

#### 4. Applying Virtual Teaching Factory to Construct a Network Platform for Teaching

After the application of the subject virtual teaching factory website in teaching, we will consider how to rely on the campus network to broaden the depth and breadth of teaching and promote teaching reform. Based on this consideration, the following work has been done: firstly, a website for the discipline of mechatronics has been established; Secondly, in terms of "teaching", reform teaching methods and models; Thirdly, in terms of "learning", guide students to adapt to the teaching mode in the online environment and learn to use the virtual teaching factory network as a teaching platform for learning. The virtual teaching factory network teaching resource platform constructed.

#### 5. Conclusion

The fully virtual simulation factory environment system based on easy to control configuration software is not limited by experimental equipment and instruments, and can intuitively display the operation status of various parts. It is an exploration, reform, and progress in PLC experimental teaching. At the same time, simulation and debugging of industrial environments can also be applied for reference. The application of modern educational technology has effectively promoted and promoted the reform of the curriculum system of programmable control technology, enabling the updating of the content of programmable control technology courses. We will continue to work hard to achieve the goal of reforming and optimizing the entire programmable control technology curriculum system, and cultivate more qualified talents who meet the requirements of military positions.

#### References

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