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Research and Practice of Online Course Resource Construction Based on PLC Technology Application Training

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Abstract: As an application-oriented undergraduate college, the orientation of talent training focuses on the training of knowledge application and comprehensive ability, and requires high class hours and objectives of practical training courses. The epidemic situation has put forward new requirements for the teaching of practical training courses, which is both a challenge and an opportunity. How to quickly adjust the teaching plan in such an emergency, not only to ensure the smooth completion of students' learning tasks, but also to maximize the mastery of the knowledge learned. Under the background of the normalization of epidemic prevention and control, school education during the delayed opening period shifted from face-to-face teaching to large-scale online teaching, which is an unprecedented large-scale online education practice. The way of knowledge acquisition and teaching, and the relationship between teaching and learning have changed significantly, which is a great review of educational philosophy. Carry out the construction and application of online course teaching resources for the professional core course PLC technology application training, and build an online course teaching resource library integrating morality and technology, college, competition and innovation.

1. Research significance

PLC technology application training is a required professional core course for the automation major of the School of Information and Control, 60 class hours, set in the fifth semester. It is a course that integrates theory and practice after students learn the programmable control technology and application course, and have the ability to maintain electrical control lines and the basic programming ability of programmable controllers[1]. Its function and function is to connect with the training goal of professional talents. It is oriented to the posts of electrical engineers and installation and maintenance technicians, and focuses on serving enterprises, especially small and medium-sized enterprises, in technology research and development and product upgrading; It is a professional course to cultivate engineering knowledge ability and self-study ability, and lay a

foundation for the subsequent training of motion control system integration, electrical control system installation and commissioning, and intelligent control technology production practice[2].

2. Status Analysis

In the context of epidemic prevention and control, the Ministry of Education issued the Guiding Opinions on Doing a Good Job in the Organization and Management of Online Teaching in Ordinary Colleges and Universities during the epidemic prevention and control period, proposing that "teaching and learning should be suspended without stopping", and unprecedented online teaching activities were carried out throughout the country. As an application-oriented undergraduate college, the orientation of talent training focuses on the training of knowledge application and comprehensive ability, and requires high class hours and objectives of practical training courses. How to effectively carry out the practical training course of PLC technology application under the current special situation has become a problem for teachers in our school to implement and solve[3].

3. Current Problems and Reform Measures

3.1 Current Situation and Problems of the Curriculum before the Reform

Traditional PLC technology application training is carried out offline, which requires students to operate PLC equipment on the operating platform of the training laboratory. Due to the special situation of the epidemic, students cannot go back to school, and the practical teaching of PLC technology application cannot be conducted offline in the traditional way. However, the online implementation of practical training courses can not meet the requirements of experimental equipment, venues, etc. With regard to how to ensure the teaching effect of students' online PLC technology application training, the teachers of the course team redesigned the traditional PLC training program, so that its new PLC technology application training program can fully adapt to the characteristics of "online" teaching and avoid the shortcomings of traditional online teaching. Virtual training can solve the problem that students cannot enter the laboratory to some extent[4]. However, how to make virtual training more effective under the current special situation requires close cooperation among schools, teachers and students, and more importantly, teachers need to think and design ahead of time in curriculum construction, and adopt more scientific and effective teaching plans and methods.

3.2 Reform Measures of Teaching Methods for the Above Problems

3.2.1 Building online Course Teaching Resources

In order to enable students to experience a more real training process, a more reasonable curriculum structure, a more complete teaching link and a more innovative teaching model, this course chooses the Superstar Fanya online teaching platform. Chaoxing Fanya Platform is a new generation of online teaching platform developed by Chaoxing Company. Its clients include mobile App Learning Link, Chaoxing Fanya Platform web terminal, and Chaoxing Live Broadcast terminal. It is an online learning platform that integrates the functions of course resource construction, teaching interaction, homework after class, testing, check-in, and teaching management, meeting the needs of online training and teaching[5].

3.2.2 Update the Course Offering form and Strategy

The course uses S7-PLCSIM and other simulation software as the basic tools for the course development, and the teaching method generally adopts the "online+live" hybrid teaching strategy. The online platform adopts Superstar Learning Link, and the live broadcast platform adopts Tencent Conference. Among them, courseware, training manual, training report, training explanation video and other key knowledge points are shared on the Superstar platform, and students can complete them by themselves under the guidance of teachers according to the course progress. In the training process, the auxiliary explanation, discussion and inspection of the experiment are conducted in the form of Tencent conference, and the online practical teaching mode is implemented, which focuses on independent practice, supplemented by discussion and comments in the classroom.

4. Content of Specific Reform Plan

During the delayed opening period, the school education changed from face-to-face teaching to large-scale online teaching, which is an unprecedented large-scale online education practice. The way of knowledge acquisition and teaching, and the relationship between teaching and learning have changed significantly, which is a great review of education concepts. This course aims at talent cultivation, develops the construction and application of online course teaching resources for the core professional course PLC technology application training, actively promotes the development of online teaching resources such as Moke and micro courses, improves students' ability to learn independently, and builds an online course teaching resource library that combines morality and technology, majors, competitions and innovation. The specific reform contents are as follows.

4.1 Improve online Teaching Resources and Platform Construction

4.1.1 Establish an online Resource Development Team for Training Courses

First of all, when developing hybrid courses, a professional team of information teachers should be established. The team should not only have the ability to teach professional theories and develop online and offline hybrid courses by using information technology, but also have relevant practical experience in enterprises. Among them, dual qualified teachers should give priority to participate in the preparation of development courses, or require front-line personnel from school enterprise cooperation units to participate, especially for the practical training courses, The team should discuss and analyze the typical tasks with commonness or individuality of the post as part of the training course. Secondly, the team should also follow the pace of information development, learn the method of course production, and use more advanced and close to the current students' favorite information means to develop courses.

4.1.2 Improve the Development Process of Teaching Resources

The online resource development should have a reasonable and perfect set of processes to ensure the standardization, rationality and practicality of the online and offline hybrid courses created. The concept of demonstration teaching package proposed by Superstar teaching platform can be used for reference here. By producing a perfect research, development and experimental teaching, and a quality course with remarkable effect as a teaching demonstration package, the elements required for a quality online and offline mixed course or practical training course can be defined, laying a solid foundation for the comprehensive informatization of subsequent teaching. At the same time, we also need to improve the course audit mechanism and strictly require the course to be produced according to the "Golden Course" standard, which not only guarantees the substantial equivalence

of online learning and offline classroom teaching, but also standardizes the teaching development process, so as to achieve the goal of "prefer shortage to abuse".

4.1.3 Recording online Course Resources

There are many online resources and resource platforms for PLC technology application training courses, such as Bilibili, My Own Learning Network, China University MOOC, etc. The video resources on the platform are rich, but these resources cannot be copied: the course content does not match the teaching objectives; The resource name does not exactly match the course name. For these reasons, it is necessary to screen and reorganize the resources that meet the teaching objectives and content and make effective use of them. Organize course team members to re record online course resources. The construction of video resources can draw on the video resources of existing platforms and use some excellent videos that meet the teaching objectives. The video resources covering all knowledge points of the course are established by combining the video of self recorded knowledge points explaining micro lessons and the video of actual case demonstration.

4.2 Introduction of Internet and Information Platform Resources of "Superstar Teaching Platform+Tencent Conference"

By using the teaching method of Superstar Learning Link+Tencent Conference, when demonstrating the external wiring, hardware parameter setting, electrical fault detection and other operating steps of PLC, the online live broadcast operation demonstration teacher can open Learning Link APP or headworn live broadcast equipment for online live broadcast, so that all students, including remote home learning, can clearly see and hear the teacher's demonstration operation and technical points. Students can also watch the teacher's demonstration repeatedly by learning the playback function of live broadcast to see every detail clearly, so as to improve the effectiveness of the teacher's demonstration.

4.3 Online Practical Teaching with Simulation Software

The virtual simulation teaching method is introduced into the online training course, and the implementation plan of training reform is formulated. S7-PLCSIM simulation software is used to verify the program. S7 — PLCSIM is a programmable controller simulation software developed by Siemens. It can realize hardware free simulation under the integrated state of step 7, and can also be integrated with WinCC flexible in the environment of step 7 to realize monitoring simulation of upper computer. In PLCSIM software, the action of actual hardware components can be simulated by changing the corresponding contact state, so as to verify whether the programming is correct, which is very convenient for the superior debugging.

4.4 Design online Teaching Scheme

On the basis of summarizing the existing online teaching mode, determining the online teaching course schedule and content orientation, the project adapted to online PLC technology application training teaching has been re developed. When designing the online teaching scheme of PLC technology application, according to the purpose of achieving the traditional offline PLC technology application teaching effect, after full demonstration and according to the existing conditions, actively develop new PLC technology application training projects that can be applied to online training, and fully consider the characteristics of students' remote online training during

the development of new PLC technology application training projects. Finally, after several meetings and discussions, the requirements for the development of online PLC technology application training project were determined; That is, the principle of allowing students to participate in, design, program, debug and simulate in person. Let each student be able to harvest their own practical achievements.

5. Conclusion

The curriculum reform and exploration of PLC technology application training has consolidated and strengthened students' theoretical knowledge at multiple levels through network resource research (early stage of the course), online video course recording (middle stage of the course), and online offline integration of teaching methods (after the course).

The expected results of the project are as follows:

(1) Complete the construction of online curriculum resources that match the curriculum and teaching objectives.

(2) It is expected to publish 1 paper on teaching reform;

(3) 1 project closing report.

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