

Construction and Practice of New Technology Course "Digital Design and Simulation of Production Line"

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Abstract: Digital Production Line Design and Simulation is a practical and comprehensive major course for electromechanical and automation majors in higher vocational colleges. This course is based on digital technology to construct automatic production lines, and uses virtual simulation and virtual reality combination technology for teaching, creating a new digital teaching ecology. In this paper, the teaching innovation means and methods are proposed, and specific exploration and practice are carried out for this course, which has achieved good teaching results.

Keywords: Production line technology; Digitization; Design and simulation; Curriculum construction.

1. Introduction

The manufacturing industry is the main body of the national economy, the foundation of building a country, the instrument of rejuvenating the country, and the foundation of strengthening the country. With the proposal of Made in China 2025, China has developed rapidly in all aspects of intelligent manufacturing, especially in Zhejiang Province, where the "machine replacement" plan has been implemented to promote the rapid transformation and upgrading of traditional manufacturing and equipment iteration. At the same time, with the development of digital and intelligent technology, advanced automatic production lines are promoted and applied in enterprises, which also promotes the rapid upgrading of intelligent chemical plants. As the main force of cultivating talents of intelligent manufacturing and digital new technology, how to cultivate talents that meet the application needs of new technologies in enterprises is a very urgent issue. The course of Digital Design and Simulation of Production Line is supported by automatic production lines. Students need to learn this course to master the basic concepts, basic methods and basic skills of automatic production line technology. At the same time, the course integrates digital virtual simulation technology to carry out digital design and simulation of production lines. At the same time, it introduces real projects of school enterprise cooperation, integrates new technologies, new processes and new specifications, and improves students' technical level. According to the advantages of students' strong hands-on ability in higher vocational colleges, the content of this course focuses on practice and application, pays attention to the close combination of theory and application technology, and cultivates digital high-tech talents for enterprises through school enterprise collaboration. [1-4]

2. Analysis of the current teaching situation of automatic production line technology course

At present, there are several problems in the teaching of automatic production line technology courses:

(1) The teaching content is comprehensive, and each project is not modularized or project-based. The basic

composition, mechanical structure, electrical control and other related contents of the automatic production line are mainly introduced in the course teaching. The learning content is broad and comprehensive, without a main line running through, and each module is independent of each other.

(2) Re teaching, lack of practical operation. The course requires high practical ability of students, but the course equipment is expensive, the number of sets is small, the course focuses on teaching, the practice link is relatively weak, the practice lacks practical ability, and the course effect is not obvious.

(3) The training content is outdated and lacks new technology. The teaching content is often the existing content in the teaching materials, lacking the introduction of new technologies, new specifications and new processes of enterprises, and the outdated training content has been disconnected from the reality, resulting in a lack of interest in students and a lack of enthusiasm for students.

(4) The training evaluation method is single, and the diversity is not strong. The existing assessment subject is unitary, and the assessment subject is mainly teacher assessment, without the introduction of student and enterprise tutor assessment, which leads to the lack of comprehensive and systematic assessment. At the same time, the assessment policy summarized the outcome evaluation, and did not effectively use the process evaluation, resulting in the evaluation is not perfect.

(5) Digital and intelligent technologies are not fully integrated into the classroom. Because the traditional theoretical course system of automatic production technology can no longer meet the needs of the training objectives of higher vocational courses, and the course construction based on digital technology and the combination of virtual and real digital twins is a mainstream direction of higher vocational curriculum reform, it has become an inevitable choice to introduce real projects into the real project practice teaching combined with the classroom through school enterprise cooperation.

3. Introducing digital innovation into new technology courses

The teaching mode of the new technology course "Digital Design and Simulation of Production Line" based on digital project practice introduces digital technology, innovatively creates a learning environment and atmosphere for the actual work of automatic production line, takes "project oriented, task driven" as the guidance, determines the learning tasks and objectives of automatic production line through the joint efforts of teachers and students, and guides students to learn unity in the learning process of new technology of digital production line. In order to cultivate learning interest, master the knowledge and skills of automatic production line courses, and improve the ability of digital application, the typical characteristics of its improvement in the innovative effect of course teaching are mainly reflected in:

(1) Students' active participation in learning. Digital innovation is a real project. Digital technology changes the way students used to learn in the passive physics learning space and environment of the automated production line course, creates conditions for students to actively explore and practice in the digital environment, and requires students to actively participate in the automatic production line technology teaching process from beginning to end, give full play to their own strengths, and constantly improve their professional action ability.

(2) The interaction and cooperation of learning actions. Digital innovation cooperation mode, digital teaching is mostly carried out in the form of groups, and the spirit of team cooperation is a necessary condition for the successful completion of the task of the automation production line project. In the cooperative action, students can also experience the happiness of common growth of individuals and groups through joint participation, joint discussion, and mutual learning.

(3) The integrity of the teaching process. The whole process of digital innovation teaching. Digital teaching emphasizes that the automatic production line course takes digitalization as the means, and the integrity of the teaching process and the real work process is unified. Students need to use digital technology to practice, use their brains and move their hearts in the learning process. Therefore, the formulation of teaching objectives must consider the knowledge, ability and emotion, and can promote the all-round development of students.

(4) The pluralism of teaching evaluation. Digital innovative teaching evaluation methods, digital teaching in the evaluation methods, evaluation subjects are diversified. In addition to using summative evaluation to evaluate students' mastery of knowledge and skills in automatic production line, enterprise tutors are also introduced to evaluate students' behavior through process evaluation through digital technology to promote students' summary and reflection on learning process and learning results, so as to improve their own learning and help teachers better optimize teaching process and improve teaching effect.

4. New Technology Curriculum Construction and Practice

4.1. Reconstruction of new technology curriculum content based on digital real project practice

According to the training objectives of automatic production line technology R&D posts, research and analyze the current skills requirements of the latest automatic production technology R&D posts, and formulate curriculum training objectives. According to the new skill requirements of R&D posts, the course content of Digital Design and Simulation of Production Line is constructed, the knowledge composition of the course is studied, the corresponding knowledge modules are designed, and the digital technology is used for project design. Based on the requirements of digital real projects, new technologies, new processes and new normative cases are integrated into the curriculum project teaching, so that the teaching process can carry out the curriculum reform and development of automated production lines around digital technology.

4.2. School enterprise cooperation to build a digital collaborative education and teaching space

The basic feature of the creation of digital collaborative education teaching space is to integrate the characteristics of school teaching and enterprise production technology. By means of small digital twins, its physical space is mainly a real enterprise project, and its virtual space is a corresponding digital real project. Its feature is to focus on the cultivation of students' automatic line digital ability, and integrate the school and enterprise production environment into the collaborative education teaching environment. In the teaching process, the combination of the virtual and the real can realize the group team's "centralized learning, job division, and centralized summary", and provide a real and reliable environment for students to communicate with each other and answer questions.

The teachers for the training of production line technical talents based on school enterprise cooperation and digital collaboration are composed of professional teachers, R&D platform teachers and enterprise backbones. Each tutor shall be responsible for at least one enterprise digital project, and be responsible for the enterprise practical course teaching and student management.

4.3. Explore the teaching mode of "project oriented and task driven" based on digital technology

Based on digital technology, carry out school enterprise cooperation digital project teaching, establish the ability based automatic production line technology curriculum system, and develop a task driven classroom teaching program with digital projects as the carrier. Project oriented teaching method has many forms, such as case teaching method, project teaching method, brainstorming method, task driven method, etc. As the course of automatic production line mainly focuses on digital project practice, it can better use project method, example method, task driven method and other methods to intersperse in classroom teaching, develop classroom teaching models at all stages, and improve the teaching effect of the course.

In the "project oriented and task driven" mode, digital instructional design is based on the integration of the project-oriented concept into the digital instructional design process, which includes five parts: the determination of teaching objectives, the analysis of learner characteristics, the analysis of teaching content, the design of teaching strategies and the design of teaching evaluation. In the automatic production line technology teaching, digital twin technology is used based on the work process orientation, Conduct case studies.

In the "project oriented, task driven" mode, explore the introduction of enterprise practice digital work situation. In the design of new technology curriculum content, the tutor is involved in the design of digital curriculum content. In the course of teaching, research and explore the way to implement digital teaching in real situations. Study how to carry out digital application teaching in combination with real projects of enterprises, and study the application practice of new automatic production technology with students as the main body under the practical environment of smart factories.

4.4. Combine "virtual simulation technology" to improve the diversity of teaching means

Using virtual simulation of automatic production line as teaching means, integrating digital technology, and using VUP software to design virtual simulation model of automatic production line, as shown in Figure 1, build a virtual simulation model library of typical automatic production line, make simulation videos, and combine virtual simulation technology, theoretical knowledge of automatic production line, and real practice of automatic production line to improve teaching effect. The project is divided into two parts: "Digital Production Line" and "VUP Simulation Platform". Through SolidWorks software design modeling, create the required geometric model and import it into the virtual simulation workstation; Carry out the layout design, I/O configuration, path setting, programming, workstation logic setting, simulation debugging of the production line workstation, and finally complete the overall simulation operation of the workstation.

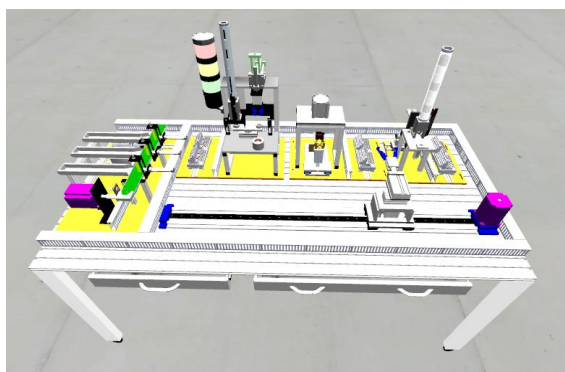


Fig. 1 Virtual Simulation Model of Automatic Production Line Based on VUP

4.5. Teaching evaluation of new technology courses

Through multiple progressive teaching evaluation, process

evaluation and summative evaluation are combined to establish multiple assessment subjects for teachers, tutors and students. Schools, enterprises, industries and other stakeholders participate in the evaluation, forming a curriculum assessment incentive model that combines process and summative evaluation to mobilize students' enthusiasm for participation, thereby improving the quality of learning and continuous improvement.

5. Conclusion

Through the research of this paper, a set of teaching mode of the new technology course "Digital Design and Simulation of Production Line" based on digital real project practice is constructed, and the core role of the new technology course "Digital Design and Simulation of Production Line" as a professional backbone course in the training of electromechanical integration and automation technology professionals is improved, so as to improve the teaching effect of the course. Digital technology is adopted, and the combination of virtual and real is achieved through project orientation Task driven to enhance the knowledge literacy and practical skills of automatic production line technicians, and the practical teaching effect is good.

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