

Research and Exploration of Automation Specialty Courses under the Background of Higher Vocational Internationalization

Te Lin, Yu Xie, Zhongyuan Zhang

Wenzhou Polytechnic, Wenzhou 325000, Zhejiang, China.

Abstract

"Double High-level Project" shows clearly requirements for the internationalized development of higher vocational colleges. Higher vocational colleges must undergo the process of "going global" and teaching overseas students. Taking the "Pneumatic and PLC Automation Comprehensive Practical Training" course as an example, the practice process and research analysis on the teaching contents, teaching plans, teacher training, and ideological and political aspects of the courses for overseas students are discussed. Explore how to carry out internationalized development, develop internationalized courses, and build the Chinese vocational education brand internationally.

Keywords

"Double High-level Project"; internationalized education; project-based teaching; practice exploration.

1. Introduction

A new round of industrial revolution has driven the change of new technologies and new industries, promotes industrial upgrading and economic structure transition of our country, the demand for technical talents in all walks of life is becoming more and more urgent, and the role and status of vocational education have gradually become prominent [1]. Against this background, the regional economic transition and industrial structure upgrading which are driven by innovation force the reform of vocational education, which requires the construction of modern vocational education system and technical talent training plan [2]. The Ministry of Education and the Ministry of Finance issued "Opinions on the Implementation of High-level Higher Vocational Colleges and Specialty Construction Plan with Chinese Characteristics" (short for "Double High-level Project"), as a kind of institutional guidance document, it endows vocational education with new connotations, point out the deepening reform direction and development direction of higher vocational colleges in the future In order to achieve high-level and high-quality development of higher vocational education. "Double High-level Project" aims to build a group of higher vocational colleges and professional groups that lead reform, support development, have Chinese characteristics, and have world-class level, drive continuous deepening reform of vocational education, strengthen connotation construction, and achieve high-quality development [3]. Among them "Double High-level Project" clearly set that higher vocational education should improve the internationalized level, the task requirements are to strengthen exchanges and cooperation with countries with developed vocational education, develop internationally agreed specialized standard standards and curriculum, introduce a batch of high-quality specialized standard, curriculum standards and teaching resources with international influence, and build the international brands of Chinese vocational education[4]. Since then, the internationalization of higher vocational education has kicked into high gear, it is of great significance to study and promote the internationalized process of higher vocational education, improve the internationalized school running level of higher vocational schools, improve the quality of talent training, and explore international exchanges and cooperation.

2. Current Situation of Internationalized Educational Practice

The internationalization of higher vocational education will inevitably undergo "inviting in" and "going abroad" two-way development process, especially under the high standards and requirements of "Double High-level Project", higher vocational colleges should not only be based on the local area, absorb and learn from foreign high-quality and successful educational resources and methods, but also spread vocational education with Chinese characteristics to the world, and produce a certain international influence [5]. However, there are still many deficits in both "inviting in" and "going abroad". In 2006, Wenzhou Polytechnic started China-Canada cooperative education project and recruited local students, after completing the courses of this school, they can continue to study in Canada. In 2010, our school started teachers' overseas study visit project, so far, dozens of our school's teachers have visited or trained abroad, investigate and learn the current situation of vocational education of developed countries and exchange experience, draw advanced international educational experience and resources, and also improves the academic status and influence of teachers at home and abroad. In 2017, our school was successfully selected in the Ministry of Education's "United Training of Tens of Million Exchange Programs of High-end Skilled and Applied Talents", carried out internationalized development professional ability building training seminars, higher vocational colleges ability building overseas training groups, and talent united training international seminars and other international exchange activities. In "inviting in" aspect, there are the characteristics of early start, many results, and rich experience, with the continuous advancement of international exchanges, higher vocational education is constantly introducing high-quality international educational resources and teaching modes, and establish the Sino-foreign united college in the school, and is developing towards the vocational education in line with international standards.

On the other hand, the internationalization of higher vocational education must also include "going abroad," it may take some time for vocational education with Chinese characteristics to go to the world and gain a certain position in the highly competitive international market. In 2018, Wenzhou Polytechnic recruited the first batch of South African students. In 2019, our school recruited Cambodian students, and established the Overseas Silk Road Academy in Cambodia and opened classes, as can be seen that in vocational education "going abroad", it started late, has little experience, and is only in its infancy. This paper takes the "Pneumatic and PLC Automation Comprehensive Practice Training" course as an example, studies how to design courses for international students in China, combines with the school's own teaching characteristics and development positioning, and introduces the initial experience of this course in internationalization.

3. Implementation of Internationalized Courses

(1) Teaching contents

The 2018 South African international students enrolled by our school are the second batch of foreign students recruited by Wenzhou Polytechnic, this project is in cooperation with the South African Chinese Cultural and International Education Exchange Center and the Food and Beverage Agency of the South African Ministry of Higher Education, aims to cultivate professional talents of automated food machinery for South Africa. On the basis of requirements of South Africa, our school trains these students into technical application-oriented talents in the food packaging industry based on its own characteristics and geographical advantages, and provide students with talent training program in the direction of mechanical manufacturing major and automated packaging equipment, not only meet the demand for technical talents in South Africa, but also make students to have clear employment direction in the future and have

strong employment competitiveness in the same field, it can also reflect the professional characteristics of our school's education.

Among them, "Pneumatic and PLC Automation Comprehensive Practice Training" belongs to professional core courses, it is set up to cultivate students' analysis and design abilities for PLC control circuits and pneumatic transmission control circuits, by studying this course, students have skills of preliminary judgment and breakdown maintenance for electrical control circuits, pneumatic circuits and PLC control programs of mechanical equipment, have the ability to design simple automation equipment, and lay the foundation for future actual work and maintenance equipment. In view of the training goals of skilled and technical talents, the teaching contents of this course are mainly the principle of situationality, supplemented by the principle of science, namely the actual action contents as the main teaching, and the theoretical knowledge contents as auxiliary teaching, and reflect the process teaching characteristics of vocational education courses. Therefore, the development of this course is carried out around the relevant professional work process, the most important feature is to learn through overall and continuous action process, and the vocational situation closely related to the major serves as the decisive reference of the course contents.

Throughout the course design and implementation process, we adhere to "combine classroom and practice training, combine practice training and production, combine teaching and technical services, three in one" idea, start from the mastery of knowledge points, the improvement of professional skills, the application of professional technology, the cultivation of innovative awareness and ability, build multi-level teaching system of "Pneumatic and PLC Automation Comprehensive Practice Training" composed of case explanation, virtual simulation, and hands-on training. This kind of curriculum design not only helps student master theoretical knowledge, but also stimulates students' interest in active learning, finding and solving problems. On the other hand, the "Pneumatics and PLC Automation Comprehensive Practice Training" is not only a professional compulsory course, but also a technical course that can be directly applied to practical engineering, therefore, in classroom teaching, it focuses on the explanation of the principle, reduce unnecessary mathematic derivation and calculations, focus on understanding and application, strengthen application cases and application expansion, so that students have the ability to apply knowledge and creative creativity.

Under this idea, the course is mainly project teaching methods, combines learning contents with practical operations, under the guidance of teachers, students can complete the construction of knowledge and skills during the implementation of project tasks. In the process of project practice, students discover and solve problems through the teacher's guidance and their own hands-on experience, and complete the whole process of absorbing, transforming and applying relevant knowledge. In addition, problems and improvements can also be found in the teaching process through phenomena observation and students' operation feedback, the aim is to establish a project-based teaching course that adapts to internationalized standards, it can provide a set of feasible and effective teaching programs for foreign students in the application direction of automatic packaging equipment in mechanical manufacturing specialty, and also provides references for the development of more internationalized courses in the future.

(2) Implementation of teaching projects

Focusing on the project teaching method and the teaching idea based on actual operation, the teaching methods that combine multimedia display, on-site equipment operation demonstration, and students' actual operation are used, achieve students in do combination of learning and hands-on connection in "teaching while learning, learning while doing", in the practical training process of students, teachers can provide knowledge in time to achieve the teaching effect of learning and doing. In project design and teaching plan, we simultaneously combine practical teaching and theoretical teaching to verify the theoretical knowledge learned

by students, and exercise students' operational skills to achieve an organic combination of theory and practice. In teaching, the "air pressure" and "electric control" two aspects are integrated, traditional teaching methods and modern teaching are integrated, and classroom activities and technological innovation are integrated throughout the whole teaching process.

When designating the teaching plan, it is required to cultivate and train students' job abilities, and organize and implement the working contents step by step in accordance with the project, appropriately introduce the technical requirements of the enterprise into the teaching, and more reflect the characteristics of vocational education. In addition, when selecting projects, try to start from the actual life of the students as much as possible, and choose the life or work situations that the students are more familiar with, so as to create teaching and learning modes that students are willing to learn, learn actively, and explore.

When constructing the course projects, the important and difficult points in the course are solved by specifying task books, explaining task knowledge, group discussion and learning, project implementation, summing up experience and communicating, and achieve the teaching goals of the course. The "Pneumatic and PLC Automation Comprehensive Practice Training" course has totally 60 class hours, according to the students' learning situation and existing habits in their home country, the half-day teaching and half-day group practice teaching mode are arranged, the course will be implemented for 3 weeks, a total of 4 hours arrange tasks assigned by teachers each morning, explain the basic knowledge points, and then the students conduct group discussion and study, implement the project. Throughout the course, a total of 4 practical application projects (Table 1) are designed, and each necessary theoretical and difficult points are explained during the implementation of the project, arrange enough time for students to practice, and ensure that students understand and use.

Table 1. Teaching plans of course project of "Pneumatic and PLC Automation Comprehensive Practice Training"

project number and name	pneumatic key and difficult points	key and difficult points of electric control	timetable
1. automatic feeding equipment	cylinder realizes bidirectional motion	PLC and electromagnetic valve communication	4 theoretical class hours + 4 practice class hours
2. pneumatic counter	gas path logic operation design	use of PLC soft components	4 theoretical class hours + 4 practice class hours
3. assembly gripper	sequential gas circuit design	realization of step sequence control chart	4 theoretical class hours + 4 practice class hours
4. pneumatic manipulator	pneumatic and PLC comprehensive application		8 theoretical class hours + 28 practice class hours

In project arrangement, the teaching progresses are advanced step by step in accordance with the principle from easy to difficult, and the theoretical class hours and practical class hours are conducted in turn, explanations first and practical operations later, lead students to master knowledge theory and practical skills. In addition, in the fourth project, in the pneumatic manipulator, a large task is arranged to realize the comprehensive application of the involved knowledge points to improve the students' comprehensive application ability, in this project; most of the time is spent on practical exploration of students, students can think independently and give full play to their subjective initiative, teachers can appropriately guide students and help students analyze problems and correct errors in the process of project implementation. For example, the sequence of actions will be wrong when students control multiple air cylinders, which causes the equipment to not work in accordance with the expected steps, at this time, the teachers can let the students try boldly, list various possibilities, then continuously adjust the signal gas path and analyze wrong reason in time. This kind of teaching method not only

makes students to complete the project tasks, but also creates a sense of achievement in their hearts, and forms an overall knowledge system and complete problem-solving ideas, which can solve more problems in the future.

(3) Teaching effect

Students will be organized to demonstrate and explain the effects of project after each project was over, and other groups of students were encouraged to ask questions and evaluate them. Finally, the teacher examined the project results of each group, gave summary experience and comments, and assessed the performance of each student. In this course, each foreign student actively participated in the course, fully thought about each project, and completed the project task diligently; the completion rate of each group's course project reached 100%, and two teams can exceed the project requirements to achieve expanded applications. It can be concluded that students can receive teaching knowledge well through the practice of the course, and more importantly, their learning enthusiasm is stimulated, achieve finding and solving problems in fun, students strengthen comprehensive skills, in addition, they can also have a positive attitude and meticulous thinking logic before the problems, use the knowledge and skills learned to analyze problems and find solutions. The practice of this course fully shows that project teaching is adaptable and effective in the internationalized teaching direction.

(4) Teacher training

Under the large environment of the school, our school always pays attention to the internationalized development, and promotes the internationalized school running process based on curriculum construction and school characteristics. In recent years, our school regularly selects outstanding teachers to study abroad to provide more learning and exercise opportunities, and conducts bilingual teaching ability training, creates better development space, and strives to build teacher teams with bilingual teaching ability.

As far as this teaching team is concerned, by the teachers' instruction, help and guidance in teaching team, a teacher with rich teaching experience guides teachers with less experience, which solve the inheritance and development of course teaching, so that teaching design and teaching effect have a better guarantee. On the other hand, this way which combines new and old also solves the problem of teaching professional courses in English. This method of guiding the new with the old, teach together with the new and old, discussing teaching methods and teaching ways, focus on the feasibility and effectiveness of implementation, ensure the quality of internationalized teaching and all-English teaching, and also form an internationalized teacher training and course development framework.

(5) Ideological and political course

The teaching object of this course is South African students majoring in mechanical manufacturing. Before coming to China, these students mostly received education from western developed countries, their advantage is that they are easy to accept new things outside their majors and have an international vision, but they do not have enough understanding of China, such as the "The Belt and Road" policy. Therefore, in the course development, the ideological and political course is carried out in accordance with the characteristics of this course, and China's "Made in China 2025" and "The Belt and Road" strategy are integrated into the classroom explanation, students can realize the responsibility of large countries to create a community of shared future for mankind culturally, students strengthen their sense of identification with Chinese civilization emotionally, promote the endeavoring craftsman spirit, and demonstrate professional responsibility morally.

4. Conclusion

The development of "Pneumatic and PLC Automation Comprehensive Practice Training" this course does not only promote the development of our school's mechanical manufacturing

major, but also provides demonstration for the promotion of internationalized school running. The teaching contents of the course is preliminarily constructed through teaching practice, the teaching way adopts project-based teaching, and the teaching method "teacher guide-student practice" combining theory and practice is used. Moreover, certain explorations have been carried out on the teacher structure and ideological and political course, the next step will be to optimize teaching resources and promote the information and best quality of courses. With the implementation of the "Double High-level Project", the development of higher vocational colleges will definitely enter into the fast lane, serving the "The Belt and Road" and "Intelligent Manufacturing in China" is the responsibility of the machinery manufacturing major of higher vocational colleges, the practice of courses should follow the development requirement of the professional era, and provide professional and internationalized talents for the manufacturing industry.

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