“Electrical Control and PLC” course under the “1333” goal teaching reform and practice of “Four-wheel Drive”

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Abstract: In response to the new requirements of the “1333” goal, which is the target of the new engineering construction, and closely centered around the educational focus of “Information Industry Business School” and the training goal of “high-quality application-oriented talents serving the information industry”, in order to effectively improve the teaching of “Electrical Control and Programmable Logic Controller” and make the course objectives closer to the talent training objectives of electrical engineering and meet the needs of social and industrial development, we have carried out research on teaching reform and practice, deepened the reform of course teaching, analyzed the current situation of the teaching of this course in detail, and put forward the “four-wheel drive” reform plan for the teaching reform of this course. Practice has proved that the teaching reform of this course has achieved significant results, and students’ comprehensive ability has been significantly improved. This reform and practice are of great significance for improving the quality of applied undergraduate talent training, keeping up with social development trends, demonstrating school characteristics and achievements in educating people, and showing school characteristics and achievements in educating people.

Keywords: Electrical Control and Programmable Logic Controller; Four-wheel Drive 1331 Goal

1. Introduction

Universities should not only cultivate research-oriented talents, but also establish an applied philosophy of running schools and train the young generation with skills to adapt to social needs[1].

According to the objectives and requirements of the new engineering construction under the new situation, closely around the school-running position of “information industry business school” and the training goal of “high-quality applied talents serving the information industry”, “electrical control and programmable controller” as the core course of electrical engineering and automation. Electrical control and programmable technology are widely used in the production process of all walks of life.[2]As a big agricultural province, the intelligent level of agricultural machinery and equipment is still relatively backward, and the course content can highlight the advantages in the control process of agricultural palletizing machine, agricultural tractor, pesticide spraying machine, agricultural product processing machine and other equipment, which has positive significance to help the agricultural machinery in our province to advance towards intelligence and promote the regional agricultural economy.[3]

In order to do a good job in the teaching of “electrical control and programmable controller”, make the teaching objectives more close to the training objectives of electrical majors, meet the needs of social industry development, carry out the research of this project, deepen the teaching reform of the course, improve the quality of applied undergraduate talents training, especially serve the needs of local agricultural industry.[4]

2. Analysis of the teaching status of Electrical Control and Programmable Controller

From the perspective of teaching practice and teaching effect, the teaching of “Electrical Control and Programmable Controller” is basically suitable for the orientation and characteristic requirements of our school. But there are also some problems, mainly as follows:

(1) The mode of school-enterprise cooperation is relatively simple, the integration of production and education is mere form, and the sustainability of cooperation is poor.

(2) The knowledge points in the teaching content are relatively isolated, the learning connection between courses before and after is not close, the boundary between majors and courses is too obvious, and there is a “generation gap” with practical engineering problems.[5]

(3) The design of practical links is difficult to be closely combined with the complex problems in the actual engineering, the actual

engineering case base is not rich enough, the integration degree of industry and teaching is poor, and the practice and innovation ability is insufficient.

(4) The curriculum assessment system is unreasonable. The course "Electrical Control and Programmable Controller" is highly practical, but the current assessment results still adopt the ratio of theory and experiment results 7:3, lack of scientific and reasonable evaluation basis, and lack of process assessment such as experiment practice and ideological and political education ability assessment.[6]

3. "Four-wheel drive" teaching reform plan of "Electrical Control and Programmable Controller" course under the target of "1333"

Based on the understanding of relevant documents and policies of the state and our school, combined with the orientation of talent training goals for electrical engineering and automation majors, this project is mainly to deepen reform from multiple perspectives such as teaching objectives, curriculum ideology and politics, teaching syllabus, teaching content, teaching methods, teaching process, teacher team, assessment methods, and innovative practice platform of Electrical Control and Programmable Controller. [7]The four-wheel drive curriculum reform structure of "thought driven + classroom driven + practice driven + scientific research assisted" has been condensed. The details are as follows:

(1) "thought inspired" to form a fusion model of soul education and professional education

Based on the requirements of the construction of new engineering majors, team members are organized to participate in special meetings to carry out discussions on curriculum education ideas, gather the consensus on teaching and educating people, combine the characteristics and advantages of our school and the development needs of new business forms, clarify the direction of education reform and update the concept of education. The main work is as follows:

1) Analyze the training objectives of electrical engineering and automation talents, and define the teaching objectives of "Electrical Control and Programmable Controller" course;

2) Deepen the teaching theme and ideological and political themes, establish a point-line-plane library of ideological and political elements, and deeply implement curriculum ideological and political topics;

3) Revise the course syllabus according to the teaching objectives of the course.

(2) "Classroom promotion" to create specialized integration, multi-level progressive curriculum project

1) "three" (namely reconstruction, comprehensive, diversified) construction of teaching content, continue to create high-quality resources

Based on the training goal of application-oriented talents in our school and oriented to practical ability training, the teaching content of "Electrical Control and Programmable Controller" is refined. In view of the problems such as scattered and outdated teaching material knowledge, difficult to grasp the key points, too much theoretical knowledge and too little practical content, and lack of practical engineering cases, the content is reconstructed in the role of programmable controller users.[8] Draw the knowledge map, divide the knowledge group, integrate the interdisciplinary knowledge, reconstruct the knowledge system; Strengthen the practical teaching content, increase the experimental operation safety training, etc., so that the curriculum theory and practice system complement and integrate comprehensively; Keep up with the frontier of the discipline, decompose the content of actual engineering projects and discipline competitions into knowledge points and embed the teaching content, and diversify the teaching resources to enhance the systematization of the teaching content.

2) Enrich the teaching methods with "diversity", promote the teaching process with "four levels", and comprehensively improve the teaching quality

Based on the analysis of factors such as students' learning level and interest in the course, on the basis of previous teaching reforms, combined with online and offline, before and after class, virtual simulation and practical operation, optimize the combination of problem-driven, project-driven, case-driven and other teaching methods and practice, break through the limitations of time and space, and build a two-way dynamic and diversified teaching method to carry out students' independent learning.[9] A new model of cooperative learning and inquiry learning. On the basis of the construction of teaching content, the project case base is updated, and the class is promoted step by step

from the level of “enlightenment - participation - training - actual combat”, so as to achieve the improvement of high-level, innovation and challenge.

3) Explore the “teacher team responsibility system” and build a cross-school-enterprise teaching community teacher team

Guided by the spirit of craftsman in a great country, we will continue to strengthen the construction of teaching teams and build a cross-school-enterprise teaching community to solve the shortcomings of some young teachers who lack working experience in enterprises. Based on the concept of “three whole education”, explore the implementation of “education responsibility system - whole-hearted education”. Based on the “four-whole education” to solve the long-term lack of responsible subjects for talent training, adapt to the development needs of social industrial enterprises, improve the quality of talent training and education level, and innovate the talent training system and mechanism.

4) Optimize the assessment method “by stages and at multiple levels”

Considering the practical characteristics of “Electrical Control and Programmable Controller” course, it is obviously unreasonable to adopt the traditional closed-book examination method that emphasizes knowledge. Based on the reform of teaching content, optimize assessment indicators, focus on process evaluation and ability evaluation, develop a new assessment plan of “phased and multi-level”, so as to meet the basic ability assessment, improve and affirm the comprehensive innovation ability of some outstanding students, stimulate the learning enthusiasm and innovation ability of students at different levels, and help students change from passive learning to active learning.

(3) “practice-driven” to build an innovative practice platform for the integration of creative teacher guidance and creative production and education

The integration of innovation, production and education is an inevitable choice for cultivating high-level applied talents required by the industry. [10]In order to seamlessly connect the needs of social enterprises with the knowledge and abilities of students, this project tries to take the construction of modern Industrial College as the foundation, build a research orientation that can adapt to a variety of practical learning tasks, and guide enterprises to practice real scenes, platform openness, operation simplification, informatization, networking, and cost intensification. Based on the existing College of Intelligent Special Vehicle Industry and other innovation laboratories in our university, we actively promote the diversified collaborative education of schools and enterprises, promote the deep integration of innovation, production and education, and build an innovative practice platform to improve students’ ability to solve practical engineering problems.

“Research assisted movement” promotes the mutual learning of scientific research and teaching, and creates a strong academic atmosphere

In scientific research practice and academic innovation, students’ independent scientific research ability, independent exploration spirit and innovative spirit are cultivated, and students’ ability to solve practical engineering problems is cultivated in combination with specific scientific research projects. With the “National College Student Competition”, “National Robot Competition” and “Intelligent Manufacturing Challenge” as the focus, we give full play to the advantages of interdisciplinary integration, promote students to break through theoretical methods and stimulate students’ creativity. Project members participate in the complete life cycle of scientific research projects or competition topics as mentors, promoting teaching with scientific research, and feeding scientific research with teaching. The two develop together to improve the level of teaching and research and the quality of talent training.

4. Effect of teaching reform of Electrical Control and Programmable Controller course

After continuous exploration and improvement, the teaching reform of this course has achieved obvious results. Specific performance is as follows:

(1) “four-wheel drive” forms a great educational force. The “four rounds” have different focuses and links, both parallel and spiral upward, starting from the core competence and personality training, to realize the training concept of “advanced concept, combination of learning and application, integration of knowledge and action, and courage to take responsibility”, educate people in practical activities, and break through the shortcomings of innovation spirit, practical ability, engineering consciousness, and insufficient social responsibility. The students form a spirit of changing and confident to the future.

(2) Set up an education responsibility team, carried out the construction of the curriculum system and the reform of the teaching content, and truly implemented the main body of responsibility for the whole cycle of student training. According to the curriculum objectives, core quality and ability requirements, based on professional teachers and other comprehensive teachers, a teacher team has been formed, which is conducive to the organization of the full coverage of "ideological and political courses - curriculum ideological and political education - four comprehensive education".

(3) In the era of "Internet +", based on flipped classroom and blended teaching, it optimizes the combination of multiple teaching modes, builds an innovative practice platform, and creates an integrated academic atmosphere of "teaching - learning - doing - research - innovation", breaks the traditional teacher-student relationship, and advocates the organic combination of students' learning subjectivity and teachers' teaching inspiration;

(4) Break the traditional assessment methods, optimize the assessment indicators by stages and levels, and focus on process evaluation and ability evaluation. After two semesters of testing, the comprehensive ability of students has improved significantly.

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Projects:

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