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The practice on the construction of off-campus practical teaching base in applied undergraduate colleges - taking the practical base of industrial robot as an example

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Abstract: This paper summarizes the construction strategy of the off-campus practice teaching base of intelligent manufacturing major for applied undergraduate students, guided by the job demand. The real technology application scenarios and tasks are integrated into practical teaching, which effectively gives play to the teaching advantages of colleges and universities and the advantages of practical resources of enterprises, and meets the needs of the industry for application-oriented technology talents.

Key words: intelligent manufacturing; practice teaching base; applied undergraduate

1 Introduction

China has put forward the application-oriented undergraduate personnel training model, with the aim of cultivating high-quality application-oriented personnel, and promoting the transformation of science and technology into actual productive forces [1]. In *Made in China 2025*, it is proposed that intelligent manufacturing should be the main direction of the deep integration of information technology and manufacturing technology [2]. Practice teaching base, as the teaching carrier of knowledge transformation into application, plays an important role in the training of applied talents in intelligent manufacturing. However, at present, there is a problem that professional courses are separated from enterprise production. Therefore, this paper takes the training of applied undergraduate talents in the field of industrial robots in intelligent manufacturing as a breakthrough, takes the construction of off-campus practice teaching base as the key point, and explores the training path of technology applied talents.

2 The main problems existing in applied undergraduate practice base

Wu Zhongjiang et al. [3] put forward that the core of application-oriented talents is to apply what they have learned and promote social progress. In relation to the construction of practice bases in the current application-oriented colleges and universities, there are mainly three problems: (1) The practical teaching content is out of line with the needs of social talents, the emphasis is on subject knowledge as the center, it is difficult to connect with the actual production process, and there is a lack of systematic practice projects [4]. (2) The practical teaching resources of colleges and universities are

insufficient [5], and do not meet the training requirements of the new technical post ability. (3) The practice assessment method is single, and can not accurately reflect the technical application ability of students.

3 Construction strategy of application-oriented undergraduate practice teaching base

In view of the vocational ability requirements of intelligent manufacturing related positions for technical applied talents, the construction of intelligent manufacturing off-campus practice teaching base should take into account professional skills and professional quality. Guided by the core competence of intelligent manufacturing positions, centering on the knowledge system and technology application, it cultivates students' engineering practice ability, technological innovation ability, comprehensive problem-solving ability and professional accomplishment ability from three ways: construction of practical teaching platform, reconstruction of practical teaching content and evaluation of practical teaching results.

4 Typical cases of application-oriented undergraduate practice base construction

4.1 Construction of practical teaching platform

Industrial robot is a typical equipment in the field of intelligent manufacturing. Taking the practice base of industrial robot technology as a typical case, practical teaching is divided into three levels: on-campus basic training, off-campus comprehensive training and innovative training [6]. A practical teaching platform that is compatible with the curriculum system and adapted to the needs of application-oriented talent training is built.

The first level: solid basic technology practice. The teaching place is the on-campus practice platform, and the training object is the second-year students majoring in intelligent manufacturing. The practical training relies on the practical training conditions of the school, the development of industrial robot teaching programming, industrial robot disassembly and maintenance and other basic practical projects.

The second level: comprehensive large-scale skill practice. The teaching place is the off-campus practice platform, the enterprise experts are the main body of teaching, and the training object is the third-year students. The development projects include practical teaching projects in line with the production of enterprises [7], non-power teaching programming projects, polish end-effector disassembly projects and other practical training projects.

The third level: technical innovation practice for social needs. Combining the on-campus platform and off-campus platform, the on-campus teachers and enterprise experts form a teacher team, and the training object is fourth-year students. Students are encouraged to participate in the technological innovation work of enterprises [8], such as participating in the development of robot spray glaze feeding system, and polishing and grinding calibration device research.

4.2 Reconstruction of practical teaching content

The development of typical practical projects is based on job requirements and students' practical basis [9]. The practice projects are selected to represent the typical working process of the industry based on real work tasks. The main line of practical project design is assembly debugging, maintenance and repair, and operation programming. The developed practice projects include the disassembly and assembly of grinding end effector, the maintenance of spray glazing robot, and hardware welding as follows:

- Assembly debugging: the project is grinding end effector disassembly for grinding the basic structure and mechanical design principle of the end effector;
- Maintenance repairs: the project is spray glaze robot maintenance for inspection and maintenance, disassembly and repair, assembly and commissioning of robot body parts;
- Operations programming: the project is unpowered instruction programming, for using the teaching device to control the end of the manipulator to reach the established attitude and position, and record the pose data;

- Typical application: the project is hardware welding, for developing welding parameters and process elements, selecting welding materials, welding mode, etc.

In the assessment of skills, the students are comprehensively evaluated according to the 7S management model with reference to the enterprise standard [10].

5 Conclusion

This paper combines the new requirements of training technology application-oriented talents under the background of intelligent manufacturing, and builds the strategy of off-campus practice teaching base construction with both professional skills and professional quality. After more than three years of construction, it has achieved good results in discipline competition, technological innovation, and has accumulated experience in the construction of practical teaching base for applied talents.

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Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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