Research and Exploration on the Training Mode of Applied Undergraduate Course—the Direction of Industrial Robot

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Abstract. According to the national policy of cultivating applied talents, combined with the Ministry of Education "Internet + Made in China 2025" production and education integration innovation promotion plan, through the combination of enterprise perfect professional direction curriculum construction, open up students innovation, creativity and entrepreneurship three creative curriculum system, Propose training the professional quality course of the team consciousness, the image and the professional ability, and carry on the research and exploration of the applied undergraduate training mode of the professional direction of the industrial robot, Aimed at cultivating moral, intellectual, physical development, with excellent professional quality, advanced application talents in the fields of mechanical, electronic, electromechanical integration and product design, production, management, service and marketing in the fields related to industrial robots.

Keywords: Internet +, Industrial Robot, Three creative courses.

Introduction

According to the statistics of the International Federation of Robotics, the global industrial robot market from 2013 to 2020 during the 5.4% compound annual growth rate of development, by 2020 its sales will reach $41 billion. China in 2014
has become the world's largest industrial robot consumer, is expected in 2017, the Chinese robot market demand will reach 64,200 units, accounting for 30% of the global total, ranking first in the world. The next decade, the Chinese robot market will remain at least 30% of the high growth. According to the Ministry of Industry and Development plans, by 2020, industrial robots installed capacity will reach 100 million units, probably need 200,000 industrial robot applications related practitioners.

At the same time, Premier Li Keqiang proposed in the government work report, to implement the "Made in China 2025", to speed up the transformation from manufacturing big to manufacturing power. Combined with the Ministry of Education, "Internet + Made in China 2025" production and education integration innovation promotion plan, to create a set of intelligent manufacturing personnel training, technological innovation, industrial services in one of the intelligent manufacturing application innovation base. Our school through the school-enterprise cooperation to build "digital factory", "intelligent manufacturing college", "intelligent manufacturing technology center" trinity of innovation platform for industrial robot professional application of undergraduate training to provide hardware base[1].

**Research Ideas and Methods**

According to the needs of modern enterprise employment and social economic development, the Ministry of Education, "Internet + Made in China 2025" production and education integration innovation promotion plan as a platform to build more suitable for industrial robot professional application of talent training system. Based on the general education curriculum, professional basic course, and to Perfect professional direction curriculum construction, open up students professional practice courses (three creative courses), put forward the quality of curriculum (professional quality courses) as the focus of the construction program. As shown in Table 1, all kinds of courses include in-class courses (the first class) and extra-curricular courses (the second class), the two classes with each other convergence, enrich the entire teaching system[2].

1) Perfect professional direction curriculum construction: through production and education integration projects to create off-campus enterprise courses, relying on the enterprise resources to carry out curriculum within a teaching program, corporate personnel as a course project support and guidance, teaching content for the enterprise real practice project, and in accordance with the specific requirements of enterprises to implement teaching. Teaching materials and experimental practice guidelines for industrial robots are written by enterprise personnel and teacher. In Table 2, the courses include industrial robot theory and training, Installation and maintenance, debugging and operation, simulation and application etc., covering the main knowledge of industrial robots point.
Table 1. Course modules.

| General education courses |
|---------------------------|
| Professional basic course |
| Professional course       |
| First classroom (Industrial robot enterprise course) |
| Second classroom (Professional skills certificate) |
| Professional practice course |
| First classroom (Three creative courses) |
| Second classroom (Student competition, project) |
| Literacy course |
| First classroom (Professional quality course) |
| Second classroom (Enterprise practice, laboratory management) |

Table 2. Industrial Robot Enterprise Course.

| Course name                                | First semester | Second semester | Third semester | Fourth semester | Fifth semester | Sixth semester | Seventh semester | Eighth semester |
|--------------------------------------------|----------------|-----------------|----------------|----------------|----------------|----------------|------------------|-----------------|
| Theory and Application of Robotics         | 3 54 54        |                 |                |                |                |                |                  |                 |
| Industrial Robot Comprehensive Technology  | 3 54 54        |                 |                |                |                |                | 3                |                 |
| Programming and Operation of Industrial Robots | 3.5 72 54 18 |                 |                |                |                | 3.5            |                  |                 |
| Basic Operation and Programming Training of Industrial Robots | 4 week         |                 |                |                |                | 4              |                  |                 |
| Installation and Debugging of Industrial Robot Workstation | 2 36 36        |                 |                |                |                | 2              |                  |                 |
| Off-line Programming and Simulation of Industrial Robots | 3.5 72 54 18 |                 |                |                |                | 3.5            |                  |                 |
| Practical Application Training of Industrial Robots | 4 week         |                 |                |                |                | 4              |                  |                 |

At the same time, according to the social enterprises in the direction of industrial robot talent needs to carry out the professional direction of the second course of classroom teaching. Combined with the relevant professional courses and training courses, under the guidance of the enterprise, to complete the industrial robot skills assessment or industry assessment, to obtain the relevant certificate.

(2) Open up students professional practice courses (three creative courses): the establishment of innovation, creativity and entrepreneurship three course system (the first classroom), and through the extracurricular practice teaching form (the second class) to attract students to guide students to effectively promote students. The first classroom and the second classroom of the organic combination. Three
creative courses as shown in Table 3, involving mechanical, mechanical and electrical (robot), electronics, Internet and other courses.

To three courses based on the second class to serve students, and further improve the enthusiasm of students to learn and professional innovation. To the national, provincial, city, school-level student professional competition and innovation projects as the leading, and actively lead students to participate in various interest groups, professional associations. To enhance the industrial robot second class construction, science and technology competition and social service work level.

| Course name                                          | Open semester (credit) |       |       |       |       |       |       |       |       |       |       |       |       |
|------------------------------------------------------|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                      | credit | Total | time | theory | practice | First semester | Second semester | Third semester | Fourth semester | Fifth semester | Sixth semester | Seventh semester | Eighth semester |
| Mechanical Creative Design (Mechanical Innovation Design Competition Project) | 2      | 54    | 18   | 36     |           |                  |                  |                  |                  |                  |                  |                  |                  |
| Robot Innovation Training (Robot contest)            | 2      | 2week |      |        |           |                  |                  |                  |                  |                  |                  |                  |                  |
| Electronic Product Design and Production (Electronic Design Competition Project) | 2      | 2week |      |        |           |                  |                  |                  |                  |                  |                  |                  |                  |
| JAVA Programming (APP application development project) | 2.5    | 54    | 36   | 18     |           |                  |                  |                  |                  |                  |                  |                  | 2.5              |
| C# Information Development (Web development project)  | 2.5    | 54    | 36   | 18     |           |                  |                  |                  |                  |                  |                  |                  | 2.5              |

(3) The proposed quality curriculum (professional quality course): On the basis of cultivating students’ good moral character and social morality, professional quality curriculum mainly trains students to have team consciousness, image and professional ability. Require college students to have a good professional ethics, positive career mentality and the correct sense of professional values; have a good team spirit, establish a correct sense of professionalism and correct professional behavior. Professional quality courses as shown in Table 4, including freshman career planning, sophomore quasi-professional training, junior career orientation and senior job training, etc.
Table 4. Professional quality courses.

| Course name                        | Open semester (credit) | Total time | theory | practice | First semester | Second semester | Third semester | Fourth semester | Fifth semester | Sixth semester | Seventh semester | Eighth semester |
|------------------------------------|------------------------|------------|--------|----------|----------------|------------------|----------------|------------------|----------------|----------------|------------------|------------------|
| Career Planning Guide              | 1                      | 36         | 36     | 1        |                |                  |                |                  |                |                |                  |                  |
| Quasi Occupation Guidance Training I| 1                      | 18         | 18     | 1        |                |                  |                |                  |                |                |                  |                  |
| Quasi Occupation Guidance Training II| 1                      | 18         | 18     | 1        |                |                  |                |                  |                |                |                  |                  |
| Occupation Orientation and Development I| 1                      | 18         | 18     | 1        |                |                  |                |                  |                |                |                  |                  |
| Occupation Orientation and Development II| 1                      | 18         | 18     | 1        |                |                  |                |                  |                |                |                  |                  |
| Innovation Entrepreneurship Practice| 2                      | 36         | 36     | 2        |                |                  |                |                  |                |                |                  |                  |
| Job Search Skills Upgrading Training| 1                      | 18         | 18     | 1        |                |                  |                |                  |                |                |                  |                  |

Carry out the second class of students, to further develop students' professional quality, including business practice, laboratory management and so on. Students use the winter and summer vacation time into the relevant business practice, feel the enterprise management system. For the relevant laboratory management, health, safety and other issues, the students are proposed to self-manage and further develop the students' awareness of the laboratory equipment and facilities, and consciously maintain the awareness of the laboratory environment and health. Do a good job of the laboratory clean and health work for themselves or others to create a good experimental and practical environment.

Cultivate Innovation

First, the teacher team to cultivate outstanding results: through the relevant production and education integration projects, production and research cooperation and regular business training. Can improve the teachers in the industrial robot level of technology, teaching and practice.

Second, highlight the professional direction: professional courses highlight the professional direction, is the application of undergraduate application ability training is different from other undergraduate level one of the places. In the mechanical and electronic engineering specialty, the enterprise courses are set up in combination with enterprise projects, train students to develop in a certain area of one's profession.

Third, enriching the students' three creative courses: combining the students' three creative courses, the construction of the second class is carried out by layer by layer, which enriches the experimental teaching system. Based on interest groups and professional community, Participate in the robot contest and other provincial competitions. To declare the provincial college students project and so on. And guides the student to carry on the hatching to the practical result, refines the student
scientific research, improve students' enthusiasm for learning\textsuperscript{[4]}. As shown in figure 1.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{three_creative_courses_diagram}
\caption{Three creative courses and hatching diagram.}
\end{figure}

Summary

With the ministry of education "Internet + Made in China 2025" production and education integration innovation promotion plan as an opportunity to study and explore the professional direction of industrial robot application undergraduate training program, mainly three aspects from the perfect professional courses (business courses), open up students professional practice courses (Three creative courses), put forward quality curriculum (professional quality course). And put forward the first classroom and the second classroom coexistence, through the extracurricular practice teaching form (second class) to attract students, to guide students to help students to use after school time to actively participate in various types of extracurricular practice projects, master the classroom teaching outside the professional knowledge and experience to improve the ability of students to practice with the practice of training students to apply skills to meet the needs of social and economic development. But also for the industrial robot professional direction of the practice of teaching system construction innovation, management change, technology updates, teacher ability to enhance the service area of economic development ability to provide support\textsuperscript{[5]}.

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References

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