Construction of Training System of Robot Majors for New Economy

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Abstract. The new economic situation has put forward new requirements for the traditional mechanical specialty. According to the demand of the market for mechanical professionals, this paper proposes the training of robot professionals at the undergraduate level. Through the market analysis, we have established an innovative personnel training system of school-enterprise joint, built a robot-oriented curriculum system, formulated a professional development plan, and formed our own school characteristics.

Introduction

With the arrival of the new economic era, more and more prominent problems, which are in the separation of knowledge, ability and quality training with market demand, exist in the traditional mechanical specialty of higher education. This urgently demands the necessary reform and upgrading of the traditional mechanical specialty. Robot technology is a very comprehensive professional, and it represents a country's high-tech development level [1-2]. The Ministry of national, who presented (the Robot Industry 13th Five-Year Development Plan), put forward the main development direction of Chinese robot industry in the next five years. This action shows that the robot has become the field direction of the development of strategic emerging industry, which provides an opportunity for the upgrading of China's traditional undergraduate majoring in mechanical engineering, lays a solid foundation for the construction of the system of undergraduate professional training robot[3].

According to incomplete statistics, the global robot trade market has reached 9 billion 500 million U. S. dollars. The market is as high as $29 billion, including software, peripherals and systems engineering. But the density of robots in the Chinese market is far behind that of developed countries. Within the Chinese manufacturing industry, only 30 robots per 10,000 workers are available, compared with 323 in Japan and 282 in Germany and 152 in the United States respectively. The United States, Europe, Japan and other developed countries have long attached great importance to the development of the robot industry, and have launched a national strategic plan to develop the robot industry [4-6]. China is now in the decisive stage of building an innovative country, and must rely more on scientific and technological innovation to lead and support economic development. Therefore, with scientific and technological innovation as the core, we should vigorously carry out the construction of the undergraduate course of robotics, and continuously strengthen the training of robot professionals. It is imperative for China's new economic development model and industrial restructuring.

Reform Ideas

For the development of new economy, with (National Plan for medium and long term educational reform and Development) as the basis, combined with the history and reality of the development of engineering education, reform experiences of the domestic and foreign engineering education and lessons, we have identified the following reform ideas:
Under the new economic situation, we need to establish an innovative personnel training system of school enterprise with the mechanical industry of industrial robot talent demand and employment as the guide, and take the talents’ training mode of the school enterprise cooperation;

The new teaching mode will be introduced into the teaching of industrial robots, and it will be carried out jointly with enterprises having a certain scale in China to carry out personnel training and professional construction;

The innovation oriented curriculum system of robot specialty should be constructed to optimize and integrate the contents of specialized courses to realize the coordinated development of students' knowledge, ability and quality;

We will construct of high-quality "Double Qualified Teachers" robot professional teaching team to improve professional teaching ability;

We are going to combine innovative teaching in classroom, extracurricular innovation activities and enterprise innovation practice to train students' innovative consciousness, strengthen students' innovative thinking, and improve students' innovative ability.

As shown in Figure 1, according to the reform ideas, we have adopted the following concrete measures:

(1) Teaching model reform. At present, we have carried out the "3+1" and "Dual System" teaching mode of exploration and reform, and have achieved good results. "3+1" means the first 3 years of undergraduate study are mainly completed in the school, and the fourth school year is arranged for all types of internships and training, in the meantime, the graduation project has to be completed in the enterprise. "Dual system", which is originated in Germany, namely, means “one system” for colleges and universities and “one system” for enterprises to improve students' ability to link theory with practice, through the joint training of universities and enterprises. In the specialty construction of "Industrial Robot", we will further explore and improve the practice teaching mode, make full use of enterprise resources, equipment and facilities and other advantages, combine the professional knowledge, skills and equipment project organically, and realize high quality, high level, high quality personnel training.

(2) Teaching team building. After years of hard work, we have initially established a contingent of teachers for professional development. This major has engaged robotics research postdoctoral staff as well as teaching robot teachers, reasonable personnel structure, and adequate teachers. In addition, there are other faculties’ teachers can also undertake the relevant professional courses. The majority of teachers have a unified understanding of professional construction in ideology, and have higher professional theoretical knowledge and strong professional and technical ability in the professional
structure. They can not only engage in professional theory teaching, but also guide the engineering practice, and effectively complete teaching and research work.

(3) Innovative curriculums' reform system. In order to follow the basic principles, which is to broaden the basic ability, enhance innovation ability, improve the overall quality and make professional features, we continue to promote the reform of curriculum content, and establish an innovative curriculum system. Combining with the new situation of social development and enterprise demands, through the "professional teaching" and "demonstration classes" activities carried out among teachers, we organize teachers to actively carry out teaching research, learn from each other and improve the quality of teaching through ways and methods of improving the integration, cohesion, updating of curriculums.

(4) Construction of personnel training system. Through the exchange and cooperation between schools and enterprises, we should give full play to the advantages of both schools and enterprises, and establish an innovative personnel training system combining schools and enterprises. Taking the campus classroom teaching and the practice teaching outside the school as the core, we should cultivate the innovative talents who the enterprise really needs. At the same time, the institutes invite high level technical personnel of cooperative enterprises and scientific research institutes to participate in the formulation of personnel training programs. In view of the major characteristics, the personnel training modes, curriculum structure systems and corresponding teaching implementation plans are formulated and modified to train highly qualified and practical talents with strong innovative spirit and practical ability.

Developmental Plan

We have established the train of thought and related measures for the training of industrial robotic major for the new economy after the full investigation of the development trend of robot direction, market personnel demand and employment prospects. In the next few years, we will start the following professional developmental plan:

(1) Jointing technical personnel of enterprises and professional teachers to set up the structural systems of professional courses, and professional curriculum materials to meet the needs of enterprises. The problems of overlapping knowledge, overlapping and application, comprehensiveness and innovation of traditional mechanical related courses are solved through compiling textbooks and monographs with technical workers of enterprises jointly.

(2) Formulate the joint examination and evaluation system school between school and enterprise consist of four aspects "curriculum achievement, practice achievement, school supervisor evaluation and enterprise tutor evaluation". The comprehensive ability of students is embodied in theoretical analysis, data application, comprehensive judgment, team cooperation etc. Adopting the assessment and evaluation system consist of four aspects "professional curriculum courses, practice achievement, evaluation of supervisors of school and enterprise", which the comprehensive ability of students is evaluated by the professional teachers of school and enterprise, to formulate a new curriculum standard.

(3) Enrich and perfect the form of students' curriculum examination, and integrate the defense, small papers, investigation reports, curriculum papers and operations into the assessment system according to the actual situation of the course. Set up an assessment method which combines independent proposition and open experiment. Train the abilities of analyzing problems, acquiring information and summing up for the students, which starts from encouraging the students' enthusiasm, initiative and creativity as possible.

(4) Formulate the training program for students' practical learning together with the cooperative enterprises. Based on following training talents' scheme formulated by university and enterprise, according to the change of enterprise production, formulate the flexible teaching plan for the students are practicing in the enterprise, clear the students' specific learning tasks and schedule, and achieve the cooperation of different enterprises have different training plan.
Characteristics of Major

We have gradually formed its own characteristics and advantages in the construction of industrial robots after a few years of exploration, which are mainly embodied in the following aspects:

(1) Orientating the major well, clear the direction of training, and constantly optimize and improve the talents' training program. The direction of the profession is determined by the market demand in the new economic situation. This major is oriented applied undergraduate major, train the students' ability of research and application of robotic technology, the applied talents who are all-around in robotic system integration, assembling and programming, and are adaptive to the applied talents in the management and application of robotic equipment installation and commissioning, equipment maintenance, equipment operation, customer service other work.

(2) Reform the teaching contents in time, adjust the curriculum structure, optimize the curriculum system, and make the content of the training mode modern, rational and systematic according to the developmental trend of the major. The training objectives of professional curriculum is in accordance with the requirements; Curriculum system structure helpful to the training of the students' knowledge, ability and quality; The ideas, plans and measures for the reform of teaching content and curriculum system is clear, and is put into practice. Figure.2 and Figure.3 show independent exercises of students in related courses.

(3) Improve the professional ability of the whole teachers in the supervisory system constantly. Promote the relationship between teachers and students through the face-to-face communication between teachers and students, teacher interviews, chat and other means, carry out alone occupation planning and employment guidance activities for the students; Carry out professional construction research, curriculum construction research and personnel training program revision and a series of teaching and research activities between teachers, to make them learn from each other, reach a consensus, form teaching resultant force, promote the level of teaching.

Figure 2. Manipulator assembling simulation.

Figure 3. Robotic pipeline simulation.
Conclusions
In the new economic situation, the demand for talents has changed greatly. It is an inevitable trend for the development of the times to reform and upgrade the traditional mechanical major. By cooperating with well-known enterprises in the industry robot actively, we established the robot professional personnel training system, formulated the complete training program and curriculum syllabus in direction of industrial robot, set up the direction of the teaching team, carry out the construction of the practice base in the direction of the cultivation of talents vigorously, and achieved good results.

References