Research and Practice on Practical Teaching System for Applied Innovative Talents of Mechanical Engineering

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Abstract. Based on the reform of the application of innovative talents and the reform of the teaching content system, this paper puts forward the diversified practice teaching model of applied mechanical engineering innovative talents training in mechanical engineering. In this paper, through the optimization of the application of innovative talents in mechanical engineering, the reform of practical teaching system, the innovation of teaching methods and means, the evaluation and monitoring of teaching management and quality, the deep cooperation mode of school and enterprise, and so on, it can strive to improve the students' engineering consciousness, engineering quality and engineering practice ability, take the initiative to meet the needs of society, and explore a suitable ordinary local mechanical engineering application oriented colleges and universities innovative talents training mode and methods of teaching practice. In this way, it can not only cultivate the shortage of talents in the equipment manufacturing industry, but also has important practical significance to the development of China's machinery industry and the local economy.

Introduction

With the rapid development of China's modernization, the scale of higher education continues to expand, the reform of higher education system is deepening, the teaching work in Colleges and universities is facing many new situations and new problems, and the task is more arduous. According to the urgent needs of enterprise for the application of innovative talents, the ability of practice and innovation for undergraduate students is becoming more and more important. Therefore, colleges and universities must follow the Scientific Outlook on Development and realize the shift of the focus of higher education. It is necessary to reform the training mode and system of innovative talents to meet the actual needs of enterprise while developing of higher school scale. The university should regard it as their responsibility that create an innovative country and higher education. Meanwhile, we should set up the concept of higher engineering education to the needs of the industrial sector, the world and the future, establish the initiative to serve the national strategic requirements, take the initiative to serve the needs of industry enterprises. Cooperation between enterprises and enterprises and combining production, teaching and scientific research to cultivate a large number of equipment manufacturing industry restructuring and transformation of the shortage of talent to enhance the core competitiveness of Heilongjiang Province, the revitalization of the northeast old industrial base to lay a solid human resources advantages for the country's industrialization and modernization of the development of engineering Technical talent pool.

Practical teaching is one of the basic conditions for colleges and universities to improve their teaching and improve their teaching quality. It is also an important means of practical theory teaching. Colleges and universities should take the strategy of talent development as the core, cultivate excellent engineers in the future for the pursuit, regard the world's two major engineering education system as a reference, take the engineering education accreditation as the guide, take the practical engineering as the background, take the engineering technology as the main line, build a "real engineering environment" as the support, it can establish and improve the practical teaching and
training system of mechanical engineering applied innovative talents. In order to create a real environment of engineering education, the colleges and universities should observe the law of cultivating innovative engineering talents, from the systematic teaching of subject knowledge into the whole life cycle of Engineering (product). We should also fully mobilize the enthusiasm of all aspects of the school, make full use of the school, enterprise research and research cooperation platform for the application of innovative engineering and technical personnel training to build an open practice teaching system.

Therefore, it is necessary to study the practical teaching system of applied innovative talents. This paper is the reform and practice of the practice teaching system of mechanical specialty in our university under the support of the project of "Heilongjiang Province Educational Science Research Base" and "Project of Key Project of Educational Science in Heilongjiang Province".

Research Objectives and General Idea

Facing the industrial circle, facing the world and facing the future, we should speed up the training of innovative talents of mechanical engineering to meet the needs of national economic construction, and lay a solid human resource advantage for the revitalization of the old industrial bases in Northeast China. Through the close cooperation between education and industry, universities and enterprises, taking practical engineering as the background and engineering technology as the main line, we should improve the students' engineering consciousness, engineering quality and engineering practice ability. Through the research and practice of the practical training system of innovative talents in mechanical engineering, we should take the initiative to serve the development strategy of our province, take the initiative to serve the social needs and speed up the training of a large number of service talents of mechanical engineering application.

(1) To provide engineering technology application and innovation ability training as the main line, the ways and methods of practice teaching course system, teaching content, teaching mode should be designed by the shortage of personnel equipment manufacturing enterprises of mechanical engineering applied essential technical and engineering practice ability.

(2) To solve the problem of mode selection and operation mechanism of school-enterprise cooperation in the process of training the practical teaching of innovative talents in mechanical engineering application.

(3) The establishment of practical teaching system in the course, extracurricular practice teaching, and production practice of enterprise, "multi-dimensional, step by step".

(4) Formulating the mode and operation management method of constructing teaching base of school and enterprise.

(5) To create a school-enterprise interaction, one of the teaching team, to achieve complementary advantages of full-time and part-time teachers, solve the problem of teacher training and part-time teachers’ team construction.

(6) Setting up the assessment and quality evaluation system to meet the needs of practical teaching of mechanical engineering applied talents.

The Specific Contents and Measures of the Study

With the Development of Service Economic Society and Science and Technology, the Goal and Scheme of Practical Teaching and Training for Innovative Talents Should be Worked Out

In order to meet the diversified demand of talent shortage in equipment manufacturing industry, it is necessary to determine the practical training objectives of mechanical engineering application talents and pay attention to the role of hi-tech in the innovation and development of mechanical engineering, so that the graduates can adapt to the needs of modern enterprises for talents. To further strengthen the role of enterprises in the engineering personnel training, the professional training plan of mechanical engineering should be made by colleges and universities and the specialists of factory. The training programs should highlight the characteristics of future excellent mechanical engineers,
"good quality, quick start, innovation, entrepreneurship". Colleges and universities should set up the training objectives and programs of practical teaching of Mechanical Engineering scientifically to highlight the cultivation of engineering practice and innovation ability.

**Constructing the Practical Teaching System of Applied Innovative Talents with the Goal of "Engineering Technology Application and Innovation Ability"**

The training of the technical application ability of mechanical engineering and technical personnel mainly shows that the students should have the ability to solve the technical problems of first production line, operate of modern high-tech equipment and engineering practice. According to this concept, the idea of teaching reform including teaching curriculum system, teaching content and teaching mode should be based on the application of engineering technology and innovation ability, and be designed by the technical ability and engineering practice ability of the equipment manufacturing enterprises to the mechanical engineering application type talent. At the same time, we should strengthen the interaction between enterprises and universities to build a practical teaching system that matches the needs of industry.

**Taking the Practice Teaching Mode of School Enterprise Cooperation as A Means to Cultivate High-Quality Engineering Talents**

A comprehensive practical teaching model of school enterprise cooperation is established for the cultivation of applied innovative talents. A set of practical teaching mode, which combine the practice teaching, extracurricular practice teaching and enterprise production practice into one, to achieve the goal of cultivating students' engineering application ability and innovation ability. To achieve the effect of enterprise application and the cultivation of innovative talents demand coincide, through participation in the method of enterprise technological innovation and development in scientific research and engineering projects, so as to cultivate the ability and innovation ability of students to solve practical problems of enterprise production. The environment for the cultivation of innovative talents is created through a variety of practical teaching links, and the use of multi-channel and multi way to build a variety of scientific and technological innovation platform.

**Establishing and Perfecting the Practice Teaching Base on the Basis of the Combination of School Enterprise Cooperation**

The “Modern equipment manufacturing” national engineering practice education center and “Advanced manufacturing technology” national engineering practice education center was established by enterprises, as an integrated platform for the training of engineering talents in Colleges and universities in our country, and the important base for cultivating engineering talents to meet the needs of the industry. The task force will combine the engineering practice education center and the construction of the college students' practical education base, so as to establish and perfect the practical base for the application of innovative talents. Off campus practice base plays a more important role in the cultivation of applied innovative talents, through establishing a stable enterprise practice base which based on the specific needs of enterprises in the province of the application of the shortage of professionals.

**Improving the Practice Teaching Effect through the Reform of Practical Teaching Methods and Means**

The effect of practice teaching has been greatly improved through the application of simulation technology, network technology, virtual reality technology and other modern educational technology widely used in the practice teaching process. The students' practical skills are trained and the knowledge is broadened, through the method of using the network resources to carry on the teaching, and combining the simulation experiment, the virtual experiment and the practice operation.

**To Strengthen the Cooperation Between Universities and Enterprises Focusing on the Mixed Team Building of Part-Time and Full-Time Instructors to Improve Teaching Ability and Level**
Establishing the exchange program to make sure teachers and engineering could get training by each other's job site, and ensure everyone goes through the process of training, communication and assessment. Encouraging instructors participate in company research projects, and apply the conclusion in university finally. Teachers work closely with production activity. Those efforts might help universities building up mechanism of open faculty, hiring senior engineering to serve as part-time teachers, opening business courses for guiding students practical training and graduation etc. Reform the mechanisms of training and teaching, sending potential teachers to participate the exchange program in order to forming a teaching team which come with understanding of community needs, rich teaching experience and practical ability of teachers' level.

**Practical Teaching Evaluation and Quality Assessment System Guarantee the Quality of Creative Talents**

Reforming practical teaching and assessment mechanism, and in accordance with the characteristics of cultivating creative talents of mechanical engineering, the evaluation system established based on the personal ability of talents. Establishing a teaching evaluation system which revolves around teaching supervisor group, teachers and students to assess the subject in teaching quality, practice teaching, students learning situation. The assessment is divided into two main part, campus assessment and off campus assessment. The campus assessment mainly paper exam-oriented, while increasing the assessment of students innovative ability and accomplishments, as well as overall assessment. Off campus assessment carried out jointly by schools and joint companies. Contents of assessment include: attitude, creativity, team spirit, practical skills, professional practice and other aspects. Assessment methods include: the number of professional practice results, written summary materials and quality assessment, professional reporting and defense, comprehensive ability and quality evaluation, etc..

**Innovation of the Implementation**

(1) This paper explores the best approach to combine the domestic practical training system and the international training system for our mechanical engineering students. Our teaching infrastructure has been improved in recent years. Practice teaching is in further construction and improvement.

(2) The engineering technology application and innovation ability as the main line, according to the shortage of mechanical engineering applied essential technical and engineering practice ability to design practical teaching course system, teaching content, and teaching mode. To improve the students' ability to analyze problems, solve problems and practical ability, and enhance the practical ability of students in practical engineering and the application of theoretical knowledge, students' perceptual knowledge and engineering awareness.

(3) Building a scientific, optimal, and effective practical teaching system, establishing up a by class within practice teaching, and extracurricular practice teaching and enterprise production practice "more bit one, and step by step" of diversified practice teaching mode, using abundant teaching resources of school and enterprise and advanced conditions of experiment and internship, through research combined interactive mode, reaching the target of that improving students' capacity of engineering application and capacity of innovation.

(4) Combined with the practice teaching characteristics of mechanical engineering innovative talents, draw the modern education technology into practical teaching, and develop modern education technology platform in the experimental teaching system, be affluent in students' knowledge, cultivating students' practical skills.

(5) Innovation applied in practical teaching evaluation mechanism of innovative talents of mechanical engineering, according to the characteristics of cultivating innovative talents, establish the examination system of the study of ability as the core, students' engineering practice ability has been improved a lot.

(6) The Mechanical College of Harbin University of Science And Technology has established more than more than 20 teaching practice base. Personnel training undertaken by schools and enterprises, the school is responsible for the theory teaching, practice teaching and practice in charge
of the enterprise provide jobs for graduates. Through the combination of schools and enterprises, schools are more comprehensive understanding of the talent needs of enterprises, and the combination helps school setting majors and teaching content. Enterprises participate in the talent training program to obtain their required professional talents, which is the source of development, enterprises rely on the school's training program that brings school enterprise to the win-win situation.

Summary
The research of mechanical engineering practice teaching system of applied innovative talent is not completed, and it is in the exploratory stage, subject to a lot of conditions, including internal and external conditions. Every condition has to be studied. Every student of Mechanical college looking for job should be market orientated, put more effort on ability training and the strengthening of expertise, to catch the "marketable" development trend of modern higher education in China.

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