

A Study on the Training Center Construction of Mechanical Engineering Theory-Practice Integration Based on “Industrial Mechanism”

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ABSTRACT: There are some problems existing in the conventional mechanical engineering training centers which are constructed based on enterprise mechanism such as: singleness of the function, poorness of the equipment, lack of the intelligence, insufficiency of the innovation training, singleness of the scope and quantity of the enterprises who participate in university-enterprise cooperation, etc. Therefore, under the background of the whole mechanical industry engineering, this paper aims to work on university-enterprise cooperation based on industrial mechanism, and also theory-practice integration, so as to construct a multi-functional and multi-intelligent training center combining theory teaching and skill training with innovation training.

KEYWORD: Industrial mechanism; Theory-practice integration; University-enterprise cooperation

1 INTRODUCTION

The personnel training model has evolved into present industrial mechanism from original enterprise mechanism. With the increase in the quantity of the mechanical engineering personnel training and the extension of the range and depth of the industrial mechanism, the university-enterprise cooperation training centers have made great contribution to training students' practical skills, but they have great bottleneck in training students' innovation ability. This paper tries to take advantage of university-enterprise cooperation and apply the theory of theory-practice integration so as to construct a multi-functional and multi-intelligent training center combining theory teaching and skill training with innovation training.

2 PROBLEMS EXISTING IN THE MECHANICAL ENGINEERING TRAINING CENTER

The mechanical engineering training center is the place for training teaching and practice. It devotes itself to the teaching of training and professional quality, and also professional skill training and appraisal, so as to gradually develop into a important base for cultivating higher education talents' practice teaching, professional skill training and appraisal, and also for the popularization and application of

high and new technology[1]. The project team will research and analyze the implementation and completion of the training center's functions. The problems exist in the mechanical engineering training centers in our province as follows:

2.1 *Singleness of the function, poorness of the equipment, lack of the intelligence*

According to the current results of the project team's research on the mechanical engineering training center in Anhui province, some problems have come up in the training centers such as singleness of the function, low level of the automation, intelligence and network, slower speed of the training equipment renewal than that of industry development, imperfection of the hardware device, smallness of the space, lack of the practical teaching resources, and so on, for the reason of funds and technology in colleges and universities in our province.

2.2 *Remaining problems from enterprise mechanism*

In the era of enterprise mechanism, the mechanical engineering training centers have achieved some good results on the students' practical skills mastery. For example, they got remarkable achievements on technological process, jig, man-machine engineering, information processing, automatic control, vehicle engineering, and also on the

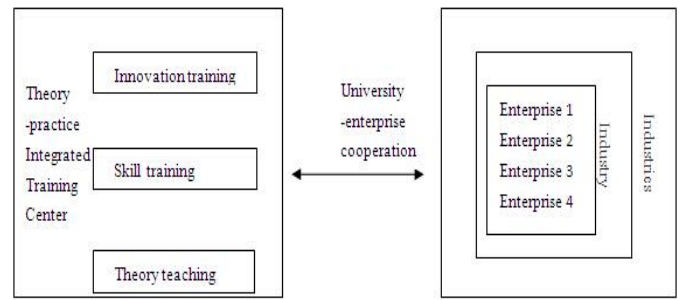
operating procedures of the mechanical principles, assembly and interface. However, they have poor performance on the technical innovation, patent and competition award [2~3]. Only by perfect combination of theory teaching, skill training and innovation training, can the mechanical engineering training centers achieve effective innovation. In the case of industry escalating, the traditional training centers based on enterprise mechanism can't adapt to the training under the background of the rapidly developing industry.

2.3 Singleness of the scope and quantity of the enterprises who participate in university-enterprise cooperation

At present, the mechanical engineering still has many training centers based on traditional university-enterprise cooperation. And university-enterprise cooperation selected the enterprises from the local and the few, not from the big enterprises of the whole industry across the country. For example, many of the training centers in Hefei basically cooperate with nearby enterprises, and the enterprises' quantity also is limited, so the training centers' construction is lack of professional standard, and the level of the training centers' equipments and venues also is not high. It is very difficult for the mechanical engineering talents trained by such way to adapt to the development of the mechanical industry.

3 A STUDY ON THE TRAINING CENTER CONSTRUCTION OF MECHANICAL ENGINEERING THEORY-PRACTICE INTEGRATION BASED ON "INDUSTRIAL MECHANISM"

The mechanical engineering training centers are changed from enterprise mechanism to industrial mechanism. The starting point of enterprise mechanism and that of industrial mechanism are not the same. Enterprise mechanism is to construct training centers according to enterprises' demands. However, industrial mechanism is to construct training centers based on the whole industry. In the environment of major industrial development, industrial mechanism makes use of the combination of mechanical engineering theory and practice, and of the cooperation between university and enterprise, to make the training centers multi-functional, multi-intelligent and integrated with theory teaching, skill training and innovation training. The training center construction of mechanical engineering theory-practice integration based on "industrial mechanism" is as below picture 1.



Picture 1. The training center of mechanical engineering theory-practice integration based on "industrial mechanism"

The mechanical engineering training center in our school is composed of machinery foundation lab, mechanism lab, materials lab, vehicle engineering lab, thermal power lab, test and control lab, and mechanical engineering training centers. Our school vigorously promoted the construction of the mechanical engineering training center by investing a lot of manpower, material resources and financial resources, by adopting all-round, multi-angle model of university-enterprise cooperation, and by making all kinds of intelligent labs and training centers. By now, the training center in our school has implemented the networked management of daily administrations and operations. For example, register, dispensing and scrap of the lab equipments and instruments, submission of lab projects, and statistics of lab staff basic information all can be done on the internet.

3.1 Making theory-practice integrated training base on the basis of industrial mechanism

Taking industrial projects as the guide and creating technical service platform as the goal, we, university and enterprise, will jointly build a multi-functional, productive training center by combining the inside and the outside of the university, which can carry out small-batch and high-technology production. And we will build a training and practice base inside and outside of the university for teaching training, learning, and employment [5], and construct a sustainably developed long-term mechanism based on university-enterprise cooperation. We also will promote the mode of talents cultivation based on "enterprise mechanism", establish the board of directors, and form a close and cooperative mechanism to jointly cultivate the talents, manage the process, enjoy the achievement, and bear the responsibility. Moreover, we will deepen the teaching reform of the professional comprehensive training and practice, and then implement the practical teaching and students' professional ability cultivation.

3.2 University-enterprise integration

Industrial mechanism is eventually implemented in the university-enterprise integration. When industrial parameters changed greatly, the enterprises who participate in university-enterprise cooperation will be affected by a certain extent in the range, degree and quantity[6]. The advanced teaching mode and system of the mechanical engineering theory-practice integrated training centers constructed by university and enterprise jointly will effectively push the reform of the high-quality application-oriented talents training plan, cultivate students' comprehensive practical ability and innovative spirit, improve the quality of personnel training, forging a team of teachers who are highly qualified and experienced at research, promote the development of subject construction, promote the construction of academic team, greatly improve the transformation of scientific research, enhance enterprises' capacity for independent innovation, and promote the rapid development of social economy.

3.3 Effects achieved by theory-practice integrated training center

Intuitive theory-practice integrated teaching can stimulate the learning enthusiasm of the teachers and students, and can avoid abstract, boredom, indigestion, and hard mastery of simply theory learning. In the meantime, it can also improve students' interest in learning and the students' learning efficiency.

In the theory of theory-practice integration, our school has constructed a modern training center. Our training center has 5 training workshops: Numerical Control Workshop (including 24 pieces of various CNC machines), Metalworking Workshop (including 44 pieces of various machines), Fitter Workshop (including 60 workstations), Welding Workshop (electro welding and oxygen welding both available) and Machine Disassembly Workshop. Our training center also has 12 professional labs: CNC Simulation Lab, Virtual Manufacturing Lab, Mechanical Principles Lab, Mechanical Parts Lab, Mechatronics Lab, MPS Automatic Production System Lab, Hydraulic & Pneumatic Lab, Number Mode Electro Lab, PLC Lab, SCM Lab and so on. And we have invested almost ten million into the theory-practice integrated comprehensive test platform in Mechatronics Lab, which is very unusual in our province. We have paid much attention to highlight the engineering background, big engineering system background, environment authenticity and simulation validity to implement theory-practice integrated teaching. We will make full use of modern educational technology to realize integration of theory and practice, institutions, venue and equipment, curriculum and system, teaching methods, teaching resources, teaching evaluation and

assessment. Students' innovation and application ability will be substantially enhanced by learning through theory-practice integrated teaching system, compared with learning through traditional learning system. This is good to serving the innovative, practical, interdisciplinary professional talents cultivation, and serving the practical teachers' teaching ability development.

3.3.1 Teaching and learning integration

Teaching and learning integration aims to cultivate "double-qualified" teachers by integrating theory teaching teachers and practice guiding teachers. This is totally different from traditional teaching mode of one teacher for one course.

3.3.2 Curriculum/courses integration

Curriculum integration aims to cultivate skilled talents. The implementation of teaching and curriculum integration will reasonably optimize course setup, and strengthen school-based teaching material development. We should integrate theoretical knowledge with professional knowledge. And during the skill training, we should strengthen the concept of opening course setup by improving professional knowledge.

3.3.3 Assessment integration

The form of assessment on qualification evaluation frequency and subject quantity should be changed from "One Paper" test to periodical project tasks by three ways: the first way is assessment upon project, which means each project will have its assessment. The second way is periodical assessment upon actual operation, which means actual operation ability test by each module. The third way is assessment on comprehensive capability every semester. Each department will be responsible for organizing its own project test.

3.3.4 Training integration

The school can refer to its own actual conditions and build a specialized courses integrated workshop by giving priority to backbone majors. The integrated workshop' area, basic equipment and students' major quantity should be reasonably arranged. Practice teaching and training workshops should be managed uniformly so as to ensure the timely optimization of the proportion between professional setting and hardware equipment, utilization of the integrated workshop, and the accomplishment of various teaching and training tasks.

4 CONCLUSION

Under the background of mechanical industry, the theory-practice integrated training centers of mechanical engineering based on industrial

mechanism and university-enterprise cooperation will definitely construct a multi-functional and multi-intelligent training center combining theory teaching and skill training with innovation training. It will fully show the benefit of the combination of the mechanical engineering's teaching, scientific research and industry.

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