

Research and practice of innovation talent cultivation coordination mode in the context of IMarEST accreditation

Lei Cao, Jingtao Du, Yong Lu and Shuying Li

College of Power and Energy Engineering, Harbin Engineering University, Heilongjiang Harbin 150001
Corresponding Author Email: caolei@hrbeu.edu.cn

CONTEXT

Harbin Engineering University (Hereinafter referred to as HEU) is an important base for talent cultivation and scientific research in the field of ship industry, marine equipment, marine engineering and nuclear technology application. College of Power and Energy Engineering relies on the advantages of talent cultivation and scientific research in the field of marine power, Closely follows the national innovation driven development strategy, aimed at the industry demand, the college has cultivated a large number of collaborative innovation oriented talents for the national marine power industry. In 2013, specialty of Marine engineering passed the review of IMarEST--Institute of Marine Engineering, Science & Technology with full excellent on-site, which marked that the cultivation of Marine engineering undergraduate and master degree graduates received international recognition. This article focus on the concept and mode formed in the process of cultivating collaborative innovation oriented talents.

PURPOSE

This article focus on the concept and mode formed in the process of cultivating collaborative innovation talents in our college, HEU and hopes to provide reference for the same professional engineering education in other colleges.

APPROACH

The college puts forward the practice education philosophy and training mode according to the characteristics of international engineering education and its own advantage in the industry. Combining with the characteristics of Marine power professional and training requirements of top-notch innovative talents, it formed a co-cultivation mode for creative talents, "combination of teaching and research, combination of virtuality and reality, co-cultivation of university and enterprise", and achieves satisfactory effectiveness.

RESULTS

In 2013, Marine engineering major passed the on-site review of IMarEST--Institute of Marine Engineering, Science & Technology with full excellence, which is the significant symbol of internationalization of education and engineering education for the college. "Marine power technology experimental teaching centre" is the Chinese national experimental teaching demonstration centre; "Marine power technology virtual simulation experiment teaching centre" is the Chinese national virtual simulation experiment teaching centre. All of these achievements mark that the college has reached advanced level of experimental teaching in China.

CONCLUSIONS

This paper focus on the Engineering education training mode, namely "combination of teaching and research, combination of virtuality and reality, co-cultivation of university and enterprise", which was formed during the process of cultivating collaborative innovation talents. The implementation of the training mode strengthens the coordination of university and industry, solves actual problems of the enterprise engineering, improves the innovation ability of student, integrates all the aspects of resource, and plays a vital role in the education of innovative talents.

KEYWORDS

IMarEST; Innovative talents; co-cultivation.

1 Introduction

HEU was founded in the PLA Military Engineering Institute. It is China's first "211" Project key universities, the first batch of national key university, the first Engineering Master's degree authorization, the first batch of a graduate school of Colleges and Universities. And it's the important base of personnel training and scientific research in the field of China's "three sea one nuclear" (ship industry, marine equipment, marine engineering and nuclear technology application).

The college of Power and Energy Engineering is one of the oldest faculties in HEU (founded in 1953), one of the main faculties school in the field of "three sea one nuclear". After 60 years of development and construction, now it has become an important base of personnel training in the field of ship power and scientific research.

With a higher level of attention in the quality of higher education, the evaluation and accreditation of higher education have received the attention in the world and the full development, which has become a worldwide trend and hot spots. People are not only concerned about the overall quality of education in Universities and the overall school conditions and levels. Meanwhile, professional accreditation of higher education has become an important mean to ensure the quality of higher education in the world, and has been recognized by the governments and the general public.

The major of Marine Engineering in HEU passed the British Society of Marine Engineers IMarEST- certification for the first time in 2005 as the school's first and the unique major that had received the international professional certification. And in 2013, it received IMarEST certification with excellent performance for the second time. By communicating with certification institutions, a summary of the certification work, summed up the international engineering standards recognized system mainly includes the following aspects: 1) Students 2) Training objectives 3) quality assessment and security 4) Curriculum System 5) teachers 6) Teaching resources 7) administrative and social support 8) improvement program. The experiment, practice resources, the school and the enterprise collaborative culture is the focus of study certified items and plays a vital role in engineering education. The college of Power and Energy Engineering, HEU Engineering Practice proposed educational philosophy and training model based on the characteristics of international engineering education and its advantages in the industry.

2. Innovative talents synergy training mode

Combined with the features of Marine Power professional and the needs of top-notch innovative personnel training, it formed the innovative synergy talents training mode of "combination of teaching and research, combination of virtuality and reality, co-cultivation of university and enterprise ", and achieved good teaching results.

2.1 Combination of teaching and research

(1) Promoting the method of research teaching; Making the research methods into the teaching; Increasing research pilot project set in professional labs; training students to refer to information before experiment consciously, to develop their own protocols, to debug experiment laboratory equipment, to complete the projects experiment projects, to analyse the experimental results and to complete all the experimental process with themselves, and in the process, teachers supply guidance and evaluation of experimental results. This method can test students' autonomy and promote top-notch innovative personnel training.

(2) Taking the research project teaching. In order to increase students' professional enthusiasm, encourage students to thinking, cultivate students' ability to analyse and solve practical problems, the teachers extract some pilot projects from the research projects for students to study or to explore. Following the research group's practices, teachers guide

students to form research team to complete the work or to submit reports or research papers as the conclusion, and this is actually the training of engineering ability practice. Years of practice has proved that through training, the students can quickly enter the state to complete the changing role with strong development potential after they go to work or graduate.

2.2 Combination of Virtual and Reality

Since 2006, after years of construction, HEU marine power technology virtual simulation experiment teaching centre has independently or jointly developed all categories of virtual simulation test system that covers marine power professional, and has been open for undergraduate students in 10 professional of 4 College. The Experimental simulation teaching resources includes full virtual simulation resources, semi-physical simulation or a combination of the virtual and reality resources. The vast majority of the systems are the experimental teaching resources transformed by some research results in the college of Power and Energy Engineering. With the development of technology, continuous improvement and update, the virtual imitation of existing resources is on behalf of the Chinese ship power professional development trends and advanced level.

"Ship Power Technology Experimental simulation teaching centre" has one ship internal combustion engine virtual simulation laboratory, gas turbine virtual simulation laboratory, steam-powered virtual simulation laboratory, marine engineering virtual simulation laboratory and energy and power virtual simulation laboratory and so on.

(1) Experimental simulation teaching resources are in line with professional features and marine power industry characteristics. Marine Power specialty laboratory equipment (power diesel engines, gas turbines, steam boilers, machine paddle transmission equipment), is mostly high-temperature, high-pressure, complex structure, large power machinery rotating at high speed, the students practice with a greater risk, meanwhile, it is restricted by less equipment quantity and long experimental preparation time, expensive cost, operational safety and other factors, it is difficult to carry out experimental teaching with large-scale practical equipment. Therefore, developing marine power professional virtual simulation experiment teaching has important practical significance.

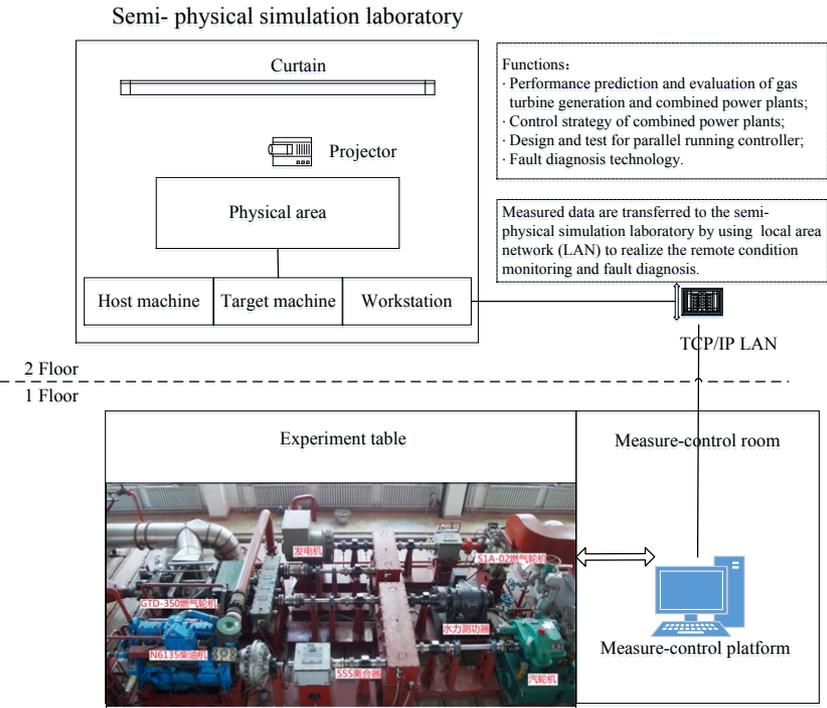


Figure 1: System structure diagram of semi-physical simulation of combined power plants

(2) Experimental simulation teaching resources, in line with the trend of modern ship power technology

Based on the specialty of Marine power plant, the traditional experimental teaching resources in addition to thermal and other basic experiments, due to the costs of other specialized laboratory equipment for teaching experiment are very high, it results in upgrading difficulty, so more traditional models or dispersing equipment are in use, and this cannot reflect the latest trend of modern marine power technology development. Meanwhile, the traditional professional pilot projects are mostly demonstrative, validation experiments, it's difficult to develop or lack of design, comprehensive and research experiments. Therefore, developing marine power technology virtual simulation resource development can make some high-risk, performance test in extreme conditions be achieved. And meet the needs of innovation Talents modern experimental teaching mode.

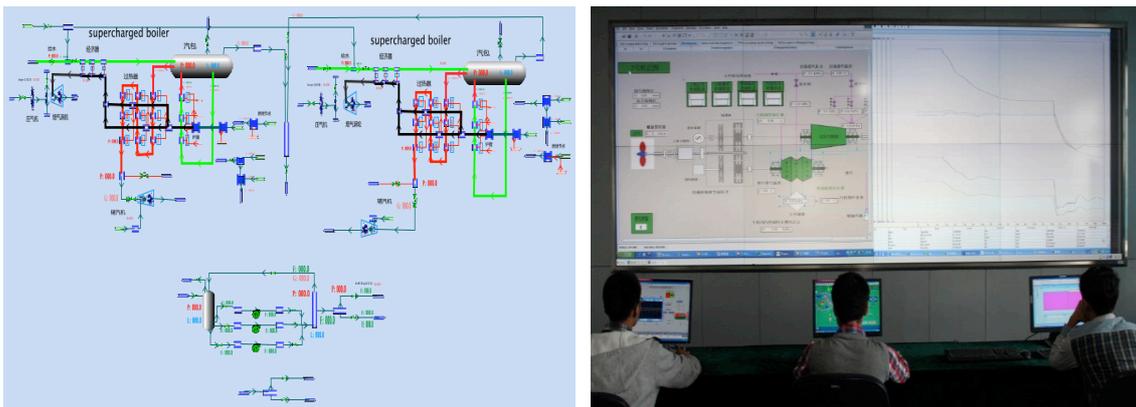


Figure 2: The virtual simulation platform of marine steam power plant

(3) Experimental simulation teaching resources, conducive to use modern teaching methods, to improve students' interest in traditional learning

Experimental simulation centre is a concrete manifestation of modern simulation techniques for experimental teaching and plays an important role in enhancing students' ability and level. Virtual simulation experiment teaching is an important part of higher education information construction, is the product of discipline and the depth of integration of information technology, is the embodiment of innovative experimental methodologies and tools; through virtual simulation resources, some projects operation that are impossible or irreversible in extreme conditions can be achieved by using multimedia, animation, historical experimental data can be historical extreme conditions, therefore, the virtual imitation resource development will be helpful in improving students' professional experimental class of ship power and interest in learning.



Figure 3: Internal combustion engine teaching website



Figure 4: The disassembly and assembly experiment of diesel engine
(Interaction between virtual and real objects)

2.3 Collaborative Training of schools and businesses

(1) Enterprises participate in the work of teach professional courses. In order to make students have access to new technologies in engineering field, new products. School invite the technicians and experts to teach students about new technology in engineering field and other courses. The specific scientific technological achievements and latest hot topics in this field will be given detail lectures, so students can timely understand the latest developments in this field of engineering and have a clear direction about their own efforts;

(2) To guide enterprises to participate in the work of the students' practical aspects. Inviting or recruiting experts of enterprises that have research collaboration with university as graduate university instructor. These experts are responsible for guiding students in the development of enterprise technology, product design, technology innovation and so on;

(3) Enterprises participate in students' dissertation work. Students' Thesis implements "project collaborative culture system". All the topics of dissertation are supported by research projects, on the basis of cooperation, taking solving practical engineering problems as fundamental, making "the needs of the enterprise - research question - Students practice" as the main line, tutors in double issue implement the industry needs innovative education to the student's practice session. Dissertation work is closely around the actual problem to carry.

3. CONCLUSION

School of Power and Energy Engineering, HEU carries out innovative engineering talent education relying on years of industry advantage. In 2013, the major of Marine Engineering passed the British Marine Engineering Association site certification review, which is an important symbol of the Institute of international education and engineering education. "Ship Power Technology Experimental Teaching Centre" is the Chinese national experimental teaching demonstration centre; "Ship Power Technology Experimental simulation teaching centre" is the Chinese national virtual simulation experiment teaching centre, the results that have achieved mark that School of Power and Energy Engineering has reached advanced domestic level in the laboratory course. This article focuses on the training mode of "combination of teaching and research, combination of virtual and reality, collaborative Training of schools and businesses". The implementation of training mode has enhanced the synergy between schools and industry, solved the enterprise practical engineering problems, improved the students' ability to innovate, integrated the various resources, and played a crucial role in the innovative talents engineering education.