Research on the Practice Education Reform for Energy and Power Engineering Specialty

Qing E*, Zhao-xia ZHOU and Xiao-jiang YE
School of Optical Information and Energy Engineering, Wuhan Institute of Technology,
Wuhan, 430205, China
*Corresponding author

Keywords: Energy and power engineering, Practice education, Multi-Dimension mode.

Abstract. According to the characteristics of the Energy and Power Engineering (EPE) specialty, combined with the demand of energy enterprises, a new mode for practice education is proposed in this article to settle the problems of now. Through practical application, it is proved that the mode has remarkable effect on improving students’ scientific quality, innovative spirit and practical ability.

Introduction

The Energy and Power Engineering (EPE) is a wide-caliber specialty, including boiler, turbine, thermal energy of power plant, ventilator, compressor, refrigeration, low temperature, internal combustion engine, engineering thermophysics, hydraulic machinery, metallurgical furnace, industrial thermal engineering, etc. The development of market economy and the accelerated flow of talents require students to have a wide range of knowledge and strong adaptability. However, under the influence of the imperfect training system of enterprises in our country, most enterprises in the energy and power industry still have very strong requirements for the specialization of talents. They have a distinct background of engineering education, and the talents who can enter the professional field quickly are still very popular [1]. Therefore, colleges and universities are trying to find out how to solve the contradiction between the training mode of wide caliber major and the strong demand for talent specialization in the energy and power backbone enterprises in our country at present. Many colleges and universities take the cultivation of students’ practical ability and innovative spirit as the breakthrough point, and actively train innovative talents who combine theory with practice.

The Problems in Existing Practice Teaching

The practice teaching is one of the important links to the students' practical ability training, and is also the most direct reflection of the teaching quality. Only in practice, the students can test the knowledge, discover new problems, grasp the scientific methods, develop the consciousness of innovation, and improve the comprehensive quality[2].

Since the formal enrollment in 2001, the EPE specialty in Wuhan institute of technology has been developed for 18 years. It has set up two specialty directions of refrigeration and low temperature engineering and building energy conservation, carried out Sino-foreign cooperative school-running project, and established an Engineering Thermal Physics (ETP) research room. This major is based on the theory of engineering thermo physics, takes the high-efficient clean conversion and utilization, the reliable operation and control of power system and equipment, the research and development and application of new and renewable energy technology, energy saving, environmental protection and sustainable development as the subject direction, and trains high-quality professionals engaged in energy, power, environmental protection and other fields of scientific research, technology development, engineering design, operation control, teaching, management and so on. However, at the same time of professional development, we also see some existing problems.
Courses and Practice are not Closely Related

The course designs of EPE specialty include Electrical and Electronic training, Boiler and Boiler Room design, Refrigeration and Air Conditioning Intelligence Basis design, Heating Engineering design, Air Conditioning design, Building Equipment Automation design, Clean Air Conditioning design, Low Temperature Device design, Refrigeration Compressor design, and so on. They are the extensions and effective supports of the theoretical teaching of specialized courses. However, through communication with enterprises and previous graduates, it is understood that the content of professional courses is outdated and backward, the theory is divorced from practice, the lack of social practicality makes it difficult to apply what has been learned. There is also a phenomenon of disconnection between the practical links set up by the specialty, which is separate and lacks the connection of design.

The Examination System of Practice Teaching is Unreasonable

The assessment methods of most of the practice courses are still the same as those of the general professional courses. For example, experimental results are only a small part of professional curriculum assessment, usually accounting for only 20% of the total scores. The evaluation criteria are mainly based on the attendance rate, the experimental report and the teacher's subjective impression. Similarly, there is also this problem in the internship link which is independent of the course, and its evaluation mainly depends on the attendance rate and the internship report. The final result is often mere formality, but lacks the reflection of the most important practical process and innovation in the internship process. These unreasonable assessment and evaluation methods will greatly affect students' attention to practice links, resulting in students perfunctory in practical learning projects[3].

The Establishment of Multidimensional Practice Teaching Mode

The practice teaching links of EPE mainly include in-class experiment, curriculum design, cognitive internship, production internship, graduation design and so on. In order to improve the quality of practical teaching, we go hand in hand. On the basis of strengthening the cultivation of experimental ability in the school, we make use of the social resources accumulated by professional teachers for many years to carry out-of-school practice teaching with the characteristics of our school, and construct a set of Multi-dimensional Practice Teaching Mode.

Pay Attention to the Cultivation of Basic Ability and Improve the Effectiveness of Practical Training in the School

The original course design content is optimized, and the adjusted class hours are used to strengthen the application training of engineering skills such as CAD, BIM. In the process of course design, the task division of each student is refined, their sense of participation and responsibility are increased, and better training results are obtained.

Strengthen the Cooperation between School and Enterprise and Establish Practice Teaching Base

The teaching of EPE specialty should fully grasp the practicality of the course, try to establish the organic relation between the abstract professional theory and the actual project, create as many opportunities as possible to make the students in-depth contact with the actual project, enrich and consolidate the theoretical knowledge of the class in the engineering practice, carry out engineering practice teaching at zero distance.

During summer vacation and production internship, students will be arranged to internship in the practice teaching base established by our school, and engineers with long engineering background and rich construction experience will guide the practice. Internship guidance adopts the form of combination of professional teacher guidance and site construction staff or project leader guidance. The construction staff or the project leader mainly carries out on-site instruction, and the professional...
guide teacher is in charge of the contact of the practice place during the internship, timely grasps the
field instruction information, processes or answers the problems encountered during the student's
internship, and leads the student to actively carry out the practice, solves the difficulties in
professional understanding, and follows the predetermined monitoring measures to monitor the
quality of internship.

Up to now, there are more than 7 enterprises that have become our practice teaching base. They
have their own characteristics, and their main projects are different. Our students are assigned to
different enterprises, exposed to different projects, different enterprise culture, and then back to
school to study, summarize the internship harvest, exchange the internship experience, enhance the
employment confidence. Students are more motivated to learn autonomously and obtain professional
information, thus enhancing their ability to solve practical problems in engineering, cultivating their
innovative consciousness and creative ability, so that they can adapt better to employment. Graduates
with good professional ethics, can quickly play a role in the production line.

**Taking the Design Institute as the Platform to Improve the Students' Engineering Design
Ability**

The graduation project is the most important practice teaching link in the undergraduate educating of
engineering, and is the last real-war drill before the graduates enter the post. During the process of the
traditional graduation project, the design state of the student is still in the mode of doing the
homework. Without the pressure of actual combat, coupled with the influence of job search and other
matters, many students have dealt with the graduation project with little effect. In order to change this
situation, we recommend excellent students to the major design institutes and production enterprises
in Wuhan from the beginning of our junior year, and construct the cooperation platform of industry,
university and research between schools and enterprises. Students use weekends and spare time to be
familiar with the work of design institutes and enterprises, practice and improve engineering drawing
skills, and help do some basic work. By the eighth semester, the graduation design of the students can
be arranged to the design institute and the enterprise to conduct, observe and participate in the actual
cases of the design institute and the enterprise. Under the actual combat pressure, the students' potential can be brought into full play, and the design ability is improved significantly.

**The Implementation of Multidimensional Practice Teaching Mode**

In order to ensure the quality of practice teaching, it is necessary to establish and perfect the
management system of practice teaching. Firstly, formulate and improve all kinds of practice teaching
documents, including syllabus, instructions and task books, and make clear the tasks and objectives of
practice. Secondly, strengthen the internship process management, adopt the double tutor system. The
professional tutor is responsible for daily management and technical and theoretical consultation, and
the site tutor (concurrently appointed by the enterprise or design institute) is responsible for the field
technical and construction management guidance. Thirdly, students are required to study the relevant
production and construction acceptance specifications carefully, strictly abide by the relevant
regulations on the spot, and ensure the personal safety in the internship process. Through the study of
all kinds of specifications, strengthen the understanding of technology and measures to ensure the
quality of production and construction. Finally, improve the evaluation system. Practice evaluation
should take into account students' attendance, learning attitude, task completion, log and report
collation, and strictly assess according to the pre-established assessment methods. For the internship
results, professional mentors and on-site mentors are also required to cooperate with each other to
give points, and there are on-site tutor units stamped as proof.

**Summary**

In this reform of practice teaching, the on-campus practice (e.g. experiment, course design), the
off-campus practice (e.g. production internship) and the industry-university-research practice (e.g.
graduation Project) are integrated organically, and a multi-angle and multi-level practice learning platform for all students is formed, which is composed of internal laboratory, off-campus production practice base and joint R & D center of school and enterprise. In recent years, the results of practical teaching in this major show that this teaching mode has overcome the defects of the traditional practice mode, and the practice process is interspersed with theoretical learning, which is beneficial to students' mastery of knowledge and skills, to arousing students' interest in learning professional knowledge, and to avoiding the phenomenon of disconnection between practice and theoretical courses. Compared with the traditional practice mode, the multi-dimensional practice teaching mode is more scientific.

Acknowledgement

This research was financially supported by the Teaching and Research Project of Wuhan Institute of Technology (X2016036, X2017036) and the Scientific Research Fund of Wuhan Institute of Technology (K201919).

References


