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Edited by

WONG Ho-ching Chris, CHU Kam-piu Louis,
CHUNG For Jonathan, CHAN Chung-shing Alexander,
and MA Chong-hoi Gary

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A STUDY ON THE STRUCTURE OF ENGINEERING TRAINING SYSTEM IN THE NEW ERA

YU ZHAOQIN, YUAN HUI, GUO ZHONGNING AND WU FUGEN

Department of Experimental Teaching
Guangdong University of Technology
Guangzhou
China

ABSTRACT

Engineering training is an important phase in education. It is an essential means of promoting students' innovation, engineering principles and their practical skills. We have made a preliminary study on how to build up a structure of the engineering training system under the new era.

KEYWORDS

engineering training, systematic structure, teaching reform

1. INTRODUCTION

With the enormous development of higher education in our country, there has been profound change in its model. It has made great impact on educational model of higher education from so-called elite education in the early period of opening and reform to mass education. Higher education is undergoing a remarkable transformation from traditional exam oriented education to comprehensive education. The Metallurgy Practice, mainly principled by traditional "Technique-learning, DIY-promoting, idea-model-transforming", is now developing toward a new direction of "Technique-learning, all-round quality-promoting, engineering practical facility-reinforcing". The enlarging enrollment in recent years has caused the employment problem of graduates thereafter. One of the important causes of the "tough employment" is that the graduates are not competent in the sense of engineering, DIY, practical work accessing. Being a local engineering school, we have to face the new problem of how to cultivate the talents needed by the market-driven society, so as to improve student's competitiveness in accordance with local economic construction. Therefore, it is necessary for us to construct a new engineering training systematic structure, and to enhance students engineering sensitivity and DIY facility, so as to facilitate the students for employment and meet the needs of talents cultivating in situation.

2. BUILD A NEW ENGINEERING TRAINING SYSTEMATIC STRUCTURE

To meet the needs of creative talents with high quality for the economic construction and social development in the new era, the discipline courses ought to be set scientifically, focusing on its qualities of advancement, openness, innovation, forming its own complete and scientific system, and promoting the students scientific manner, operating facility, engineering sensitivity, and comprehensive ability to analyze, discover, and solve problems, thus facilitating the students initiating, establishing and practicing ability. To accomplish this, the system of engineering training is to be modeled and layered, the main modules are: basic training of Mechanical Manufacturing Engineering, Thermo-engineering Training, Numerical control Technique Training, Advanced Manufacturing Training Techniques and Methods, Innovative Designing and Making Training, Electronic Technique and Electronics Training, Computer Assembling and Internet Organizing Training. The whole system has three layers:

- Basic Engineering Training, a compulsory course, mainly for 1st and 2nd year students, varied in contents and hours for different specialty, targeting at the basic understanding of traditional engineering and operating skill;
- Comprehensive Practice and skill Training, mainly for 2nd and 3rd year students, target-oriented training on specific subject for different specialty, further reinforcing students skill on that particular subject, and ultimately obtaining the vocational skills certificate;
- Innovation Training, mainly for 3rd and 4th year students, chiefly as selective course, for the competent students completing the innovation task under the supervision.

been enhanced, which plays an important role in promoting the quality of education, enlarging the educational scale, cultivating creative talents, carrying out quality education, and advancing the educational reform.

In order to improve the quality of the training course, we introduced the modern technology into engineering training, and set up the comprehensive engineering training platform, whose functions include course-selecting system, training items, facilities, mock training, initiating stage, self-testing system, etc.. Through this platform, students may understand engineering training items and its contents, laying good foundation for the selection of the training model. At the same time, the platform has made it clear the specific training contents and the way to use the facilities, before and after the training course. After the training, students may have the training effect tested through the platform. The old training had to be done on site, in which the equipment like numerical control machine was very expensive and could not meet the students' needs in number. This made it impossible for every student to operate himself/herself and it is not good for their knowledge-solidation. Therefore, a virtual training system is for students to carry out the operating practice such as numerical control processing, and assembling etc., via internet and computer. Apart from on-spot practice in class hour, training can be done through numerical control system after class, breaking the boundaries of time and space. The digital control system does not only save the facility expenses and training cost, but increase the students' operation opportunities. Furthermore, the training contents can be adjusted according to the development of the scientific technologies.

4.2 ESTABLISH A QUALITY EVALUATION SYSTEM OF ENGINEERING TRAINING

Engineering training is a basic practice course, it plays an important role as the theoretical and plays an irreplaceable in the training of student's skills, initiating sensitivity and DIY ability. As the change of engineering training module, it is necessary to establish a quality evaluation system of the engineering training to guarantee its quality. The evaluation criteria must be complete and precise, and reflect engineering training characteristics and its related factors, including training equipment completeness, contents, methods, discipline, business frequency, attitude and nurturing, etc.. Criterion has its weight and can be manipulated to reduce the errors of evaluation uncertainty. The quality evaluation system must be established to rapidly and precisely perform the evaluation and to improve its efficiency.

4.3 A CHARACTERISTIC TRAINING BASE CONSTRUCTION

Engineering training should not only base on the school of itself, but also whole face the society to play the example and radiating role and to share resource. The construction of GuangZhou University City provided us a favorite condition for the utilization of facilities shares. Our university, the main university settled in the City, has the only established engineering training center among the ten universities. The facilities can satisfy the needs of our university's teaching and training activities. It can also be shared with other universities in the form of payable use. This approach can not only improve the social university effect, but also increase our the economic benefits.

The training centre will also provide students the basic condition to participate various contests in and after class.

- After class innovation base for Robot Design and Making competition
- After class innovation base for scientific Design and Making
- After class innovation base for mechanical Design and Making
- After class innovation base for Electronic Design and making
- Challenge Cup

Moreover, the cooperation between universities and enterprises must be enhanced to make the full use of resources such as material- power and man-power, to provide students a good condition for their training and job.

Engineering training centre is not only a practical teaching base of engineering quality for the undergraduates, but also the modern public and practical teaching platform for the seniors to do course design, final project and post-graduate's research work.

5. CONCLUSION

Establishing of engineering training centre promote the reform of engineering training course system, teaching content, and teaching approach and means. It constructs the practical teaching system for modern talent cultivating, enhances students' basic skills, initiatives and intellectual qualities, improves the talent training

3. TRAINING CONTENT SELECTION AND RECONSTRUCTION

3.1 TRAINING CONTENT SELECTION

Whether the content is chosen right or not, determines the implementation of the target content design is a central task for engineering training and engineering sensitivity promotion. Therefore, the skill cultivating is emphasized in the arrangement of teaching content. Engineering training was developed from traditional Metallurgy Practice (MP), which was set up according to the practice hour and existing resources, it did not take the discipline factor into consideration. The MP had too much to learn for students that they had nothing but sensible recognition of it after practice for a short time, especially for the non-mechanic majors.

To improve engineering training and cultivate the students engineering sense and DIY ability, the training content has been reformed and reconstructed into modules, according to different training hours and contents. For the students major in mechanical engineering, all the courses are compulsory since their other continual courses and training are related. For the other students, the courses are either selective or compulsory because their practicing hour is short, and their demands are different. The compulsory module is an important and typical one, such as digital manufacturing, lathe operation, and bench work, etc. Through the compulsory courses, students are able to get the basic idea of the manufacturing process. Through training contents modulization, students can select at random the modules as required by hours and majors. Meanwhile, the design of the courses is at their intellectual and interest-arousing best, to inspire and initiate students. The old training could not stimulate or interest students because it only asked the students to process in accordance with the graph and technique. In contrast, the new content design made a great change, in which the tutors only instruct the students the basic operating principles, the manufacturing parts are designed by students themselves, so as to attract greatly the students interests. This has been made possible in welding and digital control. Through designing and making the small parts themselves, the students' sense of pride and sense of achievement has been remarkably enhanced. Therefore, the initiating sensitivity and DIY ability can be achieved.

3.2 FURTHER INCREASE THE ITEMS OF ADVANCED MANUFACTURING TECHNOLOGY

As the continuous development of scientific technology, there appear new technologies, techniques, and materials, which made manufacturing technology developing fast. ENGINEERING TRAINING need to keep the pace with it and cultivate the talents to satisfy the market-driven society. In the aspect of training content organization, the old techniques should be remained moderately to let students understand the basic knowledge of material molding and mechanical processing. In the meantime, some modern processing technology training items, such as processing training, flexibility system training, rapid prototype training, laser machining training etc should be added to the training. This will make students understand and familiar with the modern technologies and its developing trend. Students may be more sensitive to the production and development of the modern technologies, and understand the need for the combined knowledge of multi discipline. His expected the advanced manufacturing training hour will increase 50% of the total training hour within the two-year time.

3.3 CREATE A NEW OPERATING PATTERN

With the deepening of teaching reform, high education schools are carrying out the credit system, thus some modifications must be made to the operating pattern of ENGINEERING TRAINING. The old training pattern was centralized with physical class unit, and focused training with weeks. In the credit system, the physical class unit does not exist any more. Students may take the course at random. As a result, the changes must be made in the arrangement of ENGINEERING TRAINING. The reforms on the centralized training make it possible that students receive all-round opening-style training, which will give students flexibility, time and space. Students may choose corresponding course according to the teaching syllabus, and obtain the credits when they finish the training and pass the exam.

4. SET UP A COMPREHENSIVE ENGINEERING TRAINING PLATFORM

4.1 INTRODUCE MODERN EDUCATIONAL TECHNOLOGY, SET UP COMPREHENSIVE TRAINING PLATFORM

To make engineering training work well, we should not only work on the hardware such as the facilities, but also the software such as teaching approaches and teaching methods. With the development of the modern information technology and the deepening of the educational reform, the modern educational technology has

qualities and educational benefits, and optimizes public resource environment. We will continuously reform the teaching methods and system of engineering training, and improve the talent training quality to meet the needs of local economic construction and the needs of scientific and technological development.

REFERENCE

1. Ding Hongsheng etc. "Reform and innovatory of practice teaching system for engineering training", *Experimental Technology and Management*, vol.22 no.6, 2005, pp:1~4