

Discussions in Designing Industry Oriented Curriculum *

HE Qing-gang DING Jian-ru XIN Guo-dong

(School of Software, Harbin Institute of Technology at Weihai, Weihai 264209, China)

Abstract: Aimed at the requirement of the market economy, this paper analyzes the characteristics of the industry needed human resource and the existing curriculum system, suggests some methods of building the industry-oriented curriculum system of educating industrial talents, and studies the model of educating market needed qualified employees and teaching reform at the university level.

Key words: industry-oriented curriculum; qualified employees; curriculum system

CLC number: TP31 **Document code:** A **Article ID:** 0529-6579 (2007) S2-0037-04

1 Introduction

The quality of a kind of product lies in the whole process to manufacture it, including purchasing the raw material, equipment of machining, manipulator, arts and crafts, and management and so many factors. Despite every step has important meaning, but the arts and crafts of machining takes up the key effect, because design of arts and crafts include the requirements of raw material, equipment, manipulator, at the same time, more important is that it describes the mode and method of how to assure the quality of product. In other words, the design of arts and crafts possesses the key influence on the quality of product. It is the same in the higher education areas. Along with the development of global economy, the progress in science and technology, especially the influence of integrated economy in the globe make the human resource market put more requirements to the human resource. The enterprise needs more and more qualified employees who are capable of adapting to industry very quickly and best of all, and have international working background. In such circumstances, the universities and other educational institutes bear more and more responsibilities and pressures than ever before. Like the process in the arts and crafts of machining, the process of educating students is the crucial work for the university. The survival and development of the university are influenced directly by the fact that whether the curriculum in educating qualified work force has been set up scientifically, reasonably and in accord with the evolution of the market, whether the universities can produce eligible

talents for the society. Next, the paper will analyze and investigate about how to set up the system of cultivating industrial talents in the university.

2 What are industrially qualified employees

The so-called industrial talents can be understood as the talent which can very quickly adapt to the requirement of industrial evolution. The "adaptation" includes perception to the industry, the knowledge, the experience and practical abilities that an employee should have, and so on. This paper will specify the characteristic of the industrial talents from next four aspects.

Firstly, to educate for industrial recognized students, one must emphasize domain knowledge. This requires that newly graduated students not only have learned some specialty courses, done some lab exercises, but also should have understood and mastered the domain knowledge that they will engage to. For the software education, we cannot simply teach students the courses such as Principle of computer, operating system, development tools, database and software engineering, we must infuse domain knowledge to our education curriculum system, and let the students realize the value of software techniques from the domain view, and from practice of engineering view. In other words, we cannot only teach students knowledge, more important is to let the students know how to apply the knowledge they learned.

Secondly, skill education must be carried out. Skills exhibit the abilities using the technique. The re-

*收稿日期: 2007-10-28

作者简介: 何清刚 (1963年生), 男, 教授; Email: heqg_qd@sina.com

requirement of the teaching goal is that students should not only need to understand and master the general techniques, but also have the ability of flexibly using the industrial techniques. For the software education, we cannot only teach several development tools such as C language, Java language, more important is teaching students to use these tools for solving the practical problems in industry.

Thirdly, in addition to in-class teaching, students should have some experiences and social practices. Industry oriented education emphasizes application scene so that we must let students experience the practical engineering. Simple lab teaching is difficult to meet the requirement.

Fourthly, industrial oriented students should have innovation ability and management ability. At present, the pressure for graduates to take up an occupation is enormous, especially in the new economy environment, because many of the employers require the employees they will hire are "product" or "de facto product", but are not "semi finished product". To meet the requirements of employers, industry oriented students must have the abilities of selfmanagement and selfdiscipline.

Recently, many universities have suggested that their curriculum should be designed to "thicken fundamental theory and broaden specialty", namely to strengthen scope of fundamental courses, and to enhance the students' adaptabilities for their future job hunting. The motivation of this idea is positive, but has some distances with the requirement of human resource market. Recently, professional higher schools gain the acceptance from the human resource market in aspect of educating professional workers. The key point of their success is that they have produced usable graduates who master some kind of skills to meet various needs. Their success depends on their scientific and practical curriculum system. Universities have excellent students, have first class teaching environment and teaching resources, and should cultivate more outstanding graduates to meet the human resource market. It is of great importance for the universities in China to reform their curriculum system.

3 Discussions of industry oriented curriculum system

3.1 Deficiency in current existing curriculum

Traditional curriculum systems have been built according to subject and specialty in China. Because of the various rules concerning the education goals from the central government, the curriculum used by univer-

sities in China have had not been changed for many years. Although there have been some changes in the textbooks and experimental methods, the idea of "emphasize theory, ignore practice" still dominates the curriculum. The curriculum system at present has deficiencies in the following four aspects.

(1) Course arrangement has problem. At present, curriculum system used by universities has not fully considered the market requirements. The market needs seems to be not taken into account in theory teaching. Some universities do have adjusted and added teaching material regarding some needs of the economy market, however, as a whole, they still exhibit many deficiencies. From historical point of view, some curriculums are reasonable for use in the past, but from the evolution and requirement of economy and technologies, maybe they are meaningless. Some new courses that reflect the evolution of new technologies and specialties have not been added to their curriculums in time.

(2) There are problems in contents of courses. Some contents are out of date, and have not been cut out in time, while some new knowledge has not been added in time. In addition, there is a problem about the sequence of some courses, which should be taught first and which should be taught next are not arranged reasonably. Relative to this is the problem about the textbooks, some newly increased courses have no matched textbooks, and this affects the teaching effects directly.

(3) The time proportion for practice is insufficient. The lack of deep and particular research on theory teaching and practice teaching in higher education for many years results in that the proportion of practice is insufficiency. For the courses concerning enterprise management, the lack of practice is more obvious. Truth is from practice. Without practice, the ability of applying the knowledge students learned certainly can not be developed. The fact that practice classes is not enough leads to proportion of theory teaching is too large. So it makes the graduates look bookishness. They are in short of cognized skills, problem solving skills, and adaptability. Of course, some students give up learning due to not adapting or boring theory courses.

(4) There is a problem about instructors. The government advocates hiring instructors who have characteristics of both teachers and engineers in professional high school. I think this also can be applicable to the universities. There is fair number of professors at universities that is from school to school. They themselves lack practical experiences, and thus cannot meet the

requirement for industry oriented teaching

A good many deficiencies in our curriculum system lead to the fact that students spend more time and energy on learning pure knowledge but gain little progress at skill and domain knowledge. Therefore, the curriculum system should be adjusted and reformed urgently to meet the markets requirement.

3.2 Discussions on industry oriented curriculum

Accordingly, higher quality of product lies on subtle arts and crafts, so higher quality of graduates depends on scientific curriculum system. This section will discuss how to create industry oriented curriculum from several aspects.

(1) Make sure the cultivating goal

The survival and development of an enterprise depend on the approval of the market. Similarly, whether the students produced by the universities are eligible will be checked by the market too. Throughout the history, universities always view the educating qualified students as their key point of working. This is also the historical obligation endowed by the nation to the universities. Not all the students that get their diplomas are qualified employees. The truly talents have the ability to create useful value for the society. Therefore, the goal of educating industrial talents should meet market requirement. As an example, for software education, we cannot only cultivate the person who master the software techniques, but need to cultivate high quality software talent for meeting the markets requirement. School of software in HIT advocates the "internationalization, industrialization, high quality, high speed" as his guide line, and "high jumping off point, high level, high standard" as principle, which sufficiently embodies the requirement of market under newly economy environment. These educational goals are scientific and accord with the evolution of the community.

(2) Create the curriculum system

Maybe somebody will say that the curriculum systems we used have been there for many years, freshmen are enrolled in university every year, graduates step in to society every year and so the curriculum has no problem. But we should consider it from different views. Can we truly answer these questions? Do the course material, teaching hours, teaching methods are reasonable? Do we let the students learn the skill in depth? Do we have other better choices? Taking "software engineering" course as an example, which will be taught in every software specialty. According to our information about the course, most of them emphasize on teaching theory in class, and only a small number of universities require their students to develop some software in their labs when studying this course. As a result, quite a

mount of students have not learned the soul of the software engineering, they cannot apply fundamental principles in the software engineering in their graduation thesis or practical work. We can only admit that we don't reach the teaching goal.

Curriculum system is system engineering so that we must study it in an overall and development view. To gain our education goal, we should consider curriculum system from next several aspects.

a) Curriculum plan

That is to say, we should consider which courses should be provided for students.

b) The way of teaching and teaching hours

Which method should be used in the class? Does the course need lab exercise? How to deploy the theory teaching and lab work? Should we use social practice and other fashion as assistant teaching? How many hours are reasonable for the course? How to assign the theory teaching and the lab teaching?

c) Relationship between courses

Every course has some relationships to the other courses. We should consider the sequence and the time of courses, including considering a connecting link between the preceding and the following, considering how to avoid overlap and repetition between courses.

d) Examinations of courses

Namely, what kind of tests should be used to validate the course teaching? How to set up scientific and available exam criteria?

e) Experimental environment

Generally, technical courses need experimental environment. How to set up the requirement? Especially the case of lacking hardware conditions should be considered.

f) Requirement for the instructors

Instructors form the main body of initiating knowledge. How to guarantee the teacher's qualification? How to train and improve the instructor's team? All these should be considered.

g) Choosing textbook

Textbook is an important part in teaching. Appropriate textbooks that are suitable for teaching and are keeping up with the newly technology should be chosen.

First, we must decide which courses should be taught. Teaching content, teaching hours, teaching goals, exam criteria of every course should be considered. Second, we should consider how to reach our teaching goals, such as what method should be used in class presentations, especially in theory teaching, lab teaching, social practice and other teaching methods need to be discussed. In addition, we should consider

how to set up and improve teaching environment and teacher team.

Here, this paper just proposes the general ideas. If every aspect is well done, it will require a lot of effort and careful work, especially need the instructions from experts and scholars. For example, the criteria of exam should not be simply considered that the student will pass or fail to the exam, we should consider the criteria that whether the student has learned knowledge and skill. For experimental environment, we cannot emphasize that must apply theory teaching due to lacking of hardware conditions. With the evolution of the computer network, we can entirely use simulation to set up a good lab environment, allowing students to experience the practical scene. Some electronic courseware and simulated system about electronic commerce, market management, and enterprise management are at present.

4 Conclusion

Due to the feature of education enterprise, universities have no pressure about recruiting students. No matter the curriculum system is better or worse, it does not affect the survival of the universities. But from the view point which responsible for the nation, the community, the students, parents and the students, we should consider about the curriculum system in exist-

ence. The pressure of taking up an occupation for the graduates has been enlarged for recent years, this fact reflects that there are some problems in our education qualities.

From the evolutionary point of view, the qualities of our education should be checked by the market. If we cannot educate graduates who are in needs by the community, the employment rate will be decreased, and it will affect the development of the universities.

University is the base for educating students for the nation and they bear the historical responsibilities. It is worthy for the universities to study and discuss the need from the nation, from the society, from the economy in order to create suitable curriculum systems.

References

- [1] LIN F, YANG Y. Discussion on college teacher cultivation [J]. China Adult Education, 2006.
- [2] PU J. Research on college talents cultivation [J]. China Adult Education, 2006.
- [3] STEWART W R, HARTENECK M, WEISS S. Interactive teaching of adaptive signal processing [J]. Engineering Science and Education Journal, 2000(4).
- [4] ZHANG Y, WANG A. Considering on high quality creativity talents cultivation [M]. Electronic Higher Education Academy, 2006.