A Preliminary Study on the Undergraduate Teaching Reform of Computer Major

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Abstract

In this paper, the current situation of the undergraduate teaching of computer major is analyzed and some existing teaching problems are found. In order to solve these problems, we combine the current computer related specialized undergraduate learning experience with our own teaching experience for many years to propose several suggestions. Students' self-learning ability and innovation capacity are stimulated by student-oriented teaching mode and a variety of other teaching methods, simultaneously school-enterprise cooperation is conducted to improve the binding force of undergraduate knowledge and work practices.

Keywords

Undergraduates; Current Situation; Innovation; School-Enterprise Cooperation

Introduction

The undergraduate not only is the main object of institutions of higher learning’s cultivation, but also is the main body of higher education. Therefore, cultivating innovative talents and the reforming of undergraduate teaching have become a focus of attention, are important parts of higher education[1]. It is an important mission to promote awareness of innovation and practical ability, to improve the overall quality of students and create innovative talents that adapt to the social production and keep pace with the times[2]. But at the moment, most colleges and universities pay much attention on postgraduate teaching, the focus is also placed on postgraduate teaching. The lack of cultivation of innovative ability and practical ability is now a common problem in undergraduate teaching. This problem brings our society potential threat in cultivating fresh activists, because society needs graduate students to provide direct services. Therefore it is particularly important that undergraduate’s own ability adapt to the requirements of social development [3]. This paper starts from undergraduate computer major teaching and put forward some useful suggestions.

The Current Situation of the Undergraduate Teaching in Computer Major

The Current Situation of the Undergraduate Teaching of Computer Major

Now most colleges and universities in our country would like to arrange classes with first-loose and after-tight model, such as class of mathematics, physics, English, etc, for a transition period enables freshmen adapt to college better. During the sophomore year, school will arrange professional knowledge courses; different majors will have its own appropriate professional knowledge. For computer major, there are compulsory courses such as circuit-based, data structures, analog circuit, digital circuit, etc and elective courses such as multimedia technology, Internet software foundation and software engineering. In the junior year stage, students will conduct further study on the professional knowledge, including compulsory courses such as microcomputer principle and assembly language, introduction to communication networks, employment guidance, etc, elective courses such as human-computer interaction, network programming technology. There is almost no course in junior year next
semester. We find that the course schedule from freshman to first semester of junior year is relatively full; most undergraduates get enough credits in the first two years and half; the number of these courses decreases year by year and its difficulty rises as a ladder, which is reasonable, so it can leave enough time for undergraduate students to do their internships. But not all the universities arrange courses like that. Or some universities do not allow students to do their internships after such arrangement. In this way, it gives students a full theoretical knowledge, but they lack practical ability. Another reason is that the evaluation system based on examination is too single for undergraduate students, which forces students spending a lot of time and making much efforts to learn the theoretical knowledge. This will lead to facing the problem of difficult employment after undergraduate students leave school, especially for those who want to find a computer-related job[4]. It's root cause is that knowledge is detached with practice, which is the blind spot of undergraduate teaching. Of course we can not deny the importance of theory, but we should achieve the perfect convergence of theoretical knowledge and practical ability.

The Single Teaching Method

Now in the undergraduate teaching, some teachers are still scripted teaching, emphasis on the imparting of knowledge. The education mode of the 'You just teach, I just learn' can not attract students' interests and stimulate their creativity, which lacks the training for students' abilities. Undeniably, for the subjects like Higher Mathematics, linear Algebra, and College Physics, teachers have to provide a detailed explanation with few opportunities to interact with students, but ‘few doesn’t means ‘none’. Teachers can introduce the background and the connection between knowledge and reality to inspire students' interest, so we hope teachers can interact with students more frequently and combine the teaching mode based on teachers and the autonomous learning mode based on students. This is a reasonable style which not only provide students with the knowledge but also inspire their interests.

Formalization

Under the examination-oriented education environment, some teachers pay much attention to the teaching of knowledge. Even though many schools are promoting education reform, the actual work is not carried out. In some colleges, the practical classroom are just formalized where teachers just make the students to follow but not to lead them to explore independently so that many students don't really understand. For example, the metalworking practice is the compulsory course of engineering students, and its expectation of conducting the course is to develop students' operation ability, practice ability, and the ability of solving specific problems by applying theory into practice. But in most colleges, students just visit around under the guidance of the teachers, not operate the machine, so students' ability have not improved.

The Isolated Curriculum Arrangement

The arrangement of undergraduate courses is not flexible enough and is isolated, and the range of knowledge is narrow. It is the age of economization and information, and at the moment, versatile talents are needed, but the graduates teaching have no extensive and relevant knowledge system and can't combine the correlative courses together as a whole system. And the curriculum arrangement don't pay enough attention to the connection between different professional courses, so providing interdisciplinary talents for the society become impossible.

The Suggestion of Undergraduate Teaching Reform of Computer Major

School-Enterprise Cooperation

Today’s colleges and universities in our country pay more and more attention to practical ability of students, so these schools offer practical courses, such as: metalworking practice, electronics practice and so on, but these are too superficial and learning cycle is too short, usually about two weeks; before students have been able to integrate into the production practice, it has ended. Therefore, we should vigorously promote the part of the undergraduate internship during the school, the internship period for at least six months. In this way, students can combine theoretical knowledge and what they have learned with production practice during the internship. Learning purposefully related theoretical Knowledge according to the requirements of industry can greatly improve the efficiency and self-earning ability, then applying the knowledge learned to practice, studying again after practice,
and forming a virtuous circle. However, each company has its own enterprise culture, enterprise system, enterprise advantage and enterprise platform, so different students should choose enterprises suited themselves which are more advantage to their career development. Not all companies have the same practice value.

Such as IBM, as a web builder, its enterprise environment looks very easy, but the work efficiency is very high. According to IBM’s internship students, in the second day they into the company, they accepted the professional training for their different directions. Then company assigned a mentor for each person, who is responsible for training their skills in their own direction. The public training is some programming skills, such as JQuery, HTML, CSS and company standards related testing. Thus, the company not only trains knowledge that companies currently use, but also develops skills which future use. What’s more, the company offer training courses that employees can voluntarily participate in (such as English speech, Japanese training, etc.). From a technical level, IBM has a high degree of technology integration; most of the work have been made into platform. For example, most people need to write code to build a website, but IBM is not; it has its own system, and only need to click the mouse to complete the relevant operations; its website design do not require many knowledge about code areas.

Such as LINE company, which is a Japanese Multinational corporation, the headquarter is in South Korea; the company is not been known better than IBM, but it is a good choice to exercise themselves for undergraduates that just graduated from school, and most of its users are young people. According to the narrative of interns who had been to LINE, its management mode is very orderly; there is a regular meeting for 10-15 minutes every morning when they discuss what they did yesterday and what they are going to do today, and share their discoveries that others may learn from. In the regular meeting, they put forward their questions to discuss and answer doubts, so employee’s work efficiency is very high. LINE as an independent research and development company, not only trains interns’ program development ability and learning ability, but also develop their thinking skills and innovation skills. Setting different difficult projects to lead them to learning step by step. But project involve the direction of their future work, so that they can fully understand the future work after they finish their projects. Each team is assigned a senior leader, who just help them correct the general direction and answer questions, but the analysis process and the specific learning direction need to be dicided within the team. And each team can experience the whole process of project development: demand analysis, overall design, module design, software development, simulation. Each stage has a time limit, and also need to make the appropriate report for every reports, so each intern can suffer the pressure of project development. In the project development process, making decisions need to combine everyone’s view, so everyone has to be familiar with every detail of the project, not just the part that they are responsible for. In this way, a project development process can keep in everyone’s heart, thus to enhance the ability of each person in all aspects.

The above two examples illustrate that IBM and LINE are valuable internship companies for students, because these companies focus on efficiency and results. Compared with the cumbersome system, they are more concerned about employees’ creativity. IBM cultivates students’ thinking ability and work efficiency on a higher platform. As an independent development company, LINE can not only cultivate program development capabilities of students, but also develop their thinking ability and capacity for innovation, especially for the share and discussion of the LINE company’s regular meeting, it creates a positive and effective learning and working environment for undergraduate interns.

In terms of engineering, the school encourages students to enter enterprise for practice, at the same time, school should also invite enterprise engineering technicians, senior operators and CEOs as the Guest Lecturer to go into the college classroom to introduce some frontier science and technology and research directions, and explain the actual production practices for the undergraduates, thus undergraduates being able to meet the social needs before they are not out of school. In this way, the embarrassing situation that knowledge is divorced from work practice will be solved.

The Diversification of Teaching Methods

Under the traditional teacher-based teaching modes, colleges and universities should promote students’ self-learning modes and the interaction teaching mode between teachers and students. Teachers can provide teaching courseware for students, which will not only make students carry out independent learning and understanding for the knowledge without understanding in class, but also will strengthen students’ mutual communication and
exchange after class. At the same time teachers can provide students with some learning websites or learning databases, and encourage students to swap roles with teachers in class when they finish study: the student says, the teacher listen. Then the teacher makes an evaluation summary for the student who has given a lesson, and makes a correction and improvement for his errors and shortcomings. This can not only increase the interaction between the teacher and students, but also improve the enthusiasm of the students.

**The Curriculum Integration**

Now teaching curriculums are too much dispersed, each discipline is isolated, but future social development is comprehensive and integrated; we are unable to use a single discipline to solve complex problems. Therefore, we need to establish a integrated curriculum and develop comprehensive talents[5]. What are the Integrated Courses? It is the combination of education with social practice theory and application development to increase some professional foundation courses of other areas on the basis of previous computer major courses, such as: communications, electronic science and marketing. For the knowledge of these fields, we do not require the depth , but the breadth. Schools should make great efforts to cultivate talents who are able to work independently in the production and technical department. In terms of curriculum reforming, schools should breakthrough the original teaching modes, vigorously push comprehensive research, build an interdisciplinary and inter-professional new framework, and create new types of integrated curriculums.

**Keep Pace with the Times**

With the study of courses, undergraduates gradually get in touch with some professional knowledge, and also gradually define future development direction. However it is worth noticing that although these knowledge is classical, they often can't keep up with the pace of the times. Most of the theoretical knowledge has been divorced from productive practice at current stage. For example, some operating systems in computer major textbooks, they have been unable to be applied in computer for social production and can not satisfy the performance requirement that people require. So they have been eliminated in reality. Schools can recommend some relevant websites and BBS, so that the undergraduates can learn more advanced knowledge and understand more advanced science and technology in the field. At the same time, we should be in line with international standards by communicating with foreign colleges and universities, and introduce teaching methods and management ideas of global top universities. It requires China's colleges and universities be more open, keep pace with the times and promote academic research, cultural exchange and teaching cooperation. They are mainly embodied in following aspects, such as the exchange of teaching ideas and new scientific research achievements, the discussion of papers, the exchange of overseas students and so on. It greatly promotes the communication among schools and countries. At the same time it also provides more choices for the domestic undergraduates. What's more, it integrates with advanced science and technology in the world, broadens students' horizons and thoughts, and also improves their creativity and practical ability.

**Conclusions**

This paper analyzes the current situation of undergraduate teaching of computer major, discusses some existing problems in the teaching, and puts forward some suggestions. Especially the school-enterprise cooperation, we give two examples to illustrate the necessity and advantages of stepping into the enterprises, and hope to point out the direction for the undergraduates under the situation of grim employment, and also lay a certain foundation for the exploration of the undergraduate teaching's reform of computer major.

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**REFERENCES**


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