

On China's College Computer Education

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Summary

The computer technology develops so dramatically that it has brought great impact to the whole world. However, the information industry of our country cannot keep up with that of the world, which is closely linked to the education. This article discusses the existent problems with our computer education and also has done some research on the correlative measures concerning with these problems.

Key words:

Computer education, Teaching material, Teaching method, industry-academy-research, Innovation

Introduction

The 21st century is an era of knowledge economy. In the new age, every aspect of the human society will get dramatic change, causing people's conception changes, too. The development of informatization makes the contemporary society's information inflate rapidly. Some knowledge, without prompt popularization, has been substituted by the new knowledge. The renewal and development speed of computer science knowledge is even much faster. And our computer major in higher education also develops beyond times. The computer's excessive popularity has also brought a series of social issues. At present, there is a strange phenomenon on the job market. On one hand, the IT talented are so deficient that enterprise has to seek them eagerly. On the other hand, many graduates as well as the person having certain technology cannot satisfy the job requirement of enterprises so they cannot find favorable work in the job market. Then, what types of talented persons are needed on earth in the IT profession? What kind of computer education can conform to the social demand? These questions are worth of the computer educators contemplating deeply.

2. The Problems of Computer Education Existing in China

The shortage of the talented in IT industry is by no means accidental, but is destined by the following factors. A present situation of Chinese computer education is that education ideas, teaching methods and teaching systems always

serve for teaching merely. This situation also complies with our history development and the actual national situation. As for college students, taking an elective course just means another several credits and participating in computer grade test just indicates increasing several bits of chip for job-hunting. While most of them don't care about how much ability they can enhance. This kind of phenomenon is closely related to Chinese employment-obtaining guidance and reality. And at the same time the pure teaching issue also cannot be separated with the lack of teaching practice and teachers' own experiences.

The main cruxes that the college students can't obtain the favor of the employer are that they lack of applied skills and their basic employment-obtaining qualification cannot meet the employers' demands. At present, the teaching material is a little far behind so the gap between education and the enterprise's actual demand is in enlarging day by day. Moreover, too much elementary education has suffocated the talented and narrow down their development space. The university attaches more emphasis on theoretical teaching than the cultivation of students' applied capability, so the students have difficulties in keeping the pace with market demands. Usually they need 6 to 12 month-long training to be competent with work after coming to the post.

2.1 The Limitation of Traditional Computer Teaching Material

It is reported that up to now, many universities' computer majors are still using the backward teaching materials published in the beginning of the 1990s. For example, the Language of FoxPro which has already been considered as a backward programming technology and discarded by the majority of IT enterprises is nevertheless being taught in many universities. Furthermore, the computer grade test takes it as main content to check the students' computer ability. As a result, many students have to learn the discarded knowledge. An IT professional believed that the curriculum system and the course content being used in the university have already fallen behind current popular IT industry for 3~5 year on the whole. So it will be no doubt that the students are difficult to find jobs as their studying materials are outdated and obsolete. Recently, some IT professionals in Guangdong Province also point

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out that traditional computer education in colleges and universities has severely fallen behind the current technology trend both in course design and in its content. This can be considered as one of the reasons why many graduates of computer major have difficulty in job-hunting nowadays.

It is understandable that content of the textbook usually lags behind of practice, because teaching material is the summarization of historical or practical experience. However, if it falls the behind to such an extent as to block the talented-cultivating, then it should be paid much attention to or treated with seriously. The teaching material of computer education in colleges, especially of the software education, seems to be in such a dilemma.

2.2 The Deficiency of Teaching Method

It is a general phenomenon that the computer majors are poor at practical operating, which to a great extent caused by the teaching method which is not in accordance with the computer mode. In China, computer education takes the textbook but not the practical application as its teaching focus and it concerns little with practices or applications in many teaching materials. Compared with other developed countries, it is without any effort to find out this problem.

The University of Pennsylvania, where the first electronic digital computer was born, not only attaches importance to the elementary education for the undergraduate but also to the occupational training and the specialized preparatory course education. Practicality, but not the pure academic study, is the consistent attitude of University of Pennsylvania [2]. The school authority establishes various kinds of cooperative relations with the periphery enterprises. The students put themselves into practice for half a year in the enterprise and then return to school to continue study for the rest half a year since their third grade. This way can improve the students' practical ability quickly. Though it may take them five to six years to finish their undergraduate course, yet the fact proves that those students' practical capability is far better than that of many other schools'. Furthermore, the enterprises may discover the talented person and the students can also learn much more about the IT industry through this kind of school-enterprise cooperation. On the contrary, Chinese domestic computer majors have little contact with outside enterprises and they just immerse themselves in the boring theory all day long, which brings a series of problems such as indifferent study motive, poor practical ability and difficulties in job-hunting. As any computer curriculum is closely connected with practice, so it is undoubted to make a joke for the application and development of computer without the concrete and practical operation. Of course, we don't oppose to the relative research on the practical

application and development. In fact, the theoretical research on computer science has been going on consistently since the first computer was produced. But it is worthy to know that all the theoretical researches serve for the development and application of computers. Because computer itself is the tool and means for management.

The motive of learning knowledge always originates from the urgent actual need. If the students participate in the practical application first, then they will consciously study and resolve problems met in the practical process. This can not only unite the theory with the practice but also change students' passive method of study. Because the sense of achievement can stimulate their study interest and more importantly it can enhance students' abilities to study and to solve problem. Generally speaking, the majority of domestic students know about computer just through textbook and teacher's classroom explanation and illustration, while they have little actual experience. Programming is a headache for computer majors. Many students get remarkable scores in their examinations while they even cannot deal with basic operations. This is the sorrow for Chinese computer education.

3. Adopting the Computer Education Experiences of Foreign Countries for Reference and Cultivating Its Own Way to Computer Education

The information world changes unpredictably so we cannot divorce oneself from reality and should open the education pattern. On one hand, many educators think that the western education pattern is not suitable for China, so they repudiate and deny it totally. While on the other hand, some others westernize Chinese education pattern completely. In my opinion, I think we should take its essence and seek the difference while reserving common points. In other words, we should seek the education mode that conforms to Chinese students' characteristics from the western education pattern, as it were, to walk a computer education way with Chinese characteristics.

American universities set its curricula with a definitive objective, which is for students' employment-obtaining. Thus what the American students' learning is much integrated with what the market demands, and every year the curricula involves related textbook with a new version. As soon as some high technologies come to the world, the American universities commence to compiling new teaching materials, because they realize that it is of great importance for curriculum setting to keep the same pace with market demanding. While the fact is that too much learning courses will not always present anticipated results. With more than 30 class room hours in a week, the Chinese students haven't enough time to think and to reason,

not even to say the complementary of extracurricular knowledge. It is capability that should be cultivated. American universities stress on capability and application, so from operating system to database, they are taught in laboratory. Another thing to supplement the difference is American flexible exam system, and even practice etc. is one of the matters to check the students' capability. And also, in abroad, the way of lesson teaching is that a tutor, usually in charge of about a dozen of students, has the face to face talk, person to person communication with the students. The tutor sets the cultivating scheme in conformity with individual student. And often the tutor starts his class with some primary point, and then the students do by themselves. This teaching method can foster and stimulate students' studying and reaching voluntariness actively. Domestic higher education is lacking of elimination through selection and contest, especially for postgraduates. Where the postgraduates go into a university, he can get diploma. In American, owing to severe contest and higher researching requirements in college or university, the higher education the students take, the higher ratio that they will fail the selection. If the student cannot meet the qualification or fail in the defending of his thesis report, he will definitely not acquire his diploma. Only his research takes the lead in international academic world, can he obtain Ph. D of first-class college or university. And it is forbidden for doctors to work in his Alma Mater (including Harvard University) immediately, unless he has graduated for 5 years at least. With this provision, the exclusion of academic outsiders can be forcefully removed, and the academic and technological improvement can be effectively promoted.

The curriculum of science department in Columbia University pays attention not only to the computer science theories and mathematics but also to the computer experimental technology. One part of the undergraduates' computer curriculum is related to computer directly, such as program language, operating system and computer system structure. While the rest concerns with the theoretical computer science and mathematics. The practical experience is an essential factor to the computer majors. The university students participate in teacher's research projects and use the newest equipment frequently. Highmarks students always serve as tutor's assistant in computer center and provide for campus computer users with much service and convenience. While those outstanding students assist their teachers to do some research projects, especially on software development [3]. This way is also becoming popular in the mainland gradually and some ivy software institutes have already tried it firstly and obtained certain effects. But it still needs further efforts to popularize this way in all universities completely.

The Chinese always think with the conception that the bigger the college is, the better it is. While, in this way the Princeton University is quite contrary. Although it doesn't bear enormous amount of acreage, even without the school of law, business, and medicine, it still enjoys worldwide prestigious. With the traditional tenet: We needn't do everything, and what we should do is to do what we want to the best, the Princeton University actively develops its ascendancy and does its adjustment well, but not to pursue a grand scale blindly. And for such a long time, the Princeton University boasts its theoretical research and holds such outstanding team of instructors. From rudimental and elementary to academic class of computer science and advanced self-governed experiment, the Princeton University provides about 40 courses which potently satisfy various demands of the students. If you major in computer science, you should at least select two courses from each of the three series: theoretic, systematic and applied. About 90% of the postgraduates are qualified to win scholarship, which lessens students' worries about economic burden, and further, ensures students' concentration on school work and investigation. And also, beside the Princeton University locate many research institutions or corporations, such as AT&T, Lucent Bell Lab, NEC, and ETS etc, which not merely furnish with much intellectual and cultural diversity, but provide with a great deal of job opportunity.

In conformity with the teaching experiences of computer science in foreign countries, and in view of the present existing problem, we should make a deep level reform in the teaching material, the content and the teaching pattern.

3.1 Utilizing the Macro-regulation Solution to the Teaching Material Delayed Problem

The journalist of the Net Easy science and technology newspaper interviewed some experts and professors and obtained the following several methods to solve the teaching material delayed problem. Firstly, Chinese government should increase financial investment to the teaching of computer science. Secondly, the compilation of computer teaching material should be let loose properly. Thirdly, the publishing house should strengthen the communication with the author. Fourthly, we should contemplate how to attract the authors, for example, enhancing the invigorative mechanism [4]. What's more, it also can adopt original English teaching material directly, or the teaching materials compiled by the instructors immediately participating in teaching and scientific research.

The synchronized renewal of teaching material will bring the course content to follow closely with the development of the international mainstream IT technology (or industry) and keep the uniformity of social demand. And it also will make students to stand in the front line of computer

technology and adapt to the employment pattern with the best state.

3.2 The Industry-academy-research Pattern of University's Science and Technology Centre

Seeing about the talented person training pattern for computer in India will give us good enlightenment. India is just inferior to the USA and ranks number two in the world in software research and development. The practice is the main teaching mode in India's some well-known computer training organizations. The teaching route doesn't conform to the normal pattern but the reversed one which refers to do firstly and then study the needed knowledge met in the practical process. The specialized theory students are required to do projects since their matriculation. The training center divides the project in hand into several small parts and asks every student to complete a small part which urges the student to study actively during the process of doing project. All the students of training center practice in the company to accumulate work experience in the last year which also gives a chance for the enterprise to understand his employee [1]. The famous Indian National Information Institute company (NIIT) has 600,000 students and 3,000 training bases. It combines the collegiate education with entrepreneur's training and the classical theory with practice. They pay great attention to the cultivation of students' team cooperative spirit, the managing and expressive ability, and also the ability of information collection and analysis. Many senior technicians and administrant, coming from some famous international IT corporations, have been teaching in NIIT and they attach much more attention to practice than teaching concepts [5].

The success of Indian software industry owes to India's education pattern, and some vocational colleges in China also have adopted this method of combining teaching with research and production. However, there are not so many in universities. The massive practical talented people are needed by society and there appears a phenomenon that the undergraduate students are inferior to those students who graduate from technological academy on the ability to adapt enterprise. The development of higher vocational college requires innovation and new thought called the path of the combination of teaching with research and production. So does the university computer education. As the diathesis of college students is better than others', so they can be both professional and erudite to meet the society's requirements.

The industry-academy-research pattern is the cooperation and integration of research, education and production which has the advantage of function and resource, the butt-joint and the coupling of the upriver, center and downriver of technical innovation, and the effective reali-

zation form and the way of transformation of scientific and technical result and the industrialization. It requires all cooperative quarters to conform to the rule of the social productive forces and the technical innovation, following the market's competitive principle, to establish the foundation of its all quarters' cooperation according to own strength, and to realize the complementary and the new combination of all quarters' superiority and the devoted element of production. The outer environment also produces the tremendous effect on the complementary and the new combination of the element of production. According to the combinative relation of all quarters, the industry-academy-research way can be divided into three kinds: the technical achievement transformation, risk-taken together, system-revised and reorganization [6]. The goal of university is to enhance self-development ability and the strength of running a school through transforming the technical achievement to the product, to realize the combination of teaching with research and production and further to improve the quality of the cultivation for the talented, which result in producing more and better achievements. Only by connected with the enterprise truly can the students understand the society's latest tendency completely and adapt to the society's employment better.

3.3 Building Up the Innovative Education Notion

Former president Jiang Zemin points out that the innovation is the soul of a nation's progress and the endless power of a country's prosperity. The core of knowledge economy is the innovation. The realization of innovation depends on the innovative person, which demands the educational mode to be reformed thoroughly and to cultivate innovative talents actively. And it should also focus on the training of the students' innovative ability and making great efforts to cultivate their innovative consciousness and innovative ability.

In computer education, the teachers should pursue the question type of teaching mode to train students' innovative ability. It doesn't adopt traditional teaching mode which takes teacher as focus but adopt the student-focused pattern. In this way, students can discover and solve problems in the question situation. Teachers can act as the mentor who can lead students to learn to ponder over the question and to act on one's own or cooperate with other people to finish the task. Teachers should also encourage students to query daring and guess boldly not adhere rigidly to the routine. The teacher should make sure award people with fishing but not merely gives people the fish. To change the computer classroom of the traditional spoon-feed teaching pattern, we should let students participate in the class through discussion or operation, no longer acting as a pure listener, and then incorporate themselves in the study actually. Taking the hardware assembly

for example, because of some limitations, we seldom let students really dismantle and install the machine but ask them to know about through some video materials, which makes students be unable to understand deeply. The teacher can explain some present information of the hardware when students begin to learn the hardware so that it can strengthen their memory of information through the sense of touching the material object. As for the teaching method of the language course, it can inspire the enthusiasm of studying through showing their individual works. The teacher should pay attention to training the student's dispersed and convergent thinking to train their innovation abilities in the course of giving lessons. There is a typical example. It can inspire students to grasp knowledge better through making the postcard. As one problem can be resolved in many different ways, so teachers can encourage students to look for different methods and compare them all to obtain the optimum one which will not become the burden to students but make them understand knowledge profoundly. Only by real understanding can innovation and breaking through appears.

4. Conclusions

No matter educational idea, teaching method or the content of teaching material should develop from the mode of pure theory to the one of application development and liberate from the mode of traditional thinking and open up a new wide space. To dwindle the gap of our country's computer education, we should upgrade the idea of computer education, adopt the successful experience of foreign countries for reference, and gradually solve the problems that exist in Chinese computer education. In daily teaching, the teachers should learn how to guide students to make them become the solid foundation in computer field and how to spring up the IT industry of China to make it be the giant of the software industry in the world.

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