

Discussion on Teaching in Computer Course of Information and Computing Science

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Abstract

The information and computing science is the cross-disciplinary of mathematics, information science, planning and control and computing science. The author summarized the experiences through several years teaching practice, analyzed the current situation of the speciality with the actual situation, pointed out some problems in professional curriculum and students' learning, presented some opinions on guiding principles in teaching, teaching content and teaching methods. Teachers should play the advantage that the students of this speciality with a solid theoretical foundation in mathematics, content some classic mathematics problems into study of programming languages, combine the computer theory with mathematical theory, optimize the curriculum design subjects, penetrate ideas and methods of software engineering into the teaching experiment. Under the guidance of these opinions, we have gotten some good teaching results.

Index Terms: Teaching contents; teaching methods; information and computing science; computer teaching

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1. Introduction

Information and computing science is a new mathematics class speciality that it was listed by the Ministry of Education in 1998. It is the cross-disciplinary of mathematics, information science, planning and control, and computing science. The main research contents is the core of information technology and the mathematical theories and methods for solving scientific and engineering problems by using of modern computing tools efficiently. It is science speciality which is the basis for the study of mathematical of information and computing science. It will train some senior talents who would have good mathematics foundation and the thinking capacity in mathematics, can master the basic theories, methods and skills of information and computing science, can be trained through the system of scientific research and can solve the practical problems in technology of information science and engineering[1].

The speciality requires the students can not weaken their mathematics foundation, This is the main characteristics of the students that they are different from the students of computer science, information

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engineering technology. At the same time, it also requires the students have the capabilities in scientific research, design and development of the software in information and computer science initially by a more solid computer training. The main courses include mathematics foundation courses(such as Mathematics analysis, Advanced algebra, Analytic geometry etc.), Probability and Statistics, Mathematical modeling, Numerical analysis, Computational method, Computer graphics, Logistics and optimization, Information technology infrastructure, Advanced programming language design, Data structures, Database theory and Application and operating system etc. Thus the graduates are required to skill the computer, including the common program language, tools and some specialized software and have a basic algorithm analysis and strong programming ability. In recent years, The author had been engaged in teaching computer on this profession. presented some opinions on guiding principles in teaching, teaching content and teaching methods by thinking teaching problems and summarizing teaching experiences in this speciality, in order to provide some references for raising teaching standards.

2. Analysis on the situation

2.1 some problems on curriculums

This speciality has not only adapted to the talents training and professional development of mathematics with information technology as the core of the global economic development pattern in the new century, but also brought a positive impacts to the mathematics class professional recruitment. Since 1999, there had been nearly 400 colleges and universities offering up the information and computation science speciality . However, due to rapid enrollment growth, also be lack of sufficient knowledge and the limited experience on information and computer science professional content, talent training objectives, course content, curriculum, etc. so there are many problems need to be solved in practice and exploration. The speciality construction is also in constant development and improvement, there are some defects such as the speciality orientation is not clear enough, the curriculum is not reasonable, the teaching faculty is relatively weak and the employment objectives are not clear[2-5]. In programming language setting, some institutions arrange four language courses from the second semester in the first year of college, including C++ program design, VB program design, PowerBuilder program design and Java program design, This curriculum inevitably leads to each language teaching is at its most basic teaching stage, there is not enough time to complete case analysis, there is not enough time for students to make a more realistic project design . To avoid this kind of circumstance happening, we can arrange two to three semesters to learn a foreign language program design, lets the student to learn a language intensively. So-called learn intensively, is that the students can not only grasp rules of grammar of the program language, but also understand the programming ideas , master debugger to handle errors and apply this language to solve practical problems flexibility .Other language courses can be used as elective courses . Because if the students can master a program language, they can know the others just know that thing. Although they do less, but the harvest is great.

2.2 Misunderstandings in student learning

There are some misunderstands in students learning process, as shown in table 1

Table 1 Problems analysisTable

<i>No.</i>	<i>problems</i>	<i>Cause results</i>
1	Some students mistook "computing science" as "computer science" in completing the volunteer.	This will lead to their learning objectives are not clear, do not know how to build professional knowledge structure and professional skills and contrary to the professional development of the position.
2	Some students are keen on learning computer courses, and ignore basic courses in mathematics.	They can not play the professional advantages, and they are at a disadvantage in employment compared with computer science students .
3	some students neglected study of the courses related with computer ,because there are many math courses in this major,	They can't establish the thinking way of program designing, it will cause the students are weak in practice and are deficient ability to solve practical problems

From table we can see when some students were applying information and computing science , They mistook "computing science" as "computer science" speciality . But after admission they discovered many specialized courses connected with mathematics, they are not interested in these courses from their heart. This has led to the students do not understand their profession learned, seriously affect their learning attitude. It is mainly manifested that they ignore the importance of basic courses, but eager to learn professional courses. Because they don't understand of professional and the basic courses of mathematics are difficult to learn, many students do not know how to build professional knowledge and professional skills, learn with blindness, misunderstand that professional courses not associated with the basic course, so they eager to study information science or computer science courses. This method of learning against the position of the professional development, so the students who are not proficient in each discipline are likely cultivated. Although the students can learn a professional course well, in the long run, the method will greatly limit the potential for the professional development[6]. Therefore it requires the teachers should give correct guidance to these students, let them be clear about this professional connotation and training target, analysis of the professional obtain employment direction, eliminate them the misunderstanding to construct knowledge structure.

In the course of study in computer courses, the students can have two incorrect psychology. The first one, they are keen to learn the computer and neglect of other courses, this lead to their professional knowledge is not perfect, they can not play the advantage of the professional. With general computer professional graduated students compare, they have not advantages in their employments, because of the limited computer courses and the narrow expertise. The other is that they ignore the course connected with the computer course. They considered themselves to learn mathematics, so the program design way of thinking are not established fundamentally, because many mathematics courses are offered in the speciality . This leads the students are weak in practice, so they have the lack of confidence in computer programming. It also does not conform to the training objectives of information and computing science that we should cultivate application-oriented talents. Therefore cultivating the talents who should not only have profound basis theoretical, but also they have strong analysis problem and solving problem abilities. Such abilities can reflect our professional characteristics and advantages. It requires that we must take different ways of training talents from the traditional undergraduate mathematics and computer science and explore various ways strenuously. It is necessary that we adjust the curriculum and update the course contents, but also we should pay great attention to teaching ways and methods and improve the quality of teaching in order to cultivate talents with professional training objectives.

3. Combine the professional characteristics in computer teaching

3.1 learning the programming language with classical mathematical problems

Many problems exist in programming language teaching. There are many circumstances which will not result in achieving the desired effect of teaching, because the contents are more, the design methods are flexible, the practicality is strong, so some teachers can't grasp the teaching goals, contents and methods easily and some students are difficult to change the traditional learning way. In order to avoid the circumstance happening, It is the key that we should mobilize students' learning initiative and train students' correct learning methods and the ability of analyzing and solving practical problems[7-9].

It is the first thing that let students can master programming language syntax in programming language teaching. When the students are learning grammar, they are not required to rote these rules, but they should operate experiments repeatedly, thus it is not only can improve students' ability of debugging, but also can deepen the students' memory about grammatical rules. Secondly, It is required the students should master the basic algorithms used commonly. Algorithm is a description of the limited steps for solving a particular problem, the algorithm is a key part of the design for problem-solving. In the algorithm teaching process, the author often combines with some classical mathematical problems, such as the rabbit breeding, crossing the river, Hanoi tower and seats allocation problem etc. These mathematical problems can arouse student's interest generally, they can lead the students will think mathematical methods positively, then write algorithm and draw chart and program to validate the algorithms.

Finally, it is the ultimate goal of programming language that writing programs to solve practical problems. So we should use a large class time to analyze some examples with actual problems. Analysis process is very important, we can never do the work after class, because the contents in class are more and the time constraints, so the students only can see a programs that have been written already, then explain the function of every part of the program. While it can save the time to input the programs, but it can't help students to comprehend the ideas of programs design, can't find the problems in the process of program debugging, while also can't train the problem-solving skills. When teachers are analyzing a problem, they should use natural language to describe algorithm and explain the algorithm of problem in details. Then analyze and summarize the variables will be used in the program, determine the type of each variable, and define the variables. Finally, collate and write the procedures. The students should be familiar with the whole process of dealing with practical problems after such an analysis. We can exercise students' analysis abilities as they have a certain basis. Each one will have different ideas, let everyone to discuss and compare the advantages and disadvantages of different methods. Thus the students not only can master knowledge, and the classroom atmosphere can be activated, It is the more important that the students can overcome the fear of difficulties after many exercises. It also can avoid the circumstances that students understand the teacher's explication of the contents, but they do not know how to began writing the programs from which parts. Students will learn to analyze methods of solving practical problems naturally through this exercises.

3.2 the combination of computer theory with the mathematical theorys

The computer is an essential tool in the research of information science and computing, so it is important that we should do well the teaching of information and computing science professional computer courses. The discipline related with computer science grows and expands really based on the theory of In mathematics, so we should make full use of the students' advantages in mathematics on, let them grasp the theories of computer course

In the teaching process, The author has combined mathematical theory with computer theory closely under the guidance of the ideas, let students learn the computer theory with the better mathematical theory. For

example, in the teaching of Data structures , how to integrate mathematical theory with computer theory in the Data structure teaching process is introduced. Discrete Mathematics is compulsory course before Data Structure. The basic concepts such as list, tree and graph in Data Structure course are important concepts in Discrete Mathematics course . If the students can understand and master the basic theories and the related algorithms in the learning process of Discrete Mathematics course, Then they will do more with less in the learning of the Data Structures course. In the Data Structure teaching, we should start from concrete examples, then guide the basic concepts of abstraction for the students from the view of mathematics gradually, and as much as possible to use mathematical language to describe and define them. Because the students of the information and computing science with good mathematical basis, they can accept the theory of computer courses easily from the viewpoint of mathematics. In Database Principle and Application course, as we are teaching about the relational data theory of relational database , we emphasize the application of mathematical theory too. The relational data theory is based on the mathematical theory strictly, if we use the basic concepts definition and description , we can get a better teaching effect. Therefore, the teaching methods which proceed from the actual problem, explain the mathematical description and definition through the examples and integrate the of mathematical theory with computer theory, can not only play the advantage in mathematics of the information and computing theory fully, but also can mobilize the enthusiasms and initiatives, make the students participate in the theory of learning computer courses and feel boring no longer. Through teaching the computer theory, We will train the students good application ability.

4. Select a good course design subject

Good curriculum design subjects for computer courses are very important ,so teachers must make the different course designs for different computer courses . Take the Database Principle and Application course as an example, first the teachers can analyze some database systems for students, let the students have a global awareness for the development of database system by operation and explanation in the classroom. On this basis, the teachers select some small-scale and practical application system design topics for students, give some relevant information about the topics , through which students can make a needs analysis as soon as possible. It requires students write software documentations and user documentations strictly follow the formats given by the state software development standards, write program codes accordance with the norms of software project, provide a better graphical interface and scalable architecture. The teachers monitor the various irregularities of students. Students can form a group freely, the specific division of labor of members are arranged by the students themselves, so that they can develop a good team spirit. The students can choose a design topics selected carefully by teacher, as well as can choose their own interesting topics , such as Scholarship Assessment System or Student Performance Management System of our department. The choice of development platform and tools can not do any restrictions, so it can to create personalized learning space for students, so that the students in different levels can develop fully and freely, let the best students come to the fore.

5. Conclusion

In order to cultivating the talents who should have good mathematics foundation and mathematical thought and strong practice abilities, the author brought up the points that the teachers should exert the advantage fully to combine the mathematics theory with the computer basic theory , choose course design topic carefully , penetrate the software engineering methods to the teaching of computer courses theory by analyzing the professional computer courses by summarizing the experiences through several years teaching practice.

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