Pedagogy in VB programming design course for science and engineering majors

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Abstract. VB programming design is an important general course for science and engineering majors. Effective learning of VB course is critical for students to develop practical skill in using VB to solve scientific and engineering problems. This manuscript refines our experience in teaching VB courses accumulated in many years. Our discussion and analysis of VB course pedagogy have been shaped to meet the specific characteristic of students in science and engineering majors. Our practice in applying those experiences in VB teaching proves to be effective in improving the quality of education.

Keywords: VB programming; Method; Research.

1. Introduction

VB programming is an important course for students in science and engineering majors. Unfortunately, VB course materials are quite abstract, and difficult to understand. In the meantime, this course is also difficult to teach because of the challenge to consider the variety of students' knowledge background and aptitude. Although there are a number of publications that discussed the pedagogy of VB teaching, their analysis were all from a single perspective. Therefore, the effect of these publications to improve teaching quality may be limited.

VB programming teaching should comply with the development direction of computer software design and with the characteristics of structural programmer design. Teaching should be based on the engineering problems, following the basic education principles. VB programming teaching should also combine the theory and practice, and utilize multiple teaching approaches to fortify the learning effectiveness, and forester the students' interests. Looking over the trend of fundamental education of computer, programming language teaching reform should be centered with the improvement of the students' ability. VC teaching should serve to support the specialized education in the major program. Therefore, there is desperate need to improve the teaching approaches and to refine the pedagogy that is suitable for students in science and engineering majors. This is beneficial for the sustainable development of the fundamental education in computer [1-2].

2. The teaching philosophy of computing –oriented thinking

VB programmer design is an important fundamental course for college programs in computer, and is also the required course for non-computer programs. The objectives of the course is to learn the algorithm. Ultimately, the course would enable the students to know how to operate the computer and develop computer programs for innovative problem solving.

The essence of computing-oriented thinking is the conceptualization and automation. In the process of teaching, it is recommended to incorporate several similar or relevant learning points together, and design the teaching tasks accordingly. For example, the teaching of equation solving could be started with asking the students to solve the problems using mathematical methods, and then direct the students to develop the conceptual ideas for programming. It is also recommended to use multiple methods or algorithms to solve the same problem [3].

It is desired to combine the teaching of fundamental programming skills and the developments of computing oriented thinking, by stimulating the thinking of the students in the process of learning. In

the process, the students can internalize the knowledge they learned in the class and further develop the self-dependent computing thinking. This will act as the basis of their life career in innovation in science and engineering.

3. Make Reasonable Use of Teaching Mode, Cultivate students' Interest in Learning

Now, the mode of VB teaching usually adopts multimedia which is informative with text and graphics. Teachers demonstrate the case designing, running and procedure and the result of the dynamic change. The advantage is the visualization of complex problem and the translation of dull study content into vivid illustration. However, it is difficult for students to understand and absorb in such speed of teaching. Therefore, teachers should not use multimedia blindly. For illustration of algorithm or program code, it is suggested that teachers write on the board in some cases, so that students have enough time to absorb the knowledge. So, teachers should switch between multimedia and traditional board writing according to the teaching content and the differences from students' acceptance to improve the efficiency [4].

As the saying goes, "Interest is the best teacher". The teaching should start with stimulating students' interest by choosing some interesting and practical program such as supermarket cashier system to interpret how to design applications by VB. In addition to this, teachers could demonstrate some fascinating programs such as Super Mario, Angry Birds, etc. to attract students and tell them that it is easy for you to write similar programs by learning VB.

4. Specific Goals, Step by Step

Due to the period limit, lessons full of contents and few students preview. It's suggested that teachers clarify learning objectives before the class, which help students know what to learn in this class [5].The knowledge is divided into 3 grades in syllabus: mastered, comprehend and apprehend. There should be clear priorities in teaching that is emphasizing the knowledge required to master and explain the left in the syllabus.

It is the first time for most students to learn computer language. The principle of "popularity and acceptance" is also fit for VB teaching. Learning programming is a gradual process. Teachers should teach step by step, wisely approach difficulties and select reasonable textbooks during the whole teaching procedure to help students form scientific method of learning. For difficulties, start with relatively simple example to allow students understand. After a period of practice and accumulation, introduce and summaries more complicated ones to help students learn deeply and incorporate learned into new contents so that it allows to set up substantial relation between the original concept and new knowledge.

5. Complying with Students' Aptitude

First, take students' age, basic, interest and attitude into account. Analyze the complexity of the knowledge and design specific cases according to students' computer background. Second, group students by analyzing their difference. Every group consists of different levels and assign better acceptable ones as group leader to strengthen their cooperation. Third, teachers should think about students' knowledge structure and ability when design cases to adapt different levels. The operation target divides into junior, intermediate and skillful. Junior means basic operation, intermediate means continuous and less-error operation, skillful means efficient, habitual and correcting errors immediately [6].

Teachers should mobilize students' enthusiasm according to individual differences. The polarization of programming courses is obvious, some students like programming and some don't. How to meet students' demand and improve their practice ability and spirit of innovation need teachers overall consideration.

6. Strengthen Practice in Class, Consolidate Teaching Content in Time

The teaching objective is to make students understand and master the theory and apply it to actual problems. Teachers should clarify the content and allow enough time for practice. The exercise should integrate the teaching content closely and under teacher's supervision to consolidate theory and improve composite analysis capability. During the office hours, teachers should inspire and guide them to solve problems on their own. The general questions should be explained to the whole class. Though lots of practice, students understand all-round and in-depth which provide basis for next class and is good for teaching [7].

Homework and exercise class are important part of teaching which reflect the degree of understanding. By more restrictive problem-solving procedure to strengthen students' efficiency. Exercise class should be student-oriented rather than disguised teaching that is mainly about the weak spots reflected from the basic knowledge and class exercise and homework. Hard questions and references could be assigned to the students who have learning capacity to cultivate their interest.

7. Make Use of Network Resources, Cultivate Students' Ability to Learn

Using network recourse to build network teaching platform to remedy the limitation of traditional classroom teaching and provide broader study environment. VB study system should include excellent course website, Q&A forum, homework forum, BBS, testing forum and QQ group, etc. Electronic teaching plan (ETP) forum is available for students to download ETP. The QQ group helps students discuss topics of interest or exchange learning experience, it not only strengthens communication between teachers and students but also promotes study and cooperation. Teachers could check homework online. Students could raise questions in Q&A forum so that teachers would answer in time. There are appropriate number of tests in testing forum for students self-testing to increase enthusiasm to learn. By reasonable using of the VB study system and integrating traditional teaching, the teaching benefit from visible information, controllable process and reusable recourse.

No matter traditional, multimedia or network teaching platform, every method should complement each other to get good results. The relation between teachers and modernized teaching means are subject and tools which cannot upside down. Only with the teachers who can mobilize variety of media, make good use of network, play teacher's dominant role and inspire students' initiative, the process can improve the teaching effect [8].

8. Reasonable practical Teaching Reform

Mastering VB programming should pay equal attention to theory and practice. Practice not only consolidates theory but also is the base to put theory to use. The reason why students understand teaching examples easily in class but difficult to start new topic is lack of practice [9].

Beginners cannot write efficient code without lots of program reading. Reading program is divided into coarse reading and intensive reading. The former is to learn good programming habits from the framework and structure of the program and writing styles of coding; the latter is to understand key codes and master algorithm, such as cumulative, multiplicative, sorting, searching and data exchange, etc.

Many students have rich theoretical knowledge but poor operation skills. Teachers usually arrange tasks in advance which is just knock by steps in textbooks. The negative impact is students are lack of thinking and disconsolate when meet similar question. To avoid operation without thinking, teachers should arrange operation tasks before class so that students could fully prepared, they can validate and debug programs in class which is helpful to their ability to find and solve problems.

Although VB programming is simple, it is powerful and practical which can solve not only arithmetic operation and string manipulation, but also database application system development, multimedia CAI development and network applications ,even game development. It's suggested that teachers interpret and arrange some small program designing to improve students' practical skills.