Reformation of Computer Programming Language Teaching in Higher Vocational Colleges Based on the Characteristics of Python Language Grammar

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Abstract: Computer programming language teaching in vocational colleges has long been influenced by our undergraduate education, while the teaching of computer programming language in China was influenced by western universities. The development of computer programming technology faces different levels and different characteristics of students, as such the choice of computer programming language cannot be target-less. The development of the programming languages in the market has their own advantages and disadvantages. Thus, specific teaching language cannot be generalized. The purpose of this paper is to analyze the current situation of computer programming language teaching both in China and overseas, to explore the problems of computer programming language teaching in higher vocational colleges, and to propose teaching methods and ideas of computer programming language based on Python language grammar normative to the characteristics of higher vocational education.

Keywords: Python, vocational colleges, introductory programming language

The choice of computer programming introductory language is one of the core links in the construction of computer teaching system in higher vocational colleges. Different languages not only reflect the educational philosophy of computer science in different schools, but more importantly, affect student first impression pertaining to computer science. As most students need to learn and understand the programming language, the introductory language will become the mother tongue of programming for most students whereby it will deeply imprint in their thinking mode. This introductory language helps students to get rid of the mystery of computer and software programming, and to build a basic understanding of the program and an initial understanding of the computer computing model. In the follow-up
professional basic course and professional course learning, this programming language should serve as a major tool throughout the courses, to help students to understand the computer system, master the algorithm and data structure skills, and familiarize the operating system concept. Besides, students can understand the principles of compiler knowledge, understand the software abstraction and basic software design, complete a certain amount of curriculum and extracurricular project practice, and to establish the right software development practice. In addition, this language must be a mainstream programming teaching language, otherwise students use not what they learnt and thus the learning motivation cannot be guaranteed.

1. The contemporary domestic and international computer introductory programming language teaching mode

Prior to the mid-1990s, American computer programming introductory education was mainly conducted in Pascal language. By the end of 1990s ANSIC language was a more popular choice at many American university programs. In 1998, an association of the American instructional programming recommended C++ as an introductory language. After about two or three years of unsuccessful practice, at the beginning of this century, the American computer education community generally accepted the Java programming language as the preferred medium until the year 2014. In 2014, Philip Guo, an assistant professor of cognitive science at the School of Computer Science and Engineering at the University of California, San Diego, pointed out that Python has become the most popular language for teaching Computer Science (CS) introductory courses. Among the Top 10 CS departments, 8 were using Python language; 24 out of the Top 39 CS departments were adopting Python language in their introductory course, thus showing its high acceptance of practicality.

In China, until the mid-1990s, the BASIC language and its variants were still the main teaching mode of the computer programming course. By the late 1990s, C language was established in the Chinese university engineering computer programming language education in the mainstream status. A small number of domestic colleges and universities gradually began to switch to Java as the introductory programming language. However, until now, most of the higher vocational college computer students are still sticking to C programming language as an introductory programming language course.
Objectively, C language as the most efficient implementation of the programming language, the function is undoubtedly strong, the application is also very broad, and as a computer professional teaching language is understandable. However, the C language inherently has two very important flaws, which makes it rather unsuitable as the current programming language for the computer major of higher vocational colleges.

1.1 Not having an object-oriented performance

Computer programming language development until now is geared towards object-oriented programming as the current mainstream medium of programming. C language is a typical process-oriented programming language is not conducive to students to grasp the logic and ideas of a quite different object-oriented programming language. Thus, it is difficult to quickly adapt to the present market demand for programming skills and method.

1.2 Lacking of rigorous grammar norms

C language syntax is too flexible and C language is more difficult to grasp than other high-level language from the teaching point of view. As a language used in computer programming, C language is very inappropriate from the perspective of language structure and grammar norms. Students find it is difficult to form a standard language norms and to learn from others on how to write a program. On the other hand, many students also need to conduct a further second study in the company to master the standard language paradigm after graduation.

2. Problems faced in the teaching of programming language in higher vocational colleges

2.1 C language contains general bias theory

As the C language is process-oriented, biased towards the underlying characteristics, its application to the teachers and students is relatively difficult to comprehend. At present, the computer programming language teaching model emphasizes grammar teaching. Teaching process is mostly theoretical knowledge and lacks practicality. There is a lack of student-related programming skills in the teaching content, including the ability to reference documentation, the ability to use development tools, the ability to debug, and the ability to deploy projects.

2.2 Vocational students lack learning interest on the computer programming language

C language as a computer programming language for students of vocational colleges is theoretically speaking too complicated with a rather complex data structure and algorithm setup, which making it generally difficult to master and apply effectively and efficiently. Thus, it is giving rise to fear of learning programming course. Meantime, students are now learning the C language first, but C language differs from the mainstream of social business applications which is object-oriented language. As such, it entails starting all over from the beginning for a switch from C language to object-oriented language at later stage for the student to effectively catch up with the mainstream requirements in the business world. It appears daunting and will remain a great challenge to be overcome by programming students.

2.3 Entry programming language practical knowledge is unable to meet the requirements of society

Computer programming language course in higher vocational college aims to develop the ability of students. The purpose is to develop professional software developers, not for the examination and college credits, but geared towards the future employment of students with a deeper relationship to the future of professional software development team formation. Higher institutions’ teaching methods center on lecturing, though practical aspects have been incorporated, little emphasis or attention is paid to that aspect of learning. In real essence, teaching methods have not changed much
and the students’ practical standards required of them to face the working world have not significantly improved or may have even been neglected. Achievements fall short of expectations, so computer programming teaching is considered out of touch with reality.

3. Normative teaching ideas based on the Python language

3.1. Python programming language features

C language standards are written in the basic principles of C language and C design spirit. There is a saying: “Make it fast, even if it is not guaranteed to be portable.” This sentence laid the C language design first to adapt machine intuition, followed by adaptation to human intuition. Hence, there will be a pointer to this memory address display, array subscript from 0 instead of 1 to start the design logic that violates human intuition.

In contrast to the C language, the Python language design concept is basically geared to human intuition, so the “executable pseudo-code” reputation. Its syntax is straightforward, and unlike most other programming languages using curly braces, it uses indentation to define block of statements. If there is indentation of the place where there is no alignment, the program will be considered erroneous, which from the grammar point of view will strictly ensure the preparation of the normative program. This brings a great advantage, that is, Python learners do not need to pay too much attention to the details of grammar, but can be more focused on the format of standard specifications and programming thinking, which is the most important beginner programming.

At the same time, Python is a completely object-oriented language and functional, where module, number, and string are objects. Besides, it fully supports inheritance, overload, derived and multiple inheritance. It is conducive to enhance the reuse of source code. Python provides a wealth of APIs and tools to allow programmers to easily use C, C++, Python to write expansion modules. The Python compiler itself can also be integrated into other programs that require scripting languages. As a result, many people use Python as a “glue language” integrate and encapsulate programs written in other languages. Many projects within Google, such as Google App Engine, use C++ to write high-performance parts, and then call the corresponding modules in Python. These features of Python language greatly enhance the learning of C, JAVA and other languages and also a good extension of the learning path.

3.2 Project practice-oriented teaching model

Because of the high readability of Python, students can master the basic language concept. Under the guidance of teachers, students can understand and implement the source code debugging procedures, the current foreign GitHub, the domestic code cloud and other free open source code platform that can provide a large number of leading case examples. Moreover, because of GitHub branch function, it is able to make a project code from the creation to completion of all the stages of code and is found to be very conducive to the teaching practice of students.

At the same time, the teaching process is not theory-oriented but project-oriented. Taking the famous Python Flasky project as example, starting from the social network site infrastructure framework, database configuration, user service design, background functions to completion of debug deployment, and each step has a complete branch source. In the teaching process, using the project module to drive students’ interest, starting from a complete project to the project needs to drive students' knowledge needs, follow up the theoretical knowledge to explain the project theory. This is also very beneficial to students in understanding the requirements of the market programmers and in adapting to the employment status by laying down a solid foundation as soon as possible.

In conclusion, the use of Python as the computer programming language entry course, and even the entire computer, software, network and other professional language class introductory courses, while implementing the project to project practice-oriented teaching model, there are several significant advantages. Firstly, Python uses indentation to define
a block of statements, which means that Python’s syntax is limited to the character level. If the student does not have mastery over indentation when compiling the program, after some practice will learn to master the strict grammar norms which is the equivalent of writing a good programming. Secondly, Python as an object-oriented programming language is comparatively easier to read and understand and can be as flexible as C language, and also as good as JAVA with respect to rigorous structure. Python also helps to facilitate the next stage learning of mastering any advanced language, and also facilitates students to develop programming interest. Thirdly, Python has been used in Google in 2004 to promote the use of one of the world’s IT technology leader, thereby proving Python’s advanced technology and market prospects. Python appears under various platforms namely, the network program, APP development to scientific computing, artificial intelligence, graphics and image coverage is very wide. It is also very conducive and beneficial to students through the algorithm, data structure, system theory, compilation and data processing, software design and component technology and other key areas of knowledge. Therefore, students can fundamentally understand the principles and construction of modern software systems and through effective practice to establish the correct concept of software design and good engineering practice. On this basis, learning of C/C++ , Java or Ruby in the future will be greatly enhanced.

References
7. Ling X. Higher vocational colleges based on the training of applied talents as the goal of C language teaching reform ideas [J]. Chinese Information 2015 (2)