Research on the Reform of Online Course Construction for Computer Science Majors

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Abstract For students in the field of information, especially in the direction of computer, it is important to practice to master the idea of problem-solving programming and develop good programming habits, with the idea and vision of using computers to solve practical problems at the beginning of university studies. Therefore, building a good online course platform is of great significance to the training of professionals.

1. Introduction

For students in the field of information, especially in the direction of computer science, it is not enough for them to master only a few programming languages. They are important in the beginning of university studies, we must work hard to master the problem-solving programming ideas and develop good programming habits, with the computer to solve practical problems of thought and vision. In this way, it's not just about learning the programming language itself, but about opening up the mind and laying a foundation of thinking. With this foundation, it makes practical sense to take classes on various programming language tools, and it is also easy to get interested in learning and to use the programming language as a beneficial tool to implement your own algorithms and solve problems. At the same time, it will also give you a strong motivation for further courses and even research activities in graduate school.

2. Organization and Organization of Teaching Content

Changing perceptions: knowledge in the basic areas of programming consists of basic concepts of programming and the art of programming (skills). To master these basic concepts and design art, must be based on rational learning and rational practice. Competence is skill-based knowledge, a synthesis of knowledge. A basic course in a highly practical discipline such as this can never be learned without more hands-on work, but it is also different from the kind of course that simply focuses on explaining programming languages and completing operations. Programming requires a solid theoretical foundation, disciplinary approach and method of thinking to guide practice. In short, it is about both hands-on and brain-based rational thinking and practice.

Student-centered: Quality education emphasizes respect for the main role and initiative of students, the development of students' potential, and the formation of a sound personality as its fundamental feature. Students are the main body of teaching, and the first thing to be taken into account in arranging teaching is the goal of cultivation, students' cognitive laws and learning characteristics. Every aspect of teaching should take into account the actual situation of students, so as to help motivate students to learn and guide them to learn actively. Scientific worldview and methodology, rational thinking and practice, good programming habits and the spirit

of cooperation with others should also be incorporated into the teaching content. We focus on interactive teaching; we also pay attention to differentiated instruction according to students' abilities.

3. Use of modern Information Technology

Use multimedia electronic lesson plans, taught in class and published online.

We have opened a self-developed and designed web system for this course, which is also one of the features of our education reform. We give full play to the role of "sharp students", guiding them to a higher level, and develop course-specific network software on the purchased server machines, providing a platform for online Q&A, online homework submission and automatic marking.

3.1. Curriculum and teaching reform

Highlight the focus, the principle of this course is to teach students to "hold the watermelon" rather than "picking up sesame", focusing on problem-solving ideas, algorithm design, programming ideas. Programming language statements are just expression tools, classroom only talk about some of the main, subtle things not to say. Students are required to think positively in class and try to learn as much as possible in class. Emphasis on hands-on training, in the process of writing programs, so that students improve the use of the computer as an intellectual tool to analyze the problem and problem-solving skills.

Encourage and guide exploratory learning, according to the learning theory of constructivism, students, as the main body of learning, construct their own knowledge structure in the process of interaction with the objective environment (refers to the learned content). The teacher should guide students to explore the regular understanding in the practice of problem solving and programming and elevate the emotional understanding to a rational level.

Active interactive teaching, in the teaching process to actively create an active, relaxed classroom atmosphere, interactive, to avoid only the teacher to talk, everyone passive listening to the situation. In order to avoid a situation where only the teacher speaks and everyone listens passively, we should encourage everyone to think about the example questions and encourage students to introduce their own methods and opinions and start discussions. Invite "junior teachers" or other high level students to give "special reports" or demonstrations on a practical problem, as well as to explain the topic.

The regular onboarding training and practice is intensified, and the group time for onboarding is 7 hours per person per week. Each small class of undergraduates is assigned at least two "junior instructors" to tutor the students during the scheduled machine time, and one assistant is assigned to each of the two small classes of undergraduates to tutor the students during the scheduled machine time.

Reform the examination method to test real skills. There is no written test, and the questions will be solved on the machine, and the machine will mark them objectively.

Exams are not an end in themselves, but only a means to test learning. Therefore, work should be done on a regular basis. A web-based system has been constructed for this course, which allows students to use the web environment to ask questions, download assignments, submit good source programs, and finally use assessment software tools for objective and automatic grading.

After specific teaching practice, we have achieved very good teaching results, and students have given us high praise: "The teaching method is unique and innovative, in-depth and inspiring, which stimulates students' interest, motivates them and helps them to improve their independent thinking ability (quoted from Tsinghua University Teaching Evaluation Result Inquiry)." The students who participated in the work of the "small teachers" increased their sense of responsibility and cultivated their professionalism. Their standards and abilities were further enhanced: a number of them represented our university in the ACM Student Programming Competition.

3.2. Staple

The work of building the online course for this course is based entirely on the aforementioned pedagogical philosophy, with the following key elements.

In terms of teaching materials, we will aim at high-quality teaching materials and provide supplementary handouts on the online platform step by step to further improve and enhance the quality of the supplementary handouts. The main direction of our efforts will be to make them more concise, easier for self-study, and more directly able to guide students in their practice.

We will also further improve the electronic lesson plans for the online courses. Our starting point is that the e-Teaching Plan is not to repeat the existing content of the textbook, but to try to take advantage of the advantages of multimedia good at expression, animation, intuition, etc., to make the static content of the book more easily understood by students.

Further strengthen the system in the course network and consider adding interactive functions such as online discussions, small design animated presentations, etc., in addition to the questioning, answering, questioning and machine marking that have already been implemented.

Further improve our online examination system and build a formative assessment system.

The teaching of problem-solving programming ideas as an entry point, the choice of a high-level programming language (C++) as a support tool, and the supplementation of the online course with a large amount of relevant material highlight the focus and the uniqueness of our teaching philosophy for this course.

Emphasis on hands-on practice, using the "baton" of the examination: "object-oriented programming" this course is a high-intensity mental work. It is not to listen to, not to see, but to practice. Focus on the development of hands-on ability of students is one of the outstanding features of our online course construction, so that students can make full use of online courses to improve their practical hands-on ability. At the same time, through the network course reform assessment methods, do not engage in paperwork, the implementation of machine test, machine assessment, test the real skills, but also to urge students to practice has played a role in promoting.

Grasp all teaching sides and strive for good teaching results. We have implemented interactive online classes to create a lively and relaxed learning atmosphere; we have tried to teach students according to their individual abilities and to unlock a lock with one key: one-on-one tutoring for students with poor fundamentals, additional tutoring for international students, and opportunities for "junior instructors" and a few other students with good fundamentals to further develop their talents. Make full use of online courses for teaching and learning services: multimedia electronic textbook production, online quizzes, online homework submission and automatic correction.

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