Teaching Research of the College Computer Fundamentals Course

Na-na ZHANG¹,a and Fang-qin XU¹

¹Shanghai Jian Qiao University, Shanghai, China
*a nanazhang2004@163.com

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Abstract. In order to adapt to the new needs of talent cultivation in the rapidly developing information society, improving undergraduate’s information literacy, strengthening undergraduates computational thinking, and cultivating undergraduate’s ability to apply information technology to solve disciplinary problems, which have become the direct driving force for the teaching reform in the college computer fundamentals course. This paper analyses the current situation of college computer fundamentals course, and proposes the teaching reform direction: reshape course structure, update course content, integrate teaching resources, reform teaching methods, construct online courses, revise cultivation scheme, promote the cross linkage of computer fundamentals education and professional education, and build high-quality college computer courses.

1. Introduction

New information technologies are constantly emerging, Cloud Computing, Internet of Things, Mobile Applications, Big Data, Artificial Intelligence, etc., which have brought disruptive changes to the entire society and human life. These technologies contain a wide range of development space in various fields. It is also the growth point of the intersection of various majors and information technology.

National strategic plans have been issued one after another. In December 2016, the Ministry of Industry and Information Technology put forward development plan (2016-2020) about big data industry. In July 2017, the State Council put forward development plan about new generation of artificial intelligence. At the end of 2017, the Ministry of Education officially announced the "General High School Information Technology Curriculum Standards (2017 Edition)", emphasizing that the high school information technology curriculum aims to comprehensively improve the information literacy of all high school students. In April 2018, the Ministry of Education put forward artificial intelligence innovation action plan for universities. In 2018, the Party Group of the Ministry of Education approved the "Opinions on Accelerating the Construction of High-Level Undergraduate Education and Comprehensively Improving Talent Training Ability" to accelerate the construction of high-level undergraduate education, and comprehensively improve the ability of talent cultivation.

Under the background of the new era, cultivating compound innovative talents is the fundamentals demand of the society for the cultivation of talents in universities [1]. College computer general education courses have shown special importance. College computer fundamentals course education must play an important role in the cultivation of innovative talents. College computer fundamentals course education must undergo substantial or even subversive reforms. Reform the course framework and teaching modules, and build a "multi-level, multi-
module, self-constructed" curriculum teaching system, as shown in Figure 1, which can improve information literacy, strengthen computational thinking, and deepen integrated applications.

<table>
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<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
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Prerequisite level

General level

(Required)

Advanced level (Limited selection)

2. Current Situation and Problems of Computer Fundamentals Teaching

The computer fundamentals courses of our university is mainly the fundamentals theories of computers and the operation of common software. The content is relatively simple and can no longer adapt to computer learning of the new era undergraduates. **2.1. The Undergraduates’ Needs have Changed**

The high school information technology curriculum standard has been implemented, most of the computer fundamentals content has been studied in the high school stage. College students are more interested in emerging technologies, the content of college computer fundamentals courses can no longer meet the learning needs of undergraduates in the new era.

**2.2. The Social Need has Changed**

Information technology is developing rapidly, and college computer fundamentals courses are out of touch with new information technology, so that the computer knowledge mastered by students cannot meet the needs of social development and professional development.

**2.3. The National Strategic Level has Changed**

Various national strategies and excellent talent training programs require a certain high-quality fundamental of information technology. The current competency goals of computer courses are not in line with the national strategy.

Universities should make a fundamental reform of the knowledge system of computer fundamentals education as soon as possible, and to guide computer science education with ability as the guide, so as to help develop the core competence of students.

3. The Research of Teaching Methods

3.1. Revise Cultivation Scheme

The college computer course is divided into three levels: the advanced level, the general level and the advanced level. Revise the elective requirements of the computer fundamentals courses:
When the freshmen enter the school, they must take the computer test. Students who fail the test must take the computer fundamentals introductory course. Students should pass relevant formal tests to lay a solid foundation for college computer courses.

(2) The general level.

Establish a college computer fundamentals course system with the "1+x" model adapted to different teaching levels.

"1" is a compulsory course, mainly learning the content of university information technology, and the start time is the first semester of the university; "x" is a required elective course with three modules: Digital media foundation, Artificial intelligence foundation, Data analysis and visualization. Each major selects the corresponding module to study according to the characteristics of the major, classes start in the next semester. Students initially have the awareness and fundamental ability to apply information technology to solve problems in the subject area.

(3) The advanced level.

By setting limited computer improvement courses for majors, students can develop a deep understanding of the ideas and methods of a new generation of information technology, enhance their frontier information awareness and field innovation capabilities, and solve practical problems in the subject field through the in-depth integration of information technology and professional applications.

3.2. Reshape Course Structure

The college computer fundamentals course is divided into 1 required course and 3 required elective courses, as shown in Figure 2. The compulsory course content is information technology foundation, internet foundation and information security; the elective course has 3 elective modules: digital media foundation, artificial intelligence foundation, data analysis and visualization. The main content of digital media foundation is digital media technology, digital sound, digital image, animation foundation, video processing foundation, digital media integration and application. The main content of artificial intelligence foundation is computational thinking, programming foundation, artificial intelligence technology foundation and application. The main content of data analysis and visualization is data thinking, data analysis foundation, database application foundation, and data visualization foundation.
3.3. Update Course Content

The content of course teaching should be changed according to the development of social economy, technology and industry, it needs to reflect the forefront and contemporaneity [2]. Students can understand the fundamental principles and technologies of the new generation of information technology, initially have the awareness and fundamental ability to apply information technology to solve problems in the subject area. Through the integration of information technology and professional applications, Students can solve practical problems in the subject area.

As the first computer course for non-computer majors, college computer fundamentals courses need to explore more in-depth reforms based on computational thinking, focusing on a deep understanding of the fundamental principles of computers and a good grasp of technical characteristics to promote the cultivation of creative thinking. Focus on promoting course content updates, introducing new generation information technologies such as Internet +, cloud computing, mobile applications, big data, artificial intelligence. So that students can understand the current development trend of new technologies and the impact of the integration of these technologies with other industries. Strengthen the mastery and understanding for general and fundamental methods, improve the ability of comprehensive application of knowledge to solve domain problems, stimulate students' interest and potential in learning, cultivate applied talents with "Internet +" thinking, "big data" thinking, and "artificial intelligence" thinking.

3.4. Integrate High-quality Teaching Resources and Build an Online Learning Platform

Create online courses, use Chao Xing, BB and other learning platforms to share high-quality teaching resources, so as to achieve a good atmosphere for teaching and learning.

Reform teaching methods and improve learning effects. According to the new situation, new tasks and new requirements of teaching reform and education informatization development, rationally develop and appropriately integrate network teaching resources, fully tap the value of teachers' own curriculum resources, learn from each other, make progress together, and strive to cultivate teachers' professional quality and improve teachers classroom teaching ability, while realizing the optimization of classroom teaching effect, while refining high-quality teaching design, teaching courseware, classroom records and uploading them to the school's resource network, enriching the school's teaching materials, and realizing the sharing of network teaching resources.
Online course resources cover the fundamental knowledge, fundamental methods, typical cases, comprehensive application and other contents, and have certain fundamental, scientific, systematic and targeted features. Online teaching content sets up teaching materials of multiple modules, including teaching videos, classroom exercises, theoretical tests, homework after class, online discussion, comprehensive practice, etc.

3.5. Reform Teaching Methods and Improve Teaching Effects

According to the teaching reform strategy, use different teaching methods, carry out the practice of mixed teaching mode oriented by the cultivation of computational thinking [3]. Reform teaching methods, pay attention to student-centered classroom teaching, make students truly become the principal part of the teaching process, so as to stimulate students' enthusiasm for active learning.

(1) Flipped Classroom

Teachers give students a certain amount of learning tasks before class, so that students can learn independently. In class, teachers can carry out targeted teaching to promote students' learning enthusiasm. Flipped classroom improves student learning efficiency, reduces the pressure on students in the classroom, completes learning tasks easily, and cultivates students' autonomous learning ability and self-control [4].

(2) MOOC

Enrich online teaching materials of online courses, stimulate students' learning enthusiasm, and improve students' classroom participation. Make full use of the characteristics of MOOC online learning to develop a blended education combining online independent learning and offline precision teaching [5].

(3) Mixed Teaching Mode

Combining online learning and flipped classroom teaching methods [6], let the classroom atmosphere will be active, relying on each other, complementing each other's advantages, organically integrated into classroom teaching and talent training practices, it is an effective way of college computer teaching methods under the development trend of information technology.

3.6. Design Science Teaching Evaluation Method

Teaching evaluation method take care of students with different foundations, according to the characteristics of the courses and the level of knowledge of different students, rationally plan the teaching content, explore scientific teaching evaluation methods to improve students' learning interest and learning effects, cultivate students' practical ability and teamwork ability.

(1) Course evaluation methods focus on procedural assessment: students are assessed from various aspects such as classroom performance, homework, online learning, in-class tests, comprehensive practice, so as to improve the learning effect of the course and cultivate students' comprehensive computer application ability.

(2) Constructing a teaching quality assurance system for courses: the arrangement of homework is reasonable and effective, the online platform is applied to course teaching, comprehensive practice focuses on students' application innovation.
(3) Standardization of work process: standardize the requirements of homework and unify work evaluation standards.

4. Conclusion

The teaching reform purpose of college computer fundamentals course is to explore a reasonable and efficient teaching mode and teaching implementation plan. The curriculum is divided into two parts: compulsory and elective, which not only guarantees students' information literacy, but also provides students with autonomy based on professional development. Establish a professional teaching team, update teaching content, innovate teaching methods, optimize the teaching process, and build an effective learning platform for students. College computer fundamentals courses are combined with the development of information technology in the new era, which comprehensively improve students’ information literacy, help students master fundamental knowledge and skills of information technology, develop computational thinking, improve digital learning and innovation capabilities, establish correct information society values and sense of responsibility.

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References


