Research on Computer Teaching in Universities Based on Computational Thinking

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Abstract. With the development of computer technology, basic computer application has become a basic course in various professional courses. Of course, with the development of network information technology, computer teaching is facing new challenges and opportunities. This paper mainly focuses on the current situation and reform of computer teaching.

Keywords: Computational thinking, Computer in Colleges and Universities, Teaching Reform

1. Introduction

Computer-based courses are suitable for students of any major. Learning computer basics can cultivate students' basic computer abilities. This allows students to keep up with the development of the information age. Computer teaching is an important part of cultivating compound innovative talents. We must focus on improving college students’ information literacy and application ability.

2. Current status and situation of university computer teaching

In recent years, computer courses in colleges and universities have been questioned. Computer application ability training should be an important wing of the school’s "one specialization and two wings" talent training concept. However, due to the misunderstanding of the management department and some teachers in the curriculum positioning and the problems of the curriculum itself, the basic computer courses in various colleges and universities have problems such as outdated content, low starting point, emphasis on tools rather than principles, emphasis on application rather than ability, and disconnection in learning and use. This is why the curriculum is...
quite questioned and criticized. Therefore, how to find a breakthrough to solve the problem through curriculum reform is very urgent [1]. The proposal of computational thinking provides direction and opportunity for the solution of this problem.

With the improvement of the computer application level in the whole society, new requirements have been put forward for the teaching content of basic computer courses in colleges and universities, that is, not only focus on the use of software tools, but should have relatively stable core content that reflects the ideas and methods of computer science, And at the same time need to focus more on the training of thinking methods.

In 2010, the "Nine Schools Alliance (C9) Computer Basic Courses Seminar" discussed how to improve the quality of basic computer teaching under the new situation, and formed a series of consensus, and issued the "Nine Schools Alliance (C9) Computer Basic Teaching Development Strategy Joint Statement". The core points of the statement are: to correctly understand the important position of basic computer teaching in universities, to cultivate students' "computational thinking" ability as the core task of basic computer teaching, and to build a more complete computer basic course system and teaching content [2].

According to the relevant requirements of the university computer curriculum reform of the Ministry of Education, the information literacy education of "popularize computer culture, cultivate professional application ability, and train computational thinking ability" has become a new goal of university computer curriculum teaching.

3. University computer teaching reform practice based on computational thinking

According to the talent training goals and needs of the colleges and universities, we have determined the basic idea of implementing the reform of university computer courses based on computational thinking, that is: to change teaching concepts, we must make full use of modern educational technology methods and means, oriented to application, classification, and classification. Level planning and implementation of teaching reforms, through the reform and innovation of teaching links such as teaching models, teaching methods and methods, assessment and evaluation, and faculty, to cultivate students' professional application ability and computational thinking ability [3].

3.1. Classification and stratification, with some emphasis

According to the characteristics of majors, we divide students into five major categories: liberal arts, science and engineering, arts and sports, civil examinations and preparatory courses. Different types of students implement different teaching programs, and provide convenience and possibility for integrating interdisciplinary elements in teaching, and realize the realization of differentiated teaching goals. For example, add the content of the national language and word processing to the computer course of "Min Kao Min"; add computer music production software, video editing software, etc. to the "Art and Sports" computer course. The starting point for training "Liberal Arts" and "Science and Engineering" is to apply computers to solve professional problems, and then to train computational thinking ability; while "Arts and Sports", "Citizens" and "Preparatory Courses" students mainly popularize computer culture. Cultivate professional application ability. The purpose of stratification is to teach students in accordance with their aptitude and implement teaching more effectively. Therefore, at the beginning of enrollment,
students must be graded and tested, and teaching will be divided into classes according to the test results [4]. In terms of course content organization, the knowledge points are combined into "knowledge modules", and different combinations of "knowledge modules" are selected for teaching for students of different majors.

3.2. Innovate the teaching model and implement a mixed teaching model with technical support and practice

The integrated design of network teaching and traditional classrooms provides solutions for solving related problems in university computer teaching. Compared with traditional teaching, blended teaching combines the advantages of traditional teaching and network teaching, not only enjoying the convenience of new technology, but also without losing the advantages of traditional teaching. Compared with traditional classroom teaching, blended teaching is easier to achieve higher-level ability training goals. While improving students' computer application ability, it also improves independent learning ability and helps cultivate teamwork ability [5]. According to the various problems existing in the teaching of university computer courses and the principle of mixed teaching, the author’s school has carried out the teaching practice of university computer courses based on mixed teaching for many years since 2010. In the specific design process, the curriculum design is completed according to the steps of student analysis, curriculum analysis, learning activities and resource design, and learning evaluation design, as shown in Figure 1.

![Blended teaching process](image)

**Figure 1.** Blended teaching process

The mixed teaching mode has realized the role change in teaching, and has truly realized the change of the mode of teacher as the leading, student as the main body, and learning as the main body. It not only improves the initiative of learning, but also greatly meets the individualized learning needs of students, and enhances students' independent learning ability and teamwork ability.
In order to cultivate students' comprehensive information literacy and computational thinking ability, according to the current situation of significant differences in students' computer skills, we have designed a multi-level and three-dimensional teaching model, including three-tier mixed teaching, task-based learning activity design and practical ability through competitions Expand three areas.

(1) Three-tier mixed teaching. According to test scores, students are divided into three levels from low to high. For low-level students, adopt face-to-face teaching methods; for middle-level students, adopt both face-to-face and online teaching methods; for higher-level students, adopt network-based teaching methods.

(2) Design of learning activities. In the specific teaching process, we use task-based learning activities to carry out teaching. This kind of learning activities originate from real and complex life situations, and the teaching content is embedded in the designed tasks, which can not only stimulate learning motivation, but also connect with practice, maintaining a certain degree of complexity and openness. Through the design of learning activities, the learning content is designed as a series of highly practical activities. These activities include basic operations, general tasks and complex tasks. Learning activities include individual tasks and group tasks, focusing not only on cultivating students' independent learning ability, but also on cultivating students’ communication and collaborative problem-solving abilities [6].

(3) Practical ability training. For students with strong abilities and outstanding achievements, provide them with the opportunity to participate in the competition and further cultivate their practical ability. For example, many students have won the China University Student Computer Design Competition, and the school representative team won the first prize of the fourth and fifth National University Student Computer Application Ability and Information Literacy Competition.

3.3. Excavate teaching rules and guide students to learn

The cultivation of computational thinking is inseparable from the improvement of the ability to use computers. Only by continuously improving the ability of computer application can the ability of computational thinking be gradually trained, which means that only by using computational thinking can computational thinking be developed. Here are two examples [7].

(1) Summarize the essential laws in the working principles of computers, guide students to learn, and improve learning efficiency. When explaining the basic composition of a microcomputer, you can simply abstract its working principle as a model as shown in Figure 2.

![Diagram](image)

**Figure 2.** General flow of computer information processing

This model reflects the general process of computer data processing and can be abstracted as an "I-P-O" structure. I is the abbreviation of Input, which can represent input (equipment); P is the abbreviation of Process, which can represent various data processing and related equipment in the computer; O is the abbreviation of Output, which represents output (equipment). This model is the material basis of
computer information processing. Obviously, the application software running on it will show corresponding information processing laws, but the functions contained in the corresponding I, P, and O are different. If you are learning specific software When assigning specific meanings and operations to I, P and O, this abstracted model structure has general guiding significance, which can help students master the essentials of learning from the basic laws and procedures of information processing, and can also guide students Learn commonly used application software. For example: I in Word can give text entry, image object insertion, table insertion and other functions; in video production tools, I can represent video capture equipment, video materials (text, audio, pictures, etc.) import functions. The corresponding P and O also have different functions. After learning a few compulsory application software, students can learn the use of other software in this way, first master the overall functions of the software, and then conduct in-depth exploration of its input, processing and output parts [8].

(2) Abstract the commonly used operating methods in the Windows system to train students to improve their basic operating ability and level. The basic method used by the software in the window system can be abstracted as "S-R-C", S is Select, which means to select an object before operating it; R is RightKey (right key), which means to press Press the right mouse button to display a shortcut menu (which can generally refer to the currently available menu items or tool buttons); C is Command (command), which means an operational command or option that can be implemented. After such an abstract summary, in the operation of system files, the use of Office software or the use of multimedia tools, no matter what operations are done, there is a basic method to guide students to complete related operations.

4. Reform the assessment method

Combination of assessment and assessment, pay attention to formative assessment, and strengthen the analysis and management of the learning process. The assessment of the course should be based on the objectives of the course implementation. In the case that the assessment of thinking ability has not been fully quantified, standardized and effectively implemented, the application ability assessment is the core and promoter of the course assessment, but it should avoid "one assessment" in the implementation. "Lifelong" exams. The author's school mainly adopts the method of "stage examination + comprehensive homework + final assessment" to increase the proportion of comprehensive homework and pay attention to process evaluation. The curriculum knowledge points and skill points that can reflect the connotation and extension of computational thinking are used as assessment points, and the purpose of thinking quality assessment is achieved through ability assessment [9].

5. Construct teaching resources to ensure the development of teaching activities

According to the teaching needs, the teaching content is refined, the teaching resources based on micro-videos are produced, and the expansion resources are provided for students to learn, and the "flipped classroom" is implemented in the teaching to effectively improve the initiative and efficiency of students' learning. On this basis, we will improve the comprehensive practical content and compile new-form teaching materials to provide convenience for students' learning in the mobile Internet environment.

6. The construction of faculty is a key factor in curriculum reform
The construction of the teaching staff is the key to curriculum construction and improvement of teaching quality. Teachers play a leading role in the teaching process. The level of teachers directly determines the quality of teaching. Cultivating computational thinking in university computer courses is not to mention computational thinking concepts and meanings everywhere, but to refine and show the computer-based problem solving methods hidden behind the knowledge, which in turn arouses students' desire for knowledge. This requires teachers to change their teaching concepts, carefully design teaching content and cases, reform teaching models, and adopt appropriate teaching methods to implement teaching; this has high requirements for teachers. Based on existing practices, the success or failure of this reform The key lies in the teacher. In the course construction and teaching reform, we carry out a series of activities such as collective lesson preparation, mutual lectures, participation in academic conferences and training, and comprehensive evaluation data to support the entire process of the design plan, and provide an objective basis for the modification of the design plan. It is closer to the needs of people in various behaviors in the exhibition space [10].

7. Conclusion

Introducing computational thinking into computer teaching is a new developmental model of computer teaching. Computational thinking cultivates students’ computational thinking ability. Of course, there are still many unsolved problems, so we should continue to explore and practice.

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