The Reform Scheme of Fundamentals of Computer Culture based on Multi-level Blended Teaching

Jiemin Yang, Meile Tan, Gang Du, Ying Li, Xiaoxue Fu and Yi Zhou*

Information Management Center, Shanghai University of Medicine & Health Sciences, Shanghai, 201204, China

*Corresponding author’s e-mail: zhouy@sumhs.edu.cn

Abstract. As a general course for college students, Fundamentals of Computer Culture plays an important role in the training of professional talents. However, there is a large gap in the ability and quality of college students. In order to promote the creative teaching reform of this course and improve the theoretical and skill levels of college students, our college proposed a reform scheme of multi-layer blended teaching to realize an all-round reform of curriculum system, teaching content, teaching arrangement, teaching method and means, teaching assessment, etc. It also gives a detailed introduction to the reform plan and its implementation in the paper, and provides a creative solution for the teaching reform of the Fundamentals of Computer Culture in other universities, which has great practical value.

1. Introduction

Fundamentals of Computer Culture is a general course for college students, which is important for the training of professional talents. In order to implement the spirit of the National Conference on Education and accelerate the establishment of first-class undergraduate education, the Opinions of the Ministry of Education on Accelerating the Establishment of High-level Undergraduate Education and Comprehensively Improving the Ability of Talent Training stated that colleges and universities should take "multi-level, multi-module and self-construction" as the framework of course teaching reform, optimize and reconstruct the curriculum system, integrate the new generation of information, practically ensure credit hours and points, construct and utilize online courses, and synthesize the application of various teaching methods to create high-quality computer courses in universities[1].

Therefore, in view of school-running orientation, student basis, teaching resources and requirements of various disciplines and majors, our computer teaching reform will focus on "improving information literacy, enhancing computational thinking and deepening fusion application", establish a multi-level teaching system consisting of "online learning and offline tutoring", offer general courses and advanced courses, lay emphasis on the new demands for talent training in the new era and information society, promote the concept of ability-oriented talent training, and promoting the all-round development of students by expanding their basic knowledge and improving their comprehensive quality[2].

2. Analysis of Learning Condition

According to the data of freshmen from 28 provinces in our universities in recent two years (Table 1), the educational development and information level are different, and the students' knowledge, acceptance ability and learning interest are also different. Hence, teaching contents at different levels
shall be designed and different teaching methods shall be adopted (teaching according to "level"), which not only reduces the learning difficulty of "poor students", but also satisfies the needs of "top students" to expand their scope of knowledge, so that every student can get a better development.

**Table 1.** Partial data of freshmen in our universities in 2019-2020

| Year | Total | Male | Female | Shanghai | Non-local | Ratio of minorities |
|------|-------|------|--------|----------|-----------|-------------------|
| 2019 | 2133  | 31.6%| 68.4%  | 51.8%    | 48.2%     | 6.4%              |
| 2020 | 2877  | 29.0%| 71.0%  | 60.0%    | 40.0%     | 5.1%              |

**3. Scheme Design of Multi-level Blended Teaching**

Through the comprehensive reform of curriculum system, teaching content, teaching arrangement, teaching method and means, teaching assessment, etc., development of online courses, and establishment of the multi-level teaching system suitable for training talents of health care, a better self-learning environment is created for students to further improve their information literacy and enhance their computational thinking, and also to improve the quality of talent training and meet the demand for computer skills in the new era and information society[3]. Besides, a prominent long-term contradiction of insufficient teaching staffs of computer courses is settled.

The teaching reform will be propelled on the principle of three integrations: full integration of online and offline, organic integration of compulsory and elective courses, and point-sphere integration of skill competition and grading certificate. As a result, the teaching team will fully utilize the advantage of online teaching resources, and establish a computer course system consisting of general courses and advanced courses in combination with our school-running orientation, student basis, teaching resources and requirements of various disciplines and majors. The reform framework is shown in Fig. 1.

![Figure 1. The reform framework of Multi-level Blended Teaching](image)

**3.1. About General courses**

General courses are compulsory public courses, which are offered in the freshman year. These courses mainly cultivate students' basic information literacy and computational thinking, so the students initially have the awareness and basic skills of applying information technology to solve problems in the field of disciplines. General courses are taught in multiple levels, that is, the original Fundamentals of Computer Culture is subdivided into two online courses (College Information Technology and Digital Media Technology). Students select one course according to their own situation.

- **College Information Technology**: suitable for students with little basic computer knowledge. Main course contents are introduction to information technology, operating system setting, data file management, literal information processing, spreadsheet processing, presentation file design, etc.
- **Digital Media Technology**: suitable for students with certain basic computer knowledge and basic skills of common office software. Main course contents are understanding of digital media,
acquisition and processing of digital sound, acquisition and processing of digital image, fundamentals of animation production, video and its basic editing, digital media integration, etc.

3.2. About Advanced courses
Advanced courses are elective public courses, which are offered in the sophomore year or above. These courses mainly cultivate students' thoughts and methods of deeply understanding the new generation of information technology, improve their awareness of advanced information and ability to innovate in the field, and deeply integrate information technology and professional application to solve practical problems in the field of disciplines[4]. At present, Introduction to Big Data Technology Application for Health is already offered. In the later stage, it is planned to offer Introduction to Health Information and Network Security, Fundamentals and Practice of Artificial Intelligence, Data Analysis and Visualization Practice and other courses, so as to meet the learning needs of students in different majors.

4. Implementation Scheme of General Courses

4.1. Teaching arrangement
Both College Information Technology and Digital Media Technology are taught online, with 32 credit hours and 2 credit points. These two courses are offered in the second semester of the freshman year, and students can learn them on the school cloud platform of teaching resources or "Superstar Erya" APP.

4.2. Teaching mode and teaching method
(1) Online learning
   The teaching team will implement "hierarchical and general teaching, small class personalized management". The team import the list of students to the corresponding courses, upload teaching materials and distribute weekly learning tasks in the course, and make clear the course learning content, sign in method, assessment method, and Q & A arrangement, etc. According to the different requirements of each week and their own situation, students use computers or mobile phones to carry out autonomous learning, online sign in, activities participation, and learning tasks completion; the teachers in the original class mainly undertake the management of the courses, including the students' attendance rate, homework completion and online Q & A of the two courses. The online teaching mode is shown in the Fig. 2. (assuming that 60% of students in each class choose University Information Technology and 40% of students choose Digital Media Technology)

   In the online learning process, students can ask questions to the class teachers at any time. This hierarchical teaching, autonomous learning and real-time counseling not only fully mobilize the enthusiasm of students, but also ensure the learning effect[5].

   ![Figure 2. The online teaching mode](image)


2. Offline tutoring

In addition to online learning, the teaching team will arrange a teacher to provide offline tutoring during the undergraduate incentive program on a daily basis. The location of offline tutoring is the public computer room, which can not only provide a good learning environment for those students who lack learning conditions (no computer or smart phone), but also play a complementary role in the lack of online Q & A.

The content of offline tutoring mainly includes: ① online course Q & A: students can come to the computer room for consultation for problems encountered in online learning, and the tutor will provide on-site explanation for the key and difficult points and assignments in the course; ② Level 1 examination guidance: for Shanghai College Computer Rank Examination (Level 1) and the National Computer Rank Examination (Level 1), the teaching team will also develop an online question bank for examinees to carry out simulation exercises, and provide offline Q&A for students. ③ Pre-competition guidance: The teaching team encourages students to participate in various activities, including Shanghai College Students' Computer Application Ability Competition, college students' innovation and Entrepreneurship training program, etc., and provides guidance and help for the candidates.

4.3. Course assessment method

(1) Process evaluation

The process evaluation will be determined based on the process evaluation data and student learning records provided by the learning platform online (as shown in Table 2).

Table 2. online process evaluation method and weight setting

| Evaluation method       | Proportion | Score description                                      |
|-------------------------|------------|--------------------------------------------------------|
| Sign in on time         | 10%        | It is released once a week, full attendance will get full score |
| Course audio and video | 20%        | Full score will be obtained when the course video / audio is completed |
| Online work             | 20%        | It is released once a week, late or missing delivery is not included in the score |
| Classroom interaction   | 20%        | Post or reply to a discussion can get 2 points, the full score is 100 points |
| Unit test               | 30%        | At the end of each unit, the online test paper will be distributed with a full score of 100 |
| Total                   | 100%       |                                                        |

(2) Summative evaluation

After the online course, the teaching team encourages students to actively participate in the registration of Shanghai College Computer Rank Examination (Level 1) and the National Computer Rank Examination (Level 1). If the students obtain the level 1 certificate, they can "replace the examination with certificate", and the Academic Affairs Office will directly give them recognition of course credits; If the students have been unable to obtain the level 1 certificate, they need participate in the final examination of the corresponding courses in the second semester of the fourth grade. The assessment contents are issued according to the requirements of the national level 1 examination, and the students will complete the computer examination, with the full score of 100 points[6].

(3) Calculation method of achievements

Total course score = process evaluation * 50% + summative evaluation * 50%. According to the centesimal system, those whose total score is more than or equal to 60 are regarded as qualified, otherwise they are unqualified.
4.4. Achievement recognition and management

After the reform, the "Computer Culture Foundation" course performance recognition adopts the qualification determination (including qualified and unqualified), and the situation meeting one of the following conditions is recognized as qualified:

1. Students who obtain the certificate of Shanghai College Computer Rank Examination (Level 1 or above);
2. Students who obtain the certificate of National Computer Rank Examination (Level 1 or above);
3. After the final examination in the next semester of fourth grade, the total score of the course of students is more than or equal to 60.

Qualified students can get 2 credits. Those who fail in the examination can study online and take the make-up examination before graduation.

If a students have obtained the National Computer Rank Examination Level 1 or above in the first semester of first grade, they can apply to the Academic Affairs Office for exemption from "Computer Culture Foundation" and get credits directly.

4.5. Arrangements for obtaining certificates

(1) National Computer Rank Examination Level 1

National Computer Rank Examination (NCRE), sponsored by the National Education Examinations Authority, is a national computer proficiency examination system for examinees' computer application knowledge and skills for all people. It is held three times a year in Shanghai, and the examination time is March, September and December respectively. NCRE certificate number is unified and universal in China. It is also the certificate of the holder's computer application ability, which can provide reference for personnel department to employ and assess staff.

(2) Shanghai College Computer Rank Examination Level 1

The examination is a unified teaching examination organized by Shanghai Municipal Education Commission. It aims to standardize and strengthen the computer teaching of non-computer majors in Shanghai Universities and enhance the computer application ability of non-computer majors. The test is held once a year, usually in November, and covers non-computer majors in Shanghai universities. Students whose grades are qualified or outstanding will be awarded the corresponding certificate by Shanghai Municipal Education Commission.

As our students come from all over the country, there are great differences in their demand for certificates. The teaching team encourages students to sign up for the level 1 examination in line with their own conditions, and through the teaching reform, we will realize the "deep reading integration and seamless connection" between the course and the examination certificate, so as to increase the certificate obtaining rate of our students and strive for the certificate holding rate of undergraduate graduates to exceed 80%.

5. Conclusion

After one year of practice in our school, the reform scheme of multi-layer blended teaching has basically solved the learning needs of students of different levels by integrating high-quality teaching resources in a variety of ways. Among the students interviewed, 95% of them think they have no obstacles or difficulties in learning this course, 80% of them think the course is useful for their future work, and 90% of them are satisfied with the reform scheme.

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