The reform and practice of college computer basic courses towards computational thinking and empowerment education under the background of new liberal arts

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Abstract—**Research purpose of the article is to explore new ideas for the reform of university computer basic courses. The proposed method starts with the background of the construction of new liberal arts and the demand for computational thinking and empowerment education. It aims at the current teaching status of college computer basic courses in application-oriented local undergraduate universities, and deeply analyzes the new situation faced by the reform of college computer basic courses. The result is to explore the path and methods of computer basic course reform in liberal arts universities from three aspects: setting course modules, reconstructing teaching content, and reforming teaching methods. The conclusion is a new idea for the reform of computer basic courses in universities.**

Keywords- College Computer; Basic courses; New liberal arts; Computational thinking; Empowerment education

I. INTRODUCTION

The new liberal arts construction plan points out that it is necessary to cultivate liberal arts talents in the new era who know China, love China, and be worthy of the great task of national rejuvenation; Cultivating excellent new era social scientists; Constructing the Chinese school of philosophy and social sciences; Creating a Chinese culture that shines in the era and the world [1]. In order to support the four major tasks and missions undertaken by the new humanities and occupy a strategic high ground in the future global innovation ecosystem, it is urgent to cultivate a large number of new humanities talents. The new situation has put forward new requirements for the teaching content, methods, and methods of college computer basic courses. The teaching reform of college computer basic courses needs to further shift towards empowerment education while deepening computational thinking [2].

Empowerment refers to endowing a certain subject with abilities, and the connotation of empowerment education includes at least the following three points: (1) what abilities are endowed; (2) Who is empowered; (3) How to endow these abilities. Generally, college computer basic courses aim at non computer majors. The abilities are expected to be imparted to students include basic computer operation skills, to solve professional problems using information technology. The application ability of various computing platforms is to obtain, evaluate, and use information. The ability is to learn independently, and adapt to development based on information methods, as well as to communicate and continue learning [3]. The objects of empowerment should include both students and teachers, that is, through teaching activities, students should be equipped with the aforementioned abilities, while teachers should also have the ability to endow students with corresponding abilities. In order to achieve the aforementioned empowerment goals, a series of specific measures and corresponding supporting conditions need to be taken. As far as the college computer basic courses are concerned, first of all, it is necessary to reconstruct the teaching content, change the traditional content system with "single computer principle and application" as the main line, and integrate the new technology and new applications of "Internet+" into the courses to adapt to the development trend of deep integration of all walks of life and information technology. Secondly, it is necessary to reform teaching methods, utilize high-quality online course resources to carry out blended teaching, construct online courses with unique characteristics of each school, improve teaching quality, and fully utilize various resources to provide support and guarantee for enabling education [2,4].

II. PROBLEMS IN COURSE TEACHING

In application-oriented local undergraduate colleges, there are several problems in the teaching process of basic computer courses in universities [4,5].

(1) The existing teaching content is not closely linked to students' professional needs. Due to differences in students' cognitive levels, many students are unable to align their university computer knowledge with their professional needs when learning basic computer course knowledge and skills, and let alone effectively apply their university computer knowledge to daily life and work. They only stay at the superficial learning level of completing homework and dealing with exams, and making it difficult to feel the "usefulness" of computer knowledge. This requires strengthening the cultivation of students' application and practical abilities, and improving their experience of learning the "usefulness" of computer knowledge.

(2) The existing teaching hours are insufficient. The teaching objectives of college computer foundation courses require students not only to possess basic computer knowledge and processing abilities, but also to achieve the goal of combining the teaching of this course with the characteristics of students' majors and corresponding to the needs of students' professional positions. This requires college computer foundation courses to teach more teaching content, and not only to teach general knowledge and

culture in computer science. We also need to teach students some computer knowledge required for relevant professional courses and technologies. The current course content has become more diverse and difficult compared to before, and it is difficult to complete relevant teaching tasks during the existing class hours.

(3) The existing teaching effect is not ideal. In the teaching process, there are situations where students have poor hands-on and application abilities, thus making it difficult for them to transfer their university computer knowledge and technology to dealing with professional problems. There are two main reasons for this situation: (i) The teaching content is relatively fixed, and teachers have not directed the taught knowledge to the application level of students' professional characteristics; (ii) The knowledge taught lacks professional requirements.

(4) In the current teaching process of computer basic courses in universities, there is a current situation of passive learning among students, thus making it difficult to achieve a teacher led and student centered "dual heart" teaching model. It cannot achieve personalized, participatory, and autonomous learning for students, which will hinder their understanding and internalization of knowledge, as well as the cultivation of application and innovation abilities.

(5) The rapid development of information technology is limited by experimental conditions and practical teaching difficulties, which cannot effectively support the cultivation of students' practical skills.

III. RESTRUCTURING TEACHING CONTENT

In accordance with the general requirements of the ministry of education on undergraduate teaching reform and quality improvement, we further promote the construction of new liberal arts in order to better integrate information technology, big data, and artificial intelligence with talent cultivation in various majors. We fully realize the data empowerment role of the big data modern industry college, and assist in the cultivation of composite application talents. Addressing the curriculum needs of some majors in areas such as data analysis, Python and big data, achieving personalized, participatory, and autonomous learning for students, enhancing their understanding and internalization of knowledge, and continuously improving the quality of cultivating their application and innovation abilities. The college computer basic course is divided into the following three modules, and students choose one of the following three "college computer general compulsory course modules" according to their professional training requirements to study the university computer foundation course.

A. Compulsory module 1 of College Computer General Education-Fundamentals of College Computer Science

The teaching purpose of this module is for students to master the basic knowledge and operation of computers, proficiently apply the Office series of office software, and have a preliminary ability to analyze and solve problems using computers by studying this course. This lays the foundation for further learning other computer courses and

applying computer knowledge and skills to solve practical problems in their major in the future. To better serve the scientific research and work of various disciplines, this further achieve the cross integration of computers and various disciplines. The teaching content is updated in real-time based on the development of information technology. In addition to the existing Office and operating system, it also adds basic knowledge of big data and artificial intelligence, and focuses on cultivating students' computational thinking ability.

This module mainly introduces the basic knowledge and principles of computers, as well as commonly used Office series office software tools, basic applications of the Internet, and basic knowledge and applications of multimedia technology. It enables students to learn and proficiently master the use of conventional tools such as text, tables, and presentations, and to learn the thinking methods of computer problem-solving. The teaching goal is to comprehensively cultivate students' information literacy and improve their computer application level, and cultivate students' computational thinking ability.

B. Compulsory Module 2 of College Computer General Education-Fundamentals of Data Science

Data science is an interdisciplinary field that utilizes scientific methods, processes, algorithms, and systems to extract value from data. Data scientists utilize a range of skills, including statistics, computer science, and professional knowledge, to analyze data collected from networks, smartphones, customers, sensors, and other sources.

This module mainly enables students to understand the process of solving practical problems in data science, understand the close relationship between various disciplines and data science, and develop the habit of using computers to solve problems. It enables students to master the basic theories and working principles of data science, and master the specific steps to solve problems using the Python platform and language. This module mainly cultivates students' ability to use the paradigm of data science to analyze and solve problems, cultivate their innovation ability, better serve the scientific research and work of various disciplines, and further achieve the cross integration of data science and various disciplines.

C. Compulsory Module 3 of College Computer General Education-Introduction to Big Data

The strategic significance of Big Data technology lies not in mastering massive data information, but in specialized processing of meaningful data. In other words, if big data is compared to an industry, the key to achieving profitability in this industry is to improve the "processing ability" of data and achieve "value-added" of data through "processing". From a technical perspective, the relationship between big data and cloud computing is as inseparable as the front and back of a coin. Big data cannot be processed using a single computer and must adopt a distributed architecture. Its characteristic lies in the distributed data mining of massive data. But it must rely on distributed

processing, distributed databases, cloud storage, and virtualization technologies of cloud computing.

This module mainly enables students to understand the process of solving practical problems through big data analysis, understand the close relationship between various disciplines and big data, and cultivate the habit of using big data to solve problems. It enables students to master the basic characteristics and working principles of big data, and use the disciplinary methods of big data to analyze and solve practical problems. This module mainly cultivates students' ability to use the paradigm of big data to analyze and solve problems, cultivate their innovation ability, better serve scientific research and work in various disciplines, and further achieve the cross integration of big data and various disciplines.

IV. REFORMING CLASSROOM TEACHING METHODS AND MODELS

To address the problems in the teaching process of college computer foundational courses, changing the teaching and learning mode, they are effective methods that to utilize high-quality online open course resources to improve classroom teaching, and to utilize various online experimental/practical platforms based on new technologies to promote practical teaching [4].

A. Reforming classroom teaching methods and means

By using modern information technologies such as animation, video, virtual experiments, and even VR technology, knowledge can be presented to students more intuitively and effectively, which is conducive to students' understanding and internalization of knowledge, as well as the successful implementation of online teaching models [5,6]. It has become a consensus to promote educational equity and high-quality resource sharing through online open courses, and improve teaching quality. The content of basic computer courses in universities is broad and knowledge updates are fast. In the context of heavy teaching workload, insufficient faculty, reduced class hours, and solidified course content, it is particularly necessary to reform teaching methods based on online courses, build a diversified and distinctive course content system, enrich teaching methods, and achieve course training objectives [4].

In the context of the new liberal arts, college computer foundation courses need to reflect interdisciplinary characteristics, and through the introduction and self-construction combination. The college computer foundation courses should be integrated with more majors to improve the value of the courses. By using network platforms and various teaching software tools to build efficient online virtual classrooms, knowledge is imparted through various methods such as online live streaming, screen sharing, online meetings, recorded broadcasts, etc., to meet the teaching needs that cannot be taught offline. It can also be used for pre-class task assignments and post class Question and Answer (Q&A), etc. Traditional and virtual classrooms complement each other and are not constrained by geographical location, time, or special circumstances, ensuring the effective implementation of teaching work.

B. Reforming the classroom teaching mode

The traditional classroom teaching mode is mainly based on teachers to impart knowledge, and in the classroom, teachers mainly teach new knowledge. Teachers can effectively maintain classroom discipline and supervise students' learning status, and timely discover students' learning status, thereby engaging in face-to-face and real-time communication with students. This is the advantage of the traditional classroom teaching mode. However, traditional classrooms do not have extra time for students to engage in discussions, knowledge digestion, and application training. Students complete knowledge digestion and understanding through after-school review, practice, and other methods, which cannot effectively cultivate students' application and innovation abilities. This is the disadvantage of traditional classroom teaching models [5].

Based on the advantages and disadvantages of traditional classroom teaching models, allowing students to watch videos, assigning homework, and taking exams are the most basic application in the process of organizing teaching. To achieve better teaching results, teachers need to carefully design class hour assignments and task arrangements for online and offline classrooms based on students' professional training requirements and individual differences. Design discussion topics that can stimulate students' interest, making the discussion area lively. Teachers choose appropriate methods (such as flipped classrooms) to organize teaching, readjust the learning time inside and outside the classroom, and fully stimulate students' interest and enthusiasm in learning university computers through teacher designed themes, student discussions, student group discussions and mutual evaluations, pre-class online courses, classroom Q&A, and other methods. Teachers utilize various data and corresponding statistical analysis functions on the course platform, pay attention to students' learning status, and combine process evaluation with summary at the end of the semester.

V. CONCLUSION

In the context of the new liberal arts, the importance of college computer basic courses is becoming increasingly prominent. It is an important guarantee for cultivating students' innovation ability, cross-border thinking ability, adaptability to future career development, lifelong learning ability, etc. Correspondingly, it also puts forward higher requirements for classroom teaching, requiring us to actively adapt and actively seek change. Based on information technology, we reform the teaching of college computer basic courses from the aspects of teaching content, teaching methods and means, teaching mode, teaching organization and management. This can effectively solve the problems of insufficient class hours in the existing teaching process, weak correlation between teaching content and students' majors, poor hands-on and application abilities of students, and inefficient teaching organization and management.

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