Exploration on the Practice System of Computer Software Course under the New Engineering

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Abstract: The rapid development of information technology and the new economy is a challenge to the training of computer technology and engineering professionals. The cultivation of engineering talents in Computer Engineering under the new engineering is an important part of the construction and exploration of new engineering in universities. According to the teaching reform of computer specialty in the new engineering construction, starting from the practice of curriculum system of software, mainly discusses the basic ideas of practice teaching reform of the course of computer software, software engineering practice curriculum system and practice curriculum system implementation method. The basic ideas of teaching reform practice in the course of the software include: expanding computer professional students' knowledge, strengthening students' computer science and software engineering knowledge and engineering practice ability, strengthening the frontiers of computer science and technology guide. Software practice course system is divided into three levels, including basic language course, engineering basic professional practice course and the professional practice course of engineering application direction. The implementation method of engineering application practice curriculum system is discussed in detail, such as strengthening university-enterprise cooperation, introducing teachers of social training institutions and guiding students to participate in subject competition and innovation projects.

Keywords: New engineering; Software practice; Curriculum system

1. Introduction

On February 20, 2017, the Ministry of Education issued the "Notice of the Department of Higher Education of the Ministry of Education Concerning the Launch of New Engineering Studies and Practices" (Letter from the Higher Education Department of the Ministry of Education [2017] No. 6) for the needs of new economic development, facing the future, and facing the world. We will carry out research and exploration of new engineering majors, and work on new ideas, new structures, new models, new quality, and new systems for the reform of engineering education. On April 8, 2017, the "Seminar on the Construction of New Engineering Courses in Colleges with Engineering Advantages" was held at Tianjin University. The meeting put forward: Grasping the new situation and new tasks of personnel training in colleges and universities, comprehensively deepening the reform of higher engineering education, accelerating the construction of new engineering disciplines, taking the initiative to face the future, and adapting to and leading the new economy.

With the rapid development of information technology, talent shortages have emerged in the fields of big data, Internet of things, artificial intelligence, and new technologies in the Internet, showing that China's computer science technology and engineering education are out of touch with emerging industries and new economic development[1]. At present, many colleges and universities have set up computer-related majors such as computer science and technology and software engineering. There is a close relationship between software-related practice teaching and curriculum setting for related majors. As far as the current practical curriculum system is concerned, it

is somewhat out of date or backward compared to the development of information technology[2]. Combining with the practical teaching and exploration of computer professional software in our school, we discuss the direction and implementation of practical teaching reform in the new engineering subject.

2. Basic Ideas of Teaching Reform of Software Practice Course under the New Engineering

2.1 Broaden students' Computer Professional Knowledge and Multi-professional Cross-Integration Teaching

The computer major is increasingly intertwined with other majors and forms many new majors and research directions. At present, the more popular information technology majors are directly related to computer science. For example: software engineering, network engineering, internet of things engineering, data science and big data systems, etc.; new engineering majors developed by computer professionals include: cyberspace security, service science and engineering, robotics, etc.; integration of computer science and industry applications. Professionals formed by the integration of computer professionals and industry applications, such as: Internet finance, digital health, e-commerce, geographic information systems, etc. The curriculum system related to the computer major is adjusted according to the orientation of the school and the needs of the employees, taking into account the scientific nature, advanced nature, and rationality.[3][4]

The training of computer professional software engineering talents under the new engineering discipline depends to a large extent on other cross-integration professions. In the conventional software practice teaching, the basic knowledge of algorithm and program design, software engineering technology, database and information system, Internet technology and its application are mainly emphasized. For the training of software quality in new engineering disciplines, the professional basic knowledge and core technical knowledge of relevant interdisciplinary subjects are strengthened, and professional crossover and innovation practice, industry application domain knowledge, etc. are strengthened[5]. Students are trained to use software technology to achieve cross-convergence professional related technologies and solve related professional problems.

2.2 Strengthen Students' Computer Science and Software Engineering Basic Knowledge and Engineering Practice Capability

The solid theoretical foundation of computer science technology and software engineering is an important goal of cultivating students in the construction of new engineering disciplines, and is a basic literacy for students to adapt to complex projects in the future. The core of computer software development and design is algorithm design and optimization, mode and architecture, database technology and performance optimization. International STEAM education represents science, technology, engineering, art, and mathematics. STEAM education is a comprehensive education integrating science, technology, engineering, art, and mathematics. Among them, mathematics, foreign languages, computer science, software engineering, quality assurance and testing techniques need to be further strengthened, so that students have the quality of acquiring new knowledge and skills in their future jobs[6]. Cultivating students not only has the ability to use computer technology to solve existing problems, but also has the ability to learn new knowledge and new technologies to solve the problems that arise in the future, and to play a leading role in future technologies and industries.

2.3 Strengthen the Leading Area of Computer Science and Technology

The advancement of curriculum structure with the times is an important part of the construction of new engineering disciplines. The emergence of some new majors in information technology, on the one hand, has adapted to the rapid changes in technology and economy, and on the other has challenged the construction of knowledge systems. The practical courses in computer professional software are constantly adjusted with the development of information technology. In recent years, the hardware development of information technology has continuously promoted the development of software. Technologies such as multimedia technology, big data, image technology, artificial intelligence, human-computer interaction, sensor technology, supercomputing, virtual reality, augmented reality, and cloud computing are all inseparable. To open computer software, how to set up a practical curriculum system based on specific research directions is an important task for the construction of new engineering disciplines. Based on personnel training objectives with both computer professionalism and integrated professional knowledge, we should scientifically and reasonably formulate training programs for new engineering computer majors in order to support the achievement of knowledge, ability, and quality of personnel training elements[7].

3. The System of Computer Software Course

There are many computer related software courses and a

wide range of content. In recent years, the development of computer technology has been more and more rapid, and the direction of computer science and technology extension has also been increasing. Almost all information technology developments are inseparable from computers. In general, the computer software courses are divided into three categories: basic language, engineering basic professional practice courses and engineering application professional practice courses. There are many kinds of computer-based programming languages, and students of computer-related majors are proficient in a programming language. Other languages can learn very quickly[8]. The languages listed in Figure 1 below have cross-platform and wide application features. Professional Practice Courses Current computer professional practice courses, combined with programming languages, implementation principles or engineering projects, which strengthen the practice of Linux teaching, because it can be applied in a variety of hardware platforms, embedded systems, notebooks and desktops, servers and so on. With the development of information technology, the professional practice courses in the direction of engineering applications are dynamically changing, combined with the development of new information technologies in recent years.

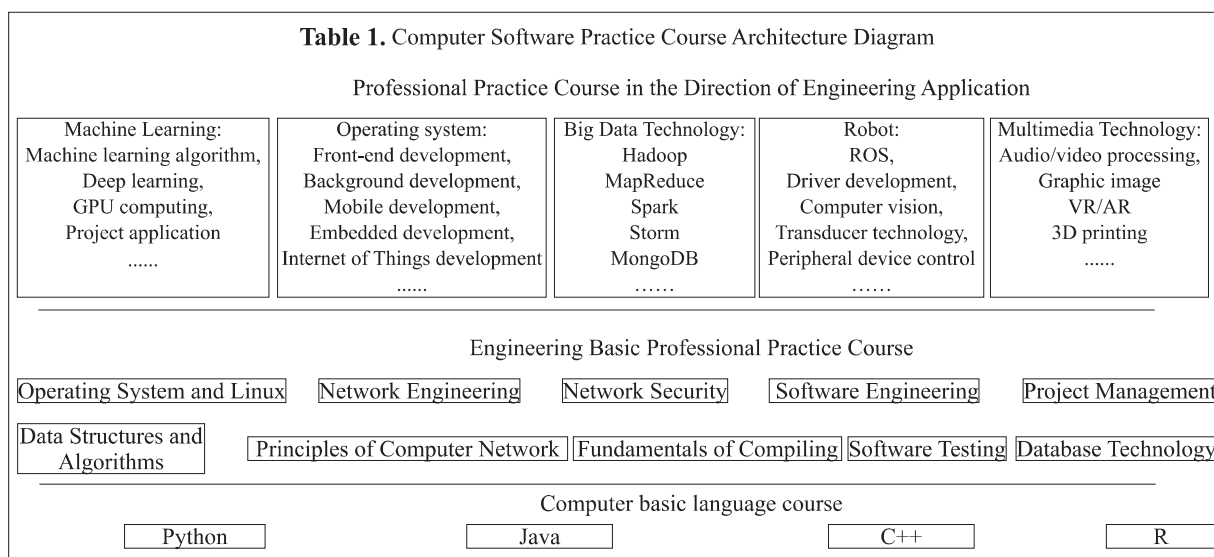## 4. Implementation Method of Engineering Application Practice Course System

4.1 Strengthen University-Enterprise Cooperation and Cultivate Talents that Meet the Needs of Society

The important criteria for cultivating qualified personnel meet the needs of society and enterprises. Some of the company's senior technical talents have the actual engineering and technical capabilities that are lacking in col-

lege teachers, effectively use these resources, and combine with the strong theoretical characteristics of universities to cultivate innovative technical talents.[9] The universities should employ outstanding talents such as technical backbones, senior engineers, and large-scale project architects of well-known companies to serve as creative classes or instructors and to formulate part-time teacher management standards. Improving the awareness and ability of college teachers in innovation and entrepreneurship education is an important part of pre-service training, curriculum training, and key training. Computer software-related professional teachers are employed by well-known companies in the industry to participate in the research and development and training of engineering projects.

On May 13, 2015, the General Office of the State Council issued the "Opinions of the General Office of the State Council on Deepening the Implementation of Innovation and Entrepreneurship Education Reform in Higher Education Institutions" (General Office of the State Council [2015] No. 36), and proposed an innovative cooperative mechanism for production and learning. In the past two years, the Higher Education Department of the Ministry of Education has organized relevant enterprises to support universities and colleges to jointly carry out cooperation projects on cooperation between companies and universities, and encouraged our school teachers to actively participate in project application.

Establish a new mechanism to jointly cultivate talents in colleges and industry. Enterprises from simple employers to co-cultivating units, strengthen engineering capabilities and innovation capabilities as the focus of reform of personnel training model, colleges and universities to establish an outside practice education base, colleges and

Table 1. Computer Software Practice Course Architecture Diagram

Professional Practice Course in the Direction of Engineering Application

Machine Learning: Machine learning algorithm, Deep learning, GPU computing, Project application	Operating system: Front-end development, Background development, Mobile development, Embedded development, Internet of Things development	Big Data Technology: Hadoop MapReduce Spark Storm MongoDB	Robot: ROS, Driver development, Computer vision, Transducer technology, Peripheral device control	Multimedia Technology: Audio/video processing, Graphic image VR/AR 3D printing ......

Engineering Basic Professional Practice Course

Operating System and Linux	Network Engineering	Network Security	Software Engineering	Project Management
Data Structures and Algorithms	Principles of Computer Network	Fundamentals of Compiling	Software Testing	Database Technology

Computer basic language course

Python	Java	C++	R

enterprises to jointly design training objectives, develop training programs, and jointly implement the training process[10]. Students participate in a certain period of engineering project training in enterprises, creating opportunities for students to participate in innovation and entrepreneurship practice and internships for famous enterprises.

4.2 Introduce Teachers from Social Training Institutions and Strengthen Cooperation Between Universities and Training Institutions

At present, there are many training institutions for computer-related majors in the society. Their teachers are strong in technology and most of the training teachers participate in actual information technology projects or engineering research and development. The introduction of talents in colleges and universities tends to be highly educated, emphasizes theoretical knowledge and scientific research dissertations, light engineering technology and management capabilities[11]. The advantage of colleges and universities lies in having a large number of high-level talents with high levels of research, and how to cultivate innovative engineering and technical personnel required by new engineering disciplines, and there is a certain disconnection between them[12]. There are many IT education and training institutions in Beijing, such as: Danai Education, APTECH Beijing, Qianfeng Education, Shangguan Training, and ChinaSoft International Education Group. The training courses set up by these training institutions are characterized by strong engineering, practicality and advanced technology.

Teachers of training institutions regularly go to campus to give lectures and combine practical teaching with engineering projects. Our school implements the "three semester" system. The third semester is arranged before the summer vacation. During this semester, our university and Dane use the joint training method for students in the second grade or the third year of university for computer science and technology and software. In the engineering major, the teachers in Dhanai are assigned to the school to give lectures. The contents mainly include Android development, Java project development, front-end development, etc. Their training content is combined with actual engineering projects and is deeply loved by students.

4.3 Participate Appropriately in Academic Competitions and Innovative Projects to Stimulate Students' Engineering Capabilities Through Competitions

At present, there are many kinds of computer-related competitions in the society. A considerable part is computer-related competitions organized by enterprises and associations or enterprises and universities. Selecting

some key competition projects and participating in subject competitions purposefully will help cultivate students' awareness of competition and innovation. The relevant competitions organized by our university include: ACM/ICPC International College Student Program Competition, National Software Professional Talent Design and Skill Contest, North China Five Provinces (City) Computer Application Contest, and Sharing Cup University Student Science and Technology Resource Sharing Service Innovation Contest. The school has organized laboratory open-fund projects and innovative experimental projects for undergraduate students. Students are encouraged to apply software development projects with divergent thinking and continuously improve their engineering practice. Guide college students to actively participate in scientific research activities and cultivate and improve scientific and technological innovation capabilities[13].

5. Conclusion

The engineering of computer specialized software direction requires highly qualified personnel with strong practical ability and strong innovation ability. Through the practical teaching reform of new engineering computer software courses, colleges and universities cultivate students to have sustainable competency of high computer software engineering literacy, have sustainable and innovative talents, and have a sense of responsibility and mission for global future affairs and national development, and have international competition. In the area of information science and technology, we will foster a large number of high-quality engineering and technical talents with strong innovation capabilities and adapted to the needs of economic and social development, and serve the country's strategy of building an innovative country and a powerful country with talents.

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