Research on Optimization and Integration of Curriculum System for Computer Science and Technology Specialty Based on Knowledge Network

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Abstract: This paper studies the optimization method of the curriculum system of computer science and technology specialty in local universities based on knowledge network. The theoretical curriculum system is based on modular design, highlighting the courses of mathematical basis, professional basis and programming technology, and cultivating talents in line with social needs through professional direction modules. Based on School enterprise cooperation, students' engineering practice ability is cultivated. Comprehensive application of knowledge and training of enterprise research and development process are emphasized. Based on teacher guidance, students' innovative practice ability is cultivated. The structure of knowledge, ability and quality is constructed. The optimized curriculum system has achieved good results in application practice.

1. The Origin of Knowledge Network

Knowledge is the summary of human practical experience, the cognition of human to nature, society and mode of thinking through information resources, the generalization of human subjective world to objective world, and the systematic recombination of human information. The concept of knowledge network originated from Swedish industry. In 1995, M.J. beckmanni described knowledge network as an institution and activity for the production and dissemination of scientific knowledge. There are different understandings of knowledge network in academic circles. However, no matter from which point of view, the connotation of knowledge network is unified: the formation of knowledge network is based on the knowledge flow between knowledge organizations; Knowledge network can be understood as a network structure formed by a plurality of knowledge chains, and each intersection can be understood as a node in the knowledge network; Knowledge network realizes information sharing and knowledge innovation through knowledge flow, which leads to a good learning mechanism, which in turn accelerates the generation of new knowledge and thus benign interaction, as shown in Figure 1.

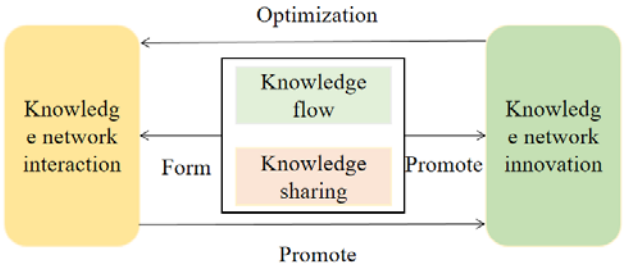

Figure 1 Interaction

2. Optimization of Curriculum System for Computer Science and Technology Specialty Based on Knowledge Network

2.1 The Thought of Curriculum System Optimization

In formulating computer science and technology talents training program, Dongguan University of Technology guided by the concept of higher engineering education, aimed at training advanced applied computer technology talents, guided by the actual needs of local industries and social

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development, followed the principles of systematicness, scientificity, advanced nature and practicality. Strengthen the theoretical basis, pay attention to the engineering practice ability, focus on training students' comprehensive ability to solve engineering problems, and establish and optimize the curriculum system from three aspects of theoretical knowledge, technical ability and comprehensive quality. The specific method is:

1) According to the curriculum module organization curriculum system, according to the personnel training goal of knowledge, ability, quality structure requirements set up each module curriculum composition and hours ratio, make the macro structure of the curriculum system scientific and reasonable.

2)Increase the proportion of natural science theory and professional basic theory courses, improve the ability of model design, innovation and development; Increase the proportion of programming language and algorithm design courses, and strengthen the training of programming ability and algorithm design ability; Set up a number of professional direction modules to reflect the characteristics of talent training and meet the diversified requirements of the industry for computer technology talents.

3)To build a hierarchical practical teaching system, to cultivate students' engineering practice ability in a step-by-step way, and to improve the effect of practical teaching. The practical training task provides as many different types and different difficulties of practical projects as possible, allowing students to choose the types and difficulties of practical projects according to their own basis and interests, realizing individualized teaching and supporting students' personalized development.

4)Raise the proportion of comprehensive practical projects, and strengthen the training of comprehensive knowledge application ability and project development ability; Strengthen the training of mainstream development tools, development platforms and application of programming languages, so that students' knowledge and skills are in line with social needs, and pay attention to the cultivation of students' humanistic quality.

2.2 Curriculum System Design of Modular Theory

According to the above thought of curriculum system optimization, we have designed the theoretical curriculum system as shown in Figure 2. the whole system is divided into four modules: general courses, professional required courses, professional elective courses and professional courses. each module is divided into several sub-modules.

The general curriculum module mainly trains students' natural science literacy, social and humanistic science literacy, foreign language ability and cross-disciplinary theoretical knowledge, and is divided into four sub-modules including mathematical foundation, humanistic quality, foreign language and cross-disciplinary. The sub-modules of basic mathematical courses mainly include five basic natural science courses of advanced mathematics, linear algebra, probability theory and mathematical statistics, discrete mathematics and college physics. The more solid the students' mathematical foundation is, the stronger the ability of model design, problem-solving and innovation is, and the stronger the development potential is. Considering that the current employers have more feedback on the weak mathematical foundation of graduates, the optimized theoretical course system will increase the number of hours of higher mathematics to 192; the sub module of humanistic quality course includes 6 courses, to cultivate students' professional ethics, legal awareness, The quality of mental health, pressure, etc. can cultivate students' writing ability and improve students' humanistic quality. The sub-modules of the cross-discipline courses include two courses, namely, engineering drawing and introduction to enterprise management. They mainly teach the basic knowledge of enterprise management, the basic norms and basic methods of engineering drawing, and are the basic knowledge that computer professionals need to master in the design, development, operation and management of many application systems. The sub modules of foreign language courses include two courses of College English and cross-cultural communication, which train computer professionals to engage in the basic language skills needed for computer technology research, design and development. Students' foreign language ability will be further

strengthened in practical teaching by arranging English manuals, technical materials, academic papers reading and other processes.

The professional compulsory course module includes the basic courses and professional courses of computer science and technology, which are divided into three sub modules: programming, hardware and software. The sub module of programming course includes four courses: programming foundation, object-oriented programming, Java programming, algorithm and data structure, covering three mainstream programming languages and algorithm design methods, such as C, C + +, Java, etc., and training the basic programming ability and algorithm calculation ability that computer science and technology specialty should have. The sub-modules of hardware courses mainly include four courses of circuit and analog electronic technology, digital logic, computer organization and system structure, assembly language and interface technology. They systematically teach the structure composition, basic working principle, peripheral interface and input/output control method of computer hardware system, so that students can obtain a more complete understanding and clearer concept of computer hardware system. The sub modules of software courses mainly include six courses, such as operating system, compilation principle, computer network, database system principle, software engineering, Linux system, etc., which enable students to grasp the basic working principle of computer software system, network interconnection principle, data information management technology, large software development method more completely; The professional required course module covers the public core course “Computer Science and Technology Professional Standard” of the Computer Professional Teaching Sub-Committee of the Ministry of Education's Computer Teaching Steering Committee.

Professional orientation curriculum module is composed of five parallel curriculum sub-modules of embedded system, e-commerce, enterprise informatization, network engineering and information security. Each sub-module corresponds to a professional orientation, which cultivates professional knowledge and skills required by different types of posts, shunts students according to professional orientation, and improves the post adaptability of graduates. The direction sub module of embedded system includes four courses, including microprocessor structure and application, embedded operating system, circuit design automation, wireless sensor network, etc., to cultivate the technical skills required by the students to engage in the design of embedded system equipment and digital products, mobile communication and industrial control, etc.; the direction sub module of e-commerce includes introduction to e-commerce, network marketing and e-commerce. Business law, network information collection and editing, e-commerce system planning and design and other courses, cultivate the technology and network marketing talents required by e-commerce system planning, design, development and operation; The main courses of the sub-module of enterprise informatization direction are introduction to ERP system, J2EE framework and program design, management information system and supply chain, data mining and data warehouse, to cultivate the technical development, system management and ERP implementation required by enterprise informatization. The sub module of network engineering direction includes network protocol and programming technology, wireless and mobile computing, network planning and design, large-scale database, training the technical ability required by large-scale network planning, design, management, maintenance technology and network application development; the main courses of the sub module of information security direction are information security foundation, operating system security, security prevention technology and information security management. Manage and evaluate, cultivate the theory, knowledge, technology and method needed for network information security management, security application development and security evaluation.

The modules of professional elective courses include model design, application development and technology frontier. Mathematical modeling, calculation method, artificial intelligence and digital image processing help to further improve the ability of model design. Software testing, SCM principles and applications, mobile application development, project management further develop students' application development and tool use skills. Cloud computing and other courses help students understand the technological frontier. These courses are available for students to choose according to their professional foundation, learning interests and career planning to build a

personalized knowledge system.

2.3 The Trinity Practical Teaching System

Practice teaching system is a trinity practice teaching system composed of in class practice, extracurricular practice and non professional practice (as shown in Figure 2).

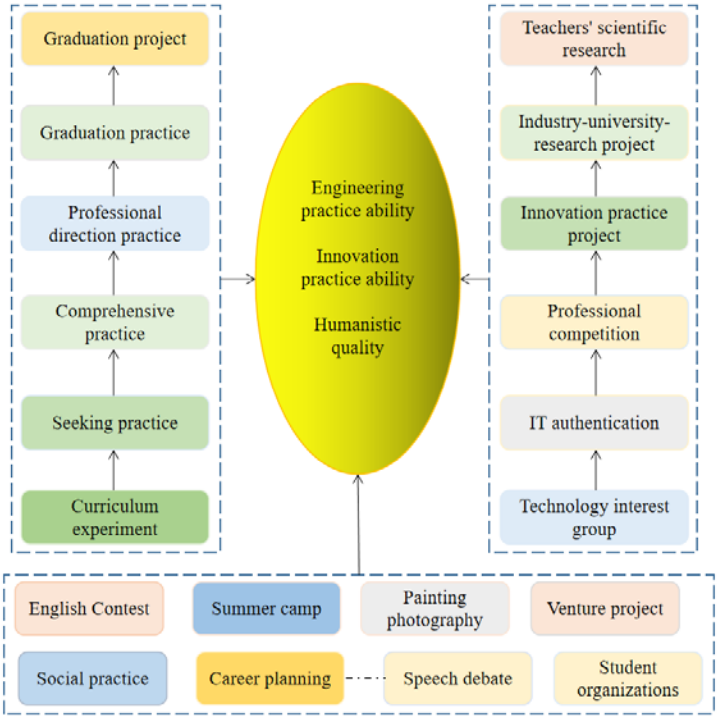

Figure 2 The Trinity Practical Teaching System

2.3.1 in-Class Practice Based on School-Enterprise Cooperation

In-class practice is partly based on school-enterprise cooperation, which trains students' engineering practice ability in a step-by-step manner, and carries out comprehensive knowledge application ability and project development ability training, including six experimental, practical and practical forms such as curriculum experiment, curriculum practice, comprehensive practice, professional direction practice, graduation practice and graduation design.

Due to the strong practicality of computer science and technology major, most professional theoretical courses arrange a certain proportion of experimental hours to promote students' understanding of curriculum theory and application of professional knowledge. Because programming and algorithm design are the basic skills of computer science and technology students, but they are often the weak link of graduates' professional technology.

In the sub modules of programming, hardware and software, one or two main courses are selected to arrange curriculum practice (or curriculum design). The programming courses include two courses: programming practice and data structure practice. The micro case method is used to cultivate and train students' programming ability. The hardware curriculum includes two curriculum practices: digital logic curriculum practice and computer organization and system structure curriculum practice. The former runs digital logic curriculum knowledge and uses integrated circuit chips to design logic components or digital systems with moderate difficulty. The latter uses logic components to design a processor based on students' knowledge of computer principles. These two curriculum practices train students' ability to design digital circuits and deepen students' understanding of computer hardware system structure and principles. According to the theory and under the guidance of teachers, based on the analysis of a small operating system framework, the students expand and enhance its functional modules, realize a more functional operating system, and deepen the understanding of the structure, principle and technology of the operating system.

Internship on post means that students enter the enterprise as quasi employees, participate in

project development, participate in technical discussion and complete assigned tasks under the leadership of enterprise engineers in accordance with the requirements of enterprise rules and regulations. Students experience enterprise culture, understand enterprise operation mode, improve social ability and cultivate professional quality through internship on post. Graduation design comprehensively uses theories, knowledge, technology and skills obtained from theoretical courses and practical training to complete the design and development of a project with a certain workload and difficulty. Besides further training students' engineering practical ability, it also cultivates the abilities of data consulting, thesis writing, team cooperation and expression, which is the training of students' comprehensive ability and comprehensive quality.

2.3.2 Extracurricular and Non-Professional Practice Based on Teacher Guidance.

In the extracurricular practice part, students are allowed to choose the type and difficulty of practical projects according to their own basis and interests by using extracurricular time and relying on self-study or under the guidance of teachers to cultivate their innovative practical ability, so as to realize individualized teaching and support students' personalized development, including six forms of scientific and technological interest groups, IT certification, professional competitions, innovative practical projects, production-study-research projects and teachers' scientific research. The non professional practice part uses the extra-curricular time to participate in social practice activities unrelated to the major, and trains the students' humanistic quality. There are different forms, such as career planning, entrepreneurship projects, speech and debate, social practice, student associations, summer camps, calligraphy and painting photography, English competitions, etc.

Science and Technology Interest Group is a learning group formed by students according to their interests. It arranges special laboratories and instructors to guide students to learn mainstream development tools, programming techniques, development platforms, and supplementary knowledge. Complete the design and development of one or more optional projects in a short time. Innovation practice project is a kind of innovative software, application system or integrated hardware and software equipment determined by students after investigation and analysis. It takes a long time to develop with the latest platform, tool or technology. The former is suitable for freshmen and sophomores, while the latter is suitable for junior and senior students. These two forms of practice provide students with the opportunity to give full play to their freedom. They are conducive to arousing students' learning enthusiasm and giving full play to their creative and innovative abilities. They are effective ways to cultivate programming techniques and skills.

In the practice of IT certification, it is an effective form of practice to train students' professional skills to participate in the certification examination and obtain certificates representing certain employment qualifications, such as software engineer certificates, embedded system engineer certificates, Cisco certified network engineers, etc. In the practice of professional competition, students from colleges and universities all over the country or in the same region compete together on the same stage, display their works together, and the experts evaluate the award-winning level according to the same standard, which can objectively and fairly reflect the professional level and innovation ability of the students participating in the competition. It is also an important occasion for the single employer to find talents and create a platform for local college students to prove their abilities. Good platform, deeply loved by students, schools and enterprises. Professional competitions stimulate students' enthusiasm for learning and innovative ability, in the form of ACM program design competition, software design competition, mathematical modeling, embedded system design competition, robot contest, etc.

Teachers' research and research projects research frontier or enterprise technology problems, such practice can make students' algorithm design ability, document writing ability, problem analysis and problem solving ability get more comprehensive training, scientific research ability get some exercise. In the non professional practice part, students are trained in organization and management ability, planning ability, expression and communication ability, social responsibility, hobbies and artistic quality, which are more and more important to computer professionals.

3. Conclusion

Based on knowledge network, this paper presents a method to optimize the curriculum system of computer science and technology in local universities. The theoretical course system adopts modular design, highlighting the courses of mathematical basis, professional basis and programming technology, and through the professional direction module training to adapt to the professional knowledge and technology required by different posts, so as to make the talent training and social needs docking. In the practical teaching system, based on school-enterprise cooperation, students' engineering practice ability is cultivated in an orderly way. Through the real project research and development practice of enterprises, the comprehensive application of knowledge and the training of enterprise research and development process are emphasized. Based on the guidance of teachers, students' innovative practice ability is cultivated, and the cultivation of humanistic quality is emphasized.

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