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On the Cultivation of Innovative Computer Talents in Local Universities under the Background of New Engineering

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ABSTRACT. *In the background of new engineering education, how to meet the new needs of social development and cultivate more high-quality computer professionals is the key to the development of computer professional education. Based on the basic idea of new engineering education, this paper renews the concept of education, strengthens the integration of production and education, and explores the training mode of computer professionals to adapt to the transformation and development of Local Application-oriented Undergraduate Colleges.*

KEYWORDS: *New engineering; Personnel training mode; Local universities*

1. Introduction

At present, a new round of scientific and technological revolution and industrial transformation are speeding up in the world. The country is implementing the major strategy of innovation driven development, "made in China 2025", "Internet +", and " The Belt and Road ". In response to the national strategic needs, it supports the vigorous development of new economy characterized by new technologies, new formats, new industries and new modes, breaking through the core key technologies and building the first mover advantage in the future global innovation ecosystem. Hence, there is an urgent need to cultivate a large number of emerging engineering science and technology talents. As one of the important subject systems of new engineering, the development of computer specialty is facing new challenges and opportunities. How to carry out the reform is crucial under the current background of new engineering.

2. Formulation and revision of talent training program

In accordance with the principles of "combination of skill training and post requirements, theoretical teaching and practical teaching, classroom and training room, students and employees, curriculum content and professional standards", the requirements of "professional setting meets industrial demand, teaching process

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meets production process, and curriculum content meets professional standards" are implemented, and the school and the enterprise jointly formulate talents of relevant majors. The training plan and curriculum system introduce the requirements and standards of enterprises into the whole process of talent training, optimize the curriculum system, strengthen the practice link, truly realize the deep integration of production and education in talent training. From April 2016, school experts and QST technology experts jointly discussed and formulated the "3 + 1" talent training program for computer science and technology specialty after repeated demonstration, discussion and modification by school and enterprises. According to the plan, the four-year training process of the students in the university is as follows: for the first three years, the students will be trained in professional knowledge, professional skills and professional quality; for the last year, they will enter the enterprise for on-the-job practice, complete the graduation thesis (Design), and obtain high-quality employment. The curriculum of talent training program consists of four modules: general courses, professional basic courses ,professional courses and development courses. The proportion of theoretical and practical courses is adjusted to 1:1, which is fully connected with information technology enterprises. The curriculum and content selection meet the professional requirements and post requirements of information technology enterprises. Professional courses and professional skills courses are taught by QST enterprise engineers[1].

3. Training framework of new engineering talents

3.1 Theoretical teaching system

Information technology is one of the core contents of new engineering. Under the environment of new engineering, the interdisciplinary is almost inseparable from information technology, which poses a new challenge to the traditional computer science and technology. In the background of new engineering, the emerging data science and big data technology, artificial intelligence and other specialties have many intersections with the traditional computer specialty. Taking artificial intelligence as an example, at present, the Ministry of education has officially approved the naming of "artificial intelligence" undergraduate major. Whether there is a difference between the former "intelligent science and technology" and "artificial intelligence" and how to do a good job in personnel training of new major should need to be further explored and studied, and gradually put into practice. But there is no doubt that the new major must have new connotation and be the intersection of multiple disciplines. The training plan of computer science and technology professionals formed through long-term school running practice needs to embody new connotation. From the perspective of interdisciplinary, the new specialty reflects the demand for knowledge and ability of talents under the background of new engineering.

Taking the computer major as an example, its core courses include programming technology, data structure, operating system, computer network, software engineering, etc. The content settings used in the traditional teaching process,

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especially the practice link, are seriously disconnected from the current development of computing technology. On the one hand, this disconnection makes the teaching content obsolete. On the other hand, the outmoded content affects students' enthusiasm for learning. In order to adapt to the development of new engineering, the solution of these problems needs to strengthen the reform in the actual teaching. The core content of the courses involved in the training program remains unchanged. What needs to be improved is the part reflecting the forefront of technological development, especially the part of innovation promotion and the part corresponding to the development of new engineering. For example, we should add knowledge and solutions corresponding to the development of actual computer systems in computer system courses. In order to adapt to new applications such as artificial intelligence, machine learning and deep learning, the design and instruction structure of GPU may need special design to improve efficiency, such as using artificial intelligence, deep learning and other methods. In order to meet the new needs and give students inspiration and thinking, we should increase the special design, instruction design and other aspects of the class hours, which plays an important role in broadening students' horizons and interests. The introduction of these specific ability points enables students to understand the development direction of computer system and the system functions provided by computer system to adapt to the development of new engineering. What's more, we should stimulate students' interest in designing efficient instructions, and lay the foundation for future innovation and development.

With the rapid development of information system, all kinds of new technologies and applications are active. Both in hardware level and in software level, they provide an excellent background for enriching the course content. Different courses have space to reflect the development of new technology in content setting. In the course implementation, it is not necessary to tell the principles and implementation process of these technologies in detail for students, but to put forward ideas for students to think and self-study after class.

3.2 Practical teaching system

(1) Construction of practice system

In the professional training program, the practical link is generally valued by the engineering specialty. Taking the computer specialty as an example, the practical system is particularly important. There are many practical links and urgent needs for practical ability in this major, which is relatively easy to realize. By the end of 2018, there are more than 800 schools with major in computer science and technology in China. The specific practices of each school are different, but it is generally agreed that the practice link needs to be strengthened. Through many years of school running practice, the basic ideas that need to be taken under the new engineering environment are: school enterprise joint construction of practical teaching system, building practical teaching base. On the basis of this idea, we should carry out the in-depth research on the practical link, cooperate with the excellent enterprises in the IT field, introduce the enterprise plan in the practical teaching link, provide the students with the opportunity of practical training in the enterprise for as much as

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possible, and provide the training environment for improving their practical ability[3]-[4].

(2) Construction method of practice system

1) Establishment of practical teaching base

The new engineering requires the students to have outstanding practical ability. The cultivation of this ability needs to rely on the close cooperation between the school and the enterprise, and implement the practical project training from the perspective of the actual needs of the enterprise. In order to implement the environment and conditions of practical ability training, the main body of the school actively carries out the work, organizes and contacts the relevant IT enterprises in many ways, and constructs the practical teaching base of school enterprise cooperation. The information technology new engineering alliance led by China Software Industry Association is a good platform, which combines Huawei Technology Co., Ltd., Guangzhou Yuezhi Communication Technology Co., Ltd., Qingdao Soft Training Education Technology Co. Ltd.,Tencent Technology (Beijing) Co., Ltd., Microsoft Asia Research Institute, and other enterprises. Therefor, they can establish close cooperation between these enterprises and colleges, sign the school enterprise training base agreement, and provide enterprise training environment for the training of new engineering talents[5]-[6].

Both schools and enterprises must participate in the construction of the base. There are two types: inside and outside school, that is, inside school practice base and outside school practice base. In the school and the experimental teaching center of each teaching unit, a fully functional experimental environment is built, including the special laboratory for practice. According to the characteristics of the enterprise, the training rooms with different functions are constructed according to the practice contents, such as software development training room, embedded design and development room, network and information security training room, etc. Outside the school, it can be combined with the new engineering alliance enterprises, and the training base can be located inside the enterprise. The school and the enterprise sign the school enterprise cooperation agreement to carry out substantive school enterprise cooperation. These enterprises provide certain training capacity for the school every year. The enterprise training is divided into two parts. In the early stage, centralized training is adopted to set up development platforms and data environments such as Python and Java for students to strengthen knowledge training. After strengthening, the qualified students carry out the enterprise post practice and are directly arranged to carry out specific projects. After the later stage of practical training, students can enter the trial and practice stage in the graduation design stage according to their wishes[7].

2) Adopt project practical teaching to improve practical ability

The training system mainly consists of a series of training items. According to the relevant professional knowledge system, in line with the University's four-year learning process, and taking into account the skill requirements of major posts in the industry, a series of step-by-step training projects are given. Each training project

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covers a number of knowledge points of the intersection of new engineering, and targeted training of certain skills. Through these programs, students can get more systematic and comprehensive professional training. The teaching design and implementation are based on the case teaching and the simulation or real project of the enterprise operation process (software production and development process), and the development process of multiple projects is completed step by step with the team mode, so as to improve the engineering application ability. In the past few years, more than 50 practical projects (basic training, special training, comprehensive training, etc.) have been carried out by the author's unit, and the total number of students who have participated in the practical training projects has reached 4 sessions, and good results have been achieved. The above practical work site is not only a practical place to cultivate students' professional skills, but also a training environment to cultivate students' social responsibility, professional ethics, integrity and team spirit. It is also the best way for students to move towards employment and society[8-10].

4. Conclusion

Under the background of new engineering education, according to the requirements of “national standard for teaching quality of computer major” and “engineering education major certification”, this paper explores the training mode of computer major talents. Although there are still some deficiencies and gaps, we will continue to standardize the process of personnel training, improve the level of computer professional personnel training in the future education and teaching process, so as to improve the comprehensive ability and quality of graduates of this major.

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