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### Research on Comprehensive Reform of Education Mode of Computer Specialty in Colleges and Universities in the New Engineering Era

#### Jun WANG, Dongxu LUO, Jiying MA<sup>1</sup>

College of Computer Science and Technology, Shenyang University of Chemical Technology, Shenyang 110142, China.

Abstract. The construction of new engineering is an important part of higher education reform in the new era. The construction of new engineering will accelerate China's transformation from a big country of engineering education to a powerful country of engineering education. Therefore, this paper puts forward a "new model" of talent training in engineering education. In the process of building first-class computer majors, taking engineering certification as an opportunity to promote the construction of first-class computer majors, taking the practice base as the tentacle, and creating a practice system under the real scene, through the "Trinity" talent training mode, from talent training scheme design to curriculum system construction, from teacher team construction to first-class curriculum construction, from student training to ideological and political construction, it has opened the deep integration of industry, University and research A good mechanism for collaborative education, so as to improve students' abilities in all aspects.

Keywords. New engineering construction, educational mode of computer specialty, engineering education, collaborative education

#### 1. Introduction

The professional training goal is the wind vane of teaching behavior, with the development of higher education and the adjustment, transformation and upgrading of industrial structure, the professional training goal should focus on the needs of regional development and industrial development, and cultivate students with good cultural literacy, professional ethics, legal spirit, innovative thinking and other basic qualities, and application-oriented talents with basic professional knowledge and professional skills. In recent years, more and more new models of talent training have been proposed in different disciplines [1-3], the application of the teaching model based on engineering education accreditation [4] of thinking cultivation has been applied in various fields [5-6], it is imperative to reform the teaching mode of computer major in colleges and universities. Therefore, this paper puts forward a "new model" of talent training in engineering education. From talent training scheme design to curriculum system construction, from teacher team construction to first-class curriculum construction,

<sup>&</sup>lt;sup>1</sup> Corresponding Author, Jiying Ma, College of Computer Science and Technology, Shenyang University of Chemical Technology, Shenyang 110142, China; E-mail: 382134224@qq.com.

from student training to ideological and political construction, a complete set of practical education and teaching mode has been established.

#### 2. New mode of computer specialty construction

2.1 Taking engineering certification as an opportunity to promote the construction of first-class computer majors

#### 2.1.1 Identify training objectives and standardize teaching management.

Aiming at the demand of market development for talents, combined with the format of contemporary IT industry, computer science and technology disciplines are preliminarily divided into big data, artificial intelligence, software development and Internet of things. The professional training goal is the wind vane of teaching behavior. With the development of higher education and the adjustment, transformation and upgrading of industrial structure, the professional training goal should focus on the needs of regional development and industrial development, and cultivate students with good cultural literacy, professional ethics, legal spirit, innovative thinking and other basic qualities, and application-oriented talents with basic professional knowledge and professional skills. When formulating training objectives, full investigation and regular feedback mechanism shall be carried out to determine the rationality of training objectives and continuously improve them.

#### 2.1.2 Optimize the curriculum system and improve teaching efficiency

According to the CDIO mode, the specialty constructs an integrated curriculum system that meets the output requirements in combination with the characteristics of the University and the specialty of planning. Starting from cultivating students with a solid professional theoretical foundation, good humanities and social science literacy and professional ethics, and the ability to solve complex engineering problems, the teaching links composed of courses, projects, internships, practices and various extracurricular activities integrate knowledge Ability and quality are coordinated and integrated in a way of mutual connection and support, so as to realize the goal of professional training in an integrated way. Clarify the contribution of each course or link in the curriculum system to the professional training standard, that is, the curriculum system support matrix. The assessment method is designed according to the learning objectives, learning methods and feedback requirements, and the evaluation feedback and continuous improvement are carried out based on the training objectives. Meanwhile, according to the requirements of the national undergraduate education reform and new engineering construction in the new era, the knowledge of artificial intelligence, big data and Internet plus has been integrated into the specialized course teaching.

# 2.1.3 Strengthen CDIO Engineering Education Concept and build a three-level iterative project practice teaching system

A project runs through the four-year practical teaching mode of the University, and the project knowledge points cover the theoretical content of professional core courses. With

the deepening of professional courses, iterative development of the project is carried out to exercise students' project practical ability. From in class experiments, curriculum design, secondary projects, primary projects to graduation design and other practical teaching links, strive to cultivate applied talents with strong engineering practice ability required by the industry.

## 2.2 Take the practice base as the tentacle to create a practice system under the real scene.

According to the feedback of market information, timely revise the content of base practice projects, and complete the development of new technology fields in the market according to the design of base practice projects; The base project is linked with students' learning. According to the needs of the base project, several realizable, evaluable and teachable sub projects are set to link with students' daily learning, so that students can realize the project needs with the learned content. At the same time, students also propose innovative projects according to the learning results and incubate them in the base.

# 2.2.1 Strengthen the leading role of the experimental teaching center in the school and create a practical teaching platform

The experimental teaching center should build a provincial practical teaching platform with the construction concept of "one foundation and three strengthening". According to the CDIO Engineering Education Concept and the needs of computer engineering education experiment practice, the experimental teaching center, based on the cloud platform, strengthens resource integration, strengthens the construction of teaching system, strengthens school enterprise cooperation, and establishes experimental teaching platforms such as big data, artificial intelligence and Internet of things. The experimental teaching center should build a provincial practical teaching platform with the construction concept of "strong concept, foundation and comprehensive". The experimental teaching center strengthens the CDIO Engineering Education Concept, establishes a four-level basic experimental teaching system platform, and integrates complex problems to design comprehensive experiments.

#### 2.2.2 Build an off campus practice base and create a "Trinity" practice system

Strengthen the cooperation between schools and enterprises and the construction of teaching base, and formulate a detailed construction and management system of industry university research practical teaching base. In order to realize the long-term cooperation mechanism of benign interaction between schools and enterprises, achieve the three goals of cultivating talents in market demand, enhancing students' practical ability and exploring the education mode of combining industry with education, the two sides reached a consensus to jointly carry out research on industry university research projects and build an off campus practical teaching base, so as to provide students with a perfect off campus practical learning environment. In the construction of off campus practice base, it is necessary to establish the "Trinity" construction mode of students, base and market, link the market information with the base project, and link the base project with students' learning, timely revise the content of the base practice project according to the feedback of market information, and complete the development of new technology fields in the market according to the base practice project design; The base project is linked

with students' learning. According to the needs of the base project, several realizable, evaluable and teachable sub projects are set to link with students' daily learning, so that students can realize the project needs with the learned content. At the same time, students also propose innovative projects according to the learning results and incubate them in the base.

# 3. Collaborative education mechanism of industry education integration under the background of new engineering

The integration of industry and education and collaborative education is an important link in the talent training of "new engineering". The opinions of the general office of the State Council on deepening the integration of industry and education emphasize: "The main goal of deepening the integration of industry and education is to gradually improve the participation of industrial enterprises in running schools, improve the diversified school running system, fully implement the collaborative education between schools and enterprises, fully mobilize the enthusiasm and initiative of enterprises to participate in the integration of industry and education, strengthen policy guidance, and build a longterm mechanism for school enterprise cooperation." No matter in terms of talent training objectives, scope of cooperation and degree of integration.

### 3.1 School enterprise linkage

Employ experienced technical and management personnel of the enterprise as part-time teachers to give lectures in the school. On the other hand, teachers of this major are encouraged to practice in enterprises regularly to improve teachers' practical teaching ability and build a "double qualified" team of teachers. At the same time, actively explore the talent training mode of 3 + 1 school enterprise cooperation. In the first three years, students completed public basic, professional basic and professional technical courses in the school. In the fourth year, they went to the enterprise for engineering practice study, and completed the graduation design in combination with enterprise projects, so as to realize the seamless connection between talent training and enterprise needs, and also provide personalized services for students' academic growth, Achieve accurate and optimized collaborative teaching and training process.

#### 3.2 Normalization of Ideological and Political Education

Ideological and political education can make college students always maintain good spirit and character, arm their thoughts with firm and conscious, and improve the party and the state's high recognition of principles and policies, so as to cultivate talents who meet the needs of the party and the state.

In the process of first-class professional construction, we should always normalize the ideological and political work, carry out curriculum ideological and political construction among teachers, strengthen the ideological and political concept among students, and integrate the ideological and political concept into the daily work and learning of each teacher and student. Establish the educational concept of "moral education first". Teachers should bring ideological and moral education into classroom teaching and infiltrate ideological and political education into classroom teaching. Teachers' professionalism requires them to adhere to correct ideological and moral concepts, develop good professional ethics and ethics, and internalize them into their own behavior. Teachers can guide students to improve their ideas, and comb out the correct outlook on life and world outlook in the process of learning professional knowledge.

## 3.3 Guided by market demand, strengthen the awareness of innovation and entrepreneurship

Through the practice of the "Trinity" talent training mode, students can improve their working ability in project practice, shape the overall view of software development, exercise their communication ability, understand the theoretical and technological frontier and development trends, and strengthen the opportunity to integrate with the cutting-edge advanced technology. Attract outstanding students to participate in scientific research and innovation and create conditions for students to continue their further study through provincial practice centers, collaborative innovation platforms and other on campus and off campus cooperation bases. Through the construction of off campus practice base and employment base, help students understand their work ability and suitable work in multiple dimensions, and improve students' high-level employment rate through accurate recommendation.

### 4. "Trinity" talent training mode

Under the "Trinity" talent training mode, the OBE education concept is adopted, and the training objectives are found in time and the teaching management is standardized according to the engineering certification and CDIO education mode. Optimize the curriculum system and improve teaching efficiency. Strengthen team building, improve teaching quality, improve teachers' comprehensive ability, and comprehensively improve the quality of talent training.

- Pay attention to personality and moral education to ensure the all-round development of students. The fundamental task of the school is to cultivate morality and cultivate people. In addition to the cultivation of professional ability, the school also places special emphasis on the cultivation of students' Ideological and moral quality, sense of social responsibility, innovation ability, personal professional ability, communication expression and team cooperation ability, which reflects the greatest love of the school for students' development.
- Implement integrated talent training to realize the synchronous improvement of students' knowledge, ability and quality. An integrated talent training program integrating professional education, innovation and entrepreneurship education and quality education has been implemented. According to the technology and process of real production and service, the structure, content and order of professional curriculum system have been redesigned, and an integrated curriculum system with ability orientation, five-level project traction and dynamic updating of content has been constructed to realize the integration of professional education and quality education, The integration of theoretical courses and practical courses, the integration of teaching, learning and doing,

the integration of in class teaching and extracurricular activities, the integration of school enterprise cooperation and vocational ability training.

• People oriented, teaching students according to their aptitude and implementing flexible teaching. The school pays attention to students' different characteristics and personality differences, and implements the credit system teaching management mode, as well as hierarchical teaching methods such as English Classification and mathematics classification; Through the construction of "4A" (anytime, anywhere, anytime, anywhere) flexible teaching system, explore the diversification of teaching locations, the combination of teacher arrangement, the normalization of project implementation, the mixing of learning methods and the diversification of assessment and evaluation, so as to provide more opportunities for students' learning and development.

#### 5. Conclusions

In the construction of first-class computer majors, through the "Trinity" talent training mode, from talent training scheme design to curriculum system construction, from teacher team construction to first-class curriculum construction, and from student training to ideological and political construction, a good mechanism of in-depth integration of industry, University and research and collaborative education has been opened. Explore the cultivation of students under the mechanism of industry education integration. Through the "Trinity" linkage mechanism, students can connect with the market during school, and then improve their ideological and moral quality, social responsibility, innovation ability, personal professional ability, communication and team cooperation ability.

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### References

- S.S. Li, J.Y. G. Thoughts and Exploration on the reform of Ideological and political teaching in Colleges and universities of traditional Chinese medicine in the new era. Lishizhen Medicine and Materia Medica Research. 2019;30(11): 2741-2743.
- [2] Y. Ying, Y. Mei. Thoughts on the construction of new agricultural science in higher agricultural education. Journal of Zhejiang a& f University. 2019;36(1): 1-6.
- [3] W. Li. Performing the national teaching quality standards for undergraduates, comprehensively improving the training quality of Water Science and Engineering professionals. Water & Wastewater Engineering. 2020;46(7): 172-176.
- [4] H. Jiang. Construction and reform of water conservancy undergraduate majors facing new water conservancy situations in new era: thoughts based on engineering education accreditation. Advances in Science and Technology of Water Resources. 2021;41(1): 1.
- [5] W. Pan, Y. Feng, X. Zhang. Exploration and research on online teaching mode of Medical Immunology experiment course. Chinese Journal of Immunology. 2020;36(19): 2353-2356.
- [6] X. Sun, G. Zhu, J. Chen, et al. The application of the teaching model of thinking cultivation in microbiology teaching. Journal of Biology. 2019;36(5): 121.