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Research on Specific Measures to Train Professional Talents of Internet of Things Engineering with Engineer Culture

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Abstract: *The improvement of engineers' cultural quality is a key link in the training of applied talents, which has been the focus of education and teaching in colleges and universities all over the country, and is also an important direction of the reform of new engineering majors and the core of the connotation of engineering education. However, at present, some schools pay little attention to the improvement of engineering literacy and engineer culture in the construction of engineering majors and student training. Therefore, this article takes the Internet of Things engineering major as the background to elaborate specific talent training measures. This paper first describes the problems existing in the construction of Internet of Things engineering in our university; On this basis, the paper discusses in detail how to construct CDIO model with engineer culture and how to train talents with engineer culture as the core. In this way, we can effectively integrate students from university education, corporate employment to lifelong learning.*

Keywords: *Engineer culture, New engineering, Personnel training, CDIO, Three-stage integration*

1. Introduction

Positioning applied universities to cultivate skilled workers and promote the spirit of craftsmanship is a key focus in striving to practice core social values and provide strong talent support for the comprehensive construction of a socialist modern country. Enhancing the cultural literacy of engineers has become a key link in talent cultivation, attracting attention and significance from universities across the country, especially in the construction of first-class majors and new engineering disciplines [1,2].

Since 2008, China has gradually implemented the CDIO engineering education concept [3] and launched the Excellent Engineer Education and Training Program in 2010 [4-7]. In 2016, based on the original "CDIO Engineering Education Reform Pilot Working Group" of the Ministry of Education, the "CDIO Engineering Education Alliance" was established, and engineering education entered a stage of rapid development. Consequently, many scholars began to explore the important role of engineering culture and engineer culture in professional construction, technological innovation, and talent cultivation [8-10], and put it into practice in educational and teaching reforms [11]. In the past decade, engineering education has played an important role in talent cultivation in Chinese higher education and has achieved fruitful results [12].

However, research has found that some universities and majors lack substance in cultivating students' understanding of engineering culture and engineer culture. The fundamental reason is that the imported engineer culture lacks the value of traditional Chinese culture, and the rigid thinking of traditional talent cultivation cannot meet the requirements of the development of "new industries, new professions," the impact of "new technologies, new concepts," and the new demands of modern enterprises for talents. It especially fails to meet the requirements of integrated talent cultivation for universities' nurturing, enterprises' employment, and lifelong learning.

Cultivating skilled workers and promoting the spirit of craftsmanship are key aspects of practicing core socialist values and aiding the great rejuvenation of the Chinese nation. The construction of new engineering disciplines in applied universities should not only meet the requirements of the development of new professions but also reflect the important position of engineer culture in the talent cultivation mechanism. Therefore, this research deeply integrates the core connotations of engineer culture into CDIO and constructs a new model of CDIO engineering education with engineer culture, proposes

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specific measures for talent cultivation, and ultimately cultivates individuals with the "spirit of craftsmanship" who meet the needs of new engineering disciplines and the development of new professions. This is one of the main problems to be addressed.

Therefore, we take the Internet of Things Engineering major Beijing Institute of Petrochemical Technology as an example to discuss how to train people who meet the "craftsman spirit" of new engineering construction and new career development in this paper.

2. Development history and existing problems of Internet of Things engineering

1) Development history

The Internet of Things Engineering of Beijing Institute of Petrochemical Technology is formed to meet the actual needs of Beijing's new generation of information technology and related industrial upgrading. It is formed by integrating the advantage courses and teachers team of two national first-class majors of Automation and Computer Science and Technology, taking the construction of "new engineering" as a basis, the development of "new career" as an opportunity, and the traditional professional framework of measurement and control technology and instruments, as shown in Figure.1.

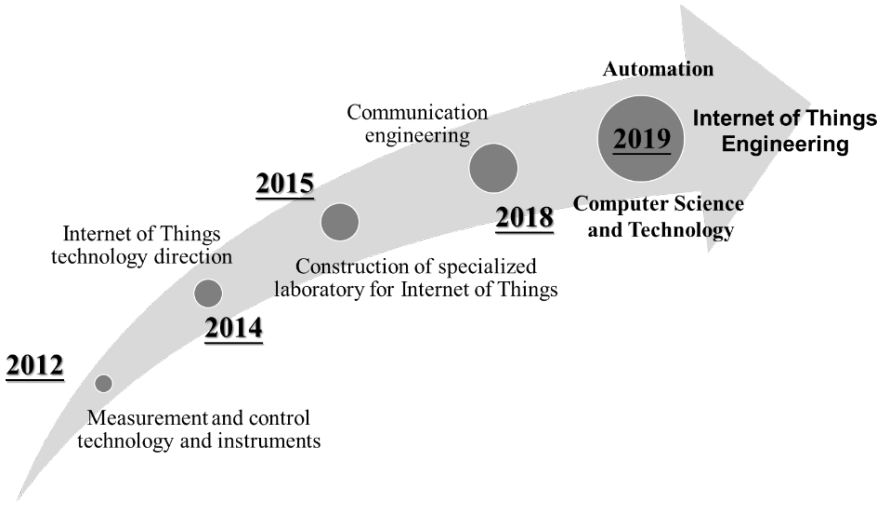

Figure 1: Development history of Internet of Things Engineering major in Beijing Institute of Petrochemical Technology

2) Existing problems

Internet of Things engineering is a first-class major in Beijing. It clearly and gradually implements the transformation of its professional positioning from "Internet of Things" to "smart Internet", ADAPTS to the transformation and upgrading of the Beijing-Tianjin-Hebei industrial structure, takes industrial upgrading and social needs as the guidance, aims to cultivate high-quality applied talents, takes education and teaching reform as the driving force, and supports the deep integration of production, university and research. Emphasize the cultivation of engineering practice ability and international vision, so that the teaching content and curriculum system are highly matched with economic and social development, and the ability and quality of graduates are more consistent with the industry demand. However, it is necessary to take the opportunity of serving the country, Beijing strategy and industrial development as an opportunity. The current professional construction has not built a new model of CDIO engineering education and specific measures for personnel training that integrate engineer culture, and has not yet formed an engineer cultural training model that meets the needs of the country. This can not train the new generation of information technology, automatic driving, artificial intelligence and other fields with engineering design, system integration, function development, installation and debugging, operation and maintenance of engineering application-oriented technical personnel.

3. How to construct specific measures to meet the requirements

(1) Construction of CDIO new mode integrating engineer culture

Engineer culture is an important component of CDIO engineering education concept, and the training

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of engineer culture is rarely involved in traditional CDIO research. To this end, the core connotation of engineer culture is deeply integrated into the CDIO education model, a new CDIO model with engineer culture is built, and the contents of CDIO are enriched and expanded, making it more in line with the requirements of new engineering major construction and new career development in application-oriented universities, as shown in Figure 2.

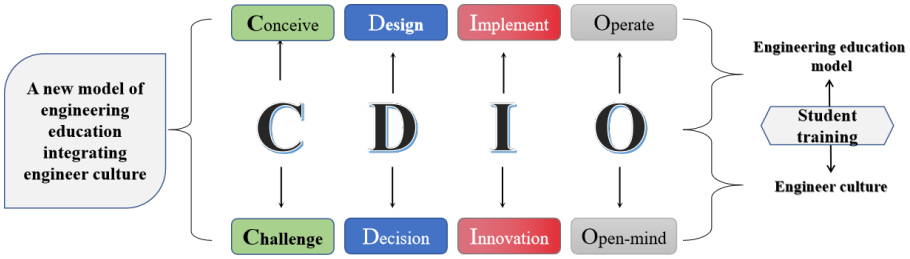

Figure 2: A new model of CDIO integrating engineer culture

(2) The specific measures of personnel training take the engineer culture as the core

It highlights the important position of engineer culture training in the construction of new engineering majors in application-oriented colleges and universities with "students as the center", and takes "originality shaping" as one of the three carriages of student training. Starting from the actual needs of enterprises and aiming at practical application and accurate training, this paper puts forward specific measures of six-dimension talent training. First of all, taking the Internet of Things engineering major of our university as an example, the rationality and effectiveness of the topic system of the new engineering major are explored, including the classification and discussion of course categories, bridging forms, class arrangements, examination forms, etc., the improvement of students' engineer cultural literacy is regarded as an important component of the curriculum system, and the curriculum system is reconstructed under the new CDIO model integrating engineer culture. Secondly, the mapping relationship model between curriculum and experiment is constructed, and the CDIO new model and enterprise employment demand are taken as two important variables of the model, so as to modify and improve the matching relationship between curriculum and experiment group, and realize the depth mapping between them. Third, to build a "double teacher" teaching team system, through discipline competitions, scientific research projects and innovation and entrepreneurship to further consolidate theoretical learning and experimental practice; Fourthly, the combination of enterprise internship and student employment can comprehensively deepen students' ability and carry out objective evaluation; Finally, the essence of engineer culture of "professional focus and excellence" is integrated into students' lifelong learning to form a three-stage talent training model of "college education - enterprise employment - lifelong learning", as shown in Figure 3.

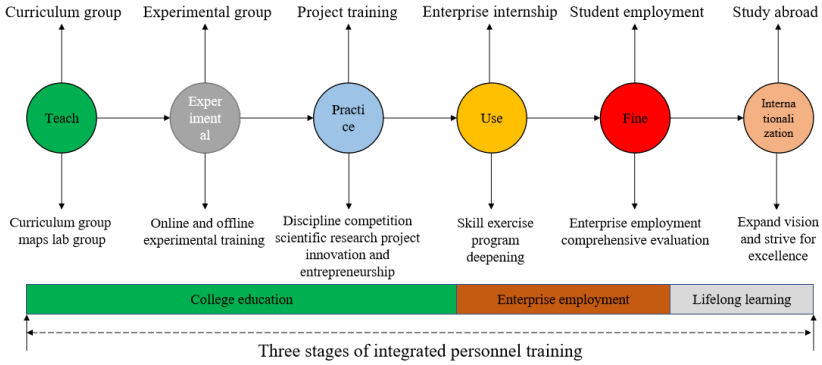

Figure 3: Six dimensions - three stages of integrated personnel training measures

4. Conclusion

This article takes the "new project" construction requirements as the background, takes the research on the improvement of engineers' cultural literacy as the core, combines the characteristics of the Internet of Things engineering, and focuses on the top-level design on the basis of in-depth thinking and research, and expounds the specific talent training measures. This paper first describes the problems existing in the construction of the Internet of Things project in our university; On this basis, this paper discusses in

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detail how to build the CDIO model with the engineer culture as the core, and establish a new model of talent training with the engineer culture as the core of six dimensions-three stages integration. In this way, it can effectively adapt to the development requirements of "new industries and new occupations", the new impact of "new technologies and new concepts" and the new needs of modern enterprises for talents, and meet the ultimate goal of students from college education and enterprise employment to lifelong learning.

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References

[1] Wei Li. On engineering culture education for applied excellent engineers[J]. Journal of Changchun University of Science and Technology, 2012, 7(10): 138-140.
[2] Wei Li, Jianjia Qi. Engineering Cultural Education Based on Outstanding Engineers Cultivation[J]. Value Engineering, 2012, 31(14): 239-240.
[3] Yongfang Tao, Cunhui Shang. The enlightenment of CDIO program to innovation of higher engineering education[J]. Chinese Higher Education Research, 2006, (11): 81-83.
[4] Huiyan Zhang. Implement engineering culture education to train excellent engineers[J]. Chinese Higher Education Research, 2013, (10): 34-36.
[5] Haijin Chen. Research on the path of humanities education in science and engineering colleges under the background of "excellent engineer" training[J]. Studies in Ideological Education, 2014, (04): 80-82.
[6] Qiquan Li, Rui Zhang. Excellence in Engineer Training and Engineering cultural education[J]. Journal of Anhui University of Technology(Social Sciences), 2015, 32(03): 103-104+106.
[7] Xiaoning Wang, Na Liu, Yongwei Li. Research on the Model of University Engineering Culture Education under the Background of "Excellence Program" [J]. Beijing Education (Higher Education), 2017, (02): 83-86.
[8] Zengfeng Zhang, Huixian Ding, Hongtao Li. Current situation and characteristics of research on higher Engineering Education and Engineering Culture Education: Based on data analysis of published papers from 2005 - 2015 [J]. Heilongjiang Education (Higher Education Research & Appraisal), 2017, (05): 61-63.
[9] Xiaofeng Zhang. Study on Three kinds of industrial culture: Craftsman culture, Engineer culture and Maker culture [J]. Journal of Henan Institute of Science and Technology, 2021, 41(12): 1-6.
[10] Ji Ma, Yanxiang Wang. Adhere to scientific and technological innovation and engineer culture to promote high-quality development of enterprises [J]. Installation, 2021, (01): 6-7+11.
[11] Yuxiang Jiang, Likai Ju, Shu Mao. Electronic Practice Course Reform for Training Excellent Engineers [J]. Heilongjiang Science and Technology Information, 2014, (11): 206-207.
[12] Jian Lin, Xingfu Lu. The connotation and constituent elements of China's engineering education governance system [J]. Research on Higher engineering education, 2022, (04): 1-9.