ISSN 2663-8169 Vol. 4, Issue 2: 9-13, DOI: 10.25236/IJNDE.2022.040202

Characteristic Development as the Goal of In-depth Condensed Characteristics of Internet of Things -- A Case Study of Beijing Institute of Petrochemical Technology

Lili Zhang[a,*], Fang Wang[b], Wei Wei[c], Jing Li[d], Yadongyang Zhu[e] and Ning Cui[f]

College of Information Engineering, Beijing Institute of Petrochemical Technology, Beijing, China
[a]zhanglili@bipt.edu.cn, [b]fangwang@bipt.edu.cn, [c]weiwei@bipt.edu.cn, [d]bipt_lijing@bipt.edu.cn, [e]zdy@bipt.edu.cn, [f]cuining@bipt.edu.cn
**Corresponding Author*

Abstract: *This paper studies how to take students as the center and develop with characteristics as the goal of in-depth condensed Internet of Things engineering specialty featured by The Internet of Things Engineering specialty of Beijing Institute of Petrochemical Technology as an example. According to the characteristics of emerging engineering education and new career development, the paper first introduces the development course of Internet of Things engineering specialty. Secondly, the characteristics of the university and the industry are summarized and refined, and finally the characteristics of Internet of Things engineering with the distinctive logo of Beijing Institute of Petrochemical Technology are formed. Finally, it gives its ideas and experience in specialty construction and student training. The research results of this paper can be used as a reference for other schools to condensed features of Internet of Things engineering majors.*

Keywords: *Internet of Things, Student-Centered, Characteristic Development*

1. Introduction

The Internet of Things comes into being in the context of emerging engineering education, and its purpose is to meet the new information technology development in China and the world [1]. Internet of Things Engineering emerged as a new undergraduate major in China in 2010 [2]. In 2017, The Ministry of Education of China carried out research and practice exploration on emerging engineering education, and Internet of Things engineering was confirmed for the first time as one of the 30 emerging engineering education majors. China's Ministry of Human Resources has released 13 new occupations in 2019, and Internet of Things engineering technician is one of them. Thus, the characteristics of "Dual New" of Internet of Things engineering are officially established.

To this end, many schools in China have started the construction of Internet of Things engineering major and undergraduate student education [2-4]. But many of them are developed from measurement and control technology, communication engineering or computer science and technology [5]. They follow the training objectives, training mode and curriculum system of traditional majors [6,7]. However, they did not consider how to summarize the characteristics of Internet of Things engineering as an emerging engineering education and the requirements of the new profession on the knowledge and ability of students of this major based on the characteristics of their own schools and traditional majors. Therefore, it is impossible to cultivate students with professional advantages and characteristics to meet the actual demand for technical talents of enterprises.

In order to solve this problem, this paper takes The Internet of Things engineering major of Beijing Institute of Petrochemical Technology as an example to review its development process in detail. With student-centered and characteristic development as the goal, the Internet of Things engineering specialty with school and industry characteristics is deeply condensed, and the concept and experience of its specialty construction and student training are presented.

ISSN 2663-8169 Vol. 4, Issue 2: 9-13, DOI: 10.25236/IJNDE.2022.040202

2. Development history and specialty characteristics-A case study of Beijing Institute of Petrochemical Technology

Based on the actual development needs of Beijing, Beijing Institute of Petrochemical Technology has set up two teaching and research directions of measurement and control technology and Internet of Things technology on the basis of measurement and Control Technology and Instrument Major (2012). After that, the construction of "New Engineering" was taken as an opportunity and based on the teaching and research direction of Internet of Things technology, the strength of communication Engineering major (2000) was integrated, and the advantage courses and faculty team of automation and Computer Science and Technology, two national first-class majors, were integrated to construct Internet of Things Engineering major, as shown in Figure 1.

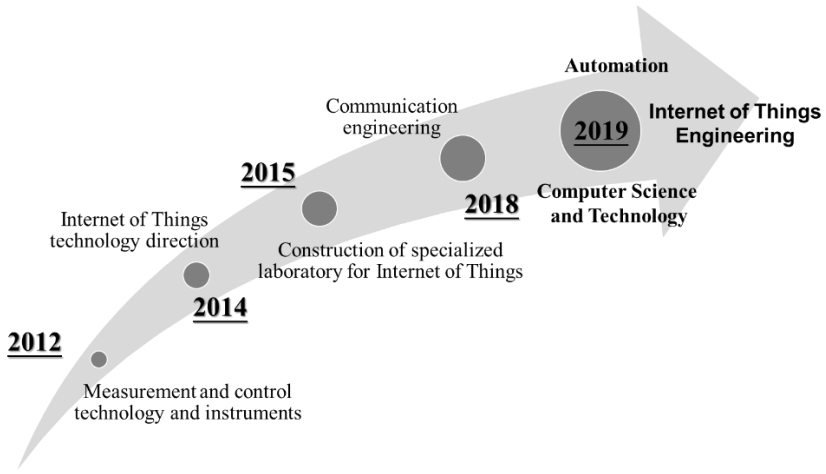

Figure 1: Development history of Internet of Things Engineering major in Beijing Institute of Petrochemical Technology

It for Beijing to a new generation of information technology and related industries to upgrade the actual demand, supported by "new engineering construction", to "new" professional development as an opportunity to develop a solid Internet of basic knowledge and basic skills, has the sense of social responsibility, professional ethics and the humanities accomplishment, with international vision, engineering practice ability, Application-oriented technical personnel who can solve the system engineering problems of the Internet of things.

The university's Internet of Things engineering major has been built with the characteristics of the university and the industry in mind. It from the "new petrochemical" and "new energy", according to the construction of "emerging engineering education" to support the development of a new career, to the actual demand for their services Beijing task, focus on the wisdom of the petrochemical refining production, for storage and transportation integration and formed the professional safety emergency disposal of the integration of three aspects, teaching and research characteristics, as shown in figure 2.

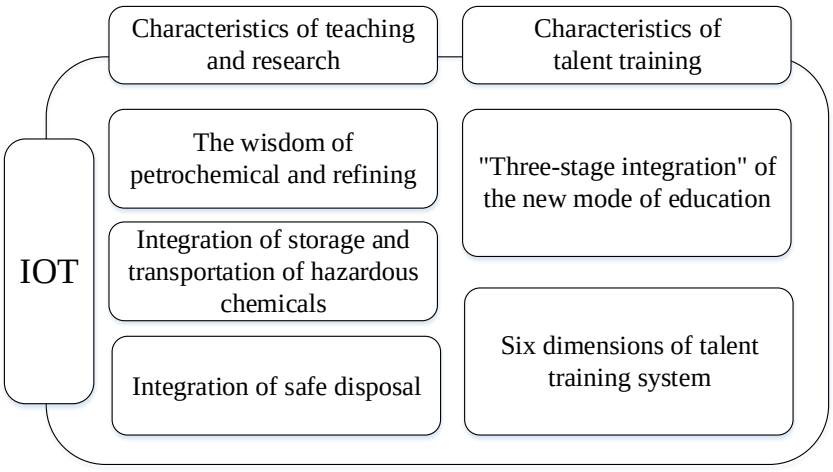

Figure 2: Characteristics of Internet of Things major in Beijing Institute of Petrochemical Technology

ISSN 2663-8169 Vol. 4, Issue 2: 9-13, DOI: 10.25236/IJNDE.2022.040202

It also takes engineering education professional certification standards as the construction criteria and establishes a new education mode of "three-stage integration", as shown in Figure 3. Moreover, it takes the cultivation of applied talents in urgent need of the industry as the main line, and designs a six-dimensional talent cultivation system of "Teaching- Experiment-Competition-Internship-Diligence-International", which has formed a good radiation and demonstration effect, as shown in Figure 4.

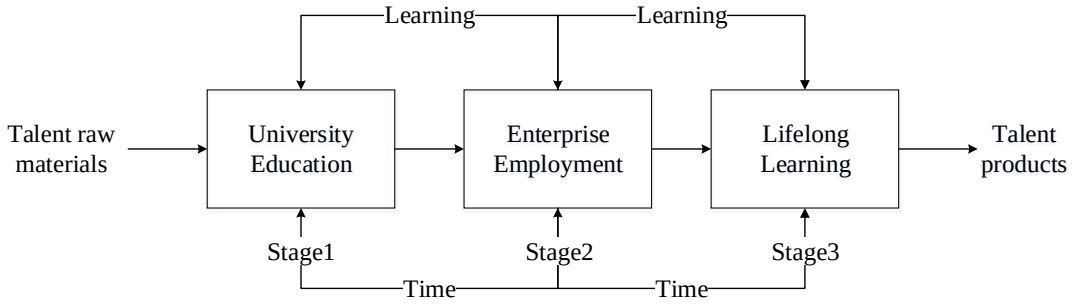

Figure 3: "Three-stage integration" of the new mode of talent training

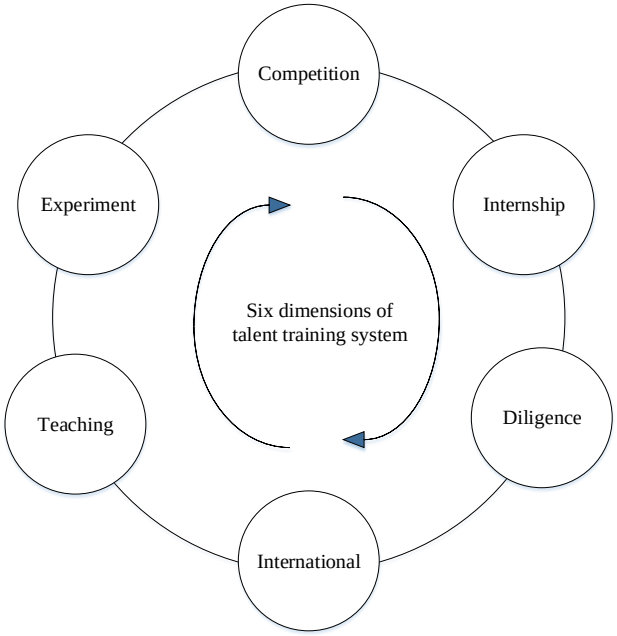

Figure 4: Six dimensions of talent training system

3. The concept of major construction and student training of Internet of Things engineering

3.1 Student development is the center of constructing the talent training system of "three comprehensive education"

The Internet of Things project of the school actively carries out guidance work with moral education as the core, with students' growth and development as the working goal, with all teachers and students' devotion to education as the working principle, and with all staff's education, covering all educational links and operating mechanism as the working structure. It is mainly aimed at the students' confusion in thought, study, psychology, career development, innovation and entrepreneurship in the process of growing up. All professional teachers adhere to the student-centered approach in all aspects of education and teaching.

3.2 The construction of engineering ability training as the main line of the curriculum system and engineering education professional certification standards as the benchmark

It makes an in-depth study on the training target system of competence-oriented engineering application-oriented talents, formulates professional training programs, clarifies professional training objectives and graduation requirements, and proposes that the training mode of high-quality application-

ISSN 2663-8169 Vol. 4, Issue 2: 9-13, DOI: 10.25236/IJNDE.2022.040202

oriented talents oriented to the Internet of Things industry is based on engineering education professional certification standards. It takes engineering ability as the main line and reversely designs the knowledge structure and curriculum system of Internet of Things engineering major.

3.3 Construction of engineering education practice platform in and out of school to industry-school integration as an opportunity

It deepens the integration of industry and education and develops customized talent training by adopting the concept of co-construction, co-governance, sharing and common development. In institute of modern industry as the carrier, the use of various depth, seeking win-win cooperation, increasing investment, cooperation method, in the practice process and all aspects of teaching, to build base, build, build the curriculum, teacher and common implementation, sharing achievement, exploration practice of the "six common" cooperative and win-win cooperation mechanism between colleges. At the same time, it actively promotes the cultivation of "double-qualified" teachers and effectively improves their teaching ability and engineering practice ability.

4. Conclusion

This paper studies how to take students as the center and develop with characteristics as the goal of in-depth condensed Internet of Things engineering specialty featured by The Internet of Things Engineering specialty of Beijing Institute of Petrochemical Technology as an example. According to the characteristics of emerging engineering education and new career development, firstly, the development course of Internet of Things engineering major is introduced. Secondly, it summarizes the three major characteristics of Internet of Things engineering institute of the university with characteristics of the university and the industry: 1) The wisdom of petrochemical and refining, 2) Integration of storage and transportation of hazardous chemicals, 3) Integration of safe disposal. It also describes the formation of a new educational model and a six-dimension talent training system around these characteristics of "three-stage integration". Finally, three ideas of the Internet of Things project in the major construction and student training of the university are given: 1) centering on the development of students, building a talent training system of "three-in-one education", 2) Based on the professional certification standards of engineering education, build a curriculum system with engineering ability training as the main line, 3) Take the integration of industry and learning as an opportunity to build a modern industrial college and a practical platform for engineering education in and out of school.

Acknowledgements

This research was supported by grants from the Key project of University-level education and Teaching reform and research of Beijing Institute of Petrochemical Technology (ZD202103001, ZDKCSZ202103002, ZDFSGG202103001), Cross-Disciplinary Science Foundation from Beijing Institute of Petrochemical Technology (BIPTCSF-006). The referees' valuable suggestions are greatly appreciated.

References

[1] Zhang Zhoushun, Zhang Hongyan, Ren Yeqing, et al. Optimizing the Content System and Teaching Practice of "Advanced Engineering Mathematics" Based on the "Golden Course" Standard. (2021) Theory and Practice of Contemporary Education, 13(6), 23-27.
[2] Deng Wenping, Guan Hua, Hu min, et al. Discussion on the Characteristic Construction of Internet of Things Engineering Specialty in Medical Universities and Colleges. (2021) Journal of Medical Informatics, 42(04), 86-89+93.
[3] Han Kaixu, Yuan Shufang, Zhao Rongyang, et al. Research on the construction problems and Countermeasures of Internet of Things Engineering specialty under the new engineering background. (2020)Public Relations World, 14: 59-60.
[4] Chen Hui, Liao Tao, Jiang Shexiang, et al. Research on Internet of Things Engineering Specialty Construction. (2019) Internet of Things Technology, 9(01), 108-110.
[5] Wu Ling. Research on the Overall Optimization of curriculum system and teaching Content reform of Automation Specialty. (2020) Electronics World, 3, 54-55.
[6] Li Naixiang. Target Positioning and Characteristic Constructing of Internet of Things Engineering

ISSN 2663-8169 Vol. 4, Issue 2: 9-13, DOI: 10.25236/IJNDE.2022.040202

Specialty in Agricultural and Forestry Universities. (2014) Journal of Tianjin Agricultural University, 21(01), 55-57.
[7] Zhang Jingwei, Yang Qing, Zhang Huibing, et al. Internet of Things Engineering specialty Construction and talent training mode Exploration. (2014) China Electric Power Education, 32, 111-112.