Exploration of Training Mode of Applied Talents Based on TOPCARES-CDIO Concept

Xiaoyu Wang, Qian Wang, and Yuxin Zhao

School of information and business management

Dalian Neusoft Institute of Information Dalian, China

wangxiaoyu@neusoft.edu.cn; wangqian@neusof.edu.cn; zhaoyuxin@neusoft.edu.cn

Keywords: TOPCARES-CDIO; Integration; Talents Cultivating Mode

Abstract: CDIO is the most advanced engineering educational concept in recent years in foreign countries. Dalian Neusoft Institute of Information put forward a new idea of TOPCARES-CDIO base on the concept of CDIO, which aims to cultivate high-quality IT applied talents through integration of student's knowledge, capacity and attitude. This article explored applied talents cultivating model based on TOPCARES-CDIO concept through integrated capacity system of specialized talents cultivating, integrated curriculum system and integrated project system. Through the research in this paper, it will be helpful to train high-quality applied talents to meet the market demand.

1. Introduction

Colleges and universities not only undertake the lofty mission of training high-level professionals for the society, but also face the pressure from students' employment. Therefore, colleges and universities must adopt advanced educational concepts so that students can cultivate integrated knowledge, ability and attitude in four years of study. At the same time, we should strengthen cooperation with enterprises, establish cooperation mechanism between schools and enterprises, and construct different training modes of professional talents with distinctive characteristics, so as to cultivate applied talents with innovative spirit. Based on the concept of TOPCARES-CDIO, this paper elaborates the research and exploration of building a diversified talent training model.

2. TOPCARES-CDIO Educational Ideas

The concept of CDIO engineering education is the latest achievement of international engineering education reform in recent years. CDIO means: Conceive, Design, Implement and Operate. It takes the life cycle from product (system) development to product (system) operation as the carrier, and enables students to acquire engineering knowledge, ability and attitude in an active, experiential and integrated way.

On the basis of CDIO concept and the concept of "Education Creates Student Value", Dalian Neusoft Institute of Information puts forward a new TOPCARES-CDIO educational concept. T-technical knowledge and reasoning ability; O-open thinking and innovation; P-personal professional skills; C-communication and teamwork; A-attitude and habits; R-responsibility; E-values; S-practical conception, design, realization and the contribution of behavioral society. TOPCARES-CDIO concept is based on CDIO concept, Make students learn knowledge, ability and attitude in an integrated way, and cultivate students' sense of responsibility and values.

Based on the concept of TOPCARES-CDIO, a series of teaching reforms have been carried out in various specialties of the College, which clarifies the training mode of diversified specialties and constructs an integrated specialty construction model. On the basis of this model, an integrated talent training ability system, an integrated curriculum system and an integrated project system are designed and implemented step by step.

  DOI: 10.25236/meici.2019.066

3. Constructing Integrative Professional Construction Model

Based on the concept of TOPCARES-CDIO, through the investigation of professional stakeholders, the goal of professional training is clarified, and the system of professional talent training is constructed. Under the guidance of professional talent training system, the specialty carries on the integrated curriculum system design, thus carries on the concrete curriculum and the project design. The integrated professional construction model based on TOPCARES-CDIO concept is shown in Fig. 1.

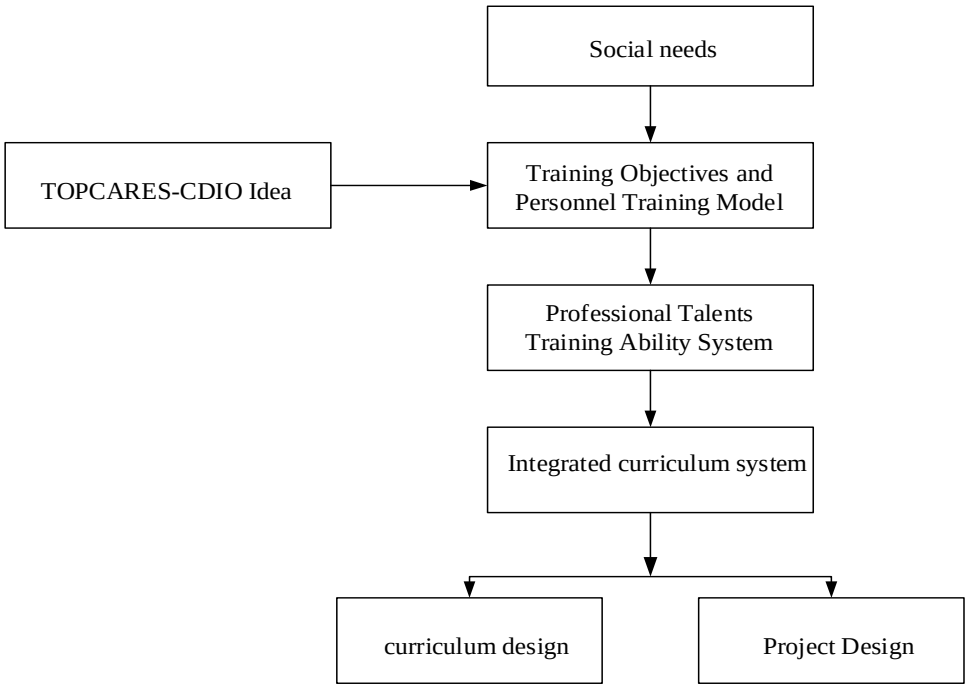

Figure 1. The integrated professional construction model

4. Constructing the Integrative Talent Training Ability System

According to the standard CDIO idea, TOPCARES-CDIO concept was put forward in the institute, and the specialties were further refined, forming a professional integration talent training ability system. Students are required to master eight categories of knowledge, abilities and attitudes as shown in Table 1 after graduation. Through the integrated talent training ability system, students can master the technical knowledge after graduation, and at the same time have the corresponding ability and attitude to form an integrated learning.

Table 1 Professional Talent Training Ability System Based on TOPCARES-CDIO Concept

TOPCARES(Level 1 Capability Indicators)	TOPCARES(Level 2 Capability Indicators)
1 Technical knowledge and reasoning	1.1 Relevant scientific knowledge
	1.2 Basic knowledge of core engineering
	1.3 Advanced Engineering Basic Knowledge
2 Open minded and innovation	2.1 Systematic thinking
	2.2 critical thinking
	2.3 creative thinking
	2.4 Innovation ability
3 Personal and professional skills	3.1 Ability of Engineering Reasoning and Problem Solving
	3.2 Experiments and Knowledge Discovery
	3.3 Information Processing Ability

	3.4 Ability to manage time and resources
	3.5 Lifelong learning ability
4 Communication and teamwork	4.1 Communication Ability
	4.2 Ability to use a foreign language
	4.3 Team work
5 Attitude and manner	5.1 Individual Attitudes and Habits
	5.2 Professional Attitudes and Habits
	5.3 Social Attitudes and Habits
6 Responsibility	6.1 A sense of self-responsibility
	6.2 A sense of responsibility to others
	6.3 A sense of social responsibility
7 Ethical values	7.1 Personal Values
	7.2 Professional values
8 Social contribution by application practice(CDIO)	8.1 External and social context
	8.2 System Conception and Engineering
	8.3 Design
	8.4 Implementation
	8.5 Function

5. Design an Integrated Curriculum System

The integrated curriculum system enables students to simultaneously learn subject knowledge and develop personal, interpersonal and product, process and system building abilities. Based on the concept of TOPCARES-CDIO, each specialty has constructed an integrated curriculum system of specialty. The design of integrated curriculum system includes the following aspects

5.1 Overall Plan of Curriculum System.

Using Integrated Model as the Main Method of Course Master Plan,Integrating the learning process of personal, interpersonal and product, process and system building abilities into the subject curriculum. All the teaching work has played a dual role, enhancing the subject knowledge and CDIO's practical ability. At the same time, the third semester of each academic year will be regarded as the strengthening stage of projects and abilities, with the time integration model to further improve the overall curriculum plan and fully promote and strengthen discipline learning

5.2 Learning Order of Curriculum Knowledge.

The most important thing in the integrated curriculum system is to determine the learning order of knowledge and ability in the curriculum system. The order of knowledge learning is easy to determine, mainly based on the training objectives of the major and the experience of the professional teachers. In determining the order of course knowledge learning, professional teachers are required to determine the degree of connection between the courses taught and other courses in the course system. There are four levels of association: 0, 1, 2 and 3. The specific form is shown in Table 2.

Table 2 Course Contact Table

	Management	accounting	Marketing	financial management	enterprise resource planning(ERP)
Management	3	1	1	1	1
Accounting	1	3	0	2	2
Marketing	1	0	3	1	2
financial management	1	1	0	3	2
enterprise resource	1	1	1	1	3

planning(ERP)	

Remarks: 0 represents the courses in the current column are not related to those in the current line

1 represents the courses in the current column and has some connection with the courses in the current line

2 represents that the courses listed in the current column must be followed by the courses in the current line

3 represents the Course's Self-Connection

According to the investigation and analysis of professional teachers, the knowledge learning order of the four-year curriculum system will be obtained. That is, the connection of curriculum content. Thus, we can get the pre-course, follow-up course and parallel course of each course.

6. Design and Implement an Integrated Project System

According to the concept of CDIO, if students can acquire knowledge, ability and attitude in four years of study, they must implement an integrated project system in four years. The project design of each specialty at all levels is based on real and actual enterprise cases. adheres to the principle of four-year consistent project design, and carries out three-level project decomposition according to CDIO engineering education mode. In the process of design, the project of learning and ability requirement of professional backbone core courses is set as a first-level project. Major backbone courses are divided into several courses groups according to their interrelated degree. Each group of courses sets up a secondary project. Professional backbone courses must be equipped with three-level projects. The project is the carrier to integrate the subject knowledge and arrange the teaching content according to the progress of the project. In the teaching reform of TOPCARES-CDIO, every major should design an integrated project system.

7. Summary

According to TOPCARES-CDIO educational concept, we constantly explore and practice the training mode of applied talents. At the same time of learning knowledge, students'autonomous learning ability, expression ability, team cooperation ability and system practice ability are improved. With the deepening of TOPCARES-CDIO education reform, high-quality IT application-oriented talents will eventually be trained to meet market demand.

Acknowledgements

This research was supported by Dalian Science and Technology Innovation Fund Project (Grant No. 2019J14FZ141).

References

[1] Ji Ce, Lei Weimin, Fu Chong,An exploration of the reform of the Signals and Systems course system based on the OBE education concept,Education Teaching Forum. 12(2017)49-50.

[2] Gu Peihua, Hu Wenlong, Lin Peng, Engineering Education Model Based on Observative Output(OBE): Practice and Exploration of Shantou University,Research in Higher Education of Engineering. 1(2014)27- 37.

[3] Sun Fuquan, Wang Xiaoyu, Wu Di, IT application-oriented talent training model based on CDIO concept, Computer Education.11 (2010) 30-35.

[4] Yin Hong-li, Enterprise Project Driven Teaching Method In Java Web Application Development Based On CDIO, Research Institute of Management Science and Industrial Engineering. 5(2017)109-115

[5] Rebecca C. Fowler, Joanna G. Katzman, George D, Comerci et al.. Mock ECHO: A

Simulation-Based Medical Education Method[J],Teaching and Learning in Medicine, 4(2018)46-53

[6] Di Wu. Application of CDIO Theory in Specialty Construction, Institute of Management Science and Industrial Engineering.Proceedings of 2019 9th International Conference on Education and Social Scienc.5 (2019)137-145

[7] Wang Xiaoyu, Wu Di, Enterprise Resource Planning (ERP), China Railway press, BeiJing, 2011.

[8] Jing Luo, Research on Practical Teaching Base Based on CIM-CDIO Concept, Proceedings of 2nd International Seminar on Education Research and Social Science.5(2019)370-374

[9] Yuxin Zhao, Research on Training System of Marketing Research Talents Based on CDIO Concept, Institute of Management Science and Industrial Engineering.Proceedings of 2019 9th International Conference on Education and Social Scienc.5 (2019)79-84