# Research on Training System for Intelligent Logistics Personnel Based on CDIO

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**Abstract:** Modern logistics is rapidly transforming into the intelligent logistics. The traditional logistics management teaching mode has not adapted to the development of the logistics industry. Logistics enterprises have now entered the stage of standardization and information development, and the demand situation of talents has shifted from skill-intensive to shortage of intelligent logistics professionals. Taking the Tianhua College of Shanghai Normal University as an example, this paper puts forward the CDIO capacity training mode with "intelligent logistics" as the carrier. This model covers the improvement and evaluation of the training objectives, competency outline, curriculum system, teaching methods and practice environment. After that, the specific contents of the conception, design, implementation and operation are discussed in detail. Finally, the CDIO-based intelligent logistics talent training system is proposed.

## 1. Introduction

In recent years, relying on modern information technology, the transformation from traditional freight transportation to intelligence logistics which are specialized, visual, intelligent, informationized and networked has become the development direction of modern logistics. In the context of the development of Intelligence logistics, the entire logistics industry is facing unprecedented changes. With the continuous improvement of the quality requirements of logistics decision-making, the ability of logistics personnel has also been put forward higher requirements.

The problems in the traditional logistics personnel training process have gradually become more prominent. So the emerging intelligent logistics teaching model needs to be reconstructed by university teaching researchers. It is characterized by informationization, integrating big data, artificial intelligence, and other new model of ideas and technology etc.

The concept of CDIO (Conceive-Design-implement-Operate) engineering education just provides a way of thinking for cultivating personnel with such capabilities. CDIO is the latest reform of international modern engineering education after several years of exploration and practice by several world-famous universities headed by the Massachusetts Institute of Technology. It consists of Conceive, Design, Implement and Operate constitutes. "Intelligence Logistics" has certain engineering attributes due to the Internet connection at present. The literature on the ability education of intelligent logistics talents in combination with the CDIO concept is still scarce.

In view of this, this paper takes the logistics management specialty of Shanghai Normal University Tianhua College as an example, constructs a CDIO-based intelligent logistics personnel training system, and discusses the key aspects of conception, design, implementation and operation in the process of capacity development to explore the path of reform of the intelligent logistics training model.

## 2 Training model construction for intelligent logistics capabilities based on cdio

The concept of CDIO is mainly based on experience learning mode, rooted in constructivism and cognitive development theory. It takes the whole life cycle of products from research and development to use as the carrier. It enables students to learn actively, practically and organically by linking courses. It enables students to learn by "learning by doing" and "project based education

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and learning” to grasp the connotation and relationship of knowledge points comprehensively and systematically, and to improve practical skills while learning specific knowledge [1].

CDIO concepts not only emphasize the accumulation of students' basic and professional knowledge, but also pay more attention to the training and implementation of comprehensive and systematic abilities, focusing on the improvement of students' complex and pioneering abilities and the specific application of various skills they need to master in their future practical work[2].

In order to train compound and innovative intelligent logistics talents to meet the needs of the times, the CDIO competency training mode with "intelligent logistics" as the carrier is put forward specially by Shanghai Normal University Tianhua College, as shown in Figure 1. The model covers the training objectives, ability syllabus, course structure, teaching methods and practice conditions and other aspects of the guarantee and evaluation improvement system.

## 3. Construction of intelligent logistics personnel training system based on CDIO

### 3.1 Conception: determination of the training objective of "Intelligent Logistics"

Intelligent logistics refers to the effective integration of Internet of Things technology, big data mining and analysis technology, perceptual recognition technology, remote monitoring technology and artificial intelligence technology into all aspects and main bodies of logistics activities. It has thinking, perception, learning, efficient logistics system for reasoning and self-solving problems [3]. Through the advanced Internet of Things technology, the social resources of logistics, warehousing, distribution, freight forwarding and other aspects of the logistics industry will be integrated to realize the intelligent, automated and informationized operation and management of the logistics industry [4]. Shanghai Normal University Tianhua College will clarify the training objectives for the development of competitive, innovative and intelligent logistics personnel in the era of Internet, big data and artificial intelligence. The focus of the training is on the “composite type” in the current environment.

### 3.2 Design: the setting of “Intelligent Logistics” training capability

According to interviews with cooperative enterprises, logistics enterprises' demand for intelligent logistics is mainly concentrated in four aspects: logistics big data, logistics cloud, logistics mode and logistics technology[5]. The demand for intelligent logistics personnel in enterprises is reflected in three aspects: senior supply chain operation management talents, intelligent logistics middle-level management talents and intelligent technology control personnel. At the same time, it puts forward higher challenges and requirements for the cultivation of logistics personnel in colleges and universities: intelligent logistics personnel should not only possess professional knowledge and practical skills, but also need to have Internet thinking and innovative thinking, master modern information technology and intelligent technology[6].

In summary, in the traditional CDIO capacity development program, for the "intelligent logistics" personnel who already have engineering attributes, the Internet-based big data analysis ability and machine learning skills should be included in the professional level ability of technical knowledge promotion.[7] It focuses on cultivating students' ability to process large-scale logistics data and the ability to apply logistics intelligence for forecasting and decision-making. At the same time, in the cultivation of personal, professional ability and attitude, students are urged not to be limited to the immediate future, but also to have a broad vision to continuously learn the technical concept of the "Internet +" era, with critical thinking to find out, analyze and resolve the real valuable problems[8].

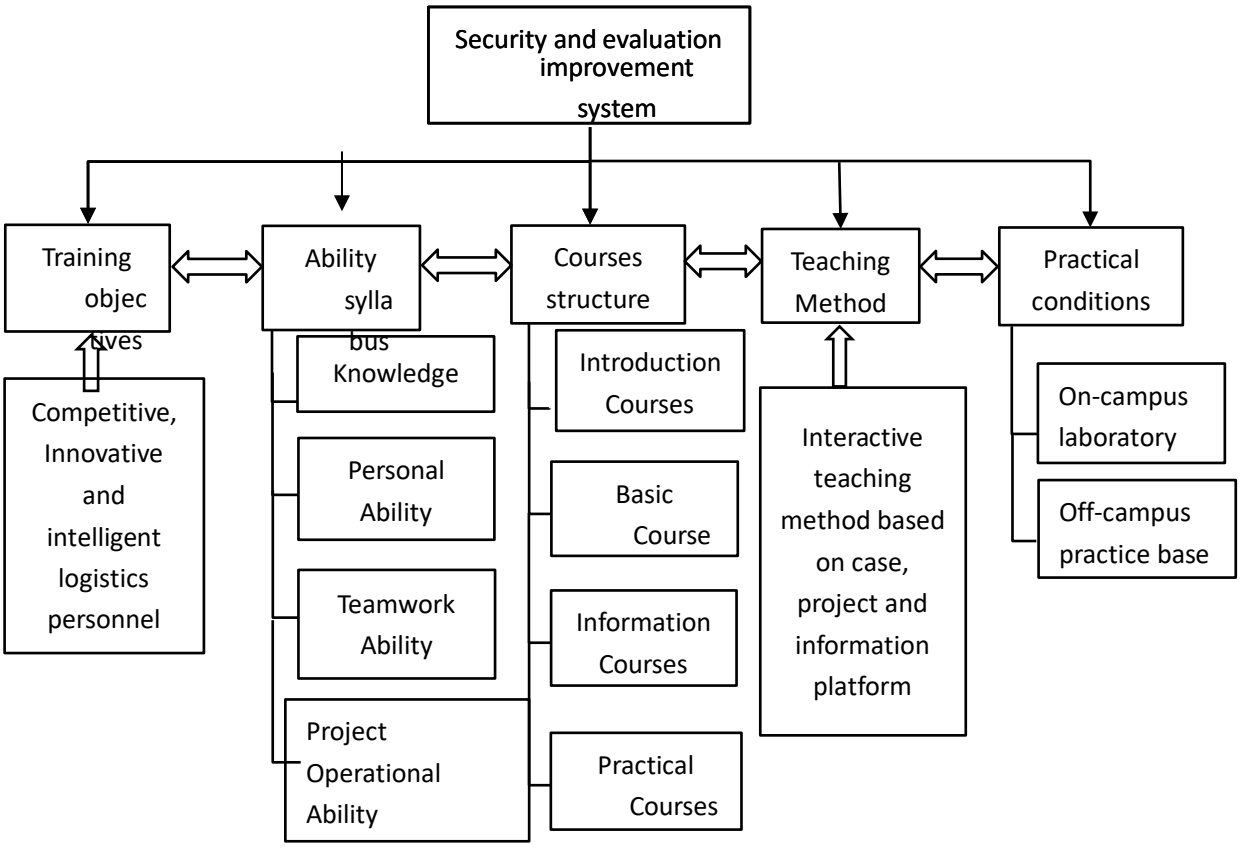


Figure 1 CDIO-based Capabilities Training Model for Intelligent Logistics Personnel

### 3.3 Implementation: The development of the "Intelligent Logistics" curriculum

Based on the CDIO concept and the learning objectives of intelligent logistics, the intelligent logistics curriculum system should include the following four types of courses: introductory courses, logistics basic courses, logistics information courses and innovative practical courses. The "intelligent logistics" course structure relationship composed of these four types of courses can be visually summarized as the concept map shown in Figure 2. As can be seen from the figure, the introductory course is at the bottom, playing the foundational role of “laying the foundation”; the basic logistics course and the informatization course are located on both sides, which are the main “pillars” in the course structure and play the role of support. The role of sex; the practical course is at the top, as the "top stone" of the entire structure, is a concentrated manifestation of the training capacity required in the course of the course. Thus, through this structure, mutual support and organic connection between the classes in each course is formed. The four types of curriculum structure will be elaborated below.

#### 3.3.1 Introduction Course

The introductory course is the cornerstone of the entire curriculum in the CDIO model. It has a groundbreaking and introductory character. It is designed to help students understand their role and contribution in the enterprise, and stimulate their interest in the field. As engineering teaching, the introductory course of intelligent logistics should also be based on the project's experience, including thinking about how to use the knowledge to implement practical projects, and let students participate in simple project exercises. Shanghai Normal University Tianhua College has gradually cultivated students' interest in intelligent logistics information technology through industry expert lectures, professional understanding of internships to logistics companies, market research and training of logistics projects, and specialized introductory courses in logistics.

#### 3.3.2 Logistics Basic Course

The basic logistics course is the first core part of the intelligent logistics curriculum structure.

This type of course takes the traditional logistics work as the teaching content. It covers courses in procurement, operations, warehousing, distribution, international logistics, and logistics system design. It focuses on promoting students' mastery of logistics theory and the understanding of theoretical connections, in order to form a more systematic logistics knowledge framework, laying a solid foundation for the intelligent integration behind.

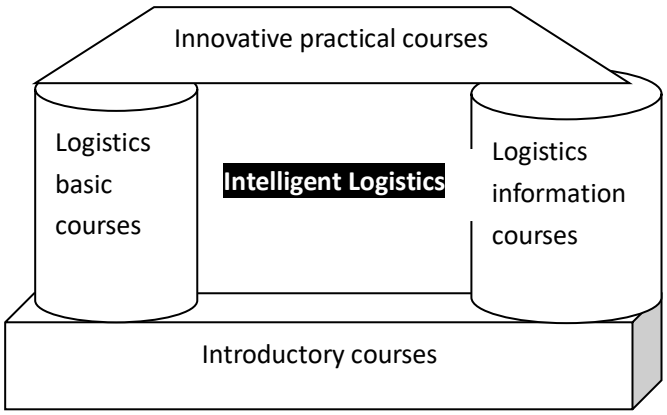


Figure 2 CDIO-based "intelligent Logistics" curriculum structure

### 3.3.3 Logistics Information Course

The logistics information course is the second core part of the intelligent logistics curriculum structure, emphasizing the cultivation of students' information technology skills. With the advent of the era of "intelligent logistics", Shanghai Normal University Tianhua College deeply understands that information technology should not only be used as an auxiliary teaching method, but should also be effectively integrated into the information course content in the curriculum structure. For example, the curriculum (see Table 1.) highlights the intelligent features, including logistics big data analysis, logistics intelligent equipment and applications, logistics network technology and many other innovative cutting-edge courses. The focus of its setup is on the teaching of basic information technology methods needed for logistics intelligence. In terms of training programs, the focus is on the organic integration of training courses based on the intelligent logistics practice platform.

### 3.3.4 Innovative practical curriculum system

The innovative practice course is closer to reality than the three types of courses mentioned above. Its goal is to highly integrate students' theoretical knowledge, personal ability and team writing ability with their learning attitude and personal accomplishment in the teaching scene. It increases students' motivation and self-confidence by providing them with a wealth of logistics theory knowledge and adequate information technology application practice opportunities. Shanghai Normal University Tianhua College has set up practical teaching courses in two modes: simulation training and off-campus practice. Among them, the simulation training requires students to carry out the practical operation of the simulated logistics business in the computer room on the basis of fully understanding the knowledge of logistics theory, while the off-campus practical courses include professional internships and graduation thesis. We mainly use the "learning, doing, and alternating" teaching methods to combine students' off-campus internships, job employment and graduation thesis. At this stage, students can choose to combine the internship enterprises to do logistics project design, or choose to write professional papers around the actual logistics management and technical issues of the internship enterprise.

Table 1. Intelligent Logistics Information course structure

| | | |
|---|---|---|
| Professional Courses | Core Courses | Management Information System |
| | | Operations Research |
| | | Business Statistics |
| | | Modeling Analysis |
| | Direction Courses | Python Program Basics |
| | | Logistics Big-data Analysis |
| | | Internet of Things Technology |
| | | Logistics Intelligent Equipment |
| Training programs | Intelligent Logistics Practice Platform | Logistics Information Training |
| | | Warehousing and transportation management training |

### 3.4 Operation: Teaching operation of "intelligent logistics"

#### 3.4.1 Improve teachers' CDIO practical ability

The essence of the CDIO concept is to implement the reform of the teaching model of “learning in implementation” and “project-based education and learning” in the logistics curriculum system. Therefore, it is necessary to strengthen the CDIO practical ability training of the teaching staff to ensure the implementation of the CDIO training model.

At present, most of the logistics professional teachers have high academic qualifications and senior professional titles, but they are out of touch with corporate practice and lack engineering literacy and practical hands-on ability. As a result, the talents trained have the shortcomings of lack of practical experience and poor hands-on ability. Therefore, we change the structure of the faculty by means of teachers' business practices and the introduction of corporate mentors, focusing on cultivating a team of teachers who are both qualified as teachers and engineers (senior logisticians).

#### 3.4.2 Establish a hierarchical practice teaching platform

Shanghai Normal University Tianhua College has built a platform for sharing logistics teaching resources, relying on the resource advantages of institutions and enterprises within the Jiading Vocational Education Group in Shanghai. The practical teaching platform enhances the collaboration and cooperation between universities and enterprises, and can share resources such as logistics theory teaching, practical teaching, practice bases and logistics teachers. Through the use of the platform, industrial development, technological innovation, management innovation and personnel training are organically combined to provide better intellectual support and talent protection for the development of China's logistics industry.

#### 3.4.3 Establish industry-university cooperation and off-campus practice base

The combination of industry and education is a process of teaching and learning. Not only can students acquire professional ability through the practice of the enterprise, but teachers can enhance their practical teaching ability through on-site guidance and cooperation with enterprise research. In line with the implementation of the CDIO talent training model, we have established industry-university cooperation relationships with a number of logistics parks and logistics companies. Through the close integration of curriculum teaching, research and corporate practice, we have fully utilized the respective advantages of universities, industry associations and enterprises in order to cultivate Logistics talents that society needs.

### 3.4.4 Pay attention to the role of extracurricular scientific and technological innovation activities

Extracurricular scientific and technological innovation and social practice activities are effective ways to improve students' comprehensive quality, professional ability and innovative quality. To this end, we actively organize students to participate in national and provincial college students' innovation and entrepreneurship training program, college students' extracurricular science and technology competitions, and social surveys. At the same time, the selection of key professional teachers and the employment of corporate instructors to guide, in order to effectively improve students' project practice ability. Finally, we have also developed incentives such as credits.

## 4. Conclusion

Taking the Shanghai Normal University Tianhua College as an example, this paper puts forward the CDIO capacity training mode with “intelligent logistics” as the carrier. This model covers the improvement and evaluation of the training objectives, competency outline, curriculum system, teaching methods and practice environment. After that, the specific contents of the conception, design, implementation and operation are discussed in detail. Finally, the CDIO-based intelligent logistics talent training system is proposed.

In summary, Shanghai Normal University Tianhua College has built an innovative intelligent logistics personnel training system by using the CDIO concept. In the next stage, through the effectiveness of the student's training and verification system, the personnel training system will be further improved in practice to continuously cultivate competitive and innovative intelligent logistics management in the era of Internet, big data and artificial intelligence.

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