



# Research and Construction of the Innovation and Entrepreneurship Collaborative Education Pattern of Design Discipline

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**Abstract.** Today's economic development of China is facing changes in the industrial structure adjustment and upgrading. Design innovation has become an important engine to promote the development of the industrial revolution. However, compared with other countries, the Education about design discipline in China set up relatively late. With more than 40 years of development, the evolution speed of Chinese design education is not synchronized with the needs of industrial development. As a significant place of design education, there are many problems in Universities, such as unitary teaching pattern and inadequate students' innovation and entrepreneurship training. Based on the analysis of several typical cases of innovation and entrepreneurship education in universities located in Shanghai, this paper explores to establish a "Five-in-one cooperative education pattern", which means university, society, industry, scientific research institutions, and enterprises are supposed to cooperate closely. Moreover, by the construction of the "LCS training model" for innovation and Entrepreneurship talents, this research finds a way to optimize the teaching mode and training mechanism for innovation and entrepreneurship in the design discipline. Ultimately the design innovation will be integrated into the industrial chain which can make the design industry play a more critical role in the national innovation system.

**Keywords:** Design discipline · Innovation and entrepreneurship · Collaborative education mode · LCS education mode

## 1 Introduction

The pattern of international industrial division is being reshaped. A new round of world technological revolution, industrial transformation and economic development of China are forming a new convergence. From a global perspective, design innovation has become a necessary engine to promote the development of a new round of industrial revolution. Moreover, it has become an important part of the national innovation strategy. In 2011, the Ministry of Education of China launched the "Collaborative Innovation Project" program, which takes the collaborative innovation model as a cooperative link. These program aims to promote the reform of the

personnel training mechanism, through interdisciplinary integration. In 2015, The International Council of Societies of Industrial Design (ICSID) released the latest definition of industrial design, which clarified that the content of design services is facing the fundamental change [1]. As an important place for cultivating industrial designers, there are many problems among colleges and universities, such as the disconnection between design education and social development needs, and the lack of collaborative innovation and cooperation among students. How to update the design education concept and cultivate interdisciplinary composite professionals that meet the needs of contemporary society is an important issue [2]. East China University of Science and Technology seized the opportunity to make full use of the accumulation of school running to tap into its resources. The School of Art Design and Media, under the guidance of the five-in-one collaborative education training concept, has launched the LCS education model education practice.

## **2 The Main Problems of Modern Education**

### **2.1 Single Education Model**

The rapid development of the Chinese economy has promoted the transformation of the manufacturing industry, among the society needs a large number of innovative and entrepreneurial designers. The United States is one of the earliest countries in the world to start entrepreneurship education. As early as 1998, American universities collaborated with federal laboratories in the industry to conduct curriculum research [3]. The “dual-track system” teaching model, which originated in the German Bauhaus, is rooted in the institutional soil of the German market economy. However, the Chinese education model is monotonous. Chinese curriculum system is mainly composed of public basic courses and professional courses.

### **2.2 Weak Awareness of Entrepreneurship**

Influenced by the current Chinese education model, college students lack of entrepreneurial experience, capital funds and in-depth understanding of the market. They are easy to be limited by less venture capital. These reasons have affected college students' choice and attitude towards innovation and entrepreneurship. At present, the division of disciplines in Colleges and universities is becoming more and more sophisticated. After entering the University, college students are exposed to more professional knowledge, which is easy to form a solid mode of thinking. It is easy to form barriers between disciplines because of the lack of linkage.

### **2.3 Separated Innovation Practice Projects**

The design project is the specific implementation object of innovation and entrepreneurship, which is an important way for students to connect theoretical knowledge with practice. Generally, practical projects in schools mainly include academic competitions, teaching researches, school-enterprise cooperation projects, etc.

Governments, enterprises and universities collect a lot of good ideas and plans through competitions, scheme solicitation, and other ways. However, these plans cannot form deeper cooperation and implementation with enterprises. Schools should constantly refine innovation and entrepreneurship projects from competition and scientific research systems to improve the practicability and feasibility of the projects [4].

## 2.4 Backward Curriculum System

The evolution speed of society may be changing in a cycle of three months or six months, while the evolution of the education system in Chinese universities is a slow process, which will not be changing greatly in five or even ten years. This phenomenon leads to a mismatch between the demand for society and the supply of universities [5]. For instance, around 2010, with the rapid development of interaction design in China. Many industrial designers change their careers to become interactive designers. However, because most schools do not offer interactive majors, graduates have to relearn professional skills from the work.

## 3 Exploration of Design Education

### 3.1 Synchronization with Industrial Structure Reform

China is traditionally a big manufacturing country. The evolution of design patterns is given in Table 1. In the development stage of the manufacturing industry, designers must have strong knowledge of modeling design, model making, material technology to cooperate with the manufacturing production. After turning to the information age, a large number of consumer products focus on information products. The development of the mobile Internet brings more possibilities and opportunities for design. The third transformation has changed to a service-oriented society. The service industry puts more emphasis on the service operation. According to the experience of developed countries, the proportion of service economy should be more than 70%, and the proportion of the service economy in Shanghai has reached more than 60% [6].

**Table 1.** Evolution of design patterns

Time	Period	Leading pattern	Concerns
1800s	Industrial age	Industrial design	Physical logic
1900s	Experience economy	Interaction design	System logic
2010-	Service economy	Service design	Design thinking
2020-	Integration development	Design driven society	Social innovation

The development of design education is closely related to the changes of society, economy and technology. There are four stages of change in design education to cope with industrial changes, while each stage required various knowledge structures. The design discipline of East China University of science and technology is a

comprehensive specialty. Throughout its history, the concept of design discipline is deeply rooted in the rich soil of industrial technology, art design, humanities, and social sciences. Students have a solid theoretical foundation, international vision, and innovation ability. In addition to focusing on the education of basic professional theories and technical knowledge, students are also guided to mine the users' essential needs, understand the business operation and pay attention to social development.

### 3.2 Interdisciplinary Collaborative Education Mode

With the development of online and offline integration, the boundary of the designer's responsibility is fuzzier, and the design link is longer and longer. The dimension of design is constantly enlarged, which inevitably leads to new cross fusion (Fig. 1 shows an example). An excellent designer should not only understand visual design, interactive design, but also understand product operation, user research, etc. The increasing transition of design from node value to system value, from focusing on individual design to the whole industrial chain. The innovation and entrepreneurship projects emphasize the realization of project closed-loop, which will inevitably lead to deep integration and intersection with various industrial chain disciplines.

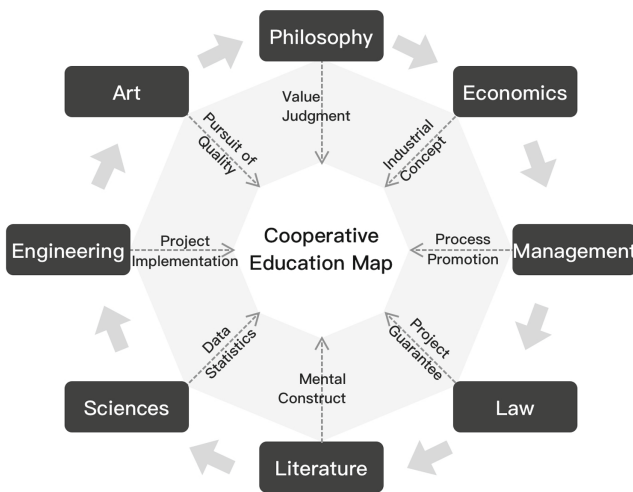


Fig. 1. Interdisciplinary collaborative education model map

Philosophy knowledge guides the value judgment of innovators. The thinking logic of economics links all segments of the project. The knowledge method of management is helpful for the smooth progress of the project. Legal content provides guarantee for enterprise operation. User psychology research of liberal arts is helpful to the success of the project. The application of mathematical logic in science contributes to the team to make decisions. Engineering guarantees the implementation of the project from the technical level. Art science uses aesthetic advantages to improve product quality.

With the help of interdisciplinary knowledge content, enriching each node of the project practice process.

### 3.3 Construction of New Knowledge System

In the new round of innovation environment, our society has higher requirements for people who need to focus on both the range and depth of their knowledge. The complete design process includes discovery, definition, development, design, transformation, integration and communication [7]. Take innovative seven-step as the overall path of innovative design development. In the first stage, art collides with philosophy and economics to perceive the next outlet of the industry. The collision between art and science engineering enables designers to predict industry trends more accurately. In the definition stage, the theory and method of management are used to develop the design strategy and business plan. In the process of actual project development, it requires deep cooperation between developers and designers to understand the current technology boundary and various innovation possibilities. In the integration stage, the integration of science and technology is applied to the nodes of the supply chain, so as to open up the commercialization path of innovative products.

Based on the vertical dimension of innovation seven-steps, combined with eight disciplines including philosophy, economics, management, law, literature, science, engineering and art as the horizontal dimension, a knowledge system of innovative personnel training under the new industry mode is established, hoping to redefine the criteria for the evaluation of new personnel [8]. In recent three years, East China University of science and technology has actively explored the teaching of innovation and entrepreneurship education for students, which has completed many undergraduate innovation and entrepreneurship projects, such as we have published <Integrated Innovation Design Based on Red Dot Competition> and <Exploration of “1 + 1 + 1” International Design Innovation and Entrepreneurship Personnel Training Mode>.

### 3.4 Redefining Teaching Scene

In the classroom, students need to discuss together and practice in person, besides speaking and listening. For design education, both collaboration and sharing are key points to adapt to the new transformation. Renovating training mode and establishing innovation and entrepreneurship training mechanisms require universities to redefine the teaching scene [6].

(1) Collaborative Group: the organizational form of curriculum changes from division to integration. The new form of curriculum organization should have a complete curriculum goal. For example, to complete a subject of intelligent travel, a cross-border group should be formed at this time. The group members should include students with different professional backgrounds, such as brand, machinery, computer, interaction, design and so on. We can also call it “collaborative group” which can accomplish the target tasks in collaboration [6]. (2) Sharing Classroom: create a new teaching scene. The boundary of the classroom will be demolished to create a more common and integrated flow space and shared space, and to break the barriers of different disciplines. (3) Application of new technology: Combine with the

development of the technology of the times and apply some new technical means. For example, through AR, VR and MR, stimulate students' interest in learning and innovation. (4) Learning ecology: schools should not stand alone. Schools should form a dynamic relationship with enterprises, R & D institutions and social organizations, thus let social resources enter schools. Schools participate in the whole process of social evolution, also can turn the curriculum into a real topic.

## 4 LCS Education Mode

Based on the “construction of multi-level innovation and entrepreneurship training platform for design majors”, East China University of science and technology researched LCS education model framework which accord with the policy background and technological development needs of “innovation and entrepreneurship” development in the new era (Fig. 2).

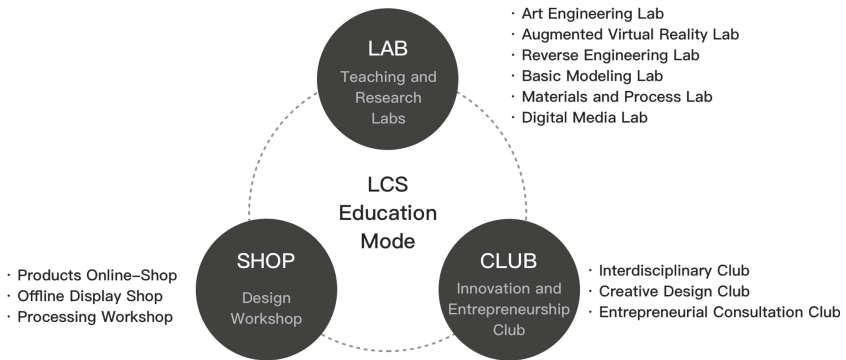


Fig. 2. LCS education mode

(1) The art design and media teaching and research laboratory are based on the establishment of the Art Engineering Experiment Center, Augmented Virtual Reality Lab (Manheng co-construction), Reverse Engineering Lab and the others to provide pilot service for outstanding projects. These labs can accelerate the transformation of achievements and reduce the risk of innovation and entrepreneurship. (2) Through the construction of effective interdisciplinary collaborative education club, strengthen the independent entrepreneurship and training of design and innovation talents, and form a good teaching supplement. (3) Through cooperation with more enterprises, the project platform will become a practice base for professional students before graduation.

The school of art design and media of East China University of science and technology cooperates with the network platforms, such as 51 design and Puxiang industrial design station, and the Industry organizations, such as Shanghai Industrial Design Association and Shanghai Creative Workers Association. Through the inter-linkage of online to offline, this mode promotes enterprise docking and achievement

transformation of innovation and entrepreneurship projects. At present, these labs that more than 90% of the comprehensive and designed experimental courses are offered are all open to the students of our university.

## 5 Summary and Prospect

This paper presents an Interdisciplinary collaborative education model that breaks the traditional boundary, including discipline boundary, industry boundary and region boundary. This mode plays a significant role in promoting the design industry in the national innovation system [9]. East China University of science and technology, based on the multi-disciplinary integrated knowledge system, carried out the project of “professional cognition and innovation ability training system construction guided by design principles” and won the second prize of the 2017 Shanghai teaching achievement award. As of 2019, the school has arranged students to participate in more than 60 practice activities and organized students to contribute to more than 100 innovation competitions. The whole process and multi-dimensional construction of LCS education mode for innovation and Entrepreneurship of design discipline will contribute to regional planning, industrial development, discipline construction, research progress, and technological development, etc. [10].

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