

Research on Collaborative-Innovation-based Talent Training System for Mechanical & Electrical Major in Applied-type Undergraduate Colleges

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Abstract: Aiming at the current situation of the lack of innovative talents in China, this paper develops a talent training system based on "cross-border integration, collaborative innovation", Providing a new idea for the cultivation of high-quality innovative talents for the major in mechanical and electrical engineering of applied undergraduate colleges. College students' innovative entrepreneurship theory and Marxist practical philosophy will run through the whole process of research. To enable students to have a good full industry chain perspective, able to communicate across industries, interdisciplinary; Having ability to work collaboratively in the context of the entire industry chain, and to assume the role of a highly contributing team member or even a unique person; Understanding and master the whole industry chain engineering management principles and value decision-making methods, and can be applied in a multidisciplinary cross-environment.

Keywords: Applied undergraduate colleges; Cross-border integration; Collaborative innovation; Talent training system

1. Introduction

The lack of innovative talents has become an important factor restricting China's economic and technological development, affecting the long-term development of the country [1]. As a dual subject of technological innovation and talent cultivation, colleges and universities should deepen the reform of innovation and entrepreneurship education as a breakthrough to promote comprehensive reform of higher education, and deepen the reform of key areas such as curriculum systems, teaching methods, practical training, and team building. Collaborative innovation [2] is a new type of innovation and entrepreneurship that China is vigorously advocating, and the development of mechanical and electrical related industries plays an important role in China's economic development. In order to adapt to the rapid development of many key industries, it is imperative to train a large number of high-quality applied talents with cross-border collaborative innovation capabilities. Strengthening the cross-border collaborative innovation ability of undergraduate students majoring in mechanical and electrical is a necessary condition for the integration of mechanical and electrical discipline development and regional economic development. Establishing a cross-border collaborative innovation talent training system will be an important

way for future applied undergraduate colleges to self-improve and serve regional economic development.

Collaborative Innovation was originally proposed by Gloor et al. [3], a researcher at the Massachusetts Institute of Technology, in which a network of self-motivated people formed a collective vision to achieve common goals through network communication ideas, information, and work conditions. In 2011, General Secretary Hu Jintao put forward the guiding ideology of "collaborative innovation" for the cultivation of higher education talents from the strategic height of building an innovative country in the 100th anniversary of Tsinghua University. In 2012, the Ministry of Education and the Ministry of Finance promulgated the "Opinions on Implementing the Innovative Capacity Enhancement Plan for Higher Education Institutions", focusing on the cultivation of innovative models of multidisciplinary cross-integration and cross-border technology collaboration. The innovation and entrepreneurship model of industry cross-border interaction and technology synergy has become the inevitable trend of traditional industry transformation at this stage. The cross-border collaborative innovation talent training model has gradually become a hot topic in teaching research at home and abroad.

The more prominent internationally is the US Stanford-Silicon Valley school-enterprise collaborative develop-

ment model [4], which brings about the talent cohesion effect and the modularization of the industrial division of labor, making Silicon Valley the most dynamic and valuable information industry innovation base in the United States. However, the industry-university research model of the Massachusetts Institute of Technology's art and technology laboratory is also worthy of attention [5]. The laboratory has a variety of cross-border collaborative innovation models, such as consulting cooperation, project group cooperation, and company-level cooperation, in schools and enterprises. Students, and other aspects have achieved a good result of multi-win. In Europe, Aalto University in Finland relies on the dominant subject cluster to establish a collaborative innovation research platform [6-7], conducting large-scale, interdisciplinary frontier scientific exploration, and has cultivated a large number of outstanding high-level innovation and entrepreneurship capabilities for industry and academia. Ligon et al. [8] first explored the cross-border training mode suitable for college art design talents promoted by the concept of collaborative innovation, and put forward the practical ideas of "course-oriented cross-border integration" and "practice-oriented synergy". Raposo et al. [9] actively explored a new model of cross-border collaborative innovation talents that meets the needs of economic development and enhances the essence of vocational education. Feedback from students, schools and enterprises indicates that the teaching effect has been significantly improved. Pei-Feng [10] quantitatively measured the coupling effect of cross-border collaborative innovation between universities and industrial enterprises and government R&D institutions in China from the vertical dimension of historical development, and not only analyzed but also diagnosed its potential structural problems. Collaborative innovation talents have important theoretical guiding significance. Yong et al. [11] discussed the reform of innovation and entrepreneurship education in colleges and universities under the era of "Internet +". It is proposed that as an educator, we must first have an open, multi-source, cross-border and shared Internet thinking, and integrate "Internet +" into talent training. China should be the direction of college education reform. The research on the cross-border collaborative innovation talent training system of mechanical and electrical specialty has important theoretical and practical significance. The theoretical significance lies in the inevitable trend of the development of higher education is the cultivation of innovative and entrepreneurial talents. It is no longer confined to a certain type of college or a specific profession, and has become a popular education in general colleges and universities. The research on innovation and entrepreneurship education for mechanical and electrical students is not only the study of mechanical and electrical education, but also the scope of management and economics. Therefore, this research can further improve the

theoretical system of innovation and entrepreneurial talent training, and enrich and develop the new concept of engineering education reform in applied undergraduate colleges. In terms of practical significance, the innovation and entrepreneurship education of Chinese college students has been proposed in recent years, and is still in the period of exploration; At the present stage, a large number of new technologies and new industries have emerged, which greatly promoted the demand for talents with cross-border collaborative innovation capabilities in the mechanical and electrical profession. The innovative entrepreneurial model based on cross-border, collaborative and integrated has gradually become an important way for the rise of emerging industries and the transformation of traditional industries. Especially for the central and southern regions where the mechanical and electrical equipment manufacturing industry plays an important role, it has cultivated a large number of high-quality applications with cross-border collaborative innovation capabilities. And it is an urgent task.

2. Theoretical Basis for Cross-border Collaborative Innovation

The research on cross-border collaborative innovation talent training system is mainly based on the following theories: TRIZ innovation theory [12], collaborative innovation theory [13], and Marxist practical philosophy theory [14].

TRIZ innovation theory. TRIZ theory is the discovery problem processing theory, which was proposed and developed by scholar Altshuller in the 1940s, and it showed great vitality in the following decades. At present, TRIZ theory has become the most efficient way to solve innovative problems, and it is also the pivotal theory that computers help technology innovation. The main points of view include: the creation of the system and the expansion of technology must follow the objective laws; the motivation to solve the technical opposition, conflict, and contradiction is the evolution of technology; the best function of technological progress is to create more functions with the least resources.

Collaborative innovation theory. The theory of collaborative innovation stems from the concept of synergy, which emphasizes the interaction between innovation entities. American scholar Gloor believes that collaborative innovation is a network of self-motivated people to form a collective vision, through the network to exchange their ideas, work conditions and other information, through cooperation to achieve a common goal. Collaborative innovation is a systematic project. It needs to realize the deep integration of various resources through cross-regional, cross-industry and interdisciplinary. It is a process from communication to cooperation to integration and then transformation. In this process, synergy is the means, and innovation is the goal.

Marxist theory of practical philosophy. The emphasis on practice in Marxist philosophy is the foundation for generating knowledge. The application-based undergraduate innovation and entrepreneurship education should maintain the concept of practice first, establish the prestige of practice, and all based on reality, thus ensuring that students' thinking and activities adapt to the order of the outside world and create the world efficiently. When exploring the cultivation mechanism of college students' innovation and entrepreneurship, the theoretical basis lies in the innovation of entrepreneurship, innovation is the practice, human innovation ability is cultivated and formed in practice, play and manifest in practice, exercise and improve in practice. Therefore, the practical viewpoint of Marxism occupies a core position in the theoretical basis of college students' entrepreneurial innovation education.

3. Construction of a Cross-border Collaborative Innovation Talent Training System

The proposed personnel training system is mainly aimed at the mechanical and electrical majors of applied undergraduate colleges, such as mechanical design and manufacturing and automation, mechanical and electrical engineering, electrical engineering and automation. Carrying out the top-level design on the training program, fulfilling the innovation practice on the teaching method, and construct a set of talent cultivation system of "cross-border integration and collaborative innovation". The goal is to enable students to have a good view of the entire industry chain, to communicate and communicate across industries and disciplines; to work collaboratively in the context of the entire industry chain, to assume the role of high-profile team members and even the most independent. Understand and master the whole industry chain engineering management principles and value decision-making methods, and can be applied in a multidisciplinary cross environment. Specifically, the construction of the talent training system starts from the following three aspects.

Construction of a teaching staff with a full industrial chain perspective. In the construction and setting of professional courses, emphasizing multidisciplinary intersection and opening can effectively promote the complementary advantages of disciplines and resource sharing, strengthen students' internal motivation for the acquisition, internalization and expansion of the whole industry chain and cutting-edge technical knowledge, and enhance students' cross-border collaboration and the cultivation effect of innovation ability. Therefore, the focus of teacher training is to develop a cross-regional, cross-industry, and interdisciplinary school-enterprise exchange mechanism, explore new curriculum ideas based on a series of academic reports and experience sharing, and accelerate the development of the entire industry

chain of mechanical and electrical professional teachers. In the process, the research team of teachers and students is deeply involved in the practical exploration of enterprise projects. In the final analysis, in accordance with the basic idea of "please come in, go out", gradually form a team of dedicated and part-time teachers with innovative capabilities and a full industrial chain perspective. Product life cycles collaborative innovation ability training. For students' cross-border communication, and pay attention to immersive experience learning in different industries and different disciplines can effectively promote the mechanical and electrical students to master the thinking mode of integrating into the whole industry chain context and enhance their cross-industry and interdisciplinary background. The subjective initiative of technological synergy accelerates the process of cultivating their cross-border collaborative innovation capabilities. Therefore, the basic idea of building a competency training platform is: Through the introduction of the existing flexible manufacturing system, the virtual simulation digital factory is constructed, and some curriculum design, enterprise internship and graduation design in the teaching process are reformed and innovated, and the whole life cycle collaborative innovation ability training and evaluation method for mechanical and electrical products is developed. And radiate it into the "Internet +", "Creating Youth" and other college students' innovation and entrepreneurial competition. In the end, the "cross-border, synergy" innovation concept covers all stages of undergraduate growth from freshman to senior, and explores and summarizes different mechanical and electrical professional curriculum innovation ideas for different stages, establishing an open, cutting-edge, and expandable Innovation, entrepreneurship assessment and training platform.

Cross-border integration and collaborative innovation talent training. Strengthen the training of product lifecycle management in the practical course, organically integrate the four important aspects of market research, engineering design, engineering analysis and engineering manufacturing, which can enhance the overall synergy between students in design and manufacturing. Then build a full industry chain perspective and value chain philosophy. Therefore, in terms of the talent training model, the focus is on: Taking the development orientation of the whole industry chain as the main theme, focusing on the frontier areas of the mechanical and electrical equipment manufacturing industry, carrying out various innovation and entrepreneurship competitions and independent innovation projects, and creating an innovative and entrepreneurial team with mechanical and electrical undergraduate students as the core, forming a demonstration role. The school-enterprise cooperation fosters an innovation and entrepreneurship project incubation platform. In other words, in view of the problems

existing in the current innovation and entrepreneurship education, follow the requirements of the engineering education personnel training of the Ministry of Education, and radiate the immersive experience teaching model to all aspects of the existing curriculum system, and strive

to cultivate the cross-border communication and communication ability of undergraduates and the whole industry as well as chain synergy and innovation capabilities. The flow chart of the construction of the talent cultivation system can be summarized as follows:

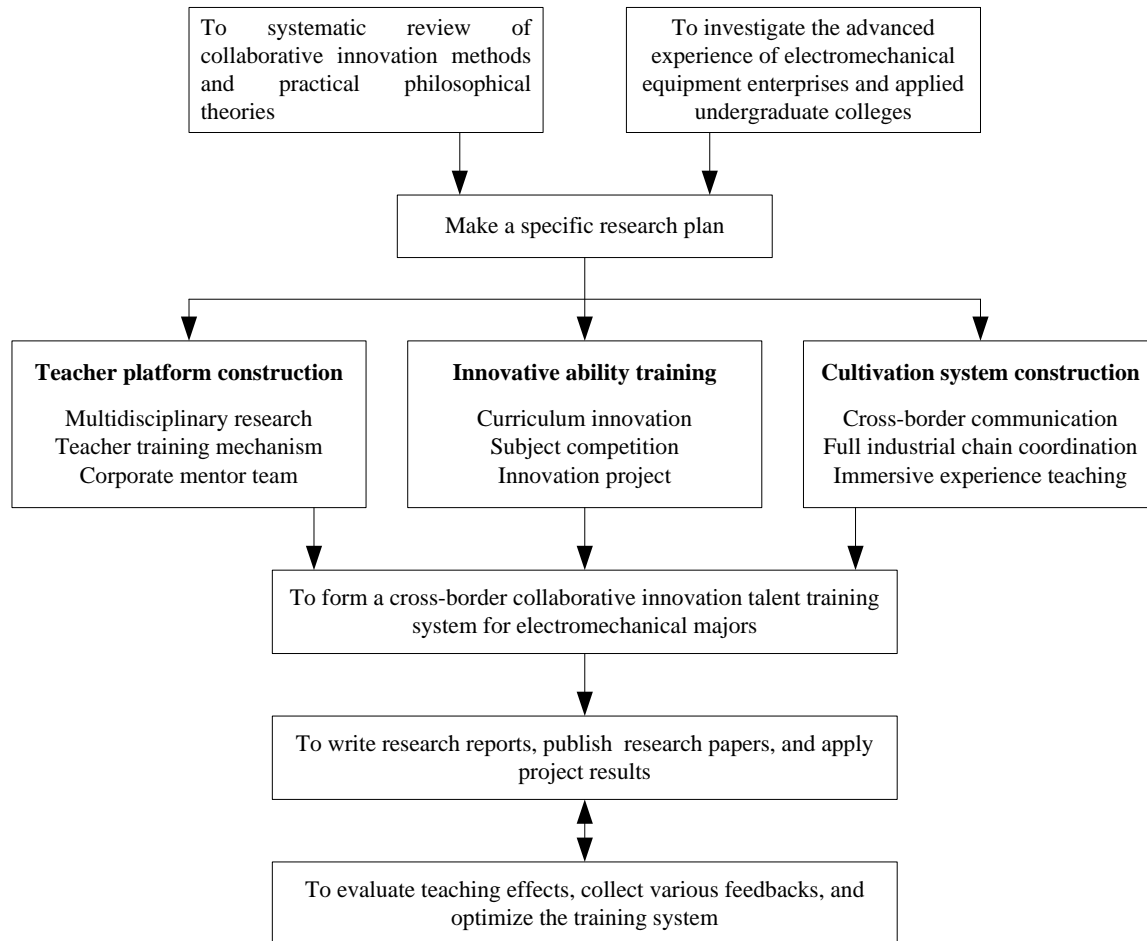


Figure 1. Technical roadmap of this project

4. Conclusion

Aiming at the current situation of lack of innovative talents in China, this paper develops a set of talent training system based on "cross-border integration and collaborative innovation", which provides a new idea for the cultivation of high-quality innovative talents in the application-oriented undergraduate colleges. The innovations of the proposed talent training system mainly include: 1) Multidisciplinary integrated education platform covering the whole industry chain. Based on the mechanical and electrical disciplines, build a multidisciplinary and cross-integrated open research and learning environment, and establish a long-term and expandable cross-border integration of the teaching staff training mechanism; To lay the foundation for further building a first-class, distinc-

tive and distinctive mechanical and electrical application education platform. 2) Open normalized cross-border collaborative innovation ability training system. Extensively develop mechanical and electrical professional skills training and certification activities, actively promote college students' innovation and entrepreneurship competitions and teachers and students' joint venture projects, form an open normalized cross-border collaborative innovation ability training system, and create an open, continuous and true collaborative innovation of the entire industry chain atmosphere. 3) Cross-border integration and collaborative innovation talent training model. Create a multi-dimensional talent training model based on cross-border communication ability, industry-wide chain engineering synergy, and full-value chain innovation drive, and develop an innovative, ability-innovative

training method with time, openness and flexibility, based on classical innovation theory and Marxist practical philosophy. Based on the characteristics of different industries, the development of a more diverse talent training model.

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