

The New Innovative Talent Training Mode in the Perspective of Collaborative Innovation in Engineering Colleges

Xingyuan HUANG
Dalian Polytechnic University
Dalian, Liaoning Province, China
hxy811124@126.com

Yangyang SI
Dalian Polytechnic University
Dalian, Liaoning Province, China

Lan LAN *
Anshan Normal University
Anshan, Liaoning Province, China
neulan@163.com

Yunfang GUAN
Dalian Polytechnic University
Dalian, Liaoning Province, China

Abstract—How to apply the concept and model of collaborative innovation to all aspects of talent cultivation, solve the bottlenecks and problems that have long plagued the cultivation of innovative talents, and improve the quality of personnel training is an issue that many universities in the country are trying to explore and study. Based on the status of innovation talents training in engineering colleges in China, this paper finds out the existing problems, develops a new model of innovative talents training in engineering colleges in China based on the concept of collaborative innovation, and puts forward the path and its implementation of the training of innovative talents in engineering colleges in China.

Keywords—Collaborative innovation; Engineering colleges; Innovative talent training

I. INTRODUCTION

Over the years of reform and opening up, China's industrialization has made great progress. However, from the overall level and dynamic development, China is still a developing country that has not completed its first industrialization. At present, the "gold content" of some engineering and technical personnel in China is not high and the name is not true. Although the number of engineers in our country ranks first in the world, there is still a big gap between quality and developed countries [1]. China's large-scale high-level industrialization construction in the coming decades attracts worldwide attention. This requires us to pay more attention to the reform and development of China's higher engineering education, and to cultivate and produce a large number of high-quality engineering and technical personnel. The talents cultivated in engineering colleges are the reserve army of engineering and technical teams. The quality of training talents directly affects the quality of engineering and technical teams, even the overall situation of China's industrial modernization. Higher engineering colleges take the basic work of cultivating important creators, and bear the responsibility of cultivating "Chinese future engineers". They

need to strengthen their understanding, actively face their own problems, and strive to explore effective ways to cultivate innovative engineering talents and outstanding talents. .

On June 19, 2014, General Secretary Xi Jinping gave a speech at the academicians meeting, stressing that "we must strengthen coordination, vigorously carry out collaborative innovation, concentrate on doing great things, and form a strong synergy to promote independent innovation." [2] It can be seen that collaborative innovation is another driving force for promoting China to be an innovative country. Peter Glo defines collaborative innovation theory as: "A network of self-motivated people forms a collective vision that uses networks to communicate ideas, information, and work situations, and to achieve common goals through collaboration." According to Peter's definition and collaborative innovation and the development of the theory, we can understand collaborative innovation as "referring to the main target (such as universities, government departments, research institutes, industry enterprises, etc.) that have different resource advantages, and integrate through deep communication and deep cooperation, sharing a talent, information, technology, capital and other high-quality resources, and organizing a strategic cooperation approach to innovation behavior. It is a new paradigm for achieving complementary and innovative development of all parties."

This paper combines the concept of collaborative innovation with the cultivation of innovative talents in engineering colleges, and explores a new model for the cultivation of innovative talents in universities under the guidance of the concept of collaborative innovation. Collaborative innovation in universities includes both internal and external aspects. Internal part mainly refers to the integration and innovation of various elements within the university, the sharing of ideas, skills and technologies, realizing innovative purposes, the enhancement of innovation capabilities, and the cultivation of innovative talents; External part mainly refers to the cooperation between universities and

local governments, enterprises and institutions, and the construction of a coordinated innovation model of politics, production, learning, research and use.

II. THE MAIN PROBLEMS IN THE CULTIVATION OF INNOVATIVE TALENTS IN ENGINEERING COLLEGES

A. *Emphasis more on engineering less on literature, and students lack the cultural heritage to enhance the innovation spirit*

For a long time, Chinese students have been influenced by the traditional Chinese culture, unconsciously following the ideas of “stable and seeking the same” [3] and “the doctrine of the mean”, which inhibits the development of students' innovative consciousness. They are used to undoubtedly accept all the ideas of the tutors and experts without questioning. In recent years, engineering problems have become more complex and continue to transcend pure science and technology issues. The relationship between engineering and socio-political economy, structure, ecology, ethics, etc. is getting closer and closer, and most of the graduates currently trained in engineering colleges lack extensive knowledge background and humanistic qualities, and oral and verbal communication skills, interpersonal communication and organization. Coordination ability is also weak, and it is impossible to adapt to the needs of modern engineering, and it is difficult to undertake the task of organization and management of modern engineering[4].

B. *Emphasis more on theory less on practice, restricting students' ability to innovate*

At present, as far as China's higher education is concerned, students generally lack practice, and it is difficult for them to apply the theory they have learned to practice. This issue has always been the focus of the education of colleges and universities in the process of talent cultivation. In recent years, although engineering colleges have repeatedly called for the strengthening of practical teaching links, due to various conditions, it is still low for the proportion of students' practical teaching links. Students rarely participate in the first-line social practice activities such as product design and machinery manufacturing. After graduation, students' ability in design is generally low, and their ability to solve practical engineering problems is poor. Sometimes faced with a larger number of engineering projects, they are overwhelmed and lack flexibility and innovation.

C. *Traditional education mode inhibits students' creative enthusiasm*

The traditional teaching model aims at the knowledge inheritance, ignoring the cultivation of innovative thinking and the development of innovative capabilities. In the teaching content, classroom teaching focuses on basic theoretical learning, lacks practical content, neglects to cultivate students' innovative consciousness, neglects to encourage and guide students' personality development; in teaching methods, traditional education pays attention to indoctrination, cramming or conveyor belt teaching, lack of teaching Interacting with learning, neglecting the training of students'

thinking ability and professional skills, students' initiative and enthusiasm are poor, hindering the cultivation of students' innovative thinking consciousness and improving their ability to innovate; in the evaluation of teaching quality, it focuses on memory-based mechanical learning, exams often examine the effect of hard-tracking, neglecting the ability of students to analyze and solve problems, and do not really give chances for the students to learn, think, explore and innovate to students, resulting in insufficient innovation.

Based on the above problems in the training of innovative talents in engineering colleges, an important task currently placed in front of colleges and universities is to step up construction and provide a new practical condition which is more comprehensive, designable and creative. According to the features of different majors, engineering colleges should explore flexible and diverse new modes of practical teaching such as skills training, professional internships, and social surveys, both in and out of class, inside and outside the school, and in various time and space, according to the characteristics of different disciplines. On the basis of attaching importance to the training of various basic skills in the school, strengthen the connection with social enterprises, so that college students can obtain theoretical and practical professional internships and social survey opportunities from modern enterprises and real society, which not only enables students to master the solid basic knowledge and skills, and it is of great benefit for students to improve the overall quality, especially to develop their ability to use knowledge and create knowledge[5]. On the one hand, the subjects and papers that students are engaged in become the key technical problems that enterprises need to solve urgently. On the other hand, they promote the cultivation of high-level talents in the practice of joint research and development. This paper will further explore a new model for the cultivation of innovative talents in engineering colleges based on the concept of external collaborative innovation.

III. THE INNOVATIVE TALENT TRAINING MODE IN COLLEGES AND UNIVERSITIES BASED ON THE COLLABORATIVE INNOVATION

A. *The talent training mode between universities*

This model refers to the model of collaborative innovation and cooperation between universities and colleges with different dominant disciplines, superior laboratories, and advantageous practice areas. This model is actually reflected in the traditional inter-school exchanges and cooperation, but the real effect mainly depends on the further liberalization of relevant national policies and the relevance of disciplines between universities. It completely shares the innovative elements including talents, money and technology through opening excellent courses, mutual teacher hiring and student exchanges. This can mainly focus on exploring the “four-interaction model” of “mutual engagement of teachers, student exchange, mutual selection of courses, mutual recognition of credits”, sharing quality education resources; establishing university talents through project cooperation, joint research, strategic alliances, etc. Cultivate innovative bases, promote cooperation in running schools, foster education, and develop cooperatively.

B. The talent training mode between universities and research institutes

This model mainly refers to the mode of collaborative innovation cooperation and joint training of talents between universities with major projects and research institutes which have scientific research capabilities and scientific research teams. Universities use theoretical advantages, and the Institute uses scientific research advantages to achieve strong alliances. It mainly utilizes some major basic research, major engineering special research, strategic high-tech research and other projects that must be carried out in the national strategic adjustment, as well as other large-scale research projects, relying on the quality innovation team of scientific research institutes and high-quality scientific research capabilities and resources, combined with the colleges and universities. The advantage of theoretical research is to integrate the scientific and technological teams, scientific research achievements and resources of universities and research institutes, jointly build resource sharing, and jointly cultivate innovative talents on the basis of collaborative innovation of relevant theories and technologies. This model focuses on the base that universities and research institutes must construct a seamless interface between mentor, project and platform.

C. The talent training mode between universities and enterprises

This model refers to the mode of cooperation between universities and industry, universities and enterprises, and the joint cultivation of innovative talents. This model is very popular in some colleges with obvious industry characteristics, and is also a positive measure that universities with strong scientific research pay special attention to [6]. Order-based training is a distinct form of expression. This model makes full use of the relevant research strengths and results of universities, and cooperates with major projects of certain industries and enterprises to solve core technical problems, promote enterprise transformation and industrial structure adjustment, promote the innovation and development of disciplines and industries in order that it can explore and effectively promote the application of talents, complex, skill and other diverse talent training models. The benefits of university-enterprise collaboration are very obvious. Enterprises can leverage on research and innovation in colleges and universities; colleges and universities can leverage on enterprises to provide students with broader practical opportunities and space, which can really make up for the inadequacy of students in engineering colleges.

D. The talent training mode between universities and regions

This model is a talent training mechanism for universities and some regions or regions, which cooperates with industry adjustment strategies according to the development needs of countries or regions, and provides practical and innovative opportunities for teachers and students of relevant majors. This model is mainly for universities to jointly establish scientific research and academic information exchange platforms with local governments and relevant ministries and commissions, regional scientific research institutions and key enterprises, jointly build research institutions, and jointly

apply for national and local major scientific research projects to carry out collaborative innovation. Constantly discover and solve major scientific and practical problems, promote the integration of science and technology and industry, promote the adjustment of regional industrial structure and the development of regional economy, realize the economic utility of science and technology and human resources, and enhance the scientific research ability, innovation ability and service society of college teachers and students ability. This model is becoming more and more frequent and widespread today.

IV. THE PATH GUARANTEE FOR THE IMPLEMENTATION OF INNOVATIVE TALENTS TRAINING IN ENGINEERING COLLEGES BASED ON COLLABORATIVE INNOVATION PLATFORM

A. Establish a system of collaborative innovation system in colleges and universities

At present, the establishment of a collaborative innovation system led by colleges and universities faces multiple internal and external dilemmas. The internal dilemmas include distinct divisions between disciplines and departments, and it is difficult to cooperate and exchange. External dilemmas are distinctive, such as systematic policy-oriented mechanisms lacking of direction, and embarrassing market expansion in trouble. The establishment of a collaborative innovation mechanism in colleges and universities needs to break the barriers of traditional disciplines, self-styled disciplines, and a single concept of talent cultivation, and build an open and inclusive institutional system. Firstly, establish an open education system, encourage interdisciplinary and integration, and implement an interdisciplinary talent training model. We should communicate with each other between universities, between different disciplines and departments, universities and scientific research institutions to solve the problem of emphasis more on engineering less on literature. Secondly, we should reform the teacher evaluation system, and incorporate the teachers' participation in innovation and the ability to transform results into the evaluation system of teachers. Thirdly, continue to deepen the collaborative innovation system of "politics, production, learning, research, and use" [7] in China. This kind of system can mobilize the resources of the government, universities, enterprises, scientific research institutions so as to give full play to their respective advantages and achieve complementary advantages and give full play to the leading role of the government, and enable the government to provide policy guidance for this effective innovation mechanism. Financial support; give full play to the ability of universities and scientific research institutions to transform science and technology into productive forces so that the productivity value of science and technology can be realized; give full play to the market promotion capabilities of enterprises, and make scientific research achievements for the society and convenience for people's lives. At the same time, give full play to the positive role of the "political, production, learning, research, and use" [8] innovation platform for the cultivation of innovative talents in colleges and universities, so that college students can participate in the practice of collaborative innovation, apply the theory to practice, and deepen themselves. Grasp the scientific research knowledge

and enhance the ability of scientific and technological innovation and scientific research transformation.

B. Establish a collaborative innovation guarantee mechanism for colleges and universities

The implementation of the collaborative innovation strategy of colleges and universities requires the system guarantee of the government, universities, enterprises and scientific research institutions. These four major entities must establish a corresponding system guarantee system to ensure the realization of the interests of all parties, especially on the basis of this innovation platform to generate a large number of innovative talents, thus laying a solid foundation for collaborative innovation in the new era. To achieve a virtuous circle of collaborative innovation. First, we must establish a policy guarantee mechanism for collaborative innovation. The collaborative innovation of colleges and universities is inseparable from the support and support of government policies. Policy protection is not only based on the unilateral efforts of the government, but also the government's collaborative innovation policy. The key to the specific operation of the policy lies in universities, enterprises, and scientific research institutions. Universities, enterprises, and scientific research institutions should actively seek opportunities for synergy under the guidance of government policies, and accordingly formulate policies and institutional systems that are supported by the unit. Second, we must establish a financial guarantee mechanism for collaborative innovation. Funds are mainly from the government, enterprises and universities themselves. The financial guarantee mechanism of collaborative innovation should give full play to the role of the three parties and establish a diversified, stable and lasting source of funds for collaborative innovation. Third, we must establish a benefit distribution guarantee mechanism for collaborative innovation. Before launching collaborative innovation, the parties to collaborative innovation must first sign a cooperation agreement, on the one hand to clarify the responsibilities and obligations of all parties, collaborative planning and progress, and more importantly, to agree on the principle of benefit distribution. Finally, establish and improve the intermediaries of collaborative innovation and improve the coordination and innovation supervision and guarantee mechanism. Not only the collaborative innovation within the university, but also the collaborative innovation outside the university needs to establish a sound intermediate management organization, become the link between the main units of collaborative innovation, and be responsible for the planning, evaluation and distribution of benefits of collaborative innovation. . Ensure the symmetry of progress, dilemma, results, market and other related information in the process of collaborative

innovation in all departments, and provide guarantee for the orderly development of collaborative innovation.

V. CONCLUSION

The cultivation of innovative talents in engineering colleges in China has always been valued by engineering colleges. At this stage, preliminary results have been achieved, but there are still problems. Based on this perspective, we explore the cultivation of innovative talents in engineering colleges from the perspective of collaborative innovation. The model establishes an innovation network integrating universities, research institutes and enterprises, forms a resource sharing mechanism, and builds a perfect national innovation system integrating knowledge innovation, technological innovation and innovative talent cultivation. At present, China is inspiring the vitality of the innovative talent training system through the innovative management model of collaborative innovation. At the same time, it is necessary to make full use of high-quality educational resources at home and abroad, draw on the concept models and methods of top-notch innovative talents training in world-class universities, and open up specialized channels for the development of top-notch innovative talents, so that a group of top-notch engineering innovation talents stand out and grow into future engineering fields. The talents will rank among the world's leading engineers.

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