

Exploration and Practice of Joint Cultivation Model of University-Enterprise Laboratory for Information Applied Talents under the Background of Deep Integration of Industry-University-Research

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Abstract: *Along with the high-speed development of information technology, more and more applied talents are required in the area of information engineering. The joint Cultivation Model of the University-enterprise laboratory provides an effective way to promote reform in higher education. Herein, the characteristics of information engineering are analyzed based on the actual situation of the university, and construction problems of information university enterprise cooperation are discussed in two aspects of cultivation mode and laboratory construction. An innovative solution for joint cultivation of information majors in the background of industry-academia-research is proposed to cultivate more high-quality information application talents for the fast-developing society.*

Keywords: *Information profession, University-enterprise cooperation, Laboratory construction*

1. Introduction

With the reform of the higher education management system, the education of high-level talent in China has entered a brand-new stage. How to cultivate practical talents that satisfy the need for social development is a common problem faced by all universities. The mode of higher education is undergoing profound changes, and the laboratory building of higher education institutions has also changed a lot^[1]. The practice of engineering higher education at domestic and international has proved that to improve education and cultivate high-quality talents, it is necessary to combine industry, university, and research. The laboratory of higher education institutions is an important foundation for the combination of Industry-University-Research. Meanwhile, it is the primary platform for cultivating students' practical ability, innovation ability, and ability to serve economic construction^[2].

At present, this mode of talent cultivation through university-enterprise cooperation has received wide recognition internationally. Especially, the information professional laboratory has prominent advantages in cultivating applied talents, such as rapid effects and a strong combination of Industry-University-Research. Through the research and practice of this cultivation mode, two main advantages are demonstrated. On the one hand, it can make full use of the laboratory resources of universities and cultivate information professional applied talents suitable for the development of modern society through continuous practice. On the other hand, it can also promote enterprises to create engineering practice centers and provide a significant platform for the development and recruitment of enterprises, and finally get a win-win situation^[3]. Therefore, it is worth researching and exploring how applied universities make full use of the resources of professional laboratories based on their characteristics to improve the building of joint laboratories and thus joint cultivation of students to serve the local economic and social development.

2. The main problems of joint university-enterprise cooperation

To further investigate this joint model, first of all, it is necessary to identify its current limitations. At present, the reform of higher education based on the joint talent cultivation mode of university-enterprise is still in the initial stage in China. Therefore, universities must be guided by the Ministry of Education to find a suitable solution according to their conditions and positioning. The central task of schools is to improve the quality of education and cultivate talents to meet the needs of society. Nowadays, university-

enterprise cooperation mainly takes the forms of creating internship bases, commissioning order training, introducing enterprise funds, etc. However, most of the schemes are only formal, and the following problems still exist in concrete actions:

1) From the government's point of view, it has not established a truly long-term, "win-win" system.

Although the government departments actively advocate university-enterprise cooperation, the relevant departments lack the motivation to participate in the policy of joint cultivation of talents by schools and enterprises, at the same time, the lack of third-party communication in university-enterprise cooperation makes it easy to interrupt university-enterprise cooperation due to negative factors of one party^[5]. In addition, the contribution of enterprises in university-enterprise cooperation lacks social recognition and financial compensation, and enterprises can hardly bear the safety risks of students' on-the-job training, which makes the cooperation lack binding force and motivation. The effect of this is that universities and enterprises need to spend a lot of human and material resources to find suitable partners and coordinate various links. Eventually, the in-depth and sustainable development of joint cultivation between universities and enterprises might be affected.

2) From the perspective of the participants, there exist differences in the perceptions of the three parties: universities, enterprises, and students.

At present, institutions, enterprises, and students have not reached a consensus on their concepts due to over-emphasize their interests. Therefore, campus enterprise joint cultivation has become a situation where everyone takes their needs and their own affairs. At present, enterprises are mainly in a passive position in the joint cultivation of talents^[6]. Although there are various joint cultivation modes such as internship bases, enterprise title classes, talent order classes, and industry-university-research cooperation, they need to wait for universities to assign students. In addition, because students are not the official employees of enterprises, the investment and cultivation of students are reserved, and students do not get the proper exercise. Cooperation is just a formality.

3) In the cultivation mode, the talent cultivation model of the university needs to be adjusted.

During their studies, students mainly learn the theoretical knowledge of their major, and the cultivation mode is relatively homogeneous^[7]. Although there are usually professional competitions, the participation of students is generally weak. Some traditional colleges and universities still imitate the experience of old colleges and universities, pursue "bigger and more comprehensive", and have no characteristics in talent cultivation. Some local undergraduate colleges and universities, especially new undergraduate colleges, have inaccurate positioning of application-oriented undergraduate talents cultivation goals and a mismatch between discipline and professional settings and industry and enterprise demands. The curriculum of colleges and universities has no professional characteristics.

3. Construction mode of joint cultivation of information professional university-enterprise laboratory

With the rapid development of modern information technology, information-related technologies have widely penetrated various fields of China's national economy. Because of the importance of information-related technologies, the demand of society for highly skilled and applied talents in this field has grown dramatically. That means that they need not only a high theoretical level but also high innovation and practical ability^[8]. Currently, artificial intelligence has been included in the 2017 government work report as a national strategy to comprehensively implement the development of strategic emerging industries and to make bigger and stronger industrial clusters. Artificial intelligence will play a very important role in the industry's future development, and the development of artificial intelligence is also an essential way to revitalize national science and technology^[9].

3.1. Joint university-enterprise talent cultivation mode

Research in-depth on the new mechanism of joint cultivation of talents in telecommunications, communication engineering and other information technology fields through universities and enterprises. The university-enterprise cooperation jointly formulates cultivation objectives, jointly constructs curriculum system and teaching contents, jointly builds internship and practice education bases, jointly implements the cultivation process, and jointly evaluates cultivation quality. It makes college students go to enterprises in their final year to practice, learn advanced technology and advanced enterprise culture, participate in enterprise technology innovation and engineering development, expand students'

professional practical skills, and cultivate students' professional spirit and professional ethics in practice. Based on the Institute of Integrated Measurement and Control of the Dalian Polytechnic University, Dalian Power Supply and Smart Microgrid Laboratory, and Dalian Key Laboratory of Smart Microgrid and Green Cycle Industry, we will carry out various flexible cooperation modes between majors and laboratories, and establish more laboratories and practice bases jointly with cooperative enterprises, and make efforts to evaluate the cultivation mode and mechanism on the cultivation of students' practical ability and innovation ability. We will try to evaluate the promotion effect of such cultivation mode and mechanism on the cultivation of students' practical and innovative abilities and actively promote it.

3.2. Innovative model of joint university-enterprise laboratory construction

The joint laboratory of school and enterprise takes information majors as the core for relevant exploration and practice. At present, the majors involved in the information specialty of Dalian Polytechnic University of Information Science and Engineering are communication, electronic information, automation, optoelectronics, computer, network, etc. The professional disciplines are relatively complete, and the complementarity between related majors is relatively strong, which is beneficial to the implementation of this educational reform project. Specific characteristics and innovation points are as follows.

(1) Based on the existing laboratory platform, we build a laboratory with cooperative enterprises to carry out the "Practical Skills Training Project for Fresh Graduates of Information Technology Majors in Universities", which provides an extremely extensive and in-depth environment for students' innovation and project implementation.

(2) Make full use of the strong research and innovation environment of the engineering laboratories of the information majors to gradually develop the ability of innovation and entrepreneurship of teachers and students. Establish a professional teaching guidance committee composed of both the university and enterprises.

(3) At the same time, fully exploit the existing traditional laboratory resources of the major to cultivate students' practical skills and innovative entrepreneurial abilities in the process of transforming waste into treasure.

(4) The laboratory is highly open to information students, and jointly with the Institute of Integrated Measurement and Control, instructors and students form research interest groups in different directions, such as the generalized information group. The laboratory provides a superior experimental environment for students and implements scientific and rigorous management, which effectively promotes teaching and innovation.

3.3. Systematic safeguards in the laboratory

The laboratory has been committed to "Building Green and Clean Dalian" for many years, engaging in the research of green energy resource assessment and development strategy, industry application promotion, and industry chain aggregation of new technology operation mode. With the improvement of theoretical systems and technology progress, the lab has gradually formed the "Key Laboratory of Smart Microgrid Core Technology System Integration" and "Smart Microgrid and Green Cycle Industry Key Laboratory". At present, the lab has hosted and participated in many national, provincial, and municipal key scientific research projects in the fields of distributed new energy, electrical energy conversion equipment, and smart microgrid system integration, published several high-level papers, and applied for and obtained patents. In addition, before the implementation of this topic, information-related majors and laboratories have done a lot of work for the implementation of teaching reform: successfully declared and approved Dalian Polytechnic University's school-level course teaching team "Information Foundation Course Teaching Team"; The personnel directly related to this topic are all front-line teaching teachers, all of whom possess postgraduate degrees and master's degrees or above. The high-level faculty has a reasonable mix of old, middle-aged, and young people, which can ensure the smooth implementation of the subject.

4. Implementation plan of joint cultivation mode of university-enterprise laboratory for applied electronic information engineering talents

The core goal of the cultivation mode of university-enterprise laboratories is to cultivate professional

and technical talents applicable to the needs of society. To improve students' professional and technical ability, it is necessary to pay attention to students' practical links. Through the training of practical links, students can not only combine what they have learned with practice but also improve their comprehensive quality, such as the cultivation of teamwork spirit, the exercise of hard-working spirit, the cultivation of interpersonal skills, the cultivation of stress-resistant psychology, etc. To enable students to achieve the desired purpose through the practical training process, the specific implementation is as follows^[10]:

1) Cultivate students' engineering awareness

Through cooperation with university enterprises and laboratory research projects pre-investment in engineering equipment, and using the scientific and technological resources of the university's experimental teaching team and the original experimental teaching conditions to build a laboratory. In this way, the school saves the cost of purchasing teaching equipment and the university teachers and students have the opportunity to practice the most cutting-edge equipment products, thus compensating for the effects of the relative lag of lesson book knowledge and the limitations of the original laboratory experimental conditions. Through advanced equipment resources and relatively adequate experimental conditions, students' learning interest is stimulated, their practical ability is improved, and their engineering awareness is cultivated. Through this method, students learn advanced technology and are exposed to the management mode of engineering projects. Students fully appreciate the difference between engineering practice and teaching experiments, which cultivates applied talents with better engineering awareness.

2) Incentivize enterprises to invest and create a win-win model

Not only is the university laboratory a major base for student practice and faculty research, but it can also serve as a platform for companies to promote new products. On the one hand, the company supplies products to the university and promotes the company at the same time. On the other hand, students receive training from the company during their study phase and gradually accept the company's design methods and usage concepts. When students graduate to their new jobs, they will subconsciously like the products designed by the company because they have received the company's design and usage concept before, which has no impact on the surface but invisibly expands the market. In addition, companies can participate in the cultivation of students by cooperating with colleges and universities. When students graduate, they can choose suitable outstanding students to work in the company, because they have received training from the company during their school years, and when they join the company, they can adapt to the company faster, contribute more, and give full play to their roles, which can make the company develop more rapidly.

3) Improve the professional level of teachers

Traditional experimental teaching content is repetitive and repeats the same content for a long time, which does not require a high professional level of teachers, and teachers cannot lead students to learn the frontier knowledge. Through the creation of a university-enterprises cooperation laboratory, with the rapid update of frontier technology, teachers can grasp the frontier technology in time, improve their professional level and adapt to the new teaching content, which further influences the quality of teachers' teaching and continuously improves students' professional level, forming a virtuous circle. It not only improves the professional level of teachers but also invariably increases the opportunities for students to acquire professional knowledge. In addition, universities strengthen the training of laboratory teaching staff, which is the best way to update the knowledge and improve the professional skills of laboratory teachers. Invite enterprise technical personnel to the school to teach teachers and students the current advanced technical knowledge and industry norms. Invest in improving the professional ability and quality of experimental teaching staff, and develop a practical and feasible student cultivation plan close to the actual engineering. Student training should make full use of the lab resources and equipment of the jointly built labs, and formulate the implementation plan of the labs with the joint participation of university teachers and professional technicians from enterprises. Make key summaries of new theories, new technologies, and new methods that are useful for experimental teaching. Meanwhile, we need to improve the teaching plan and teaching methods, and also better take up the heavy responsibility of experimental teaching and cultivating students' innovation ability.

4) Promote participation in science and technology competitions and innovative activities

The university-enterprise laboratory aims to use the advanced technical equipment of enterprises and the excellent environment of schools to cultivate various comprehensive abilities of students. In this way, students will not only learn new basic knowledge but also combine new knowledge with practice, thus acquiring skills faster and more effectively. During the project implementation process, students will

experience the concept of cooperation and a win-win situation and develop their sense of responsibility and other abilities by forming teams to solve problems. At the same time, students are encouraged and supported to participate in engineering practice projects undertaken by teachers or enterprises to cultivate their practical working abilities.

5. Practical effect

The implementation of a joint cultivation mode of university-enterprise laboratory in the information profession will bring a win-win effect for universities, enterprises, and students. First of all, for enterprises, university-enterprise cooperation not only builds a platform for students to grow but also helps enterprises recruit more excellent talents. In the long run, the joint training mode of the university-enterprise laboratory strengthens the interaction between enterprises and colleges, and the quick-thinking students constantly inject new vitality into enterprises, which is conducive to the construction and renewal of enterprise organizational culture. Secondly, for colleges, the implementation of university-enterprises laboratory joint cultivation mode fully integrates the resources inside and outside the university and gives full play to the resources and environmental advantages of the school and the employer in the process of cooperation. It realizes an efficient way of learning by combining theory and practice, which is conducive to achieving the goal of cultivating high-quality talents. In addition, the participation of enterprise technicians as part-time teachers can make the skills cultivation of students closer to social needs and solve the problem of "difficult employment" for students. Finally, for students, the joint cultivation of universities and enterprises stimulates students' interest in learning, improves their innovation and practical ability, and cultivates their engineering consciousness.

6. Conclusion

The practice of joint cultivation mode of university-enterprise laboratory in our university shows that it is a universally applicable engineering practice teaching mode, which is worth deepening and promoting. Under the joint cultivation mode, enterprises fully understand students and find and prefer suitable talents for them. The graduates cultivated by this mode have a strong sense of innovation, independent working ability, excellent thinking, team spirit, willingness to work hard, a strong sense of professional identity, and are close to the needs and requirements of the industry and market. The willingness of enterprises to further cooperation is very strong, which truly achieves a multi-win effect. We will continue to promote university-enterprise cooperation with a positive docking attitude, expand cooperation with increasingly fruitful results, gradually realize the benign development of universities and enterprises, continuously improve the effectiveness of university-enterprise cooperation, and cultivate more skilled and practical talents for economic and social development.

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