Advances in Social Science, Education and Humanities Research (ASSEHR), volume 75
2016 International Seminar on Education, Innovation and Economic Management (SEIEM 2016)

Study on the Mode of the Postgraduates' Cultivating Based on the Combination of Industry, University and Research

—An example on the electrical engineering specialty of East China Jiaotong University

LIU Shibing
East China Jiaotong University,
Nanchang 430079, China
E-mail: liucyier@163.com

YANG Ying
East China Jiaotong University,
Nanchang 430079, China
E-mail: 571534448@qq.com

***Abstract*— In this paper, the author analyzes the main modes and problems in the Industry-University-Research model to cultivate postgraduates. It concludes that the key to the next step is to establish and perfect the relevant institutional arrangements, to regulate the employment of enterprise tutors, and to construct the corresponding curriculum system and the training quality evaluation system. Only in this way can we correctly grasp the direction of cultivating postgraduates in the *IUR* mode and continuously improve the quality of postgraduates cultivating.**

Keywords—IUR; Cultivation of graduate students; Quality assessment

I. INTRODUCTION

Cultivating graduate students in the IUR model is of great practical value for the integration of educational resources of enterprises, universities and research institutes. There is important practical value for cultivating the innovative talents with the ability to discover problems, to put forward problems, and to work independently in scientific research. In addition, there is important practical value for enterprises to make technology progress and enhance the comprehensive competitiveness.

For the past few years, in our country, a lot of practical activities have been carried out in the research field of cultivating postgraduates in the IUR model, but it is still in the exploration stage because of its late start. How to establish a win-win and sustainable development in cultivating graduate students in the IUR model, and how to achieve the set goals needs to be studied deeply. In this paper the author intends to analyze the main problems in cultivating graduate students by the IUR model, and provides some policy suggestions.

II. THE MAIN MODEL AND CHARACTERISTICS OF GRADUATE STUDENTS' CULTIVATION BY THE COMBINATION OF IUR

In recent years, some universities constantly explore the IUR model in cultivating graduate students with the practical experiences. And the mainly model are showed as follow:

1. The different cultivating models in different stages of cooperation. One is the whole process cooperation model: The school awarded the enterprise expert with doctor's or master's tutor certificate, and the enterprise tutors entered the tutorial sequence and student recruitment brochure. The whole training process of the graduate student's teaching, graduation design and so on is participated by the universities and enterprises and institutions. Such as the Institute of mechanical engineering, University of Shanghai for Science and Technology cooperates with Shanghai electric group and Shanghai Machine Tool Factory Co., Ltd etc. to cultivate the postgraduates in this way. Enterprises not only recommend and encourage employees to participate in the graduate study, but also sent enterprise senior technical personnel as the normal teaching and graduation design guidance. Enterprises participate in the entire process of postgraduates cultivating. The other is the cooperation model of the stage process. The cooperation of universities and enterprises in the cultivation of graduate students is mainly reflected in the graduation project design research and internship stage. Similarly, we can take the College of mechanical engineering of University of Shanghai for Science and Technology as an example. In its cooperation with the Shanghai Branch Xin electric hydraulic control equipment Co., Ltd to cultivate postgraduates, the company mainly provides students with internship, participate in research and development opportunities, and send the corresponding technical personnel to provide guidance.

2. There are two training modes according to different cooperative subject formation. One is the mode of cooperation between School Corporation and corporate enterprises, such as the joint training mode of Shanghai Jiao Tong University and Baosteel group. This cooperation mode has obvious advantages in the movement of scientific research resources. At present, this mode derives a lot of new forms, such as cooperation between a school and a business, cooperation between a school and a number of enterprises, cooperation between schools and a number of enterprises, etc. The other is the cooperation mode that consists of government, enterprises, schools and scientific research institutions. The most typical is the mode of cultivating graduate students in the IUR model at the Shanghai Zhangjiang High Tech Park in Pudong New Area (government), that is, funds and policy from the park attract and organize many universities and research institutions to sign a cooperation agreement with 12 companies such as Pudong

SMIC and Grace Semiconductor. The universities include the Fudan University; Shanghai Jiao tong University, Tongji University, Shanghai University of Traditional Chinese Medicine, Chinese Academy of Sciences, Shanghai Institute of medicine etc.

At present, the cooperation agreement of postgraduates' co-cultivation between schools and enterprises mainly includes two aspects:

First, the responsibility of enterprises stated in the agreement should be clear. For example, enterprises should provide research laboratories and the corresponding equipment support for graduate students' cultivation in the IUR model. As well as providing funding for cultivating on the basis of consensus. Second, the agreement should be clear about the responsibility of the school. For instance, schools should provide enterprises with technical backbone and management of the backbone of on-the-job training that include the organization of Engineering Master's degree courses, postgraduate training. Schools should send the graduate student to participate in the scientific research of enterprise etc[1]. There are three outstanding features in the agreement:

1. The first feature of the agreement should be the strict cooperation access standard. There are two important criteria in the selection of cooperative enterprises that are used to training of graduate students in the IUR model. One is that the high technology content of the enterprise has a certain position in the industry. Only such an enterprise can guarantee a sufficient number of outstanding enterprise tutors. Another is that the enterprise itself has a good sense of cooperation. In other words, the enterprise is very interested in cultivating graduate students in the IUR model, and can actively support.

2. The second feature of the agreement is to pay attention to the construction of cooperation mechanism. The purpose of integrated the educational resource of enterprises, universities and research institutions is to form a good institutional arrangement with the nature of incentive and restraint, and Clear responsibilities of all parties.

By doing this, it will form a more effective benefit sharing mechanism, risk resolution mechanism and the responsibility restraint mechanism.

3. The third feature of the agreement is to pay attention to the needs of enterprises and students. To meet the needs of enterprises, more attention should be paid to the practice of postgraduate training. Our school revised teaching plan, and send teachers to enterprise for further business research. This plan fully reflects the characteristics of cultivating graduate students in the IUR model. For teaching methods, our college teachers explained the theory and the senior engineer explained the way of high technology, to combine the theoretical teaching and the enterprise practice. To meet the needs of students, we pay attention to graduate employment needs. The main approach is to implement a dual tutorial institution that graduate students have both college instructors, and corporate mentors [2]. In this way, enterprises have enough time and appropriate way to understand the ability of graduate students. Meanwhile, postgraduate may have deep impression into the enterprise technology, once out of college, the postgraduate meet the enterprise needs of faster and earlier applied talents demand.

III. The Problems in the Process of Cultivating Graduate Students in the IUR Model

As a whole, the practice and exploration of cultivating graduate students in the IUR model in our country has achieved good results, but also exposed some problems in recent years. They are mainly in the following four aspects:

1. The first is the lack of qualified teachers, and engage standards are not standardized. On the one hand, due to insufficient number of tutors, currently the scale of cultivating graduate students in the IUR model is still relatively small. The main reason is the system of cultivating graduate students in the IUR model has a higher demand for enterprises. It requires that the enterprise should have solid strength, stable operation and high technology. This caused the lack of qualified tutors, and difficult to expand the scale of cultivating graduate students in the IUR model. Especially, some enterprise tutors is still lack of training in guiding and cultivating graduate students. These leads to many problems. The role of the tutors is not prominent. The quality of Graduate Education is difficult to guarantee and other issues. On the other hand, the schools' standard in the recruitment of enterprise scientific research personnel as the tutor is not standard [3]. At present it mainly reference to the evaluation and employment standards for school's graduate tutor, but this is not necessarily suitable for enterprise scientific research personnel.

2. The curriculum system is not perfect, and it is not fit for the requirements of cultivating graduate students in the IUR model. For the moment, the factors that affect the quality of the graduate students cultivated in the IUR model are the lack of the curriculum system which is suitable for cultivating graduate students in the IUR model.

Many graduate students reflect that the school graduate program and the teaching content are usually different from the demand of the enterprise. Students feel that the learned knowledge didn't come in handy. There are many factors that cause this phenomenon. In terms of curriculum design, it is the lack of a curriculum system to adapt to cultivate graduate students in the IUR model. From the content of teaching materials, not only teachers are lack of practical experience of enterprises, but also there are problems on the cooperation mechanism. For example, many teachers, scientific and technical personnel are greatly tempted to put these technologies into teaching materials. Due to a variety of reasons, especially intellectual property rights, trade secrets and other aspects, enterprises often do not want to open advanced technology, and teachers are difficult to access to the key high-tech enterprises.

3. The quality evaluation system of graduate training is not perfect. The traditional quality evaluation of graduate education pays more attention in the quantity and quality of academic papers published. This method may be right for theoretical academic postgraduates, but it may not be appropriate for graduate students who cultivated in the IUR model. The quality of cultivation should be reflected in the

ability to solve practical problems as well as the ability to create new technology and new products for enterprises. Therefore, the traditional evaluation model cannot effectively reflect the quality of postgraduate training.

4.The power of the cooperation between the enterprise and the universities is insufficient. In the process of practical exploration, we can find that cultivating graduate students in the IUR model is also weakened for some degree, mainly displays in two aspects: (1) The issue of intellectual property rights. When graduate students participate in the research and development of the enterprise, it is inevitable to involve the problems that the ownership of intellectual property in scientific research and the Protection of intellectual property rights. The issue of intellectual property protection is bound to highlight because of the imperfect credit system and Strong mobility of graduate students. Some companies are reluctant to cooperate in the "high, fine, sharp" project, because they are worried about the leakage of core technology [4]. (2) The responsibility constraint problem. The division of responsibilities is currently clear among all parties to the training of graduate students in the IUR model. But it is also need to establish a strict performance appraisal system to ensure the fulfillment of duties, so as to ensure the sustainability of the system that cultivating graduate students in the IUR model.

IV. Policy Recommendations for Cultivating Graduate Students in the IUR Model

To sum up, the author has put forward the following policy recommendations to improve the graduate student mode:

Establish a good incentive and restraint system. In order to improve the institutional arrangement of cultivating graduate students in the IUR model, the key is to establish and perfect the mechanism in three aspects(1)Benefit-sharing mechanisms. It is necessary to form a win-win pattern of cultivating graduate students in the IUR model, especially in the aspect of personnel training, technical research and development. It not only let the colleges and universities to get more graduate training resources, improve the quality of postgraduate training, but also ensuring that enterprises have a good return on investment, and effectively improving the enthusiasm of enterprises to participate. (2) The mechanism to eliminate the risk. Cultivating graduate students in the IUR model has many characteristics, such as the strong liquidity, easy to leak trade secrets and other characteristics. Therefore, it is essential to prevent and eliminate the risk of cooperation by improving the agreement of cultivating graduate students in the IUR model. (3) The mechanism of constraint responsibility. Establish a strict system of regular assessment and specify the division of responsibilities of enterprises and schools to jointly improve the quality of cultivating graduate students in the IUR model.

Perfect the system of Postgraduate Tutor. Three key measures should be implemented: (1) We should establish the recruitment standard for enterprise tutor, to establish a unified enterprise tutor evaluation committee at the provincial city. Through this platform, we can formulate the enterprise standardization tutor evaluation institution, and this method give a clear mentor access standards to ensure the good quality of teachers. (2)Establishing the enterprise needs to be guaranteed by assessment of tutorial performance, and strengthen the performance evaluation of enterprise mentors, mentors should play in the role of mentoring in the joint training of graduate students, to prevent enterprise mentors become the "nominal tutor ". (3)Enterprise mentors should have wildly selection range. Under the premise of ensuring the quality of the enterprise, the enterprise's selection should be expanded from the large state owned enterprises to multinational corporations and private high-tech enterprises.

Set up the course system of cultivating graduate students in the IUR model. There are two key points for Promoting the exploitation of curriculum system of cultivating graduate students in the IUR model. Firstly, the construction of curriculum system should be related to the actual needs of enterprises, In order to strengthen the cooperation between universities and enterprises. A set of advanced and practical course system for cultivating graduate students in the IUR model should be developed to improve the research ability of graduate students to solve practical technical problems according to the demand of enterprise technology innovation. Secondly, the setting of basic courses and scientific research courses should be closely related. Specifically, the inner logic of the subject knowledge is the core of the construction. Then Integrate and reconstruct of the existing curriculum, and strengthen the link between the courses to optimize its structure and system.

To establish an evaluation system of the training quality of cultivating graduate students in the IUR model. In the process of designing evaluation index system, two factors should be considered. One is to consider the target of talent-cultivating in cultivating graduate students in the IUR model, the quality standards for the cultivation of graduate students and the objective needs of enterprises. Only in this way, can the evaluation system play a good Guiding role in running a school, and ensure the direction and quality of personnel training. The other is to highlight the Features of evaluation on the applied and innovative talents, and to highlight the characteristics of cultivating graduate students in the IUR model. This is the main difference of cultivating graduate students in the IUR model against the general mode of graduate education. In this regard, we can refer to the enterprise performance evaluation index system for scientific research personnel. Core indicators can be introduced, for example, “The amount of the patent for invention”, “Quantity and profit of new product development”.

V. Conclusion

This paper is a part of the research results of degree in Jiangxi province, graduate education and educational reform project "Cultivating graduate students in the IUR model".

In this paper, it takes the electrical engineering specialty of East China Jiaotong University as an example to analyze the main modes and characteristics of cultivating graduate students in the IUR model , and summed up the problems of the electrical engineering of East China Jiaotong University encountered in the development of cultivating graduate students in the IUR model. To solve these problems, this paper gives four policy suggestions that the key to the next step is to establish and perfect the relevant system arrangement, business

mentor employment norms, and construct the corresponding course system and training quality evaluation system. It is conducive to optimize and improve the existing mode of combination of production and research, and constantly improve the quality of training.

REFERENCES

[1] Cheng Aijie, Sun Yuedong, Zeng Zhong. Mode and problems of graduate students in the joint training of industry-academic-research[J]. Research on the development of Education, 2008.13-14.

[2] Yang Tiejun. Research on the typical model and quality guarantee mechanism of the joint training of industry-academic-research[J]. Scientific research and education in Jiangxi, 2007,(12) .

[3] Liu Zhiming, Dong Weichun. The Construction and Application of the mode of training agricultural application postgraduate based on the Joint training base of industry-academic-research[J]. Education of academic degree and postgraduate, 2004,(10) .

[4] Wang Yun, Li Pingping, etc. Exploration on the construction mode of the training base for the " industry-academic-research" of engineering graduates[J].Journal of Jiangsu University(Higher Education Press) , 2006,(1) .