University-Industry Cooperation in the Context of Chinese Postgraduate Education

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Abstract: Despite of a large number of postgraduates in China, postgraduates are generally considered to have insufficient practical experience and innovation ability. Universities-industry cooperation is an effective way to improve the practical ability of postgraduates. The problems of university-industry cooperation in Chinese postgraduate education are analyzed and constructive suggestions are provided in this paper. In China, the lack of sufficient practical courses and practical opportunities, lack of work experience for teachers, lack of cooperation motivation for enterprises, and imperfect laws and regulations are the main reasons that hinder the cooperation between universities and industry. It is proposed in this paper that universities and enterprises should build cooperative networks and jointly develop postgraduate education programs based on these above reasons. Internet technology such as cloud platforms should be used to take advantage of students' fragmented time, and process supervision should be emphasized to improve postgraduate evaluation mechanisms.

1. Introduction

In recent years, China has increased its investment in postgraduate education, and postgraduate education has developed rapidly. The number of postgraduates in China continues to rise, with 604,400 postgraduate students graduating in 2018. China's Thirteenth Five-Year Plan for Degree and Postgraduate Education Development states that the total number of postgraduate students will increase to 2.9 million in 2020, and the proportion of professional degree master enrollment will reach about 60%. In the era of the knowledge economy, the cultivation of high-quality talents is of paramount importance, and the choice of training models is receiving increasing attention. At the 17th National Congress of China, the personnel training mode of school-enterprise cooperation and on-the-job practice was incorporated into the outline of the national medium and long term education reform and development plan, which provided the outline guidance for university-industry cooperation.

Cooperation between universities and industry is becoming progressively important because it can create mutual benefits for parties involved. University-industry cooperation is one of the important ways to train postgraduates. It enables postgraduates to conduct theoretical education as well as practical education. For universities, university-industry cooperation is conducive to continuously adapting to the development of technology and the economy. It is conducive to expanding social influence and consolidating the employment channels for students. At the same time, universities are provided with sufficient and stable teaching practice conditions and research conditions to improve teaching quality.

Although there are a large number of postgraduates in China, postgraduates generally lack practical experience and innovative ability. This reflects the problems that arise in the training of high-level students in China. Colleges and universities should carry out educational reforms, and cultivate practical and innovative talents. The objective of this article is to analyze the problems in the practical ability cultivation of Chinese postgraduate education and to make constructive suggestions based on the cooperation between universities and industry.

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2. Literature Review

The literature has progressively dealt with the phenomenon of university-industry cooperation, taking different perspectives that vary significantly according to the effects, motivations and interaction channels.

University-industry cooperation creates mutual benefits for parties involved, and the motivations of researchers to engage in university-industry cooperation are heterogeneous. Arza and Valeria (2010) reveal that university-industry cooperation improves the quality of research and teaching through learning opportunities such as obtaining new insights and field testing the practical application of research outcomes [1]. By cooperating with industry, students and faculties can gain access to up-to-date equipment and techniques (Ankrah et al. 2013) [2] and gather new ideas for future research (Welsh et al., 2008) [3]. Moreover, university-industry cooperation is likely to enhance institutions' reputation and researchers' income. Dietz and Bozeman (2005) indicate that enhancing personal prestige and the university's image are important motives for academics to cooperate with firms [4]. D'Este and Perkmann (2011) point that securing funds relevant to research activities is predominant in prompting collaborate to cooperate with industry [5]. Enterprise support allows academics to conduct research that contributes to academic eminence, which increases their professional development and promotion perspectives (Lam, 2007) [6]. Scholars' desire to complement income also drives university-industry cooperation, particularly when the university offers a reward system or monetary incentive (Perkmann and Walsh, 2008) [7]. However, these motivations for university-industry cooperation can be hindered by organizational and institutional barriers. Debackere and Veugelers (2005) find the lack of organizational support for transfer tasks and new knowledge is the main obstacle of university-industry cooperation [8]. Insufficient resources for establishing cooperation with enterprises also hampers scholars encounter (Mudambi and Swift, 2009) [9].

Knowledge flows through multiple channels during university-industry cooperation. Frequently cited proxies for university-industry cooperation are meetings and conferences, R&D projects, training and consultancy, researcher mobility, joint supervision of degree theses (Wright et al., 2008) [10]. Postgraduate training and academic start-ups are important university-industry cooperation channels (Guenther and Wagner, 2008) [11]. Relevant criteria for differentiating channels are the form and terms of agreements, interaction and knowledge flows and application of results (Perkmann and Walsh, 2009) [12]. Arza and Valeria (2010) propose four types of interaction channels, which are traditional, commercial, service and bi-directional channels [1]. The traditional channel refers to traditional forms of enterprises that benefit from academic activities (such as hiring postgraduates, publications, conferences). The commercial channel covers academic business incubators, spin-offs and technology patents. The service channel is related to the provision of paid scientific and technological services (for example, consultation, testing and monitoring, quality control). The interaction through the service channel is generally short-term and the flow of knowledge is mainly from university to enterprise. The bi-directional channel includes participation in networks, collaborative research and project development, technology parks, which refer to a channel for a bi-directional flow of knowledge. Franco and Haase (2015) point out that the bi-directional channel, traditional channel and service channel are important in interacting with the industry. The use of these channels depends on the disciplinary affiliation and researchers' motivation [13].

3. Problems of University-industry Cooperation in Chinese Postgraduate Education

Government initiatives and institutional changes in China have facilitated cooperation. Universities and enterprises cooperate to establish postgraduate workstations, teaching, and scientific research practice bases and build a platform for practical training. A large number of postgraduates take up work after graduation, but feedbacks from society and employers are not very

optimistic. Some problems hinder the cooperation between university and industry in China.

First, the practicality of postgraduate courses is insufficient. In the postgraduate education system, courses that set up according to the direction of the tutor's research account for a considerable proportion, and these courses are highly academic. The right to evaluate course learning rests solely with the tutor, who has a strong personality and weak practicality. Although teachers may use case teaching and other methods, they are limited to the content and organization of the course. Postgraduate courses are generally conducted in the classroom of the university, and its role in cultivating postgraduates' practical ability is limited.

Second, the practical opportunity for postgraduate students is insufficient. There are two typical ways for Chinese postgraduates to practice. One is that postgraduate students look for internship companies themselves or arranged by the university; the other is to cooperate with the research project of the tutor. Some survey results show that jointing a project with a tutor occupies a large proportion.

Third, university teachers lack sufficient practical work experience. Most postgraduate tutors in China are full-time researchers with doctorate degrees and have high academic capabilities. However, many teachers lack enterprise work experience and lack extensive communication and contact with enterprises. They will encounter great difficulties in developing practical courses and conducting practical teaching.

Fourth, enterprises lack sufficient motivation to cooperate. Many practical courses require enterprise resources to be effectively implemented. Because universities and enterprises are organizations with different characteristics, there are many difficulties in cooperation in personnel training and curriculum teaching, and it is difficult for universities and enterprises to achieve a unified goal and take coordinated action. Universities and enterprises have concerns about the achievements of cooperation and the ownership of intellectual property rights. Some enterprises are unwilling to manage or are unclear about how to manage postgraduate students entering the practice base.

Fifth, the law of university-industry cooperation is imperfect. The legalization of postgraduate education in China has lagged behind the practice of postgraduate education. The Degree Regulations of the People's Republic of China, promulgated in 1980 and revised in 2004, is currently the highest specialized law in the field of postgraduate education in China, but it rarely involves practical education for postgraduates. China's postgraduate education started late, and the construction of policies and regulations is not perfect. The problem of fragmentation in the formulation and implementation of postgraduate education policies is particularly prominent.

In short, there are many obstacles to the cooperation between universities and enterprises to teach postgraduates. As a teaching and research unit, universities are better at training postgraduate students to become academic workers. Most universities do not have good practical conditions and resources. The universities' education system is lack of innovation, and teachers' practical experience and ability are insufficient. Enterprises are less willing to cooperate because enterprises cannot obtain tangible and long-term benefits from postgraduate education. On-site observations and visits replace practical teaching, and there are few opportunities for vivid research and hands-on practice, which affects the realization of the career-oriented goal of postgraduate education.

4. Strategies for University-industry Cooperation in Chinese Postgraduate Education

Universities and enterprises should work together to formulate long-term postgraduate education programs. This article explores the strategies for university-industry cooperation of postgraduate education from the following aspects.

First, universities should reform the teaching system and take practice as the basic element of courses. The setting of postgraduate courses should not only focus on the cultivation of professional knowledge but also relate to vocational abilities, reflecting the cultivation of application and innovation abilities. Universities and enterprises should promote the docking of majors and industries, the docking of courses and positions, and the docking of teachers and technicians. Colleges and universities should change the traditional training model of "teacher-centered,

classroom-centered, knowledge-centered", and adopt an innovative teaching system characterized by project-based teaching and skill training, to improve the quality of postgraduate education.

Second, universities and enterprises jointly develop postgraduate education programs. Universities and enterprises help postgraduate students discover their professional interests and encourage postgraduates to participate in different projects. Teachers and enterprise personnel jointly formulate postgraduate courses and career plans. Postgraduate education programs should be purposeful and targeted, so that postgraduates have a career orientation for future work, and have the initiative in the subsequent learning and training process.

Third, universities and enterprises build cooperative networks to strengthen teachers' practical ability. Establishing a professional learning community and forming a cooperative network are the keys to postgraduate education reform. The cooperation network should go beyond isolated classrooms and expand into enterprise operations. Cooperation should be geared to postgraduate students and teachers. With the rapid changes in society, technology, and labor market, teachers must strengthen their learning and cooperation with enterprises. If teachers equate postgraduate education with pure teaching, passing knowledge, and organizing examinations, they are in danger of being replaced. Cooperation with enterprises helps teachers build social capital and improve teaching efficiency. Cooperative also helps teachers strengthen their self-confidence and engages in change with a positive attitude.

Fourth, universities and enterprises use Internet technology such as cloud platforms to take advantage of students' fragmented time. Internet technology provides a convenient and diversified development space for university-industry cooperation. Specific methods include reducing the business threshold with the support of the network economy platform and achieving the cost advantage of a fragmented division of labor with the cloud platform. Universities and enterprises can also share risks by sharing light assets. The fragmented time of postgraduates is concentrated through Internet technology such as cloud platforms, which alleviates the problems of space division and goal diversification in traditional university-industry cooperation.

Besides, universities should emphasize process supervision and improve postgraduate evaluation mechanisms. The traditional evaluation method is based on written tests and supplemented by homework. University-industry cooperation emphasizes process supervision and project evaluation. Before the cooperation, universities inspect whether the enterprise mentors have professional guidance qualifications, and how many internship positions the enterprises can provide. In the process of cooperation, universities, and enterprises set up departments to specifically manage the attendance and discipline of postgraduate students, and to quantify and regularly evaluate postgraduates' capabilities and performance. Universities should link postgraduate internship results with credits to ensure process management and quality control of postgraduate training. After the cooperation, universities should evaluate whether the university-industry cooperation has effectively improved students' practical ability, and attach importance to third-party evaluation.

5. Conclusion

Problems and strategies for university-industry cooperation in Chinese postgraduate education are explored in this paper. The main obstacles to university-industry cooperation are the lack of sufficient practical courses and practical opportunities, lack of work experience for teachers, lack of cooperation motivation for enterprises, and imperfect laws and regulations are the main reasons that hinder the cooperation between universities and industry. It is proposed in this paper that universities and enterprises should build cooperative networks and jointly develop postgraduate education programs based on these above reasons. Internet technology such as cloud platforms should be used to take advantage of students' fragmented time, and process supervision should be emphasized to improve postgraduate evaluation mechanisms. This study is meaningful for improving the practical ability of postgraduates and promoting the reform of postgraduate education.

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