Exploration of the Guarantee System for Postgraduate Science and Technology Innovation Education in China’s Colleges and Universities

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Abstract. With the implementation of China’s innovation-driven strategy, the demand of local colleges and universities to serve the regional economy and social development increases continuously. This is in sharp contrast with the current lack of postgraduate’s innovation awareness and innovation ability in local colleges and universities. The task of postgraduate innovation education in local colleges and universities is arduous. This paper absorbs the positive experience of postgraduate innovation education both at home and abroad, connecting with the working practice in Zhejiang University of Technology, on this basis try to explore the construction of guarantee system for postgraduate science and technology innovation education in local colleges and universities. It is suggested that the guarantee system consists of three aspects, organization guarantee, resources guarantee and motivation guarantee. Through the establishment of postgraduate science and technology innovation guiding committee and fund, the construction of academic training curriculum and academic strength integration, the enforcement of incentive measures and open collaborative talents training, to improve the level of postgraduate science and technology innovation education.

Introduction

Relative to the Ministry of Education and other ministries (committees), local colleges and universities are regional colleges and universities established by provinces, municipalities and autonomous regions according to local economic and social development. Therefore, personnel training, scientific research and social services in local colleges and universities are mainly serving the needs of regional economic and social development. [1] According to the national postgraduate enrollment plan in 2012, the number of local colleges and universities recruit postgraduate accounts for 78.81% of the total number of ordinary colleges and universities nationwide, the enrollment number of postgraduate students in local colleges and universities accounts for 51.76% of the national total. [2] It can be seen that local colleges and universities play a very important role in postgraduate education in China.

In 2012, The 18th National Congress of the Communist Party of China clearly put forward the “implementation of innovation-driven development strategy” for the first time, requires taking “scientific and technological innovation as strategic support for social productivity and comprehensive national strength improvement”. The key to innovation lies in the high-level talents. In China, postgraduate education is the main approach to train high-level talents. In order to achieve research achievements, colleges and universities must promote every teacher and student has a strong independence and original spirit. [3] However, the postgraduate innovation education in our country is far from the requirements of innovation-driven strategy. Especially, there are some common problems generally exist in the postgraduate innovation education of local colleges and universities, such as postgraduate’s lack of scientific innovation awareness, technological innovation ability and original research content. Therefore, according to the requirements of the postgraduate education innovation project in “Outline of the National Medium and Long Term Education Reform and Development Program”, [4] promoting the construction of guarantee system for postgraduate science and technology innovation education becomes an important subject of
local colleges and universities. Through research and study the experience of other domestic colleges and universities, as well as the working practice in Zhejiang University of Technology, this paper discusses the construction of guarantee system for postgraduate science and technology innovation education.

Organization Guarantee: Establish Postgraduate Science and Technology Innovation Guiding Committee, Set up Postgraduate Science and Technology Innovation Fund

The postgraduate education of science and technology innovation is a systematic project, needing top-level design to provide a strong organizational guarantee and intellectual support. Local colleges and universities can establish a postgraduate science and technology innovation guiding committee. Each institute in school can set up its own subcommittee led by experts, professors and institute leader who in charge of this work, set up innovation coaching teams inside institute, between institutes and between schools. In these ways to provide consulting, technical guiding, supervision and management for student science and technology innovation work. For example, College of Information Engineering, Zhejiang University of Technology, it implements the talent incubation project based on tutorial system and the qualification system of tutor. It builds a "1+1+N" innovation guiding organization system. Firstly, it appoints a duty teacher to be responsible for the construction of innovation base. Secondly, it appoints an instructor in charge of the organization of student’s innovation education. Thirdly, it appoints long-term scientific and technological competition tutors to guide students to attend the Challenge Cup competition, electronic design competition, intelligent car competition and other various professional events. Fourthly, it appoints scientific research innovation tutors to guide students to take part in the college’s Jianlong Fund Program, the university’s Canel Cup Program, the provincial Planted Talent Plan and the national Innovation and Entrepreneurship Training Program. Fifthly, it hires outside technological experts and enterprise's technical backbones as outside innovation tutors, giving irregular lectures to expand students’ innovative vision.

The development of postgraduate science and technology innovation ability requires a good platform support. As early as 2001, Fudan University set up postgraduate innovation fund. And then Xiamen University, Chongqing University and other colleges and universities set up science and technology innovation fund successively, to encourage postgraduates to devote themselves to the practice of science and technology innovation and cultivate innovation consciousness. Since 2009, Beijing Forestry University set up a special project for postgraduate science and technology innovation, which provides an annual investment of RMB 1,000,000 to support 10-20 outstanding graduate students for scientific research and international academic exchanges. [5] Similarly, local colleges and universities should build and improve postgraduate science and technology innovation fund platform, further step up amount and coverage of the financial support, and construct platform management of science and technology innovation project in institution level, university level and province level. Taking Zhejiang University of Technology for example, it set up Yin Jiang Innovation Fund and its affiliated College of Information Engineering set up Jian Long Alumni Fund; Every year, they support a number of innovation projects to encourage postgraduate students participating in scientific research projects that required by tutors, enterprise and society. Funding projects can be tutor required project, postgraduate’s own project or project enterprise needed. School should increase special fund to set up postgraduate science and technology innovation fund, select and cultivate a group of strong innovative and challenging innovation projects, deal with the relationship between postgraduate’s innovation project and tutor’s scientific research project, make a scientific and reasonable evaluation index of innovation projects. In order to motivate postgraduate’s participation awareness, innovation spirit and scientific research potential, and train postgraduate’s practical ability of solving specific scientific problems. Furthermore, school should select outstanding students to apply for provincial graduate innovative experiment projects actively.

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Resources Guarantee: Set up Curriculum for Postgraduate Academic Training and Integrate the Academic Strength Inside and Outside of University

Comprehensive and effective academic training is a valid way to motivate innovation potential of postgraduates. At present, postgraduate’s academic training in local colleges and universities is mainly undertaken by tutor individually. Therefore, in the traditional “one-to-one” mentoring relationship, the graduate students are very susceptible to their tutors’ knowledge structure, way of thinking, research method and research field, so that it is difficult to broaden their vision and thought. Therefore, in addition to tutors’ academic training, general public course of academic training is required to be uniformed by universities, including academic writing, literature searching, academic communication ability. Compulsory course or elective course of professional academic training is unified planning by college in university, including academic frontier knowledge, interdisciplinary frontier, scientific research method, research technical training, innovative thinking training, project implementation training and other aspects of the course. Postgraduates can combine their own research direction and research topics, make a targeted selection of academic training course, and curriculum selection is not limited to their own department and institution, which can be made even in the whole school or even cross school. After training, postgraduates can get abilities of effective communication and information acquisition with their peers, timely update the discipline frontiers, so as to quickly focus, identify the direction and make innovative achievements.

New growing point of discipline and major breakthrough in scientific research often originate in the cross and integration of different disciplines. Therefore, school should strengthen academic exchange and integration, break the disciplinary boundary, which will create a favorable learning and research environment for postgraduate’s innovation ability cultivating. Massachusetts Institute of Technology (MIT) has more than 60 interdisciplinary organizations, and many mature interdisciplinary organizations have been involved in doctoral education. Through the interdisciplinary training of comprehensive senior talents, MIT set up a Science, Technology and Social Planning (STS) Institute, conducts a planned and organizational interdisciplinary education in the interdisciplinary field of natural science, technical science and humanity, social science. [6] At present, the majority of local colleges and universities have not set up interdisciplinary majors, so it’s a very useful step to construct platform for interdisciplinary academic exchange prospectively, and promote academic exchanges between similar disciplines and between different disciplines.

Taking Zhejiang University of Technology for example, the university improves postgraduate’s academic knowledge, research skills and innovation abilities by means of giving a series of general academic training public courses, professional academic training elective courses, holding postgraduate Shuocai Festival which contains a series of academic exchange activities around the theme of “tracing the source of science, picking the essence of culture”. Moreover, colleges in university invite outside specialists, scholars and postgraduates to have academic exchanges, as well as many inside school academic exchanges, which is suitable for postgraduates to participate in. The Department of Postgraduate Administration leads the integration of resources and builds Shuocai Festival platform. The main contains are as follows. Firstly, it builds school-level Shuocai Lecture, Master and Doctor Forum as the main academic exchange platform. Secondly, it establishes an information distribution network for postgraduate academic exchanges, to promote communication and interaction of similar disciplines, and stimulate crossing and penetration of different disciplines in the university. Thirdly, it organizes interdisciplinary forums by inviting well-known interdisciplinary teachers at home and abroad. Fourthly, it plans to establish interdisciplinary publications and hold special interdisciplinary academic forum and other forms for postgraduates, in order to deliver the latest research achievements and messages in different disciplines with various carrier forms. In addition, the university set up a post graduate academic exchange fund to encourage students participating in inter-school or international education exchange and learning, let the student have an opportunity to communicate with international peers. In that way, not only broaden the knowledge of postgraduates, but also provide a good thinking
collision and integration platform, a very natural growth environment for the innovation ability cultivating.

Motivation Guarantee: Reward the Scientific and Technological Achievements of Postgraduate Students, and Implement Open Collaborative Talents Training

Colleges and Universities can design a motivation system for postgraduate's extracurricular science and technology innovation. Through giving material reward, bonus points in comprehensive evaluation, innovation credits, giving priority to outstanding innovation individuals in postgraduate scholarship selection, national scholarship selection and other advanced figures selection, to encourage postgraduate students participating in scientific and technological innovation activities. According to the discipline difference, students published papers’ amount, citations, average impact factors of journal and awards, students participated projects’ amount, level and awards, students’ achievement in applying patent and software copyright, students’ contribution to book editing or writing and enterprise cooperation, schools can select and reward postgraduate star of science and technology innovation, and postgraduate star of academic paper writing. Thus school can guide and motivate postgraduate students to participate in science and technology innovation activities more actively and with more innovative results. At the same time, school should enhance policy motivating to strengthen tutors’ guidance in postgraduate scientific and technological innovation. Taking Zhejiang University of Technology for example, the subordinate colleges implement self-financing. As one of the subordinate colleges, when the college sets up management regulations, such as teaching and administrative staff performance calculation method, teaching and administrative staff teaching and research incentives, promotion of senior title recommended ranking method, it counts teacher’s guidance of postgraduate science and technology innovation activities in teaching performance workload, counts students’ achievements that teacher instructs in science and technology innovation activities equal to his own teaching and scientific research awards, and gives priority in title promotion and award recommendation.

In terms of postgraduate education, local colleges and universities must pay high attention to serve the local economy and meet the social needs, so it is necessary to break through the barriers that restrict innovative talents training in colleges and universities, and establish an open collaborative talents training mode among departments inside school, among institutions outside school. Departments inside school collaborative training is concerned with students’ innovation knowledge structure cultivating. Whereas, institutions outside school collaborative training is more concerned with students’ practical innovation capability cultivating. Collaborative training initiates postgraduates more involving in various practical activities, such as teaching practice, scientific research practice, social survey, technology service, business internships and so on, making innovation in the production practice, in order to build a practice platform for postgraduate’s science and technology innovation. For example, College of Information Engineering, Zhejiang University of Technology makes use of alumni enterprises resources, establishes postgraduate academic innovation practice base, implements two tutors system for the Engineering Master which including both school tutor and enterprise tutor, invites alumni enterprise’s senior management as part-time postgraduate tutors to guide students to carry out scientific research and innovation activities, so as to strengthen the training of students’ innovation abilities. In addition, the College of Information Engineering actively looks for a broadened stage for postgraduate practicing, contacts enterprises and institutions with technical requirements to let students have a chance to use their own knowledge to solve scientific research problems and serve enterprise and society. In these ways, postgraduates can have access to the latest technology in the industry and combine the theoretical knowledge they learned with enterprises needs, which is favorable to explore their innovation awareness and innovation abilities.
Conclusion

The construction of guarantee system for postgraduate science and technology innovation education is aimed to improve postgraduate’s scientific research ability, professional practice ability, teamwork ability, and cultivate more innovative consciousness, innovation spirit and innovation ability. From the practice of College of Information Engineering, Zhejiang University of Technology in recent years, the establishment of postgraduate science and technology innovation guiding committee and innovation fund, have played an important role as organizational guarantee and intellectual support in the postgraduate science and technology innovation education system, have an significant role in motivating participation awareness, innovation spirit and scientific research training, have gradually achieved the aim of new innovation structure, that is everyone has a project, everyone takes part in a competition, everyone is innovative, the participation rate reaches to nearly 100%. The establishment of general knowledge, professional academic training courses becomes a solid foundation for improving the guiding platform of postgraduate science and technology innovation. The effective integration of academic resources inside and outside the school, and the establishment of postgraduate interdisciplinary academic exchange platform, not only enhance postgraduate’s interpersonal and academic communication skills, but also improve their academic knowledge and academic vision. In addition, rewarding the science and technology innovation achievements of postgraduate students, implementing open collaborative talents training, motivating tutors to support students participating more in scientific research, competition and other practical activities, encouraging postgraduate students much more involving in company’s innovation, practice, development and transformation, all of these above improve the ability of postgraduates in science and technology innovation, as well as the social service capabilities of local colleges and universities.

References


