Construction of Engineering Graduate Education System Based on Cultivation of Innovation and Entrepreneurial Ability

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Abstract. Implementing vigorously innovation and entrepreneurship of postgraduate is our country's main strategy position in relying on science and education to rejuvenate the nation and making China an innovative nation. Firstly, the paper based on the idea of "interest-guided and project-oriented", which structures the training system of ability of innovation and entrepreneurship, relying on research projects and science and technology contests, breaking down the barriers, going to make it more open, practice training, advocating autonomous learning under the guidance of "tutors and seniors". Secondly, building practice education system based on uniting the university, government and corporations, making the needs of enterprise's scientific and technological become preliminary research for postgraduates to research, they can improve abilities of practical, self-study, innovation and entrepreneurship in scientific practice. Finally, strengthening process management and supervision to ensure that all kinds of well-designed and continuously improved mechanisms, policies and systems can be implemented. Researching project can create a good academic atmosphere, optimize the training mechanism, improve the teaching quality and enhance self-learning ability, practical ability and innovation and entrepreneurship ability of graduate students.

Keywords: Innovation · Entrepreneurship · Quality education
Graduate students

1 Introduction

With the 21st century coming, the scale of graduate education in China has made great progress. After the quantity growth, how to improve the quality of postgraduate training has become a hot issue of attention from all walks of life. While the Strengthening construction of hardware and ensuring basic training conditions, how to enhance the ability of graduate students in innovation and entrepreneurship, as well as training innovative talents, receive more attention. On the other hand, the cores of the current international competition are knowledgement and talents. The postgraduate education plays the irreplaceable role in training innovative talents and the research of technology. Striving to develop postgraduate education is an important measure for

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relying on science and education to rejuvenate the nation and making an innovative nation which has great strategic meanings.

2 Research Status

Modern postgraduate education originated in Germany in the first half of the 19th century. Postgraduate education in Germany was in the leading position in world higher education from then on until a very long period in the early 20th century.

While inheriting the concept of German higher education, the United States developed and innovate d according to its own national conditions. The United States has reformed the scientific research pursuit of "pure science" in higher education in Germany and closely integrated scientific research with the political and economic development of society. While focusing on basic research, the United States has made great efforts to develop applied research so that it can make good achievements in innovation and entrepreneurship development, Harvard University, Stanford University, University of Pennsylvania, Georgia Institute of Technology, University of California, Berkeley and other American engineering elite in the field of innovation and entrepreneurship education in the forefront of the world, training Zuckerberg, Musk, Jerry Yang and a large number of internationally renowned entrepreneur. Massachusetts Institute of Technology alumni founded company, even reached a total annual revenue of more than 2 trillion US dollars surprising volume, as an independent economy who ranked 11th in the world. A large number of leading international companies such as General Motors, Hewlett-Packard, Intel, McDonnell Douglas, Texas Instruments and Gillette were founded by MIT alumni (Fig. 1).

Fig. 1. Scene of U.S. students participating in a technology competition

My country started late in the field of higher education, but it developed rapidly. In order to meet the needs of the development of the times, the Ministry of Education promulgated "Opinions on Vigorously Promoting Innovation and Entrepreneurship Education in Colleges and Universities and Undertaking Entrepreneurship by Students" as early as May 2010, and proposed to vigorously promote innovation and entrepreneurship education in colleges and universities and to strengthen the building of entrepreneurship bases. Since the 18th CPC National Congress, the party Central Committee with Comrade Xi Jinping as the core has even put forward the national strategy of "making the masses popular and innovating in a large number of ways." The Opinions of the State Council on Several Policies and Measures for Vigorously Promoting Innovation in Mass Creation and Entrepreneurship promulgated in June 2015 has provided policy support and guidance for innovation and entrepreneurship in the whole society. This year's report on the work of the government has also proposed that a new batch of "double-found bases" should be set up to encourage large enterprises, research institutes and universities to set up specialization in creating more space.

China has also emerged a large number of entrepreneurship entrepreneurs represented by Huawei companies Ren Zhengfei, Alibaba Jack Ma, Jingdong Liu Qiangdong, Baidu Robin Li, Tencent Ma Huateng, millet technology Lei Jun, and DJI-Innovations Wang Tao (Fig. 2).

Fig. 2. Typical representatives of China's science and technology innovation and entrepreneurship - Ren Zhengfei (Huawei) and Wang Tao (DJI)

3 Construction of Culture System

The talent training model is the sum of educational theory, training target, curriculum system, management system, evaluation method and so on. Whether colleges and universities can cultivate satisfactory talents is largely determined by the scientific nature of the talent training model. Take the ability as a main line of innovative quality education road can inject vitality mode for university talent training, the concept of university education and training mode to innovation ability and scientific literacy cultivation of graduate students as the center, to cultivate talents to meet the social demands of innovation and entrepreneurship, bring vitality for higher education (Fig. 3).

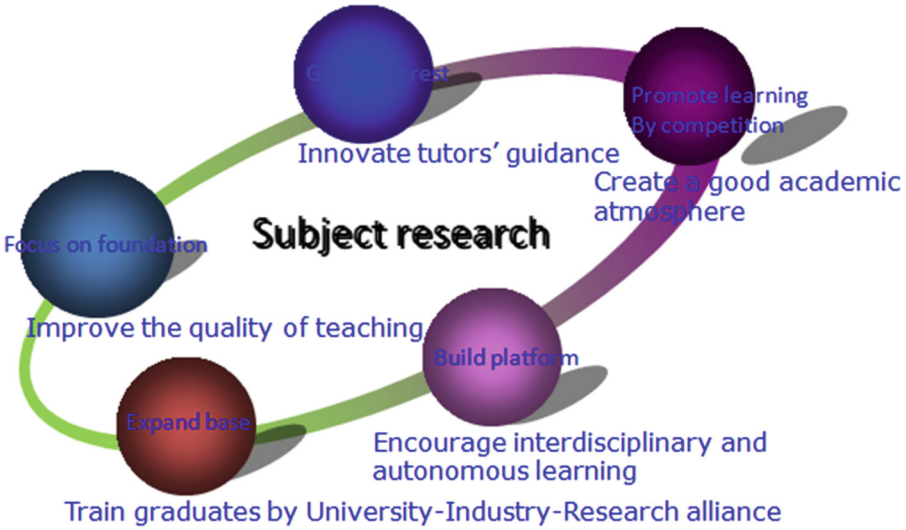

Fig. 3. The main measures taken in this article

3.1 Interest Guidance, Innovation of Tutor Guidance

Interest is the best teacher. The research training mode driven by the engineering project and the science and technology competition can stimulate the students' desire for knowledge. For example, robotics, which involves knowledge in mechanical, control, computer programming, AI, multi-agent theory and technology, is a typical interdisciplinary research platform. It not only has the basic theory, but also has the application of engineering technology, as well as the exploration of academic frontier. It is very suitable for graduate students to carry out innovative research. Learning, researching, designing and even making works for interested objects can enable students to actively build and improve knowledge system and cultivate scientific literacy in practical activities.

The so-called 'the teachers' ability and emphasis are different and varied', which leads to the strong limitations of the traditional "private ownership" direction. This project aims to break the traditional ways of guidance to the team as a unit, barriers, take individual guidance, guidance and senior fellow with the collective combination of "tutor group" collective guidance system. The implementation of the guiding process is determined according to the specific characteristics of graduate students, including their professional characteristics, training objectives, research directions, basic literacy and their research tasks. The members of the tutorial group have different professional background and broad knowledge base. The members of the group, in the whole training process of graduate students, have a reasonable division of labor, complement each other and cooperate with each other to ensure that all training links of graduate students can always get a higher level of guidance.

A group of academic activities consisting of postgraduates, tutors, steering group teachers and undergraduate students was set up to organize flexible and diverse academic salons regularly. The graduate students who choose their own interests to take turns doing academic reports. The guidance group makes specific comments on the performance of the students, points out the shortcomings and the direction of future efforts. And the group also gives a scientific assessment of the scientific nature of the academic report, the ability of speech and the preparation of the report. Academic Salon activities can not only guide graduate students to master broad theoretical knowledge and latest academic trends, but also foster the ability of postgraduates to express their language. At the same time, Academic Salon is a technological edification for undergraduates. It has an early involvement in the quality of postgraduate enrollment, and plays a good role in promoting and ensuring its quality.

3.2 Face to Engineering and Create a Good Academic Atmosphere

As for junior class postgraduates, it leads students to gradually remove the layers of the veil of engineering problems and to find the point to analyze and solve problem by the opportunities and platforms of science and technology competitions and simple scientific research. During several years of observation, the research group finds it is easier for high level science and technology competition to stimulate students' desire to attract the interest, which can guide the students to get a quick introduction and carry out basic scientific research and training. At the same time, winning of scientific and technological competitions have a good display degree, which can effectively promote enrollment, employment and platform construction.

Since Tsinghua University organized and hosted the first "Challenge Cup" in 1989, the positive effect of high-level science and technology competition on student training has been widely recognized by the society, the high-level science and technology competition every year has attracted tens of thousands of students from major universities in China, which involves Robotics Competition, Graduate Electronics Design Competition, "Internet +" Innovation and Entrepreneurship Competition, Sharing Cup Science and Technology Resource Sharing and Service Innovation Practice Contest, Smart City Technology and Creative Design Contest, Mathematical Modeling Contest, IOT (Internet of Things) Design Competition, Big Data and Intelligent Computing Competition, Smart Motor Competition, Smart Manufacturing (Industry 4.0) Innovation

and Entrepreneurship Competition, Siemens Cup China Smart Manufacturing Challenge Competition and so on. To varying degrees, these projects have reached many frontier areas. Some of them require considerable engineering capabilities and theoretical depth, they are suitable for graduate students' research training and even thesis topics.

In recent years, our school has achieved great success in robotics contest, mathematical modeling contest and challenge cup. More importantly, postgraduates showed great interest in these projects. They conducted a great deal of meaningful research and exploration on the competition, united with each other and made progress together, and created a strong academic atmosphere with common goals.

3.3 Focus on the Foundation, Improve the Quality of Teaching

Curriculum learning plays a very important role in the whole process of postgraduate training. It is not only an effective way for students to master the basic knowledge and professional knowledge of the system, but also an important foundation for training innovation ability. Firstly, teaching content and curriculum system should be reorganize, it is in the face of the rapid expansion of knowledge and exchange, science and technology and the integrated development of science that engineering postgraduates curriculum system should follow the principle of to the principle of 'rebuilding the foundation, highlighting the modern, reflecting the frontiers, and integrating comprehensively and open more human courses, interdisciplinary courses and cutting-edge courses to promote contact of discipline and curriculum.

Secondly, to improve teaching methods and teaching management system, to improve teachers' teaching methods and teaching methods such as using more heuristic and research style teaching and increasing class discussion to fully mobilize the initiative and consciousness of postgraduates. Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime. The instructors should change their teaching method so long as they raise questions and guide students to think about problems. The key point of teaching should be the ability and character related to creative activities, and a series of norms, standards, values and attitudes of creating the activity which include the consciousness of creation, the value of creation, the method of thinking and method of creating activity. We should carry out heuristic, research style teaching and more academic discussions in teaching that gives graduate students a full imagination space, guides graduate students brave to explore, dare to innovate and develops their ability to detect problems, analyze problems and solve problems.

3.4 Building a Platform, Encourage Interdisciplinary and Autonomous Learning

Based on the existing platform, equipment and site conditions, we should discard the concept of self enclosed development, break the barrier between organizations and take an open road of development. we should also promote interdisciplinary research with multidisciplinary, multi-level and multi-faceted efforts under the team spirit to create an atmosphere of interdisciplinary education and research. Graduate students are an important part of an interdisciplinary research team. We formulate curriculum plans

and management systems that are suitable for interdisciplinary and autonomous learning. So as to students can learn to study, scientific research, cooperating and learn to use different disciplines to analyze and solve problems.

Take scientific research projects and various science and technology competitions as links, take full advantage of existing research conditions and teachers, and actively organize graduate students. Especially the lower grades of graduate students who can be stationed in relevant laboratories, participate in the design, production, commissioning and other work, and to assist and guidance undergraduates to form a good platform. Take scientific research projects and science and technology competition as a carrier, achieve the seamless connection between theory and practice and train students in interdisciplinary knowledge system.

3.5 Expand the Base, Train Graduate Students by Alliance of Government-Industry

University-Research

By the construction of a platform for school-enterprise cooperation, we should expand alliance of Government-Industry-University-Research and establish graduate students training bases and mobile workstations. We should establish a system and mechanism for pre-graduate research on the participation of postgraduates in enterprise science and technology, and cooperate with effective guidance and supervision mechanisms to enable graduate students to grow rapidly in practice.

Training plan for graduate students should be revised properly, curriculum arrangement and teaching time also should be adjusted. Especially for the professional graduate, focusing on interest guidance and hands-on training, a certain number of graduate students (mainly part-time tutor-led graduate students) can enter the workstations set up by the enterprises in the second grade and participate engineering training under the joint guidance of both tutors. When it comes to the ripe condition, the graduate students equipped with much engineering training abilities, who can take the pre-research by enterprise as the research subject and take the guide by enterprise's tutor as the main direction to start the subject research. By the end of research, they can take the guide by the tutors in school as the mainstay to summarize, to refine and to improve the research of subject, and then they can write the dissertation.

4 Conclusion and Outlook

4.1 Conclusion

This article aims at the training of engineering graduate students' ability to innovate and start a business, and builds the training system of engineering postgraduates based on the guidance of interest and the cooperation of industry, university and research. After years of unremitting efforts, our school in practice base construction and alliances with production and research has Baosteel Group, the new steel group, China Ruilin, Tyco Group, Hangzhou Iron and Steel Group, Nanjing Iron and Steel Group, Jiangxi Copper Group, China Aluminum Industry, Tongling Group, Jiang Tungsten Group and

other large enterprises to establish a long-term and stable relations of cooperation and the establishment of a number of teaching practice base and talent employment base, and Guangzhou ZLG MCU Development Co., Ltd. jointly established a "3 + 1" Innovative Education Experiment Class, and Tyco Group jointly established the "Tyhao class", and Shanghai Ying Lun Information Technology Co., Ltd. jointly established the "British class." Among them, the "3 + 1" innovation education experimental class was named the national level teaching reform demonstration area, personnel training mode innovation experimental area and the national engineering practice education center.

Innovation and entrepreneurship training system based on the concept of "interest-oriented and engineering-oriented": based on scientific research projects and science and technology competitions, based on the school's existing platform conditions, equipment conditions and site conditions, we can break the barriers between organizations and take the open development Road, practical training for graduate students, advocate "guidance group + seniors" under the guidance of autonomous learning. The graduate students form a complete knowledge system in the research and design, improve the knowledge structure in the production, debugging and optimization, and cultivate the ability to analyze and solve problems and the brave breakthrough in innovation.

Based on the practical education system of cooperation between government, industry and research institutes, this paper starts from the cultivation of innovation and entrepreneurship ability, and conducts an in-depth research on the reform and improvement of postgraduate education system. Advocate the cooperation between government, academic and research institutes, expand the practical teaching base and postgraduate mobile workstations, and establish the research needs of enterprises in science and technology as pre-research projects. Research by postgraduates enables postgraduates to stimulate their interest in learning in science and technology, to activate academic atmosphere and improve academic standards, Strengthen hands-on ability, cultivate innovation consciousness.

Strengthen Process Management: Strengthen supervision and resolutely put an end to the vacuum that may emerge in postgraduate management so that students can really move on. To ensure that all kinds of well-designed and continuously improved mechanisms, policies and systems can be implemented in an effort to reduce the gap between post-graduate education and social needs.

4.2 Outlook

In response to the advent of the era of knowledge economy, international higher engineering education is constantly reform and innovation. From the long-term development trend, with the further development of economic globalization, the connotation of engineering education has expanded from engineering science, technology and management to the integration with natural sciences and social sciences. In the future, we will increase the compatibility of training system, enhance liquidity, promote practicality and strengthen interaction from the perspective of "return to engineering".

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