

Research and Practice on Innovative and Entrepreneurial Talents Training at Universities Based on HIT Racing Team

Weihua Li, Yiqun Liu *, Hailong Zhao, Ziyang Lei

School of Automotive Engineering
Harbin Institute of Technology (Weihai)
Weihai, China

*Corresponding Author: lyq.new@163.com

Chenxue Xia

School of Languages and Literature
Harbin Institute of Technology (Weihai)
Weihai, China

Abstract—With the fast development of technology industry and economy, students at universities are facing more employment pressure. The upgrading and reform of the industry make the society's demand for innovative and entrepreneurial personnel further improve. This paper analyzes the existing problems of the innovative talent training in the education process of universities. The potential solution is instructed including the training system for innovative talents, the cultivation methods based on multi-objective and multi-level technological innovation projects and the university-enterprise-society cooperation training system. Based on the related practice in the Harbin Institute of Technology (HIT) racing team at Weihai for some years, the proposed methods have produced remarkable achievements.

Keywords—higher education; innovation and entrepreneurship; personnel training; technology innovation

I. INTRODUCTION

The trend of the world economic development is leading the development of innovation and entrepreneurship education worldwide. At the early period of the 20 century, the innovation and entrepreneurship education began in some foreign countries. In America, this education aims to cultivate diversity talents for social development. It emphasizes that entrepreneurship education is different from the education for employment, not only for getting a job, but also for the free growing of each student [1]. The association of innovation and entrepreneurship education of America regards innovation and entrepreneurship as a lifelong learning process including a comprehensive education system from primary education to higher education. Finally, it has become a complete research system for the innovation and entrepreneurship education [2]. At the end of 20 century, Japan, Britain and other developed countries also began to develop the innovative and entrepreneurial education, and effectively decreased the employment pressure of graduates during the global economic crisis.

In recent years, the employment situation of graduates in China is becoming worse. With the expansion of university enrollment, the pressure of university students' employment is

increasing, and entrepreneurship has become an effective way to solve the difficult employment problem. In 2010, Yuan Guiren, the Secretary of Education Ministry, pointed out that we should strengthen the entrepreneurship education and optimize relevant policy to make breakthroughs of university graduates' entrepreneurship in 2010. Universities should also strengthen their entrepreneurship education, energetically develop the integration between the entrepreneurship education and the traditional professional courses, and regard entrepreneurship education as an important part of employment guidance course. In document 'Opinions on Development of Innovative and Entrepreneurial Education in University and University Student Entrepreneurship', the Education Ministry pointed out that developing innovation and entrepreneurship education in universities and encouraging university students to start their own businesses is the practice of Scientific Outlook on Development advanced learning and serving major strategies for the construction of an innovative country. It is an important way to deepen the reformation of higher education, cultivate students' innovative spirit and practice ability and improve the professional career of university graduates.

Innovation and entrepreneurship play an important role in driving the development of the country and promoting the upgrading of the economy [3]. As the potential successor of the country, cultivating the creative ability of university students is an important content that cannot be ignored, which is critical for the further developing of the country. The entrepreneurship is an effective economic solution to promote the active development of the socialist market economy in China. At present, the global financial crisis has started to affect the Chinese substantial economy, which induces that the employment situation of university students is not optimistic. The upgrading and reformation of the technology industry from the 'made in China' to 'created in China' need not only strong institutional guarantee, but also the people's ability of innovation and entrepreneurship [4]. Facing increasingly severe employment situations, the training of university students' career quality of entrepreneurial and innovation is becoming more and more important and pressing. In recent years, the problems of the innovation and entrepreneurship education for university students have become the emphasis of the central ministries and the education bureaus.

This work is supported by the Postgraduate Education and Teaching Reform Project of Harbin Institute of Technology at Weihai (WH2019016, WH2019010), Teaching Research Project of Harbin Institute of Technology at Weihai (BKQN201905).

II. PROBLEMS OF INNOVATIVE AND ENTREPRENEURIAL TALENTS TRAINING AT UNIVERSITIES

At present, many problems have arisen in the education process of cultivating innovative and entrepreneurial talents, and the typical problems are discussed in this section.

A. *Lack of dual qualities of entrepreneurial experience and educational experience for teaching staff*

The structure of the teaching staff for the innovative and entrepreneurial education is facing the following challenges. On the one hand, for most university teachers, they have rich theoretical knowledge but lack the practical experience. On the other hand, many universities only hire entrepreneurs as part-time professors or entrepreneurship tutors, or invite entrepreneurs for lectures. Although it is welcomed by students, but the practice proves that this form of education lacks the guarantee of the comprehensive organization and system, and is hard to induce the enough professional innovative and entrepreneurial learning. Although these entrepreneurial tutors have rich experience in entrepreneurial practice, they lack effective supervision and evaluation on their teaching contents and teaching effects. Each entrepreneurial lecture or report is self-contained, and teaching contents are not scientific and systematic enough [5].

B. *Lack of engineering practice for innovative and entrepreneurial education*

Innovation and entrepreneurship education for students in most universities is still staying at the stage of theoretical study, there is little entrepreneurship activity carried out. Most university students do not know how to write a business plan and lack the understanding of the target market, the analysis of the data is not convincing. Among university students, there exists a general situation of 'talking about strategies on paper', and they are lack of experience and related knowledge on market development, integration of resources and management. Entrepreneurship education is a highly practical educational activity. The education process from simulation to practice is a specific way to cultivate students' entrepreneurial awareness and ability.

In addition, the operation of the entrepreneurship base in campus cannot stay at the level of simulation; it should have the practical training function of the real production and management. Because production and business are the basis for long-term and benign operation of an innovation base, we must have deep involvement from enterprises to achieve effective results and make continuous development.

C. *Acceptance degree of innovative and entrepreneurial education*

The concept of innovative and entrepreneurial education in domestic universities is backward, mainly because of the late introduction in China, and it is still staying at the stage of exploration and trial. The concept for the innovation and entrepreneurship education is 'the third educational certificate' has not been accepted by most universities, regions, students, parents and teachers. At present, the education tasks of universities in China is still generally for students' employment, which means the problem of students' future career is concerned more.

Due to the restriction of hardware and software conditions and the influence of examination oriented education, innovative and entrepreneurial education is basically still at the stage of learning and digesting knowledge. Many students are uninterested and panic about the practical problems. For example, university students are not energetically interested in technology invention or any skill competition activities. They are confused by these practical tasks in their graduation theses, and also don't like the courses with practical technologies, so they are preferring to participate in the examinations with standard answers.

III. METHODS OF INNOVATIVE AND ENTREPRENEURIAL TALENTS TRAINING AT UNIVERSITIES

A. *Strengthening training system*

Most universities simply regard innovative and entrepreneurial education as a kind of quality education. Relevant activities are organized by students or the Youth League that is responsible for the extracurricular activities, which cannot cultivate innovative consciousness of university students, connect professional learning and social needs, integrate the education into the developing information society based on knowledge economy and make innovative and entrepreneurial education fully meet the needs of the community.

Innovative and entrepreneurial education must be oriented to all students and integrated into the whole education process of talent training as a new way of quality education. In addition to integrate the innovative spirit in campus culture, innovative and entrepreneurial ideas must be presented in educational philosophy, teaching plan, curriculum, experiment, practice and graduation thesis and so on. The ideas should be presented when the educational ideas like innovation and entrepreneurship management are taught, and then the complete system can be founded [6].

B. *Excavating the creative potential of students*

Entrepreneurship education cannot be conservative and disconnect from the reality. We must persist in seeking truth from facts, linking theory with practice, and building an education platform for university students' innovation and entrepreneurship, so that university students can really integrate with the society [7]. Participating in research projects is to further the teaching activities. It helps students not only understand the content of the textbook better, but also gain more knowledge which is not presented in textbooks. It is helpful for students to enhance the ability of professional quality and various aspects [8]. In recent years, there are various forms of technological innovation project gradually held in China, which intends to improve university students' innovation ability, thinking ability and practice ability. Students can master new skills, learn new knowledge and learn to use the knowledge in the real situations through innovative projects. At present, there are many technological innovation projects in China which have achieved good results, such as 'Challenge Cup' series project, Mathematical Contest in Modeling, Formula SAE and so on. Among these, Formula SAE is a good example of promoting students' innovation,

strengthening school enterprise cooperation and cultivating the spirit of entrepreneurship.

C. Establishing cooperative training mechanism consisting of university, enterprise and society

University-enterprise cooperation is a mode of talent training which makes use of two different educational resources of universities and enterprises with combining curriculum and actual work. Focusing on training students' comprehensive quality and employment competitiveness, this teaching mode can adapt to the needs of enterprise recruit [9].

It is not enough to train high-level practical personnel only by the efforts of universities. Universities should go beyond the thinking of "independence and self-reliance", and integrate the resources of governments, enterprises and universities [10]. The university has the advantages in technology, equipment, human resources, and it is easier to attract enterprises to invest the superior resources into the practice teaching of universities. Training personnel by combining technological projects and developing new products and teaching students by linking learning and practice can make students understand the operation business in enterprises. At the same time, universities and enterprises can share resources and complement each other's advantages through effective exchange. Only with the participating of enterprises, the innovative and entrepreneurial education can generate energy and make real great impacts for the students.

In particular, the polytechnics tends to focus on the cultivation of students' application ability like specialized application technologies and train students as engineers, which lead students to emphasis on application ability but neglect their innovation ability training. In addition, because of the market economy and employing needs of applied talents and adaptive talents, the development of university students' innovative ability is limited.

As a result, the training mode of university-enterprise cooperation meets the needs of university education development. It plays a positive role in promoting the integration of educational resources in universities and developing the practice teaching system and teaching reform based on innovative talents training. The key to this mode is the construction of the university-enterprise integrated curriculum system and the special courses.

IV. PRACTICE OF INNOVATIVE AND ENTREPRENEURIAL TALENTS TRAINING AT UNIVERSITIES

Formula Student China (FSC) creates the platform to training future leaders and engineers of Chinese vehicle industry based on Chinese vehicle engineering education, and create opportunities for worldwide communication among young vehicle engineers. As one of the FSC teams, HIT Racing Team (HRT) applied the training methods of innovative and entrepreneurial talents and has gained considerable achievements.

A. The idea is deeply rooted in mind and the training system is perfect

Designing a racing car is a professional work; only with annual update of technology can race team gains ideal results

in domestic even worldwide competitions. Therefore, for team members, the idea of innovation is rooted in their minds. As a technological innovation team, HRT has the excellent management system. The management methods in enterprises are used in HRT, which can ensure the orderliness and sustainability of the team operation. After new member attending in the team, they must learn related specialized knowledge and skills; senior students can apply to research new technologies related to racing car when they are writing graduation theses, which can ensure the technology storage. "Keep Racing" is the core of the team culture, it encourages each member work hard for the racing dream.

B. Innovative ability of students is developing by attending technological projects and related competitions

Since its founding in 2010, FSC has lasted for seven years. HRT at Harbin Institute of Technology at Weihai has grown up with the competition since its founding in 2009. In this competition, innovation is the core idea. Students have designed and manufactured 14 racing cars by themselves, including combustion cars, electric cars, autonomous cars and Baja off-road cars.

Team members use carbon fiber monocoque and energy absorption structure in early time, which was the first case in China, and now HRT has become one of the teams which are proficient in CFRP by learning, sharing resources with enterprises and innovating. In 2017, HRT was invited to attend the first Formula Student Autonomous China and gained good results by using self-developed technologies like autonomous environmental perception calculation and autonomous braking and steering system.

In recent years, the innovative results of the HRT team have won recognition from all walks of life. In 2015, HRT won the Annual May 4th Youth Medal and the award of Excellent Students' Technological Innovation Team. In 2016, HRT won the Excellent Students' Technological Innovation Team again and gained two domestic champions (electric car and Baja car) in FSC. In 2017, HRT gained the second prize for Innovation Scholarship of the Ministry of Industry and Information Technology of China and the Xiaoping Scientific and Technological Innovation Team. Honors and awards of HRT are shown in Fig. 1, and all of these are benefited from the presented innovative and entrepreneurial talents training methods in this paper.



Fig. 1. Honors and awards of HRT.

C. Close cooperation between university and enterprise

As the innovation and entrepreneurship base of Harbin Institute of Technology at Weihai, HRT is a good role model of student innovation group in universities and a good example of the cooperation of universities and enterprises. It focuses on the cultivation of university students' innovative ability. As the sponsors of HRT, many domestic and foreign enterprises (KAIYUN Motors, DYNAVOLT, GUANGWEI, Continental, LOCTITE, etc.) provide HRT technological and financial support. At the annual launch event for each new car, the conclusion of this season's work will be feedbacked to sponsor companies, so that HRT can achieve the desired depth of practical innovation.

Now, HRT has responded the call of students' entrepreneurship and registered an incorporated company at the base of Harbin Institute of Technology at Weihai.

V. CONCLUSIONS

The aim of innovative and entrepreneurial education in universities is to cultivate compound talents with professional knowledge, innovative spirit and entrepreneurial knowledge. In the process of training, we should follow the development of the times to meet the needs of society and promote the reform of personnel training mode. This paper analyzes the problems existing in the training of innovative and entrepreneurial talents in universities, proposes a training method based on multi-objective and multi-level technological innovation projects, and establishes a university-enterprise-society cooperation training mode. Based on the research and practice of HIT racing team at Harbin Institute of Technology at Weihai, the applied system has made remarkable achievements.

REFERENCES

- [1] W. H. Zhou, Factors and Enlightenment of Innovative and Entrepreneurial Education in Foreign Universities, *Xinyu University Journal*, 2015, 20(3): 141-143.
- [2] C. X. Qi, A Brief Discussion on the Current Situation of Domestic and Foreign University Students' Innovative and Entrepreneurial Education, *Modern Economic Information*, 2016(18).
- [3] J. Wang, Comparison and Experience of Innovative and Entrepreneurial Education in Domestic and Foreign Universities, *Innovative and Entrepreneurial Education*, 2016, 7(4): 99-103.
- [4] Z. Yang, Analysis and Exploration of University-Enterprise Cooperation Based on the Innovative and Entrepreneurial Education Reform, *The Public Science: Science Education*, 2016(3).
- [5] C. H. Wang, Research on the Development of Innovative and Entrepreneurial Education in Universities from the Perspective of Enterprise, *Chinese Vocational and Technical Education*, 2013(6).
- [6] X. F. Wang, The Cultivation and Practice of University Students' Consciousness of Innovation and Entrepreneurship, *College Party Construction and Ideological Education*, 2013(s1).
- [7] J. H. Ruan, P. Chen, B. W. Chen, C. C. Wang, New Way to Cultivate College Students' Ability of Innovation, Entrepreneurship and Practice-Based on Qiushiqiangying Practice Growth Project in Zhejiang University, *Journal of China Youth University for Political Sciences*, 2011, 30(2):26-31.
- [8] X. Feng, Y. Lin, Y. F. Li, Y. N. Dao, B. Cai, The Significance of the Implementation of Innovative Experimental Projects for College Students, *Technology Entrepreneur*, 2012(19): 203.
- [9] G. Han, J. Cheng, P. Zhang, S. K. Zhao, Discussion of College-Enterprise Cooperation in Innovation and Entrepreneurship Education, *Innovative and Entrepreneurial Education*, 2014(2): 54-55.
- [10] J. Cai, Y. Liu, Construction of College Student Innovative and Entrepreneurial Platform Based on University-Enterprise Cooperation, *University Education*, 2015(9): 18-19.