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Application of Engineering Education in Entrepreneurship Construction System

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ABSTRACT

At present, many engineering students have failed to start a business due to the lack of good entrepreneurial ability and quality. The main crux is that colleges and universities only pay attention to the professional knowledge and skills for the cultivation of engineering students, but ignore the entrepreneurship education. With the popularization of higher education and employment situation of graduates in our country becoming more and more serious, college student's entrepreneurship has become a new trend of employment of college graduates. It is imperative to cultivate the entrepreneurial ability of college students. At present, scholars in our country have done a lot of research on entrepreneurship education, but seldom integrate the research of entrepreneurship education into the engineering talents training program. Therefore, this paper analyzes the existing problems of engineering education in colleges and universities in our country through literature research and questionnaire survey, and based on previous studies, puts forward a new type of engineering students training program that combines entrepreneurial education and specific strategies for training entrepreneurship ability of engineering talents. Looking forward to provide reference for engineering education in our country.

Keywords: engineering education, entrepreneurship construction system, applied talents

INTRODUCTION

Engineering education is the activity of teaching knowledge and principles to the professional practice of engineering. It includes the initial education for becoming an engineer, and any advanced education and specializations that follow. Since the central government put forward the "mass entrepreneurship and innovation" in 2013, the central and local governments have published a series of specific measures to promote entrepreneurship. These policies provide college students with a good entrepreneurial opportunity. The rate of entrepreneurship for Chinese university graduates rose from 2.3% in 2013 to 3% in 2017.Statistics show that most of the students who choose to start their own businesses are graduates of economics, management and marketing. There are few engineering students who choose to start their business after graduation. Moreover, although the entrepreneurial rate has shown a significant upward trend, but according to statistical data, the entrepreneurial success rate of college students in China is only 2.4%. Therefore, how to build the engineering applied talents entrepreneurship education system has become an urgent problem to be solved.

The connotation structure of entrepreneurial quality is divided into physical quality, entrepreneurial awareness, adventurous spirit, willpower, and ability to capture business opportunities. I counted out the survey results of College Students' entrepreneurial awareness as shown in **Figure 1** by the way of distributing the questionnaire through the Internet. The research shows that about 85% of college students have entrepreneurial intention. But the real proportion of students engaged in entrepreneurial activities during the university is not high. Domestic scholar (Lin & Si, 2014) has shown that the success factors of college students' entrepreneurial include objective factors and subjective factors. Objective factors mainly include resources and entrepreneurial opportunities. Subjective factors

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Contribution of this paper to the literature

- The research is of certain theoretical value in reforming engineering education school's courses for enhancing engineering graduates' comprehensive accomplishment and employability, and further strengthening school's competitiveness.
- At present, a majority of engineering graduates have lower entrepreneurial ability and employability in our country, which has been becoming more and more serious, which should be brought to the forefront seriously.
- Based on engineering students training program combining entrepreneurial education and specific strategies for training entrepreneurship ability of engineering talents, the school should perform systematic and sufficient training on students.

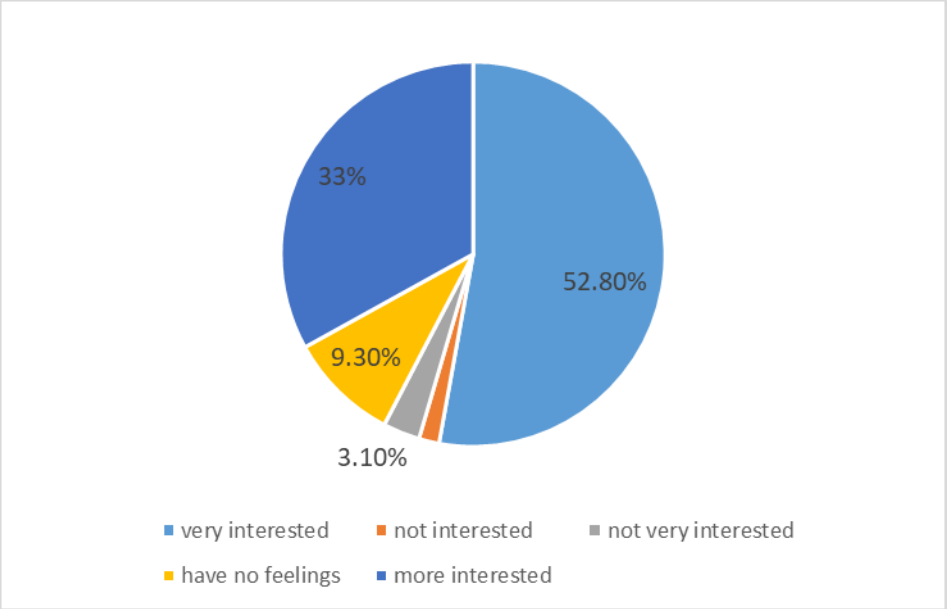

Figure 1. Statistical chart of entrepreneurial intention of college students

mainly include college students' entrepreneurial intention and entrepreneurial ability. At present, the researches on the construction of the entrepreneurship training system in China is mainly focused on what the entrepreneurial resources have done to the entrepreneurial achievements, or on what the entrepreneurship has done to the entrepreneurial achievement. They have not put forward a complete system of cultivating the entrepreneurship of engineering applied talents, which is adapt to China's national conditions. This paper intends to use the questionnaire survey and literature research method to put forward a new model of cultivating the talents of engineering applied, which is suitable for our nation conditions.

LITERATURES AND REVIEWS

The Current Situation of Entrepreneurship Education for Foreign Students

Early start and rapid development

In the United States, the Harvard Business School's Myles Mace pioneered the entrepreneurial training course "Management of New Enterprises" in 1947 (Ting et al., 2017). New York University and Stanford University opened the MBA entrepreneurship education curriculum system in 1967 (Yongbo et al., 2017). At present, there are already more than 500 American colleges offering entrepreneurial courses. Entrepreneurship education is included in formal education. In the UK, the government has set up a science center to manage and carry out entrepreneurship education. Later, they built a National Committee for college students' Entrepreneurship to implement entrepreneurship education (Zhang, Duysters, & Cloodt, 2014). It is known that the British entrepreneurship course is divided into two categories: "for entrepreneurship" and "about entrepreneurship" (Guerrero, Cunningham, & Urbano, 2014).

Hiring experienced teachers to teach

American college teachers are not all full-time. The school will hire some entrepreneurs who have some research results in academia. These teachers not only educate students, but also their own teachers for entrepreneurial training. Like the United States, British universities employed a number of academic entrepreneurs as part time teachers (Zhu, Zhang, & Ogbodo, 2017). Almost all of these teachers have entrepreneurial experience and have achieved some results. Universities in Germany specifically employ successful or experienced entrepreneurs to train students for entrepreneurship. And in the school, as long as the content associated to innovation and entrepreneurship, it will be taught by the economic and management related teachers. Japanese universities encourage teachers to do part-time jobs in Enterprises. They encourage teachers to practice in front of the production (Feng et al., 2011). At the same time, they also hire entrepreneurs to serve as teachers in colleges and universities (Chang & Chen, 2014).

Professional education mode

Entrepreneurship training model in American colleges and universities is divided into the focus mode, the radiation mode and the magnet mode (Chang & Chen, 2014). The focus mode is mainly used to cultivate students in business institutes and management institutes to be professional entrepreneurial talents (Bo, 2017). The magnet model is aimed at the students of the whole school, which is used to explore the students' entrepreneurial awareness and entrepreneurial spirit. While, the radiation mode combines the focus mode with the magnet mode. Not only providing entrepreneurship education for non-business and management students, but also encourage teachers from different institutes to participate in entrepreneurship education. Students in engineering applied majors can participate in the entrepreneurial education of magnet mode or radiation mode. The entrepreneurial education models in UK include the integration model, the intermediary model and the external support model (Guerrero et al., 2015). The integration mode refers to the infiltration of entrepreneurship education in all aspects of personnel training in colleges and universities. This is a relatively recessive educational model. The intermediary mode drives the students to accept the entrepreneurship education through the form of the project. And the external support education mode needs the employer, community and other stakeholders to take part in the enterprise education, and to implement the entrepreneurship education activities with students. Engineering students can obtain entrepreneurship education through intermediary and external support models.

Current Situation of Entrepreneurship Education in Domestic Colleges and Universities

Compared with the developed countries, entrepreneurship education in China started relatively late. In 1988, Tsinghua University pioneered the eight courses associated with entrepreneurship education for MBA. At the same time, it has opened the course of "high-tech entrepreneurship management" for undergraduate education (Feng et al., 2011). And since 1988, Tsinghua University student entrepreneurship program competition has been held every year. During the competition, the school will organize various lectures and training focused on entrepreneurship knowledge. After more than ten years of development, although China has made some achievements in entrepreneurship education and the rate of entrepreneurship is also rising, but entrepreneurship education has not formed a system yet. It is still in the experimental phase. Most of the courses offered by the schools are elective courses, and the teaching contents are mainly theoretical and empirical. Entrepreneurship education teachers are mostly teachers of the school administration positions. After years of development, the current mode of entrepreneurship education in our country has gradually formed the entrepreneurship education focused on professional knowledge and skills and the entrepreneurship education and comprehensive education focused on knowledge and skills of entrepreneurship (Guerrero et al., 2015). There is a lack of training system for the entrepreneurial skills of engineering applied talents.

RESEARCH DESIGN

In order to solve the problem of constructing educational system for engineering talents, we have adopted the research methods of literature research and questionnaire survey. First of all, we use the literature research method to look up a large number of research achievements on entrepreneurship education of domestic and foreign country. And it is concluded that the following problems exist in the entrepreneurship education of engineering applied talents in China.

Entrepreneurship Education Lacks Relevance

Statistics shows that the teachers of entrepreneurship education in various colleges and universities are administrative personnel. They not only have no entrepreneurial experience, but also do not know the direction of entrepreneurship that adapted to the major. While, entrepreneurial activities have different requirements for

Table 1. Basic situation of the questionnaire survey

	Essential information	Proportion (%)
Gender	Male	45.8
	Female	54.2
Grade	Freshman	20
	Sophomore	18.5
	Junior	15.2
	Senior	12.6
	Master	21.2
	Doctor	12.5
Major categories	Arts	47.3
	Science	52.7

entrepreneurs in different industries. Therefore, entrepreneurship education in colleges and universities does not play a role in practice.

Lacking of Entrepreneurship Practice Teaching

In the process of entrepreneurship education in Colleges and universities, the teaching content is mainly theoretical. Practice teaching is mostly the experiment that assists to proof theory, which is carried out in a simulation space. It has seriously constrained the students' innovative thinking because of the lack of practice in the actual environment. Students can not physically understand the entire operating process of a company that relies on technical support. And they can't communicate with the market and consumers, so that they do not understand the real needs of the market. Under such conditions, students will become rigid and not adapted to the market demands. It is likely to lead to the failure of entrepreneurship.

The Weak Teacher Resources

Compared with the teachers of entrepreneurship education in developed countries, the number of teachers in our country is less. Most of our entrepreneurial training teachers are full-time teachers in our school's administrative personnel. They do not have entrepreneurial experience, and do not know the professional knowledge and skills associated with students. So they are not helpful to the entrepreneurship of students. Therefore, the weak faculty has become the main factor restricting the development of college students' entrepreneurial ability.

Meanwhile, on the basis of reading related literature, the author makes some assumptions about the problem of entrepreneurship education in China. We designed a questionnaire based on the hypothesis. The content of the questionnaire includes entrepreneurial intention, the content of entrepreneurship education in Colleges and universities, the ways for college students to accept entrepreneurship education, and the quality of entrepreneurship education in Colleges and Universities. We interviewed 452 students in the form of a network questionnaire. These students came from 45 universities in 17 provinces (or municipalities directly under the central government). The basic situation of questionnaire survey is shown in **Table 1**. The survey result shows that most of the schools have set up employment guidance courses for engineering applied students. But there are nearly no schools offering specialized entrepreneurship programs. The training aim for engineering applied talents is focused on the professional knowledge and skills, and the training for entrepreneurial ability is not included. They neglect the entrepreneur education because of laying too much stress on cultivating employees. Although there are elective courses in colleges and universities which are entrepreneurial associated, the teaching content is not scientific and systematic. And there is no clear syllabus and teaching objectives. Without a perfect talent training objective and curriculum system, the entrepreneurship education just stays on the surface and thus there is no practical significance. If students want to learn the knowledge of entrepreneurship, they can only participate in the entrepreneurship competition organized by the students' association or entrepreneurship training class es after school. In a few schools that offer entrepreneurship courses, most of them arrange the course of entrepreneurship education for senior students. And at this stage, students are busy with the livelihood problems after graduation, no time to plan for entrepreneurship. The timing of entrepreneurship education is lagging behind.

DISCUSSION

In recent years, domestic experts and scholars have done a lot of researches on the topic of entrepreneurship education, and have achieved some results. Han, Huiling, and Li (2017) proposed the innovative practice education system construction idea named "five in one". They believe that establishing the "five in one" entrepreneurship

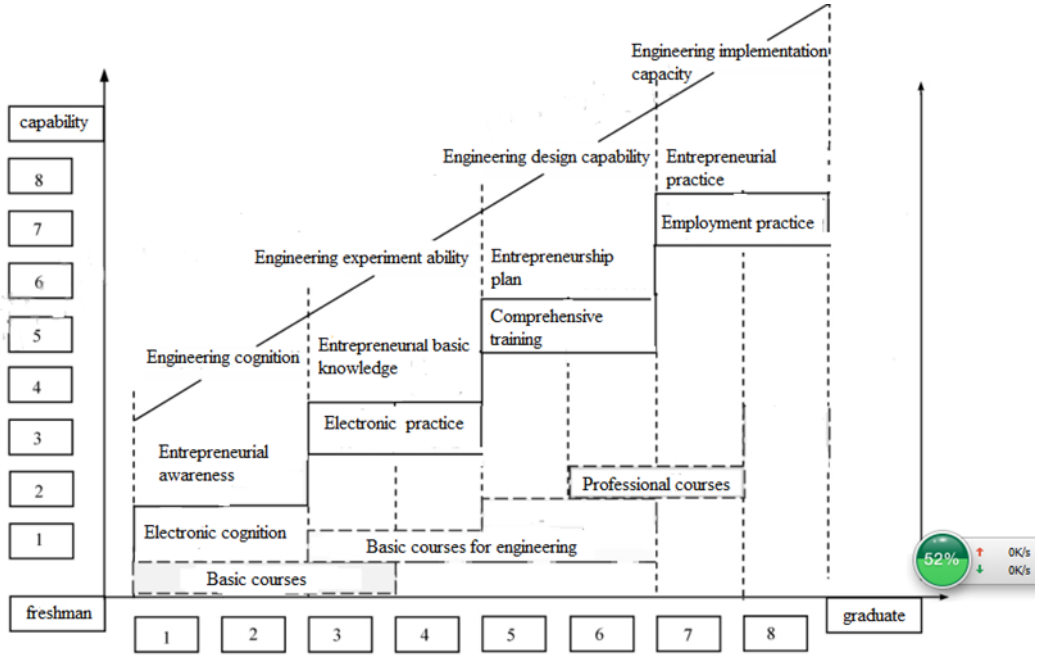

Figure 2. Model of engineering-oriented talents entrepreneurship education

education system, which is policy support, curriculum-based, project-driven, yard support and multiple communication, will be helped. The "five in one" synthesizing the resources of class, school, social and international. And developed a knowledge system merged the professional education. It is of far-reaching significance to the construction of entrepreneurship education system in China. Jing and Zhanren (2017) proposed the "inner together and external connection" entrepreneurship education ecosystem. The "inner together" refers to that the universities and colleges put the institutes, teaching resources, research resources and practice platform and other factors together, to provide students with education, training and service systematically and pertinently. The "external connection" is to build a bridge between the universities and government, the enterprises and society, to provide guarantee and service for the development of entrepreneurship education and entrepreneurship activities. They are drawing on the successful experience of foreign countries. And paying attention to the subjective and objective conditions of entrepreneurship. But they just put forward an overall framework, without specific implementation process. Such as the description on how to construct the curriculum system. We agree that in the composition of college students' entrepreneurial ability, the top four are the professional knowledge, practical experience, innovative ability and management ability. In order to start a business, the entrepreneur must be professional both in majors and entrepreneurial knowledge. Therefore, for the entrepreneurship education of engineering applied talents, it is particularly important to have a training plan which can be referred to. According to the model of engineering ability training proposed by our country's scholar (Tianlong, 2011), we put forward the project of engineering-oriented talents entrepreneurship education, as shown in **Figure 2**.

On the basis of the above research, this paper puts forward the following suggestions on the construction of the entrepreneurship education system for engineering applied talents.

Improving the Structure of Teachers

As one of the three elements of education, teachers play a very important role in the whole educational activities. At present, the teachers of entrepreneurship education in local colleges and universities are mostly teachers in administrative positions. They don't know much about entrepreneurship and students' expertise. Therefore, in order to help students start their own business and improve their entrepreneurial ability, colleges and universities must pay attention to the teaching staffs of entrepreneurship education. Colleges and universities should dedicate to introduce entrepreneurs who are associated with engineering majors.

Improving the Curriculum System

According to the statistical chart which is about college students' expectation on entrepreneurship courses published by Tencent, as shown in **Figure 3**, we propose to increase the basic courses of entrepreneurship

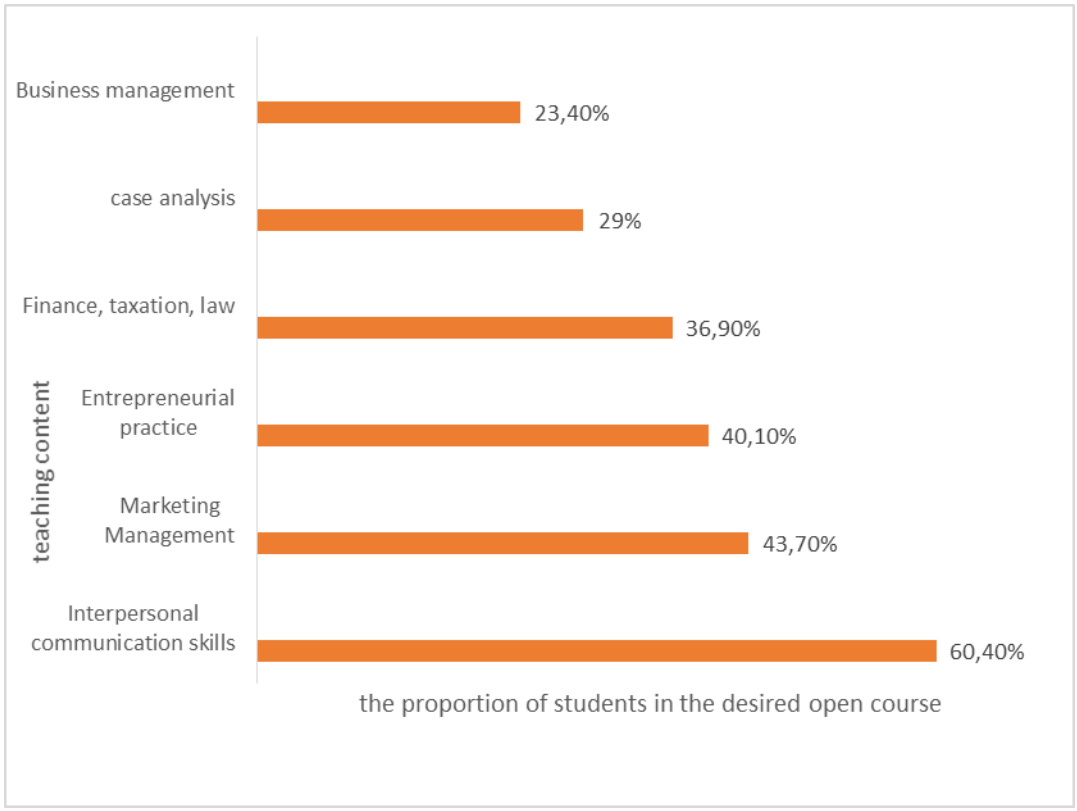

Figure 3. Students' expectation statistics on entrepreneurship courses

education, such as economics, management, and other related courses in economics and management. Laying the knowledge foundation of entrepreneurship for students who are potential entrepreneurs and also unearthing the students' entrepreneurial awareness and enthusiasm. After two years of study, students have a certain understanding of their professional and entrepreneurial foundations. Therefore, the "project driven" curriculum can be used to encourage students to combine professional knowledge with entrepreneurial knowledge and theory with practice.

Carrying out Outdoor Activities for Quality Development

Entrepreneurship is a tough process. It requires entrepreneurs not only to be tough, but also strong. Most of the students now do not suffer any bitter, life is also relatively leisurely. Most of them lack the spirit of hard work, perseverance and so on. While, in the process of entrepreneurship, regardless of the psychological and physical which first collapsed, will lead to the failure of entrepreneurship. Therefore, it is necessary to set up outdoor quality development activities.

Vigorously Support Innovation and Entrepreneurship Projects

Colleges and universities should set up special funds to support students to do innovative project experiments. For engineering application majors, the most ideal business is technological entrepreneurship. And innovation project is a common way for engineering applied talents to realize technological innovation.

Building a bridge for students' Entrepreneurship

Only in the enterprise can the value of technology be maximized. Therefore, when students make progress in innovative projects, colleges and universities should build channels for students to communicate or cooperate with enterprises.

CONCLUSION AND RECOMMENDATION

After studying a large number of academic works on entrepreneurship education both at home and abroad, this paper analyzes and summarizes the shortcomings of entrepreneurship education of engineering applied talents in China. And through the methods of literature research and questionnaire survey, this paper builds an

entrepreneurship training program for application-oriented talents. Based on that, this paper puts forward some strategies for the construction of the entrepreneurship education system for engineering applied talents in local colleges and universities. In practice, we should combine entrepreneurial education with professional education of engineering talents instead of entrepreneurship education or engineering education. Only in this way can we meet the development needs of our country and the individual needs of our students.

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