

Research and Exploration of College Talent Cultivation System under Innovation 2.0

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Abstract—The innovation 2.0 is an innovation of user participation, which is characterized by user-centric, social practice, co-innovation and open innovation. Our country puts forward that implemented the strategy of innovation-driven development, accelerate the construction of Maker space. To do this, colleges should increase efforts to cultivate application-oriented and innovative talents, by improving the education system, combined with Maker culture, construction of open source laboratory and configuration of 3D printers, laser cutter and other basic equipment, and provide a place to cultivating college students' ability of innovation and practice, construction of collaborative education platform to adapting the innovation 2.0, this can provide the necessary talent resources to the country's innovation development and promote the construction and development of innovation and entrepreneurship in the social service system.

Keywords—Application-oriented and innovative talents; Maker culture; Innovation 2.0; Open source laboratory

I. INTRODUCTION

The cultivation of innovative talents is not only focus on the education of colleges, but also has a close connection with the country development level of science and technology and

economic growth. "National Long-term Education Reform and Development Program (2010-2020)" puts forward that the development of country needs to provide a good education environment and improve the quality of education, strengthen the innovative, practical and sophisticated talents, also improve the education system and deepening the reform of educational and teaching content [1]. "Maker", "Mass entrepreneurship and innovation", "Internet plus" and other words have been proposed on the national annual report 2015 [2], several of makerspace are spring up unceasingly, and provide an entrepreneurial platform for college students. In recent years, with the core of innovation maker education has obtained fast development. Under the innovation 2.0 and the idea of open source has become more and more popular. With the emergence of makerspace, where can provide people to put their idea into reality. This paper combined with innovation 2.0 to explore the more suitable teaching method for cultivation of application-oriented and innovative talents. Drawing lessons from maker education system and methods, constructing of open source laboratory, provide a place for college students to train their engineering skills, practical and creative ability, and encourage college students to actively innovate, create and entrepreneurship, helps to enhance the country competence completely and promote social development.

II. THE CONCEPT AND DEVELOPMENT OF THE MAKER CULTURE

The concept of "Maker" comes from the book "*Makers: The New Industrial Revolution*", written by *Chris Anderson*, refers to a group of people who using open source software and hardware, 3D printing technology, numerical control equipment and others resources, not aiming at making profit, but to put their ideas into reality [3].

At the very beginning, the appears of Maker comes from the newest Fabrication Laboratory which has equipped with various types of equipment, launched by the *Center for Bits and Atoms* in *Massachusetts Institute of Technology* (MITCAB) [4], as long as they are desire to create, have new ideas, they can realize their own creative design, and they're not bound to the constraints of industry. Through this platform, people can exchange ideas, share products and, constantly forming new ideas. The core of maker culture is innovation, with the development of science and technology, the activity of Maker change from DIY design to digital and manufacturing technology design, and Makers held the MakerFaire to sharing ideas with others.

Makers gathering together to shares and exchanges their ideas in makerspace, continuously to improve the ability of innovative consciousness and self-learning ability. Unify theory and knowledge by working in practice. So far makerspace are all over the world, no matter where you are, you can acquires all kinds of data and shares your newly idea with others only via Internet.

The concept of Maker is user-centric innovation, with new type of laboratory, like Living Lab, Fab Lab and AIP, that is the typical innovation 2.0—social technologies has experienced from personal communications to personal computing to personal design and personal manufacture. Fab Lab provides a place for people to innovate and practice that is compatible with innovation 2.0, which is user-oriented, practice for stage, demand-driven, the mass entrepreneurship and innovation and open innovation [5]. There is a relation between maker educations and cultivating application-oriented and innovative talents, the former pays more attention to the practice on innovation, while the latter focus on theoretical teaching and, the combination of both can further intensify of innovative talents training. Learning from maker education advanced thought and rich resources, reform the current teaching system, construct of collaborative education platform, encourage college students to share, communicate and cooperate. This will help improve strengthen the technology innovation and cultivate application-oriented and innovative talents for the country.

III. THE REFORM OF COLLEGE EDUCATION UNDER THE INNOVATION 2.0

With the update and develop of information technology, the majority of people pursuing the idea of open source, sharing and collaboration. The mode of innovation is changing from technology-centric to user-centric and its characteristic is shown in Fig. 1.



Fig. 1. Features of innovation 2.0

National innovation and mass entrepreneurship as a hot topic in recent years, the country encourage more and more college students to conduct business. College traditional education pays attention to theoretical teaching, and it is rarely exercise students' practical ability and the cultivation of innovative consciousness. But the maker education is more focus on the practice of innovation that emphasize on learning knowledge and technology in the process of hands-on practice. Makers using a variety of open source software and hardware for self-study, which puts the idea into reality and design personalized products that responds to the new era of innovation 2.0.

By referring to the maker education to reform the present college education, can provide a place for students to put their idea into reality and improve their innovative, creativity and communicative ability.

A. Renew the idea of talents cultivation.

Early maker culture is originated in garage culture mainly from Europe and the United States. After years of evolution and development, its formation based on innovation, and through communication, cooperation and sharing, had achieve the goal of popular entrepreneurship. The development of society needs the power of the people and the user-centric innovation 2.0 build up a place for grass-root level people to innovate and create. The idea of maker education is the typical performance of innovation 2.0, which includes putting idea into reality, learning by doing; continue to share, interdisciplinary and the use of information technology.

So far maker culture in our country is in its infancy, colleges should take example from foreign country by their methods and features of talents cultivation. College students are the main force of entrepreneurship that college must have a clear positioning of talents cultivation, and foster the students' creativity and entrepreneurship, promote the education reform. Based on the cultivation of students' innovation ability to afford more hands-on practice opportunities; constantly train students' consciousness of innovation, teamwork skills, basic

engineering ability, etc. to adapt to the country's talent development strategy.

B. Reform the traditional teaching methods.

Traditionally, teacher is the leading factor in class; therefore, it is difficult to consider how much knowledge each student can accept. Simply imparting knowledge to student cannot really exercise their independent learning ability and innovation ability.

Under the era of innovation 2.0, the concept of personal design and personal making are concerned globally. In order to cultivating students' ability of independent innovation and, stimulate students' enthusiasm for entrepreneurship, colleges should reform the traditional teaching methods and take students as the leading factor, also introduced the popular method of maker education. Mainly through collaborative learning that students can exchange ideas and teacher will provide assistance. Each group of student can participate throughout the course, which compared to the traditional teaching method can create a relaxed classroom atmosphere, provide a platform for students to implement ideas, teaching usage of tools, so that students can learn by doing and improve the ability of innovation and practice.

C. Improve the curriculum design.

In terms of curriculum design, based on project as vehicle, combine theory and practice, which is refers to the Maker's teaching methods. Firstly, the students are divided into groups to submit curriculum design. And courses include teaching computer-aided design software; operation and practice of 3D scanning and printing; operation of laser cutting machine; understanding of the CNC cutting machine; the use of

hardware tools and other laboratory equipment. Secondly, after students are familiar with the operation of the equipment, they can continue the curriculum design in their spare time and, they can put up questions in class to receive answers from the teacher. In this way, teachers can take into account the needs of students in learning new knowledge, so as to make better teaching. Finally, the evaluations of the student in this curriculum are consisting of completion of group work and project quality, such as presentation with PPT and instruction of the design.

IV. THE CONSTRUCTION OF OPEN LABORATORY

With the development of information technology, the idea of open source obtain extend and develop. Various types of open source software and hardware has emerged, saving developers time and provided a good teaching platform for education.

Construction of open laboratory provides a place for students to realize their ideas. In about 300 square meters of the laboratory which provide Arduino, Raspberry Pi and other open source hardware [6], configuration 3D printer, laser cutting machine, CNC milling machine and other digital technology equipment, as it shown in Fig. 2. This enables personal design and personal making, which greatly reduce the threshold for students to carry out innovative project development. Student cooperation as a team, after determines the project they can use the equipment from this laboratory to start their project, and students accomplish the project independently and communicate with others, inspire them to create and innovate. During this process, students' engineering qualities has been training and the ability of hands-on innovation also has improved.

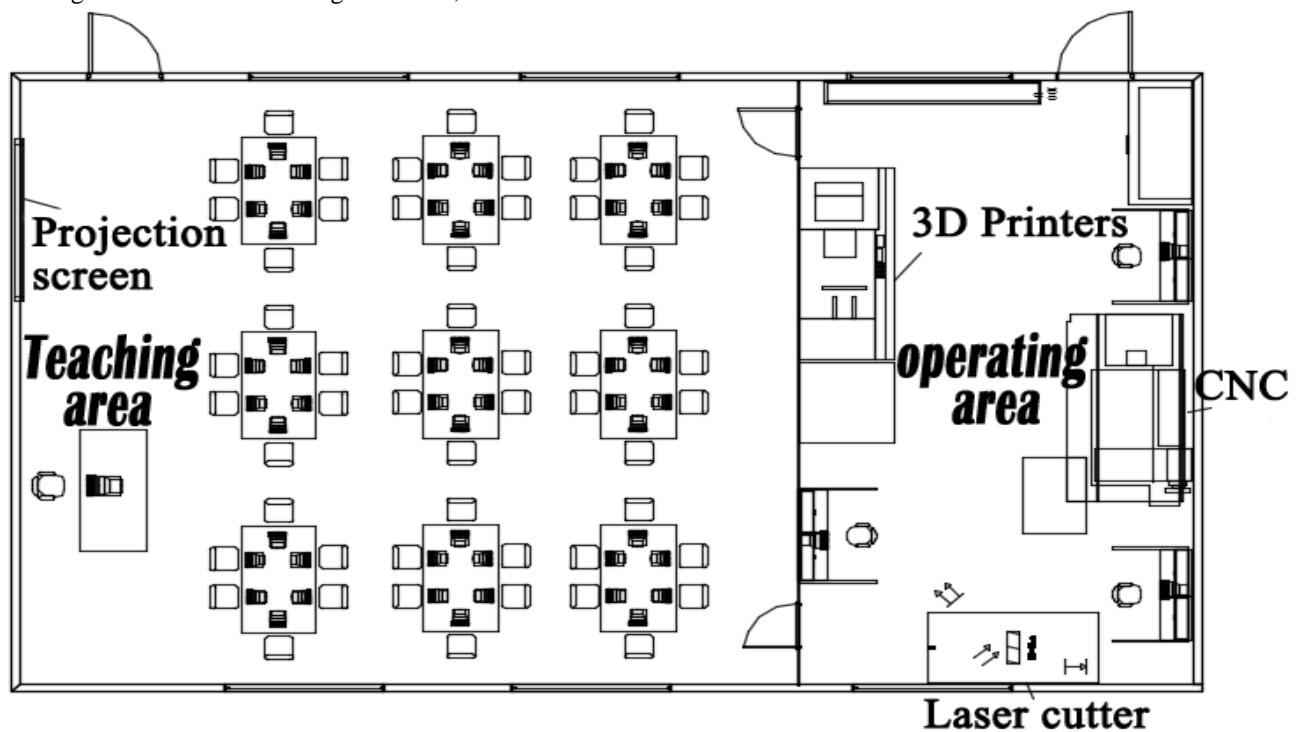


Fig. 2. Laboratory layout

With the rapid development of information technology, the improvement of national economic level and science and technology level cannot leave without the cultivation of talents. At present, the concept of innovation 2.0, industrial 4.0 etc. had put forward, needs more and more talent resources that with good engineering quality. The emergence of Maker brings a new method of teaching and had improved the existing education system. Through the open teaching environment, the main part of the class has changed from teacher to student. Student self-learning ability, innovative and creative and practical ability can be enhanced, and the overall quality of students has improved. Make full use of foreign outstanding resources; learn from their methods of talents cultivation; reform the existing education system, thereby improving the comprehensive competitiveness of our country.

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