Foreign Experiences of Maker Education in Colleges and Universities

Jiaojiao Mo

College of Accounting and Finance, Xi'an Peihua University, Xi'an, 710054, China

Keywords: Maker education, Foreign experiences, Colleges and universities

Abstract: In the era of technological innovation, there is a strong demand for innovative talents. Maker education came into being at the historic moment. Maker education is the product of the integration of maker movement and educational reform, which first rose in the United States and spread to the whole world. At present, the maker education in universities of China is still in its infancy. This paper analyses the experiences of foreign universities in the field of maker education, and puts forward some suggestions for the reform of maker education in universities of China to provide some references for the relevant researchers.

1. Introduction

In the field of higher education, the development of science and technology and the increasing abundance of educational resources provide objective conditions for the integration of the Maker Movement and higher education [1]. The strong demand for high-quality educational resources and the ardent expectation of the society for the personalized development of students have accelerated the historical process of the integration of the Maker Movement and higher education. Because of their respective characteristics, it is necessary to integrate the Maker Movement with higher education in adapting to the needs of modern society and promoting common development. Maker culture concept is helpful to innovate and supplement the teaching concept of colleges and universities. Higher education is conducive to the dissemination, development and perfection of the culture and ideas of creating customers. Maker culture mainly refers to self-practice. A person who turns his personal interests into reality. Maker education is a set of systematic educational concepts, permeating innovative, exploratory, practical, cooperative, sharing and other maker concepts, cultivating student's maker spirit, and pursuing the development goal of the whole person. Maker education refers to the cultivation of student's creativity, initiative and spontaneity, stimulated by professional learning, hobbies and other factors. Cultivate maker inspiration, form maker thinking, combine with certain hands-on practice, participate in maker activities, make every student become a maker customer, let the maker customer become a way of life and learning. Maker education integrates the spirit, culture and concept of Maker into the teaching of various disciplines, and constantly promotes the reform of higher education with the idea of opening up and innovation, exploring experience and advanced teaching methods. In order to meet the needs of individualized and diversified consumption, innovative knowledge economy develops rapidly. More and more non-profit members joined, participated, shared and exchanged, and gradually nurtured the culture of creating customers [2].

2. Basic Experiences of Maker Education in Foreign Colleges and Universities

2.1. High-Quality Maker Space

With the increase of global customer space and the collaboration between the makers, the nationwide customer movement has gradually developed into a nationwide wave of entrepreneurs in the United States. A number of colleges and universities in the United States have established customer space and implemented customer education. The establishment of Hunter Maker Space has changed the field of education and people's way of life and communication. The establishment of

  DOI: 10.25236/mfssr.2019.188

Hunter Maker Space promotes the communication between school teachers and students, social makers and emerging technologies, and enables makers to use 3D printing technology to promote creative ideas into reality. Hill Maker Space provides a series of supporting resources for users to participate in creative activities such as practice, experimentation, software and hardware skills learning. Teachers design a series of project courses in the form of a calendar to launch in Maker Space. The vast and complete Hill Maker Space provides environmental support for Maker Education and plays an important role in the development of Maker Education in American universities. The establishment of Maker Space provides high-quality educational resources for school faculty and social makers in North Carolina. It plays an important role in shaping students, teachers and community resident's maker literacy, critical thinking and scientific and technological literacy. The establishment of off-campus visitor-creating space is to expand the visitor-creating environment of the educated, so that the educated can have access to more authentic visitor-creating learning space and related activities personnel, so as to improve the enthusiasm of the educated to participate in the visitor-creating education. The establishment of Maker Space provides high-quality Maker Education resources for school staff and social makers. It plays an important role in shaping students, teachers and community maker literacy, critical thinking and scientific and technological literacy. Maker space provides a characteristic service of humanization, customization and customer orientation to a comfortable and relaxed material environment and humanistic environment for the whole college staff and social makers.

2.2. Diversified Educational Model

Universities in developed countries adopt a diversified model of entrepreneurship education. Students make their own choices according to their own needs. Generally speaking, there are three main types. Open Maker Education Space mainly provides relevant resources and information. Students learn according to their own needs and interests and create their own creative wishes. Many novel works have been produced. Maker education, which is integrated into conventional courses, pays attention to the integration of Maker education and traditional theoretical courses in Colleges and universities. For example, the Chicago Academy of Art creatively combines emerging technology resources with teaching resources of traditional courses, organizes the Maker Summer Camp and Maker Laboratory, and provides students with 3D printers and sandbox environment [3]. Specialized Maker Education Courses are offered in the form of major and minor courses. For example, Carnegie Mellon University has introduced some interdisciplinary courses that can be supplemented by the maker course for interdisciplinary teaching. The United States promotes the implementation of maker education nationwide, encouraging enterprises, scientific research institutions and universities to engage in active communication and dialogue in order to promote win-win cooperation. Especially those technology-developing and manufacturing-innovative enterprises which need a large amount of scientific and technological investment and research and development expenditure every year should actively provide the most advanced creative tools and research and development direction for colleges and universities, and support colleges and universities to carry out customer-creating education. Maker education in colleges and universities in developed countries changes lives by promoting research and invention. Maker education pays more attention to goal-oriented and result-oriented practical learning in order to serve social needs. The results of practical learning are often valuable and meaningful to oneself, the community or the society.

2.3. Open Cultural Atmosphere

Maker education is not a movement in the field of education, but a teaching concept. Maker culture needs to be integrated into the school education system and teaching system. Therefore, in order to enable students to accept and adapt to the concept of maker education as soon as possible, American colleges and universities should vigorously create a good culture of maker and encourage innovation. For example, MIT has built a dedicated customer space in student dormitories. In addition. In order to meet the teaching needs of teachers and students, we have developed a special

network and software to provide special services. This model has been learned by universities all over the world. In the Netherlands, College De Populier encourages students to create in-school visitor clubs. In Britain, Swansea University, in cooperation with Aberystwyth University, Bangor University and the University of South Wales, has set up Techno Camps in Wales [4]. They all hope that by enhancing the culture of creating visitors, they can play a better role in guiding and inspiring students to learn in creativity and innovation in learning. We can really feel the joy of learning and creating. Develop and expand the space specially designed for hands-on creation, support and promote the development of student clubs and the experience of extracurricular makers. Many schools invest in creating customer space for students. While emphasizing rapid prototyping, design and other customer activities, they further consider the needs of cooperation and interdisciplinary. Yale Engineering Innovation and design maker space online training program ensures that users are familiar with the tools and skills in the space before accessing the space. Universities such as Cornell University are seeking to collaborate with communities in the form of incubators and shared spaces to enhance the potential for interactive and mutually beneficial relationships between academia and the wider community.

3. Experience Enlightenment of Maker Education in Foreign Colleges and Universities

3.1. Upgrade Infrastructure Level

It is necessary to speed up the construction of supporting facilities for Maker Education in Colleges and universities. Many enterprises believe that college graduates lack experience and practical skills. Although most students have certain data processing ability, few students can use manual tools or machinery to carry out practical operations. Lack of practical skills is an important factor that makes it difficult for innovation and entrepreneurship education to achieve practical results. The United States provides students with an environment of experimentation, creation and learning by establishing an educational customer space, promoting cooperation and communication among students, cultivating student's practical ability and solving practical problems. Maker education in the United States inspires us that innovative entrepreneurship education requires breaking through the traditional classroom model, building new teaching methods and more flexible and functional new learning space to adapt to informal learning. At present, some colleges and universities in China have made attempts in this regard. Enthusiasm, can hold a large number of tournaments, tourist's analysis, exhibitions and so on in the campus. In order to meet the student's learning needs for the Maker Education, it is necessary to build a corresponding learning information platform. Through the support of Internet technology and mobile APP, we can provide students with massive learning resources about the college entrepreneurship education, which is a favorable condition to promote the integration of the entrepreneurship movement and college education. We make full use of the existing library, laboratory and other teaching resources in colleges and universities. Colleges and universities can use emerging technology resources to transform them into effective creative education space. We can initiate the Maker Club, through collecting tools and resources from schools, communities, families, enterprises and governments, so that students can carry out independent Maker Education in practice. We can set up a multi-school shared Maker Center, which can not only reduce costs, but also help to strengthen cross-school exchanges and cooperation between students and teachers.

3.2. Enrich Curriculum System

Referring to the curriculum system of Maker Education in the United States, Chinese universities should speed up the construction of high-quality curriculum of Maker Education, improve the existing situation of boundaries between disciplines in China, integrate isolated disciplines, emphasize the intersection and integration of disciplines, and encourage interdisciplinary learning. Combining with the current situation of the development of Chinese customer-creation education, the first thing to do is to bring the customer-creation education in our universities into the comprehensive

promotion stage under the guidance of the educational administration department, so that students at all levels and stages can receive customer-creation education. In the construction of the teaching system of Maker Education, the state should focus on promoting the construction of the teaching system and teaching reform of Maker Education. In the evaluation of student's education, teaching and learning effect, students' ability to use the knowledge they have learned, practical ability and innovation and entrepreneurship ability are taken as assessment indicators, and students are encouraged to use the knowledge they have learned to carry out various forms of innovation and creation. We change the traditional teacher-centered classroom theory education and introducing Project-Oriented Curriculum are of positive significance to cultivating student's innovative thinking. Project-oriented curriculum learning can inspire students to innovative thinking, and inspire students to apply their own experience to solve practical problems in creative ways. College students can build a relatively free organizational system based on their personal interests, improve their knowledge and skills in mutual learning, and truly experience the creative process and pleasure in the creative education. Specifically, through the Project-Oriented Curriculum teaching, students will be introduced into practice, students will be exposed to practical projects, students will be stimulated to interest in Engineering Science and technology, students will be encouraged to further explore the theory of professional technology, knowledge will be transformed into experience through hands-on learning, and then through the Project-Oriented Curriculum transformation to form a diversified education model.

3.3. Cultivate Maker Culture

Nowadays, the atmosphere of entrepreneurship is becoming increasingly strong and innovative capital is declining. We should cultivate a culture that does not foster impetuous social atmosphere. Instead, we should firmly grasp the educational essence of student's learning and development and guide young people to invest rationally, orderly and earnestly in creating new customers. Campus culture atmosphere plays an immeasurable role in cultivating student's scientific emotion, knowledge attitude, creativity and practical ability. Creating a good culture atmosphere of creating customers can enable students to unite and share their wisdom in the culture of creating customers. By making students participate in various kinds of customer-creating activities in the form of teamwork, such as campus customer-creating Association activities, customer-creating congress, customer-creating works exhibition, team competition and so on. Such activities can enhance creative interest, form creative synergy, pool creative ideas and create customer-creating culture. Maker courses need student's continuous experience. Starting from students' professional interests and exploratory desires, they actively participate in the process of creative activities, project exploration and results display, thus embodying the essence of maker education: potentially guiding the development of student's interests, promoting students' in-depth learning and self-awareness, as well as science and technology. Improvement of literacy and creativity. The implementation of school entrepreneurship education requires teachers to possess basic knowledge and skills of science, engineering, technology, art and mathematics, as well as keen insight and suggestive teaching ability. Teacher's suggestive teaching ability and guidance ability play an important role in the establishment of students' learning interest and direction guidance. Colleges and universities should pay more attention and support to the innovative environment and public services, create suitable soft and hard environment for the development of the innovative group and the innovative culture, and support the innovative group to enter a healthy development track.

4. Conclusion

The integration of the maker movement into the higher education named maker education in colleges and universities has become popular in the world since the rise of the United States. Drawing lessons from the maker education in Universities of developed countries, this paper explores the paths to further improve maker education in colleges and universities in order to promote the reform of higher education in China. In the future, maker education in each university of China will continue to

absorb the experiences of maker education at home and abroad, and the reform results of maker education also need the theoretical exploration and practical testing.

Acknowledgement

This paper was the result of the Shaanxi Educational Science Subject of the 13th Five-Year Plan in 2018 named Construction and Implementation Strategies of Maker Education System of Universities in Shaanxi Province under the Background of Innovation and Entrepreneurship (Grant No. SGH18H504).

References

[1] Webb S, Bathmaker, Ann-Marie, Gale, Trevor, et al. Higher vocational education and social mobility: educational participation in Australia and England[J]. Journal of Vocational Education & Training, 2017, 69(1):147-167.

[2] Singh S, Ranjan P, Annals of Operations Research, et al. Efficiency analysis of non-homogeneous parallel sub-unit systems for the performance measurement of higher education[J]. Annals of Operations Research, 2017(1):1-26.

[3] Cohen J. Maker Principles and Technologies in Teacher Education: A National Survey[J]. Journal of Technology & Teacher Education, 2017, 25(1):5-30.

[4] Logan, Helen. Retaining meanings of quality in Australian early childhood education and care policy history: perspectives from policy makers[J]. Early Years, 2018, 38(2):1-17.