

Research on the Mode and Practice of Maker Education in Higher Vocational College under Information Technology Environment

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Abstract. To ensure the operation and development of maker education in university teaching, according to students' different learning levels of theoretical knowledge and students' interest in classroom learning, using methods such as integrating theory with practice, conducting investigations and scientific experiments, the traditional classroom and maker education can be well combined, so that high school maker education is open to all high school students, providing students with different learning methods and contents. It is of great significance to carry out the innovation of maker education mode under the environment of information technology, construct the teaching structure under the environment of maker space information technology, and apply it to the whole process of curriculum design, implementation, and evaluation, which is of great significance to promote the balanced development of teaching.

Keywords: Maker education; Information technology; innovation.

1 Establish the process of developing maker courses in senior high schools in the environment of information technology

We can from the target design, process design, activities, and evaluation feedback - these four links to start with, in the information technology environment embarked on a high school education in the practice, design the activities of the clear goal, make effective and reasonable activity process, and a guest in the process of education in high school the rational use of 3 d printers, set up information resources cognitive tools such as equipment, To carry out activities according to the actual needs of high school makers' design activities, and then form a good evaluation and feedback mechanism, and finally achieve the preset education and teaching goals.^[1] The following figure shows the teaching model of maker course development.

2 Maker education has certain particularity in high school

Maker education is indeed a systematic project. In terms of the essential characteristics of education, we usually need to grasp the basic laws of maker education activities in practice. Makers' educational and teaching activities have certain particularities in the development of high school education.^[2] Therefore, we need to make overall arrangements and consider the complex relationship between high school education itself and educational content.

2.1 Due to the particularity of education, maker education cannot become a unified model but has its unique survival soil.

Every school's educational practice and any educational reform must face this cultural feature and have a good grasp and positioning of the educational practice itself. To a certain extent, maker education is also an educational reform and must be based on the practice of Chinese high school education. Our country promotes its ideas. On this basis, we can absorb advanced educational concepts and excellent educational resources at home and abroad, for inclusive development.

2.2 Application model of maker education model in the information technology environment.

Under the environment of information technology, based on maker education, it is necessary to make full use of information technology and computer technology, actively establish the sharing platform of curriculum resources, make use of all beneficial educational resources, and skillfully integrate the concept of maker education into the independent exploration activities of professional students.^[3] Then let the student's curiosity and curiosity better get satisfied.

2.2.1 Technical support.

The promotion and implementation of maker education need the effective support of information and computer technology.^[4] For example, we need to use 3 d technology to create a space, use a guest room of the network communication technology as a link between a guest with others, and use wearable technology, virtual reality technology, and sensor technology, to make it into the education of the creator, to implement and promote the education of technical support to provide material basis.

2.2.2 Maker space.

As a place for creative activities by makers, Maker Space is a physical space equipped with various hardware tools and related equipment as well as auxiliary processing. In the maker space, they have common interests and hobbies. People from all fields share their ideas and resources and work together on maker activities. In this kind of maker space, basic facilities such as 3D printers, open-source hardware, and software platforms are used according to actual needs, and they are constantly updated and improved to maintain the continuity of the maker space.^[5] It creates a good atmosphere of collaboration and sharing for makers, avoiding a place where only creative activities take place. In this environment, makers will gain cooperation, communication, experience, and social recognition, which is the basis for maintaining team cooperation and an important reason for connecting and promoting projects. Among them, "Tsinghua Maker Space" is the most representative typical software and hardware open-source community in China.

2.2.3 Maker network.

Maker Network is an online platform that enables ongoing communication among makers, including a Maker community, an open-source community, a crowdfunding Network, and a Maker forum. By building Internet platforms, exchanging experience and knowledge, sharing tools and technologies, and operating across spatial and geographic barriers, the world's

production elites have made up for the time and space constraints of maker education.^[6] At the same time, Maker Network provides a platform for project creators to showcase creative gatherings. They can post proposals about fundraising projects in the Maker community and present their ideas so that interested people can participate in the project.

2.2.4 Maker courses.

At present, there are two ways of maker courses: one is to organically and internally integrate maker education with all disciplines; the other is to set up special maker courses in high schools. The first one is similar to the STEAM education abroad, which focuses on combing the knowledge of various disciplines by developing multidisciplinary knowledge and integrating maker courses.^[7] The second specialized maker course is to train a series of maker courses, such as 3D printing technology, 3D modeling, computer control technology, and mechanical design so that makers can divergent and diversify their thinking and innovate various new technologies so that students can innovate, build and create a new ability of maker thinking.

2.2.5 Maker activities.

Maker Action has grown rapidly in recent years thanks to the launch of Maker programs represented by Maker Carnival. Maker Carnival is a local creator that brings together the elite to showcase products and share experiences. At the same time, the Maker Carnival is fully open to the community, which not only enables the public to participate actively but also avoids the Maker event as a small-scale social event of Maker. Thanks to these activities, maker education has gained popularity. However, the maker education culture in schools needs various forms of publicity and promotion to make more maker activities conform to the characteristics of students. The school often conducts maker education activities, such as quizzes on maker knowledge, exhibitions of maker works, visits to Maker Spaces, and occasional maker culture festivals.^[8] In addition, to increase students' interest in maker activities, the education authorities can also hold maker competitions from time to time to promote the development of maker education in senior high schools.

We set up a high school maker education course in the school and established a maker space to reintegrate the original teaching resources so that the students in the maker team can get rid of the pressure of classroom learning and become "young makers" who create freely.

Maker education provides students with a strong heart and a stage for innovation. In maker spaces, students don't care much about teachers' evaluation and compensation. Their works on Weibo and maker forums have attracted a lot of attention.^[9] Relying on the Chinese discipline, our school divides "Young Makers" into three areas: art, research, and engineering. On February 25, 2017, students volunteered to be grouped into groups of "Art Maker Camp", "Research Maker Camp" and "Engineering Maker Camp". During the activity, students learned how to innovate and what to do for themselves. The most important thing is to make yourself a happy person.

2.2.6 Team building of creative teachers.

To avoid wasting educational resources, a professional team of teachers is particularly important when students engage in maker activities. But maker education is just beginning in

China. In the eyes of many front-line teachers, maker education is still a new field, lacking many professional teachers. Therefore, it is urgent to establish a high-level maker team. At present, maker teachers lack professional teachers and are mainly composed of information technology teachers from various schools. Therefore, the construction of maker teachers has become a new issue affecting the development of maker education in China. At present, the school's training for maker teachers mainly includes providing maker education concepts and constructing maker courses. We hope that teachers in all subjects of high school education will apply the ideas of Maker education in their daily teaching. Outside education experts come to the school to conduct on-site maker education activities to guide students and teachers.

3 Some methods for the development of a maker education model

The development of maker education depends on the improvement of the high school education model, the application of modern information technology, and the guarantee of the education system, which depends more on our information technology literacy. Combined with the current level of information technology and its application ability in China, the curriculum method of Chinese maker education can be constructed under the guidance of the cognitive development level of Higher vocational college students to develop maker education.

The maker education in Higher vocational colleges should be based on the current vocational reality and encourage students to transform their creativity into works so that they can form the spirit of independent thinking and innovation in the whole education process, and feel achievement and happiness. For example, let the students use the Internet to learn the map of the Stone arch bridge in China while building a THREE-DIMENSIONAL map for independent exploration. Students not only learn skills, and master the structure and sequence of stone arch Bridges, but also expand the breadth and depth of Chinese expository learning.

3.1 Create an implementation space for maker education and provide an application place for makers

Makerspaces provide a place for practical application and implement the education and teaching of high school makers. In maker spaces, makers can make full use of advanced technologies such as 3D printers to replicate their creative works. In other words, a maker space is an open experimental place where makers can share resources and experiences and realize their creativity. Therefore, maker spaces are not only placed for makers to share resources and activities but also laboratories for exchanging experiences, as well as online virtual Spaces. Virtual Spaces provide a variety of services and support for makers, enabling them to exchange ideas and share experiences. ^[10]According to the function and orientation, maker spaces can be divided into "hackerspaces" for original DIY enthusiasts, "Fab LABS" for innovative 2.0 model maker spaces, where everyone can create a customer Maker Space and so on.

3.2 Cultivate maker teachers and provide sustainable teachers for maker education

With the national maker movement booming, various maker Spaces have sprung up across the country. However, everyone was unhappy with Makerspace's development. Some front-line teachers report that their schools do not have maker teachers, but simply create maker Spaces.

This embarrassing situation shows that makers are not taken seriously enough. Since we have established a maker space, school leaders should not only build it for construction purposes but also take their school's teaching staff into full consideration. Once the school's maker space is built, maker education cannot be implemented without maker teachers. Maker teachers are not only active guides and disseminators of maker education knowledge but also organize the production and promotion of maker projects for students. Maker teachers want to use new technologies in their topics, and imparting knowledge and competence becomes particularly important. At present, China needs a large number of teachers specializing in maker education. However, the teachers engaged in maker education are not information technology teachers or general technology teachers, and they face a serious shortage. In this way, it is necessary to train a group of professional maker education teachers to guide students to carry out activities.

3.3 Develop maker resources to make the curriculum system of maker education perfect

Maker course refers to the general term of the goal, content, method, and final evaluation of maker education activities conducted by maker schools. In China, there are no special maker education courses for high schools, most of which are school-based courses. Therefore, we need to establish a curriculum system for maker education and develop specialized maker education courses. At the same time, schools can also set up unique and innovative courses when their conditions allow and actively guide students to try to independently develop their new works, and then gradually form a basic curriculum as the center and expand the curriculum scope. To establish a more conducive to the growth of students maker education curriculum system.

3.4 Construct a new concept of maker education evaluation to promote the comprehensive and vigorous development of maker education

At present, Maker Education has not developed its evaluation system and is still in its infancy in China. However, high school maker education needs to evaluate high school students who have completed the whole process of maker activities and those who are preparing to participate in maker projects, to provide certain positive and effective references and better provide a strong basis for the follow-up development of high school maker education. The scientific evaluation method of maker work results is needed to evaluate the various maker activity projects completed by high school students and to comprehensively evaluate the whole process of high school student's participation in maker activity projects from multiple dimensions. In establishing the evaluation mechanism for maker education in senior high schools, the following main principles should be grasped: A. Diversified evaluation subjects should be ensured. In addition to teacher evaluations, evaluations can be conducted by group members or parents; B. Use a multi-angle scientific assessment method to ensure fairness and objectivity. Due to the diversity of student participation in projects or activities. Thus, a comprehensive assessment perspective can be ensured. We need to evaluate student performance from multiple perspectives.

4 High school maker education promotes innovation in teaching practice

4.1 Under information technology, teachers are encouraged to make use of maker space resources for innovative teaching

At present, we need to establish a modern teaching structure with students as the main body. Under the condition of information technology, Chinese teaching in Higher vocational colleges should give full play to the role of modern cognitive tools such as multimedia and maker space and gives full play to their functions of communication, cooperation, and sharing. We need teachers to innovate teaching models, using situational integration and interactive exploration. Through other teaching methods, students can more effectively increase their knowledge and develop their abilities through observation, reflection, interaction, and inquiry. Let's take moonlight over the Lotus Pond as an example. First, I use multimedia and maker space resources to achieve the soundtrack to make it more accessible to students and allow students to resonate with their thoughts. Then, I choose pipa "Autumn Moon Night", in the sound of music, let the students indulge in it, feel the moonlight like tranquility, and appreciate the tranquility brought by the song. Feel the beauty of the lotus pond under the moon. Finally, when the students were enjoying the lotus pond under the moon, I used multimedia to play the moonlight slides of the lotus pond. The use of pictures and texts combined with the intuitive demonstration was appropriate. The winding lotus pond was covered with leaves, which were high out of the water, like the skirts of graceful dancing girls. Leaves are distinct, dotted with the ornament of some white flowers, some are open, some are shy and swaying, stone-like pearls, like millions of stars in the sky, I use words to describe this scenario, the combination of seeing and hearing, fully mobilize students' various senses and imagination, and let them feel the beauty of the lotus pond from various angles. So that students can receive education on emotion and beauty differently. Teachers use various forms of maker space resources and various modern methods to play a guiding role in integrated teaching. This further strengthens and helps the student to study the textbook knowledge, causes the student to better fully mobilize his study enthusiasm, and studies better.

4.2 Cultivate students' ability to make innovations by using maker space network resources independently

The most prominent disciplinary knowledge required for maker activities is the integration of interdisciplinary knowledge, which is a very complex process involving all aspects. When solving problems related to maker activities, a lot of knowledge involved required us to search some literature and ask for help from various related disciplines. This can be done through self-study and collaboration with Makerspace resources. For example, in the teaching of Chinese courses, we can make full use of Dewey's teaching mode of "learning by doing" and provide effective support for learners' learning strategies through maker space network resources. Use 3 d printing to create a mock-up of the needed for Chinese teaching, robot parts, the building structure of the bridge, and the beauty of the peach garden, to the student's imagination into work, and transform the abstract academic term for the visualization of 3 d model, so that learners naturally into project founder, also promoted the innovation of Chinese learning.

To sum up, to make a good and full combination of traditional classroom and maker education in senior high school, we must provide different learning methods and efficient content for all students following the principle of suiting education to different persons and students' different cognitive learning levels and learning interests. It is of great significance to carry out the innovation of maker education mode under the environment of information technology, construct the teaching structure under the environment of maker space information technology, and apply it to the whole process of curriculum design, implementation, and evaluation, which is of great significance to promote the balanced development of teaching.

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