Cultivating Maker Literacy Among University Library Patrons in the Maker Era: Postprint

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Abstract

[Purpose/Significance] Cultivating patrons' maker literacy constitutes a crucial element in developing their core competencies. By proposing effective approaches to foster maker literacy, this study offers insights for enhancing maker literacy among patron makers in the maker era. [Method/Process] Based on an analysis of the connotation of maker literacy education, this paper elaborates on the five dimensions of maker literacy: maker awareness, maker ethics, maker capability, maker technology, and maker spirit. It proposes eight approaches for libraries to cultivate maker literacy, including transforming mindsets, creating maker environments, rendering maker space paradigms, cultivating diverse maker DNAs, and supporting the formation of maker teams. [Result/Conclusion] Libraries should grasp the development trends of innovation and entrepreneurship education, properly implement space reengineering, actively conduct maker activities and implement maker literacy education, truly fulfill their responsibilities in innovation and entrepreneurship education, and contribute to building a sound campus maker culture.

Full Text

Preamble

A Study on the Cultivation of Readers' Maker Literacy in University Libraries in the Maker Era

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Abstract

[Purpose/Significance] Cultivating readers' maker literacy is a key component of developing their core competencies. By proposing effective pathways for

cultivating maker literacy, this study provides a reference for enhancing readers' maker literacy in the maker era. [**Method/Process**] Based on an analysis of the meaning of maker literacy education, this paper elaborates on five aspects of maker literacy: maker consciousness, maker ethics, maker capability, maker technology, and maker spirit. It proposes that libraries should adopt eight approaches to cultivate maker literacy, including transforming conceptual thinking, creating maker environments, rendering maker space paradigms, cultivating different maker DNAs, and supporting the formation of maker teams. [**Result/Conclusion**] Libraries should grasp the development trends of dual maker literacy education, correctly implement space reconstruction, actively carry out maker activities and implement maker literacy education, truly assume the responsibility of dual maker literacy education, and contribute to building a healthy campus maker culture.

Keywords: maker era; maker literacy education; maker space development; university libraries
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According to the *Horizon Report* (2016 Higher Education Edition) and surveys by the New Media Consortium, maker education will bring profound influence and transformation to higher education, and the role of university students will shift from knowledge consumers to knowledge creators. China has now entered the maker era, and maker culture along with maker literacy cultivation have rapidly become emerging research fields. Although current research on this topic remains limited, it constitutes an indispensable and important component of maker theory research. Faced with the tremendous opportunities and challenges brought by the maker movement, university libraries should consider the necessity and feasibility of cultivating students' maker literacy, and actively leverage their advantages in space, resources, technology, and talent to play a vital role in cultivating readers' maker capabilities and maker literacy.

1 Maker Literacy and Its Educational Implications

The maker movement originated from the Innovation Laboratory at the Massachusetts Institute of Technology. The term "maker" originally referred to creators or manufacturers, but in recent years has evolved to describe innovators who use advanced technologies such as the internet and 3D printing, along with various software and hardware, to transform spontaneous creativity into reality [**?**]. Moreover, everyone can become a maker. At the 2009 Education Innovation Conference, former U.S. President Obama called on American primary and secondary school students to become creators of knowledge, not merely consumers. Chris Anderson, former editor-in-chief of *Wired* magazine, ignited the global maker movement with his book *Makers: The New Industrial Revolution*. In 2014, the White House hosted the first Maker Faire and launched a nationwide maker participation initiative. In 2015, with the wave of "mass entrepreneurship and innovation," the term "maker" was written into China's

government work report at the Two Sessions for the first time, attracting tremendous attention. Makers have become an important orientation for innovation, entrepreneurship, and educational reform, and maker education has become a key hallmark of educational reform and innovation in the new era. The development of the maker movement, the guidance of maker culture, and reflection within the education community have collectively promoted the advancement of maker literacy education.

Given that "maker" has both broad and narrow definitions, "maker literacy" should also have dual concepts. In the broad sense, maker literacy refers to the maker culture and spirit of the general public, while in the narrow sense, it refers to the qualities or capabilities that individual makers possess in innovative practice. Maker literacy education is the education of the maker qualities that readers should possess. Zhu Zhiting [**?**] pointed out that maker education in the broad sense is an educational form, while in the narrow sense, it is an educational model oriented toward cultivating learners' maker literacy. Maker educators Liang Senshan [**?**] and Xie Zuoru [**?**] believe that maker education is the combination of maker culture and education, based on students' interests and project-based learning, using digital tools, advocating creation, encouraging sharing, and cultivating cross-disciplinary problem-solving abilities, teamwork skills, and innovation capabilities as a form of quality education.

Although the academic community has not yet reached a unified academic definition of "maker literacy education," there is unanimous agreement on the impact of makers and the maker movement on education [**?**]. Based on the concept of "maker" and the influence of the maker movement on education, and summarizing domestic academic discussions on maker education, maker literacy education is considered to be a learning process where learners, through group communication and collaboration, based on spontaneous creativity and shared interests, utilize mastered scientific technologies and means, undergo continuous experimentation and attempts, ultimately discover, analyze, and solve problems, and are willing to share their innovations and capabilities. Maker literacy includes five aspects: maker consciousness, maker ethics, maker capability, maker technology, and maker spirit. First, maker consciousness refers to the creative thinking mode that emerges in maker practice and is the prerequisite for implementing innovative production. Second, maker ethics refers to the moral standards and bottom lines that makers adhere to during the production process and is the fundamental requirement for implementing innovative production. Third, maker capability refers to the professional disciplinary knowledge and interdisciplinary comprehensive knowledge reserves that makers possess when discovering, analyzing, and solving problems, which are the most basic conditions for implementing innovative production. Fourth, maker technology refers to the various scientific and technological means and methods that makers adopt when implementing innovative production, which is the fundamental guarantee for realizing maker production. Fifth, maker spirit refers to the internal drive, production values, and sharing attitudes that makers demonstrate during the creative production process, which are the inexhaustible source and motivation

for implementing innovative production.

Since the maker movement originated in institutions of higher learning, over a hundred universities in the United States have already established maker literacy education courses. Whether it is early information literacy education or the developing maker literacy education, both are conducted in universities. Foreign researchers believe that maker literacy education is "learning by making" [**?**]. Domestic researchers believe that although maker literacy education is an emerging educational concept, it is built upon many well-established educational theories, integrating core educational concepts such as problem-based learning, project-based learning, experiential learning, immersion learning, and "do-it-yourself" [**?**]. [Figure 2: see original paper]

2 The Necessity of Cultivating Readers' Maker Literacy

2.1 "Maker Consciousness" Is the Key to Developing Readers' Core Competencies

The research results of *Core Competencies for Chinese Students' Development* indicate that core competencies for student development refer to the essential character traits and key capabilities that students should possess to adapt to lifelong development and social development needs, with the core being the cultivation of "well-rounded individuals." These are divided into three aspects: cultural foundation, autonomous development, and social participation, comprehensively manifested as six competencies: humanistic heritage, scientific spirit, learning to learn, healthy living, responsibility, and practical innovation, which are further refined into 18 basic points including national identity [**?**]. These three aspects and six competencies all contain the fundamental connotation and spiritual essence of cultivating students' maker consciousness. The requirements for cultivating students' "learning to learn" and "practical innovation" competencies particularly highlight the need to cultivate students' maker consciousness, with the focus of learning to learn being the cultivation of students' information awareness and their ability to actively adapt to social informatization trends such as the internet. Practical innovation competency refers to students' ability to discover and pose questions, selectively formulate reasonable solutions, possess maker consciousness, and apply innovative concepts to daily life and practice. Therefore, cultivating students' maker consciousness is a necessary prerequisite and key to achieving core competency development. As Zhang Gailun [**?**] believes, maker education is important for cultivating students' creative abilities and methods, but essentially it must transform their thinking modes.

2.2 "Maker Ethics" Is the Foundation of Readers' Character Education and Innovation

Maker ethics refers to the moral bottom lines and behavioral norms that makers should adhere to during the creative process and is the most basic requirement

for implementing innovative production. As social beings, students must comply with and fulfill moral norms and behavioral standards that align with the civilized development of society, which is the most fundamental starting point and endpoint of education. The research results of *Core Competencies for Chinese Students' Development* also clearly state that cultivating students' core competencies is an important measure and development goal for effectively implementing the fundamental task of character education, as well as an urgent need to adapt to world trends in educational reform and enhance the international competitiveness of Chinese education. Therefore, cultivating students' qualities and capabilities in social participation, responsibility, practical innovation, and social responsibility is particularly important. With the arrival of the maker era, students need to utilize university library maker spaces to transform infinite, intangible ideas in their minds into tangible products through teamwork, leveraging their inexhaustible potential to promote social civilization and progress. Consequently, students' innovation and entrepreneurship behaviors require not only continuous improvement in innovative spirit and practical abilities but also adherence to social moral norms and behavioral standards to realize the life value of innovation and entrepreneurship.

2.3 "Maker Capability" Is the Basic Condition for Implementing Innovative Production

The core concept of maker literacy cultivation advocates allowing students to learn through exploration and practice, and to master skills through hands-on activities. This learning process, where students spontaneously pose questions and solve them through their own abilities, plays a crucial role in cultivating and enhancing students' maker capabilities. Although the main body of maker literacy cultivation is the student readers themselves rather than university librarians, librarians can serve as designers, guides, and evaluators of activities. University libraries can facilitate full integration among readers and utilize maker space resources, combined with librarians' comprehensive knowledge reserves and service capabilities, to help readers independently solve practical problems. Readers in maker education are no longer passive recipients of knowledge but rather assume multiple roles as mathematicians, scientists, and inventors [**?**]. The focus of maker literacy cultivation should be on the learning process rather than the creative outcome; project completion does not signify the end of learning, but rather profound reflection and process improvement in innovative production are the goals of maker literacy cultivation. Innovative production is not a process of creation out of nothing but essentially involves making innovative reforms to previous research findings by standing on the shoulders of predecessors. Therefore, maker capability is an essential quality and ability that every maker must possess to implement innovative production and is also the basic condition and necessary prerequisite for makers to implement innovative production.

2.4 "Maker Technology" Is the Fundamental Guarantee for Transforming Ideas and Creativity into Reality

Any maker activity is an embodiment of the full integration of modern information technology and comprehensive professional knowledge. When transforming creativity into reality, maker technology plays a crucial role. Whether in the maker process or maker education practice, information technology is an indispensable "enabling" means [**?**]. Information technology can provide favorable conditions for makers, that is, cutting-edge science and technology can provide necessary technical support for maker production, while also providing creative methods and communication means for maker activities. Rapidly evolving information technology has built a favorable soft platform and infinite possibilities for makers to integrate their comprehensive knowledge and achieve innovative production. Moreover, the popularization and utilization of many open-source software have promoted and accelerated the development of the maker movement, with open-source software playing an important leverage role in maker production. As university student makers, being able to skillfully use various information technologies to achieve maker production is the most basic quality and requirement. If in maker activities, one only stays at the conceptual and design stage and cannot use maker technology to transform ideas into reality, then these ideas are merely armchair strategizing. Therefore, maker technology is the most basic guarantee condition for realizing maker production.

2.5 "Maker Spirit" Is the Inexhaustible Driving Force for Courageous Exploration and Creation

The Chinese government has incorporated "dual maker" into its basic national policy, with leaders attaching great importance to makers and vigorously advocating and promoting the maker spirit of daring to explore and sharing cooperatively throughout society. The essence of maker spirit is the powerful engine and internal driving force for makers in their pursuit of truth, the proactive and daring attempts in practice and exploration, the perseverance and tolerance for failure in the face of adversity, and the learning spirit and attitude of being willing to share creative ideas and achievements. It is the most fundamental quality and requirement for makers to achieve success in innovation and entrepreneurship. With the changing times, maker spirit has evolved into the craftsman spirit of the knowledge era. On the one hand, cultivating the maker spirit of the general public is not only beneficial for the inheritance and innovation of Chinese national culture and the promotion of public intellectual development but also conducive to the overall rejuvenation and prosperity of the nation. On the other hand, cultivating the maker spirit of individuals in society can not only promote changes in traditional education models and stimulate students' learning initiative but also cultivate students' positive, enterprising, daring, persistent, and cooperative learning spirit. Simultaneously, maker spirit will help guide and assist some "geeks" in using their excellent talents and abilities for the innovative transformation of society as a whole.

2.6 Maker Literacy Is the Booster and Catalyst for Innovation and Entrepreneurship

Currently, "mass entrepreneurship and innovation" has become an important national strategy in China, which will promote and drive a profound social transformation in our country. Cultivating students' maker literacy will inevitably become the booster and catalyst for dual maker initiatives. Maker consciousness can provide necessary brainstorming, creative inspiration, and thinking modes for innovation and entrepreneurship, guide innovation direction and goals, and play a positive catalytic role in the effective combination of various innovation elements such as technology and talent resources. Maker ethics safeguard the effective development of dual maker initiatives from the perspective of social moral standards and behavioral bottom lines. Maker capability provides the necessary prerequisite paradigm for implementing innovation and entrepreneurship and offers basic conditions for the smooth realization of knowledge recombination and knowledge innovation in dual maker initiatives. Maker technology is the source and guarantee for realizing innovation and entrepreneurship; without the support of maker technology, all concepts would be impossible to transform into reality. Maker spirit provides strong internal driving force for individual makers' innovation and entrepreneurship from the perspective of national cultural inheritance and social values, representing the core element of the boosting and catalytic effect. The five elements of maker literacy, in a comprehensive and multi-level interconnected manner, play an irreplaceable role in boosting and practicing this national strategy of innovation and entrepreneurship.

3 Approaches to Cultivating Readers' Maker Literacy in University Libraries

3.1 Construct Maker Spaces to Provide Platforms for Information Exchange and Resource Sharing

To effectively implement the basic national policy of innovation and entrepreneurship and meet the needs of makers to transform creativity into reality, various countries have established maker spaces with distinctive features. As talent cultivation bases, university libraries cannot stand idly by and should transform traditional service concepts, adapting measures to local conditions to construct maker spaces. This is the need of the maker era, the need to cultivate innovative talents, the need for China's innovation and entrepreneurship national policy, and the need for mass entrepreneurship. Rolf Hapel, director of Aarhus Libraries in Denmark, stated in his report *The Library as an Open Informal Learning Center in the Network Society* that the significance of libraries has shifted from educational and cultural institutions in the industrial era to open informal learning centers. Using Danish libraries as an example, contemporary libraries should be spaces for inspiration, learning, performance, and gathering, emphasizing the construction of a service platform for the entire society through user participation. The University of Nevada,

Reno Library and the University of Texas at Arlington Library have both established "university library maker spaces serving the community" workshops [**?**]. Successful domestic maker spaces include the Guangzhou Library Maker Space and the Shanghai Mushroom Cloud Maker Space. Additionally, libraries at Tongji University, Tsinghua University, Wuhan University, and Shanghai Jiao Tong University have successively established maker spaces and maker clubs in their institutions. The construction of maker spaces and network platforms has changed talent cultivation and scientific knowledge transmission methods, promoting continuous technological development and innovation. It has practiced the concept of reader maker literacy education and effectively played the auxiliary educational function of university libraries as a second classroom in a fashionable and innovative form. It provides makers with the necessary physical working environment, advanced equipment, and open-source software, enabling online communication and achievement sharing among makers through cyberspace and forming an innovative form of learning and education that combines online and offline activities, laying the necessary material foundation for cultivating readers' maker literacy.

3.2 Render Space Paradigms to Comprehensively Meet the Innovation Needs of Maker Groups

After constructing maker spaces, university libraries should focus more on rendering campus maker culture atmosphere and promoting learning communication and creative exploration activities among teacher and student maker groups. In rendering maker space paradigms, university librarians should use various methods such as visiting departments and schools, library website BBS bulletin boards, and WeChat and Weibo public account push notifications to promote different themed maker spaces and activities to teacher and student maker groups, improving the actual utilization rate of maker spaces and publicizing campus maker spirit. For example, Singapore's National Information Authority has established maker laboratories in libraries where users can attend their first class for free but must commit to serving as training mentors for other makers thereafter. According to the different characteristics and focuses of maker spaces, flexible and diverse maker space promotion activities should be planned and designed, using fabrication laboratories to conduct physics and chemistry creative experiments for maker groups in science departments and launching experimental maker activities such as creative experimental fields; using creative workshops to conduct thematic discussions and human library activities for maker groups in liberal arts departments; and using achievement display spaces to promote the teaching of professional knowledge and encourage the application of learning.

3.3 Cultivate Maker Consciousness to Promote Organic Integration of Disciplines and Maker Practice

Faced with the surging wave of the maker era, traditional information literacy education methods can no longer fully meet the needs of the times, and reader maker literacy education has become the core and key of university library education. Therefore, university libraries need to transform traditional thinking concepts, timely update reader information literacy education content, improve systematic cultivation frameworks, and shift from information literacy education to maker literacy education. A successful domestic case focusing on cultivating maker consciousness is the "Mars Pie Practice" workshop from a youth science and technology education company, which mainly cultivates students' scientific interests, innovative consciousness, and maker thinking, stimulating learning interest. As university libraries, they should first establish the core concept of maker literacy education, focusing on cultivating students' innovative thinking, inquiry abilities, and collaborative skills. For example, Shenyang Normal University (abbreviated as "Shen Shi Da") Library, in addition to cultivating students' maker concepts and consciousness through information courses embedded in professional courses, uses new spaces and new equipment to plan a series of themed maker activities such as "Creating Youth," creating a maker atmosphere, teaching maker knowledge and creative skills, stimulating creativity and actively carrying out practice, transforming previous classroom teaching into experimental fields and training grounds for maker space practice, emphasizing students' autonomous and active engagement in maker activities, innovating and creating in practice, and integrating information technology with creative practice.

3.4 Tap Potential Resources to Guarantee the Cultivation of Makers' Character Education Quality

University libraries can design and carry out various maker activities such as DIY hands-on production experiences, thematic creative competitions, learning experience exchanges, and celebrity demonstration reports by combining different maker elements and themes. This provides students with a campus second classroom informal humanistic maker learning atmosphere and environment, allowing students to unconsciously immerse themselves in the learning and creative environment. Simultaneously, university libraries should actively tap all available high-quality resources and correct guidance, inviting "living teaching materials and living models" from various fields, especially those who have achieved outstanding results in innovation and entrepreneurship, to give series of expert lectures or conduct human library activities for students. Shenyang Normal University Library has already practiced this multiple times, successively inviting dual maker famous teachers and entrepreneurial experts to the Entrepreneurship Lecture Hall, such as Secretary-General Liu Qi from the Liaoning Private Science and Technology Entrepreneurs Association with his report *Opportunities and Challenges of the New Industrial Revolution*; Researcher Yuan

Zhizhong from the Chinese Academy of Social Sciences with his report *Pragmatic Innovation, Reliable Entrepreneurship*; and Chairman Wu Dasheng from Beijing Taoye Zhenghe Tourism Culture Co., Ltd. with his report *Entrepreneurship Is Letting Life Bloom*, totaling more than ten sessions. With different identities, experiences, and industries, they shared different feelings, experiences, and insights face-to-face with students, communicating correct innovation concepts and entrepreneurial perceptions and guiding and leading college students' innovation and entrepreneurship thinking and direction. The Entrepreneurship Lecture Hall activities bring dual maker famous teachers and entrepreneurial experts from online to offline, realizing face-to-face communication and interaction between readers and entrepreneurial experts, listening to the most cutting-edge entrepreneurial concepts, learning the most practical entrepreneurial experience, and inspiring students to strive for their ideals.

3.5 Train Maker Skills to Timely Enhance the Creative Capabilities of Maker Groups

University libraries should adapt measures to local conditions and teach students according to their aptitude based on different maker groups, cultivating their pioneering and innovative maker consciousness and enhancing their open information acquisition maker capabilities. This includes cultivating the maker DNA of student maker groups, focusing on enhancing their maker consciousness, network equipment utilization, and open information acquisition abilities. Through regularly conducting popularization training on maker space-related equipment and open-source software, they can keep abreast of and master the practical operation and application of advanced digital equipment and open-source software, continuously improving their open information acquisition capabilities. For example, Shenyang Normal University Library uses its internal maker space to hold various dual maker education and training activities, forming a normal working state for university library maker activities, such as offering courses like "Fundamentals of Innovation and Entrepreneurship," series training on "New Technology Function Experience," series training on "Thesis Writing Innovation Guidance," series training on "Information Resource Promotion," series training on "Characteristic Skills," and "Innovative Business Workshop" activities. On the one hand, this transforms the maker space into a knowledge laboratory and wisdom processing factory; on the other hand, it strengthens readers' maker consciousness, activates readers' creative thinking, and exercises readers' maker skills through activities. Simultaneously, university librarians should not only play the role of instructors in maker activities but also participate as makers themselves, which requires librarians' professional literacy and professional standards to be continuously improved to better catalyze makers' creative inspiration and more effectively cultivate maker capabilities.

3.6 Guide Project Transformation to Enhance the Technical Strength of Makers and Maker Teams

China's maker movement is still in its initial stage, with various supporting policies and management rules lacking guarantees, maker concepts not yet established, and maker culture not truly formed, leaving everything to be done. There are problems in society such as the lack of effective communication and exchange platforms between public libraries and university libraries, between schools and enterprises, between universities, and within universities themselves, leading to disorderly and scattered research and development fields and difficulties in transforming innovative technologies and achievements. These issues require the national government to introduce various policies and systems for systematic planning and supervision improvement. Strengthening the technical strength construction of makers and maker teams is even more lacking in attention and in-depth research, which is precisely a key issue that cannot be ignored in maker literacy education. For example, Tongji University designed China's first Fablab laboratory, which not only promoted the development of open education systems but also advanced the incubation of innovative and creative projects [**?**]. In view of this, university libraries should systematically grasp the development trends of the maker movement, correctly guide their own maker activities, carry out maker literacy education to enhance maker technical strength, and truly assume the responsibility of guiding campus maker activities, conducting student dual maker literacy education, and promoting the social transformation of campus innovation achievements. Additionally, university libraries should fully cooperate with relevant departments such as the student affairs office and the Youth League Committee to organize and establish organizational institutions for maker project research and development such as "Maker Clubs," "Maker Associations," and "Maker Federations," and assist in formulating relevant organizational management systems, thereby building core campus maker organizations and promoting the inheritance and development of campus maker culture.

3.7 Establish Maker Concepts and Focus on Cultivating a Maker Spirit of Courageous Innovation

The core of university libraries' literacy education for makers is to enhance their creative production technology and capabilities and cultivate a maker spirit of courageous innovation. This inevitably requires university libraries to devote themselves to constructing and rendering the maker culture environment and atmosphere, which mainly includes the following aspects: First, accept new things, actively accept the policies of "mass entrepreneurship and innovation," construct maker spaces that meet the needs of maker activities, equip high-end hardware and software tools, and build communication platforms that satisfy the needs of maker activities. Second, research new issues, establish specialized departments in libraries, construct maker space paradigms, scientifically plan maker themes according to makers' disciplines and actual needs, create

diversified maker activities and training courses, embed them into makers' professional learning and curricula, realize the normalization of maker activities, and transform previous classroom teaching into experimental fields and training grounds for maker space practice, emphasizing students' autonomous and active engagement in maker activities, innovating and creating in practice, and integrating information technology with creative practice. Third, establish maker concepts, through planning various entrepreneurship inspirational lectures and activities such as creativity competitions and works exhibitions, actively advocate for and attract maker groups to be willing to enter libraries, enter maker spaces, pay attention to maker activities, use maker spaces for collisions of ideas and inspiration and innovative production, and ultimately form a virtuous cycle of development. Fourth, cultivate maker spirit; while ensuring good information and knowledge services for teachers and students, university libraries should vigorously carry out rich and colorful maker services, allowing readers to fully experience the maker culture feast, attracting makers' yearning for and even dependence on university libraries, and cultivating readers' maker spirit of courageous innovation and fearlessness of failure during the maker service process.

3.8 Establish Incentive Mechanisms and Construct an Evaluation System for Maker Literacy Education

Incentive refers to the psychological process of stimulating human behavior, which motivates, drives, and mobilizes people's enthusiasm, enabling people to work consciously and voluntarily and strive to create good performance. Maker literacy education also needs incentives and requires the construction of a systematic evaluation system for maker literacy education, which can not only enhance the maker literacy level of maker groups but also examine the scientificity and feasibility of current maker literacy education models. The incentives here include two levels: First, the evaluation of maker team work and maker project outcomes themselves. Since maker projects are usually completed through team or group collaboration, an excellent maker outcome often requires makers to invest high-intensity time and energy, making it particularly difficult to accurately evaluate each maker's contribution and value in the group, which urgently requires the construction of a maker literacy education evaluation system. Second, university libraries and librarians conducting maker literacy education also need performance evaluation. The planning, organization, implementation, and summary of activities, as well as each librarian's work attitude, ability level, and contribution size, all require correct evaluation. Incentive is an indispensable procedure for various activities, and the evaluation of maker literacy education should adopt a combination of qualitative and quantitative evaluation, as well as process evaluation and outcome evaluation according to project needs, and establish a complete and effective incentive mechanism for maker projects.

References

[?] Li Ling, Wang Jie. "Makers": Softly Changing Education[N]. China Education Daily, 2014-09-23(005).
[?] Zhu Zhiting. From Maker Movement to Maker Education: Cultivating Mass Innovation Culture[J]. e-Education Research, 2015(7): 5-13.
[?] Liang Senshan. China Maker Education Blue Book (Basic Education Edition)[M]. Beijing: People's Posts and Telecommunications Press, 2016: 2-6.
[?] Xie Zuoru. Two Important Documents on Maker Education in 2016[EB/OL]. [2017-03-12]. http://blog.sina.com.cn/s/blog_{6611ddcf0102wfgt}.html.
[?] MOOC Xin Qianyan. Maker Education Continuum: Activating Innovation Genes in the Mass Innovation Era[EB/OL]. [2016-10-28]. http://www.moocxing.com/industryangle/chuangkejiaoyuchuangkejiyi.shtml.
[?] He Kekang. On Maker Education and Innovation Education[J]. Educational Research, 2016(4): 12-24.
[?] Sina Education Column. Six Core Competencies for Chinese Students' Development Finalized[EB/OL]. [2017-03-08]. http://edu.sina.com.cn/zl/edu/2016-09-18/11143922.shtml.
[?] Zhang Gailun. Maker Education: A Quiet Revolution from the Bottom Up[N]. Science and Technology Daily, 2017-01-20(7).
[?] MARTINEZ S, STAGER G S. How the maker movement is transforming education[EB/OL]. [2017-03-08]. http://www.weareteachers.com/hot-topics/special-reports/how-the-maker-movement-is-transforming-education.
[?] Zhu Zhiting. Maker Education: An Innovative Education Practice Field Enabled by Information Technology[J]. China Educational Technology, 2015(1): 14-21.
[?] "Maker Space: Creativity in the Library—Maker Spaces for Everyone" International Academic Symposium Successfully Held at Guangzhou Library[EB/OL]. [2016-11-30]. http://www.gzlib.gov.cn/ckkjhydt/144114.jhtml.

Author Contributions:
Che Baojing: Provided and organized materials, wrote the paper, and proofread the paper.
Liu Sisi: Proposed the core research ideas and structure of the paper, wrote the paper, and revised the paper.

Note: Figure translations are in progress. See original paper for figures.