Postprint: Investigation and Analysis of Children's Makerspace Services in U.S. Public Libraries

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Abstract

[Purpose/Significance] This study investigates the practical cases and service characteristics of children's makerspace services in U.S. public libraries, aiming to provide reference for the development of children's makerspace services in Chinese libraries. [Method/Process] Based on the results of the 10th "Star Library Ranking" evaluation in the United States in 2017, 30 public libraries were randomly selected from five-star libraries as research subjects. Among them, 22 public libraries provide children's makerspace services, encompassing four types. Through analysis of typical cases, the service characteristics of children's makerspaces in U.S. public libraries were inductively summarized. [Results/Conclusion] The following implications are obtained: emphasize cultivating young makers and constructing a service model for children's makerspaces; promote children's STEAM education and creative activities, and intensify publicity efforts to attract girls' engagement with technology; foster children's autonomous learning abilities and creativity; enrich service project activities and advanced technical equipment in children's makerspaces; emphasize collaboration and mutual assistance, and strengthen talent team construction.

Full Text

Preamble

Research and Analysis of Children's Maker Space Services in American Public Libraries *Shi Jianlan, Liao Fan* School of Economics and Management, South China Normal University, Guangzhou 510063

Abstract

[**Purpose/Significance**] This study explores practical cases and service characteristics of children's maker space services in American public libraries to provide

reference for Chinese libraries developing similar services. [**Method/Process**] Drawing from the 2017 10th "Star Library Ranking" in the United States, 30 five-star public libraries were randomly selected as survey objects. Among them, 22 libraries provided children's maker space services with four distinct service types. Through analysis of typical cases, this paper summarizes the features of American public library children's maker space services. [**Result/Conclusion**] The findings offer the following insights: emphasize cultivating young makers and constructing children's maker space service models; promote children's STEAM education and creative activities; increase publicity to attract girls' attention to technology; develop children's independent learning abilities and creativity; enrich children's maker space service projects and advanced technical equipment; value collaboration and mutual assistance while strengthening talent team building.

Keywords: United States; public libraries; children makers; maker space; space service
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1.1 Research Background

Interdisciplinary education centered on Science, Technology, Engineering, Arts, and Mathematics (STEAM) has become one of the development trends in 21st-century library services. Maker spaces represent a rational choice for current library transformation and upgrading, and providing maker space services for children presents a unique opportunity for public libraries to transform their youth services. The term "maker" originated in the United States, referring to individuals who use creativity as a source and foundation to turn ideas into reality and share these achievements with others to some extent [1].

According to surveys, 2,295 maker spaces are currently registered on Wikipedia [2], with the United States having the most. American libraries describe maker spaces as places where children gather to build Lego robots, teenagers use computers and synthesizers to create digital music, movies, and games, students design and manufacture new projects, and adults use laser cutters and 3D printers to create small commodities [3]. As early as 1905, American libraries began providing maker space services for children and adolescents when the Carnegie Library of Pittsburgh assisted working-class communities in establishing home libraries and organized children in sewing and weaving activities. In 1979, the Merrimack Public Library established a children's craft room after renovation. Though different from modern maker spaces, these initiatives embodied the same spirit of serving young makers. In 2011, the Fayetteville Public Library opened the first public library maker space in the United States, dividing users into children, teenager, and adult groups to provide targeted maker services, marking the beginning of modern library children's maker space services. In 2014, the American Library Association (ALA) announced support for libraries, including children's maker spaces, to build maker spaces in response to the presi-

dential call on the eve of the first Maker Carnival. The Public Library Manifesto also explicitly states that public libraries have the mission to provide opportunities for personal creative development, stimulate the imagination and creativity of children and youth, and promote scientific achievements and technological innovation [4].

Given the vigorous development of children's maker space services in American public libraries, this study investigates practical cases and service characteristics to analyze success factors and extract valuable elements, aiming to enrich domestic theoretical research on public library children's maker space services and provide references for Chinese library practice.

1.2 Research Status

1.2.1 Domestic Research Status As Chinese libraries have introduced maker spaces, academic discussions on integrating library service functions with maker space construction have intensified, yielding fruitful results. However, research specifically on children's maker space services in public libraries remains extremely limited. Using advanced search on CNKI with the strategy "Subject = public library AND maker space AND (children OR youth OR teenagers)" yielded only three results as of March 1, 2019: "Practice and Enlightenment of American Library Children's Maker Services," "Analysis of the 'HYPE Teen Center' Maker Space Construction at Detroit Public Library," and "Research on Public Library Children's Maker Services." The latter was published in the science and technology magazine *Jiangsu Science and Technology Information*, discussing development strategies based on the relationship between maker spaces and children's services. Additionally, only five papers address children's maker education in public libraries, primarily introducing the necessity of children's maker education or preliminary explorations based on surveys of foreign practices. Overall, research on public library children's maker space services is scarce, lacks depth, covers narrow scopes, features single types, and lacks specific practical exploration. Research quality needs improvement, and more systematic and in-depth studies are urgently needed. In contrast, foreign research is more abundant and flourishing, though it focuses mainly on the necessity of maker education, case analysis of children's maker activities, and service improvement strategies, with relatively little research on performance evaluation and feedback.

1.2.2 International Research Status Children's maker space services are flourishing in public libraries in developed countries such as Europe and America, with abundant research results focusing on the necessity of maker education, case analysis of children's maker activities, and service improvement strategies. For example, A. Katrin believes that the goal of maker education is not to create more scientists and engineers but to promote such courses in low-income communities, enabling local youth to obtain the right to innovate, cultivate creative consciousness, and give them hope for the future [5]. L. Bowler and R.

Champagne systematically introduce the construction status of public library maker spaces, including funding sources, user fees, technical facilities, and activity impacts. They summarize issues such as funding maintenance and user training, and propose strategies for libraries to provide maker space services to teenagers [6].

These studies provide valuable, referable experience for Chinese public libraries to construct maker spaces and offer a strong theoretical foundation for further discussion of children's maker space services. However, foreign research on effect feedback and evaluation of public library children's maker space services is relatively limited and needs further in-depth study.

1.3 Data Sources

In 2017, 7,409 public libraries in the United States participated in the 10th Star Library Ranking held by *Library Journal*, with 85 five-star libraries ultimately selected and divided into nine categories based on operating expenditures. Using Excel's random number generator, five libraries were randomly selected from each of the first six categories, totaling 30 public libraries as survey objects. Investigation revealed that 22 public libraries provided children's maker space services, accounting for 73.3%. This paper uses these as the research and analysis objects (see Table 1).

2. Case Studies of American Public Library Children's Maker Space Services

2.1 Service Projects and Classification

American public libraries have keenly recognized the importance of maker space services for children, with an increasing number offering related services. The children's maker space services provided are rich and diverse, with flexible, interesting, and highly creative activities (see Table 2).

Based on Table 2, American public library children's maker space services can be comprehensively categorized into four types according to content and method (see Figure 1 [Figure 1: see original paper]).

2.1.1 Lego Club Services

Lego clubs are specialized spaces providing Lego services for young children aged 3-8. These services offer various Lego bricks and related materials, allowing children to use their imagination and creativity, along with science and technology, to build their own worlds, construct houses and vehicles, and design interesting technological works.

2.1.2 DIY Craft Creation Space Services

DIY craft creation spaces are attractive maker spaces suitable for children aged 5-18, providing comprehensive craft materials, board games, drawing stations, and art activity areas. Professional instructors regularly hold themed DIY ac-

tivities such as paper cutting, 3D printing, brooch making, clothing design, and puppet making. Children can work independently or with parents to design and create exquisite crafts using provided materials. Nine public libraries provide such services, including the Art Lab at Cleveland Public Library and the Art Creation Room at Allen County Public Library.

2.1.3 Digital Media and Computer Programming Space Services

Currently, eight American public libraries provide digital media and computer programming spaces where teenagers learn to use digital media, Minecraft programming, and other STEAM courses. These spaces encourage teenagers to utilize creativity, programming, and 3D printing technologies to craft inventions, robots, game software, and electronic devices, stimulating interest in digital media and improving digital media and computer skills while cultivating programming ability, creativity, collaboration, and innovation capacity. Examples include the Library Lab at Seattle Public Library and the Digital Media Lab at Kansas City Public Library.

2.1.4 Scientific Invention and Creation Space Services

Scientific invention and creation spaces enable teenagers to learn science, use tools and equipment, and engage in design, collaboration, and invention. These spaces are equipped with industry-standard technology, advanced equipment, and software, offering services such as laser cutting, 3D printing, game development, video production, and creative programming courses. Teenagers can design shapes according to their creativity, use 3D printing to invent robots, technological crafts, and electronic products, thereby stimulating technological awareness and cultivating creativity and scientific literacy from an early age. This service is suitable for teenagers aged 10-18, with children below middle school age requiring parental or caregiver supervision. Currently, 12 of the surveyed libraries (54.5%) provide this service, including the Science Discovery Lab at Cincinnati and Hamilton County Public Library and the Maker Space at Cleveland Public Library.

2.2 Analysis of Typical Cases

Among the 22 surveyed libraries, five typical cases were selected that reflect the current state of American children's maker space services. These libraries offer rich, diverse, and distinctive services. For example, Seattle Public Library's Digital Media Learning Space is a characteristic children's maker space service offering varied activities such as BB-8 games, Finch robots, and VR experiences. Some libraries provide multiple service projects, while others conduct various activities under one project (see Table 3).

American libraries have long been committed to cultivating children's scientific literacy and innovative spirit. Table 3 shows that American public libraries focus intensely on children's technological learning and creativity development, providing space services that foster creativity and conducting distinctive activities such as DIY craft creation, digital media and computer programming training,

scientific invention, and 3D printing technology.

Among the five typical cases listed in Table 3, except for Camden Public Library, which provides only one specialized service for girls, the other four libraries offer multiple children's maker space service projects and activities for different age groups.

Westport Library deserves special mention. Despite covering only 27,561 people—far fewer than Group 1 libraries (highest operating expenditure) like Cincinnati and Hamilton County Public Library, which covers 802,374 people—its daily average attendance of 14.3 exceeds Group 1 libraries' 8.1. Furthermore, Westport Library offers six typical children's maker projects (see Table 3), the most among the 22 libraries, reflecting its strong emphasis on children's maker services and service quality that attracts users to utilize library services and participate in activities. Westport Public Library's maker space was established after hosting a Maker Carnival. In spring 2012, the library partnered with CLASP Homes to host Connecticut's first mini-maker conference, attracting 2,200 participants [8]. In July 2012, Westport Library established its maker space and has held mini-maker conferences annually since. The library particularly focuses on child and teenager maker groups, establishing dedicated children's maker spaces that provide collaborative maker experience projects, cultivate active learning habits, and offer flexible, personalized maker projects while conducting maker training sessions and exchange meetings to promote learning, communication, sharing, and collaboration. Over the years, its scale has continuously expanded, receiving funding support from the Institute of Museum and Library Services. Table 4 shows Westport Library's children's maker space construction, revealing a professional service team and volunteer force, diverse funding sources, and effective service implementation. The library provides rich and varied tools and equipment, emphasizing creative thinking and scientific spirit cultivation, offering various maker projects for different age groups.

Additionally, the most distinctive cases among surveyed libraries are East Baton Rouge Parish Library's DIY Online Creation Space and Camden Public Library's Girls Who Code (GWC). The DIY Online Creation Space is an online platform where teenagers can learn and create interesting works, representing the only online maker space among surveyed libraries. Its services mainly include online craft creation, such as providing platforms for making and sharing craft tutorials, mini-art online creation zones, and public welfare fashion websites. This allows children to conduct online learning, creation, and communication anytime according to their interests and creativity, also facilitating parental accompaniment and guidance, greatly benefiting users and aligning with the characteristics of the internet era.

Camden Public Library's Girls Who Code specifically provides programming learning and creation services for girls to narrow the gender gap in technology and promote women's development in tech fields. It is the only library among surveyed institutions offering specialized programming learning and creation

services for girls. Its services are divided into three programs based on training duration: club projects conducted daily, two-week campus programs, and seven-week summer immersion programs (see Table 5). These services are free, with the summer immersion program providing stipends for transportation and daily expenses. GWC strongly encourages girls of different races, ages, and social backgrounds to join, offering STEAM courses, computer programming, and technological innovation training. It is a project emphasizing diversity and American characteristics, providing valuable reference for emphasizing women's technology education.

3. Characteristics of American Public Library Children's Maker Space Services

American public libraries provide children's maker space services according to children's age characteristics and needs, cultivating independent innovation abilities and scientific skills while enhancing social benefits and value status. Their service characteristics are reflected in five aspects:

3.1 Emphasizing Maker Space Construction and Young Maker Cultivation

American public libraries attach great importance to constructing maker spaces and deeply recognize the importance of providing children's maker space services and cultivating young makers. According to surveys, over 51% of American public libraries have established maker spaces, with an increasing number providing children's maker space services. Among 30 surveyed American public libraries, 22 provide children's maker space services, some with dedicated spaces, offering four service types with rich and diverse activities for different age groups. In contrast, almost no Chinese public libraries have dedicated maker spaces for children, with very limited practice in providing children's maker services. American libraries demonstrate high regard for maker space construction and young maker cultivation.

3.2 Promoting Children's STEAM Education and Creative Activities

American public libraries emphasize children's STEAM education and independent learning creativity cultivation. Most libraries have introduced excellent STEAM talent, providing STEAM-related service projects and conducting children's STEAM education and creative activities. For example, Princeton Public Library's STEAM Studio provides professional STEAM instructors, comprehensive tutorials, advanced equipment, and emerging technologies for children aged 7-18, guiding them to write code and create technological inventions. Among surveyed libraries, eight provide digital media and computer programming space services, and 12 provide scientific invention and creation space services, demonstrating American public libraries' strong emphasis on developing children's STEAM skills, digital media and programming abilities, scientific literacy, and

technological creativity.

3.3 Focusing on Cultivating Girls' Interest and Skills in Technology

American public libraries pay close attention to women's development in technology and the gender gap, emphasizing the cultivation of girls' technological interest from an early age. They believe that to narrow the gender gap in technology and enhance women's influence, girls' interest in scientific knowledge must be cultivated from childhood, encouraging active participation in maker activities to improve their technological capabilities. The previously mentioned distinctive case—Camden Public Library's Girls Who Code—exemplifies this effort, providing computer courses and programming training for girls of different ages and allowing them to design and create innovative products through programming, including girls-only projects to enhance STEAM skills and computer programming abilities for women of diverse backgrounds.

3.4 Encouraging Children's Independent Learning and Creation

American public library children's maker spaces actively respond to learning method transformations, encouraging children to learn independently through active exploration, develop innovative thinking, and actively create, practice, and invent to become creators. In maker spaces, children operate independently, solve questions, and use their innovative thinking to invent and create products. For example, Middle Country Public Library's 567 Club emphasizes children's independent learning and creativity, encouraging them to create artworks using natural materials, invent small electronic products, and design game products. Westport Library's Take-it-Apart Workshop provides old or useless electronic products for children to disassemble and explore internal components and operations, using their imagination to invent similar electronic products.

3.5 Providing Rich and Diverse Maker Space Service Projects and Advanced Equipment

American public libraries offer four types of children's maker space services for different age groups: Lego clubs for ages 3-8, and scientific invention spaces for ages 10-18. Service projects are abundant, including: (1) online maker education platforms or consulting services, such as East Baton Rouge Parish Library's DIY Online Creation Space providing tutorial videos and online consultation; (2) user training or professional guidance for equipment and technology; (3) diverse maker activities such as themed lectures, achievement exhibitions, and maker competitions. Some libraries provide multiple maker spaces—for example, Cleveland Public Library offers Art Lab, Studio 470, and Youth Creativity Center, combining craft creation and scientific invention spaces. Seattle Public Library's Digital Media Learning Space conducts STEM training, robot making, VR experiences, and 3D printing under one service project.

Additionally, American public libraries provide diverse technologies, equipment,

and tools, including hardware such as 3D printers, laser cutters, digital manufacturing equipment, electronic devices, and multimedia facilities, and software such as image production, audio/video editing, web design, 3D modeling, and writing/reading software. Children can use these tools to design and create creative projects, transforming innovative ideas into manufactured products.

3.6 Actively Seeking Partners While Emphasizing Talent Team Building

American public library maker spaces have diversified funding sources, including government allocations, library association funding, social welfare foundations, etc. Westport Public Library's children's maker space funding includes government, Institute of Museum and Library Services (IMLS), National Science Foundation (NSF), Nancy Jones Beer Foundation, Westport Library Friends, and crowdfunding platforms like Indiegogo and Kickstarter. Allen County Public Library partnered with maker organization TekVenture to create a maker space, alleviating financial pressure. American public library maker spaces also emphasize talent team building, configuring professional teams primarily composed of librarians, community experts, university students, excellent STEAM teachers, and volunteers [9]. Cleveland Public Library strengthens personnel construction by recruiting volunteers and hiring relevant experts and technicians to better serve young makers.

4. Implications for China

Although China and the United States differ in social background and cultural systems, American public library children's maker space service models and experiences offer valuable references for constructing and improving Chinese children's maker space services.

4.1 Current Status in China

Currently, China does not pay sufficient attention to library children's maker space services. Domestic research on public library children's maker space services is nearly blank, with few practical cases of maker spaces open to children or children's maker education and services. Typical cases include: Shanghai Jiading District Library's "Youth Innovation Space" (launched November 2016), Guangzhou Library's "Yuechuang Space" (operating since January 2017) which relies on volunteers and "Innovation Forest Maker Space" to conduct "Yuechuang Space · Little Maker" series activities for ages 3-18 [10]; Shenzhen Library's maker space, which collaborates with coding education companies to hold children's maker activities like "Scratch Programming" and "3D Projection Lamp" [11]; Changsha Library's "New Triangle Maker Space" offering creative activities for teenagers; and Guangdong Provincial Sun Yat-sen Library's "Chinese Library Children's Maker Space" (established April 2016) conducting irregular children's maker activities on topics such as telegraph assembly, 3D

printing, traffic light programming, and robot cars.

Compared with the United States, Chinese public library maker space construction and children's maker space services have the following shortcomings: (1) Late start, insufficient attention, few practical cases, and no complete development system. American public library maker spaces have developed distinctive features through years of exploration, while Chinese library maker space construction remains in the exploratory stage. Currently, only five Chinese public libraries provide typical children's maker services, with only Shanghai Jiading District Library, Guangzhou Library, and Guangdong Provincial Sun Yat-sen Library having established children's maker spaces. The earliest launched only in April 2016, with immature related technologies and business, lacking a complete children's maker space service development system. (2) Regional imbalance and insufficient momentum. Statistics show that in Europe, one in three libraries has a maker space, and among those without, 94% want to establish one and 74% hold maker activities. In China, the first library maker space was established at Shanghai Library in 2013, with children's maker services being extremely rare. The five typical cases are all in developed areas like Shanghai, Guangzhou, and Shenzhen, while less developed regions with limited talent reserves and operational capacity rarely build maker spaces, let alone provide children's services, showing significant imbalance. (3) Single service types lacking flexibility and richness. Due to the early stage of development, some Chinese libraries' children's maker activities remain relatively simple, mainly manual art creation, science experiments, and basic 3D printing, requiring improved flexibility and richness. (4) Lack of professional institutional guidance, insufficient partner seeking, and non-diversified funding. Chinese public libraries only began providing children's maker space services in recent years, without forming regular services. Some only occasionally hold activities without professional guidance, at most co-organizing with partners. For example, Shenzhen Library's Scratch programming activities for children were co-organized by a coding education company, with funding partially covered by the co-organizer and mainly relying on government allocations. Additionally, Chinese public library children's maker space services face issues such as work teams needing improved overall quality and professional competence, lack of interdisciplinary talent, and insufficiently advanced technical equipment.

4.2 Recommendations for Improvement

To address current deficiencies and draw on American experiences, the following recommendations are proposed to promote improvement of Chinese children's maker space services:

4.2.1 Emphasize Young Maker Cultivation and Construct Children's Maker Space Service Models Children's maker space services represent a new and worthwhile service model for public libraries. Construction can only be well planned, designed, and operated with attention and support from national

government and library leadership. Chinese public libraries should increase emphasis on cultivating young makers, learn from successful American cases, and build children's maker space service models that keep pace with the times, suit library conditions, and center on young users. Additionally, comprehensive space policies and regulations are crucial for maker space development, including safety guidelines, equipment safety training, staff responsibilities for maintaining safe environments, and user safety behavior standards. Libraries can develop independent policies for children's maker spaces or supplement existing general policies with regulations matching maker space daily use characteristics to effectively constrain and protect the rights and obligations of libraries and users.

4.2.2 Promote Children's STEAM Education and Creative Activities China has increased emphasis on maker education in recent years. Since 2014, the Ministry of Education has organized the China-US Youth Maker Competition, and in July 2016 incorporated STEAM education into the "Education Informatization 13th Five-Year Plan" as important content [12]. However, compared with the United States, Chinese public libraries still lag in emphasizing children's STEAM education and creative activities. Chinese public libraries should learn from American counterparts to vigorously promote children's STEAM education and creative activities, conducting STEAM-related activities in children's maker spaces such as STEAM courses, computer programming training, digital media practice, and scientific invention projects. Libraries should equip professional instructors or invite experts for regular themed lectures or training to guide children in learning STEAM, writing code, and using creativity to invent technological products.

4.2.3 Increase Publicity to Attract Girls to Technology In China, girls are more expected to study humanities and social sciences, while boys are encouraged toward natural sciences and engineering from childhood. We can learn from American emphasis on women and attention to female development in technology fields by using games and activities combining technology with girls' interests to attract them to maker activities. Libraries should provide targeted services matching girls' psychology, such as Hour of Code, STEAM skill training, coding activities, programming fashion design, and DIY crafts, guiding them to learn digital media and programming, improving scientific awareness, cultivating STEAM skills from childhood, and encouraging them to practice boldly like boys, using computer technology to solve practical problems and exert creativity to invent technological products.

4.2.4 Cultivate Children's Independent Learning Ability and Creativity In today's era of rapidly developing technology and internet, "cramming" teaching methods can no longer meet societal requirements. Chinese public library children's maker spaces should adapt to learning model transformations, emphasizing the cultivation of children's independent learning ability and

creativity by providing self-directed exploration learning environments. After providing basic skill training, libraries should guide children to use tools and technology for spontaneous, active exploration, developing independent learning and creativity to make artworks, 3D models, electronic products, and robots. Alternatively, libraries can provide old or useless electronic products for children to explore disassembly and assembly, using imagination to invent similar products. This environment cultivates children's habits of independent exploration, hands-on practice, and knowledge acquisition, improving critical thinking, problem-solving, and creative abilities.

4.2.5 Enrich Children's Maker Service Projects and Advanced Technical Equipment Chinese public libraries can learn from American experiences by designing different projects for different age groups. For children aged 3-8, libraries can conduct simple hands-on expansion or cognitive projects such as Lego bricks, toy design, and small craft making, including traditional Chinese craft projects with distinctive features like kite making, paper cutting, shadow puppetry, carving, woodblock New Year paintings, and clay sculpture. For teenagers aged 10-18, libraries can design projects expanding STEAM skills, digital media, and programming abilities, combining school knowledge in mathematics, physics, and chemistry with hands-on activities like wind turbine production, magnetic car model making, and circuit design [13]. Libraries can also conduct 3D printing, audio/video production, and scientific invention projects. Establishing online creation and exchange platforms, regularly holding various children's maker activities such as competitions, themed lectures, achievement exhibitions, and experience sharing meetings can promote maker concepts and attract more children. Additionally, Chinese public library maker spaces should be equipped with new technologies, tools, and software such as 3D printers, laser cutters, digital manufacturing equipment, and VR/AR experience devices, providing children with early access to cutting-edge technology and cultivating technological awareness and scientific skills for creative projects.

4.2.6 Emphasize Collaboration and Strengthen Talent Team Building When constructing and operating children's maker spaces, Chinese public libraries should learn from American experiences by emphasizing collaboration, actively seeking partners, applying for special funds from higher authorities, and cooperating with commercial companies, science museums, youth activity centers, creative counseling centers, and other information service institutions. Libraries should actively publicize children's maker space services to users, seek support from foundations and all sectors of society, and mobilize more makers, inventors, and creative handicraft manufacturers as volunteers. Simultaneously, libraries should learn from foreign funding experiences using social donations, government allocations, individual or group contributions, and equipment manufacturer donations [14]. Furthermore, professional teams are the greatest source of knowledge and strength for children's maker spaces, capable of providing technical guidance and training while stimulating children's innovative thinking

and incubating innovative achievements [9]. Therefore, Chinese public libraries should attach great importance to talent team building by improving staff quality and professional competence, providing technical training courses focusing on practical equipment skills and daily maintenance. Staff should be proficient in using various digital media and 3D printers, possessing strong information capabilities. Libraries should also recruit technical personnel in computer programming, 3D printing, and CNC technology, and involve social volunteers or high school students in construction and operation. As high school students are also main service targets, their participation helps libraries better understand teenagers' needs and suggestions, effectively promoting targeted service improvements.

As a new organizational form and service platform, maker spaces have become a new engine for optimizing and upgrading social innovation ecosystems, playing an irreplaceable role in improving scientific literacy and fostering innovation and entrepreneurship. They represent a rational choice for library transformation and upgrading in the new era with rich theoretical significance and extensive features [15]. Chinese public libraries can draw on advanced American experiences, emphasize young maker cultivation according to actual conditions, and jointly build children's maker space service models, enabling public libraries to fulfill their proper role in cultivating children's creativity, scientific awareness, and practical abilities.

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