

Research and Practice on the Construction of Hackerspace in Libraries

Jinyu Lv

Hanjiang Normal University Library, Shiyan 442000, China;

jiliaoyuxiang@163.com

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Abstract.

In response to the many drastic changes happening in information consumption and user expectations, forward-thinking librarians are devising groundbreaking ways to remain relevant. The paper expounds the hackerspace systematically from its conception, origin, development and significance, etc. Based on that, it explores the meaning of hackerspace in public library from the points of social function service and competitiveness the introduces and summarizes the related project cases at home and abroad. At last, it puts forward some suggestions on the planning and implementation strategy of hackerspace in the public library.

Introduction

Recently there has been tremendous interest in “hackerspace” and its potential in libraries: from middle school and public libraries to academic and special libraries, the topic seems very much top of mind. A number of libraries across the country have been actively expanding hackerspace within the physical library and exploring its impact; as head of one such library, I can report that reactions to the associated changes have been quite polarized. Those from the supported membership of the library have been uniformly positive, with new and established users as well as principal donors immediately recognizing and embracing its potential to enhance learning and catalyze innovation; interestingly, the minority of individuals that recoil at the idea have been either long-term librarians or library staff members.

Hackerspaces are interactive, multifunctional spaces for creative exploration and design, increasingly being employed in academic and public libraries to engage patrons adding value to traditional services in enjoyable, non-threatening and inspiring ways. They aid innovative learning and productive self-expression by supplying equipment including 3D printers, laser cutters, software and electronic updates, craft and hardware supplies and tools and more, in a space where people can gather to share resources and knowledge as they create, invent and learn. While coffee houses, pubs and bookstores are increasingly providing gathering spaces, there is an opportunity for the library to provide the ‘place on the corner’ where friendships, discussion and entertainment can really unify communities.

The question prompt is a verbal tool that can reveal variables associated with self-regulation, self-awareness, reflection, and reflexivity, opening a window of thought processes during the making process. Question prompts can also, if skillfully applied, provide a meta cognitive scaffold to help steer novice makers toward a critical technical practice in maker spaces. In this study, the qualitative analysis of question prompts used in maker spaces for youth resulted in a rich description of what critical thinking looks like in the context of technology practice that engages verbal tools to encourage reflection, and secondly, a set of eight activation questions that serve as a tool kit for scaffolding mindful and critical practices in community-based hackerspace for youth.

Significance of Hackerspace in Libraries

Hackerspaces inspire deeper learning and lead to better thinking through better questioning. Curiosity is a powerful tool when it comes to learning. Hackerspaces push students toward

constructing and formulating their own understanding, powered by meaningful questions and experiential learning.

Making grows enthusiasm about learning. Give a kid a worksheet, and they may fill in the blanks and master the concept, but will their eyes light up when they talk about it at the dinner table? But give a kid a challenge—offer them the chance to work with their peers, throw in a sense of competition or adventure, and see what happens! We frequently talk about instilling a passion for lifelong learning in education. Hakerspaces are a very real way to make that happen.

Hakerspaces increase student confidence. The maker movement itself is all about growth as a mindset. Failure is expected, accepted, and sometimes even encouraged. Making is about the process rather than the product, and all students are given the chance to make their own decisions and build independence. Often, it's students who become the experts in the room, giving some of our kids the rare opportunity to take on the role of teacher to both their classmates and their teachers.

Hakerspaces provide natural opportunities to collaborate. Making is a social activity, and kids are social creatures. We know collaborative skills are essential to the success of our students as they head out into the world, but teaching kids how to be collaborative doesn't always happen in a traditional classroom. Kids can only learn how to collaborate by collaborating. While making, students get to practice how to effectively communicate their ideas, how to listen with focus, and how to respond to opposing ideas and expectations. It's a very authentic way for students to learn these critical life skills.

Hakerspaces teach kids to tinker, hack, and customize. Some kids have been makers their whole lives, but others have never had the chance to discover the joy and excitement in creating. Tinkering and hacking gets kids thinking about problems and the many possible solutions. It teaches them how to hypothesize and test their theories. It challenges them to observe carefully and to imagine different outcomes. Encouraging our students to tinker and hack is gifting them with a sense of empowerment that traditional learning can't always provide. Hakerspaces help students develop resilience, determination, and grit. Making gives students a chance to look carefully at a problem, to research ways to solve that problem, and to try something and fail, only to redesign and try again. When making, students will stick with a problem and work it over and over until they're satisfied. This doesn't come naturally to every kid, and it's that sense of grit that we can use to develop resiliency in other avenues of their lives.

Hakerspace in School Libraries

Libraries have always been in the business of connecting students to learning. When we think about our library programs, our school libraries are the spaces where: Students come to engage as a learning community; Questions of all kinds are asked and answered; Learners come to construct their knowledge and understanding; New learning and exploration is encouraged.

Our students are challenged to think critically to form their own ideas and opinions. Hakerspaces open the library to students who want to discover, use, and share information beyond book discussions or research projects. Hakerspaces are simply another means to engage learners. In Lincoln Public Schools, our hakerspace initiative began with an idea. We mulled the idea of hakerspaces over in our heads, read stacks of professional journals, and talked it over with colleagues all over the country. We pitched our ideas around and developed a plan. In this case, we decided to identify and purchase portable kits that could circulate throughout our libraries and provide an introductory maker experience. From our sphere of influence, we can't build or supply or even mandate hakerspaces in our libraries, but we can give our librarians valuable experience with hakerspaces that might in turn result in investments at the building level.

Our hope is to spark excitement and a commitment to the use of hakerspaces. So we did what good makers do—we took the leap. We sought out open-ended materials that would lend themselves to creative making, thinking, and learning; things like snap circuits and bridge-building sets, LEGO bricks and animation kits, simple machines and tiny little programmable robots. We created kits that could be circulated to our libraries, and then we began telling the hakerspace story, teaching our librarians and administrators about the value and purpose of making.

We found librarians who were willing to leap with us and reinvent bits of their programs to support giving students the opportunity to design and create. It's been exciting to watch the different ways schools are building hackerspaces into their teaching and learning.

We currently have 42 hackerspace kits that circulate throughout the district. What's more exciting are the examples cropping up all over our district of library programs that are integrating making into their everyday business. At Park Middle School students come to the library during lunch recess to spend time designing and creating. Our librarian at Belmont Elementary School has built time for exploring and inventing into her daily lessons. The library team at East High School has even involved staff in learning through making during staff meetings. We are seeing kids unearth talents they never knew they had. We are seeing quiet kids become animated, and disengaged students suddenly very interested. We are tapping into a source of learning that has been underused in our educational system and it's exciting work.

A common misconception is that our hackerspaces are just for elementary students. This couldn't be farther from the truth. We believe our hackerspace kits can be used powerfully at all grade levels. Again—it's not about the materials, it's about the thinking that is prompted by the materials. Throw a bucket of blocks on a table, and tenth graders may roll their eyes. But challenge the same tenth graders to design or compete or create with those same blocks, and the learning transcends the materials. It's all about the questions we ask and the way we frame the learning.

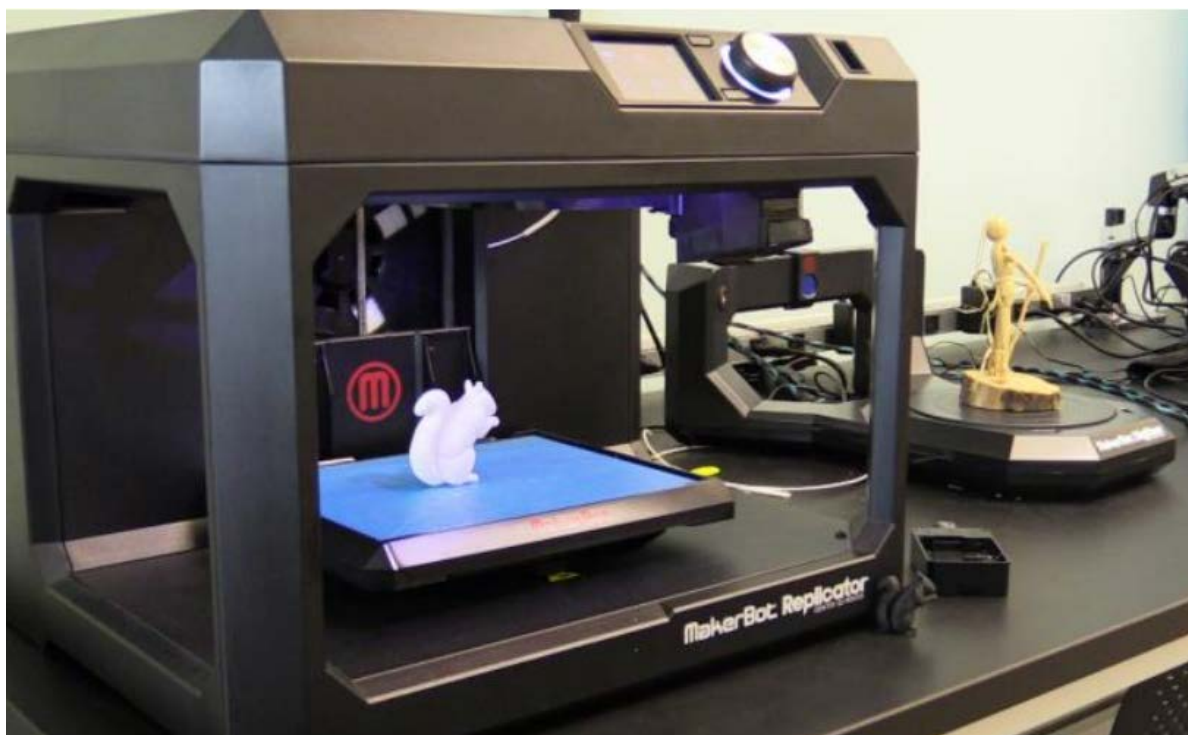


Fig. 1 A 3D model of a squirrel, part of the hackerspaces logo, sits complete in the MakerBot Replicator among other maker projects.

Council Bluffs Public Library's Adult Hackerspace

Since opening the doors of its new location in 1998, the Council Bluffs Public Library has embraced new trends and technology to give its patrons the best experience possible. Starting with a Gates Foundation computer lab in 1998 and followed by a modern young adult area known as "Teen Central," the new hackerspace is the most recent development at a library that prides itself in being on the "Leading Edge of Iowa."

For more two-dimensional projects, a Silhouette Cameo cutter and an Office jet Pro printer fill the need nicely. The Silhouette Cameo cuts much more than paper; fabric, vinyl, magnet paper, chipboard, foam and more can all be incorporated into whatever craft project one desires. The Silhouette software makes it easy to designate cut lines on user-created content, as well as providing

hundreds of free and paid projects. The space also has a Design jet, large-format printer for banners and posters.

Perhaps the most popular area with patrons is the digitalization station. Patrons can bring in personal recordings in a variety of formats, including VHS, 8-track and vinyl records, and make digital files of the audio and video recordings. Family reunions and dance recitals take on new life after decades in the closet. For family photo albums, a Fujitsu Snap Scan makes quick work of two pages at a time, and OCR software and facial recognition make pages searchable. After they are digitized, a 5-in-1 CD/DVD Duplicator burns five copies of the media at once, to hand out to family and friends.



Fig. 2 The overhead book scanner (left), sound booth (center) and turntable station (right) at the Council Bluffs hakerspace.

High-end Apple computers with the full Adobe Creative Cloud give any patron the ability to be their own photographer. Patrons have come in with their children to use the green screen for hilarious Christmas cards, including one family transporting themselves to Tokyo in winter, with a cheerful Godzilla photo bombing them.

Also provided is a soundproof recording booth, microphones and a mixing board for budding musicians and podcasters. Also included in the Hakerspace is equipment for checkout. High end DSLR cameras, GoPro action cameras and a professional grade camcorder are all available for patrons to take home with them for five days at a time. Perhaps the most exciting adventure for one of the library's GoPro cameras so far was a zip line ride on the chest of a patron's son, but they attach securely to bicycle handlebars, helmets or anywhere else a creative adventurer might want to record from.

For the younger patrons who find their way in, the Hakerspace has a full complement of LittleBits, as well as a supply of LEGO Mind storms pieces. LittleBits are designed to teach basic wiring and circuitry without the need for welding skills. Pieces are magnetic, and can only fit together in a way that works electronically, and cards suggest simple projects such as adding a switch or a buzzer, and why each piece works the way it does. LEGO Mind storms show how basic robotics work, with plenty of projects at both beginner and more advanced levels of proficiency. Classes have generally been well-attended, with favorites including the Silhouette Cameo Christmas cards class and Christmas ornament design with the Makerbot. With more equipment and more software to use, classes have become much more varied and have attracted patrons who have never come to a computer class at the library before. Housed next to the computer lab on the second floor, the Council Bluffs Public Library Hakerspace provides patrons with technology that most do not have access to at home. Aimed at adults, but with plenty to keep teens and grade scholars busy as well, the hours pass quickly working on projects that would be unthinkable with just the supplies around the average home.

Conclusion

In this paper, it expounds the hackerspace systematically from its conception, origin, development and significance, etc. Based on it, we explore the meaning of hackerspace in public library from the points of social function service and competitiveness, introduce and summarize the related project cases at home and abroad. At last, it puts forward some suggestions on the planning and implementation strategy of hackerspace in the public library.

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