# STEAM: Science and Art Meet in Rural Library Makerspaces

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**Abstract**

Public libraries around the world are adding collaborative creative spaces, often known as makerspaces, which facilitate hands-on activities with digital and electronic tools such as 3D printers and soldering irons, as well as more traditional tools, such as sewing machines and wood working materials. Many makerspaces incorporate art with STEM (Science, Technology, Engineering and Mathematics) to create a STEAM-charged participatory culture that encourages people who were not previously inclined to code or solder to interact with science and technology in ways they had not before. This poster synthesizes three qualitative studies, one of which is ongoing, using grounded theory methods to build a picture of makerspaces in rural public libraries from the perspective of the users and librarians.

**Keywords:** makerspaces, public libraries, access, intellectual freedom

## 1 Introduction

Public libraries around the world are adding or considering the idea of collaborative creative spaces, often known as makerspaces. These spaces facilitate hands-on activities with digital and electronic tools such as 3D printers and soldering irons, as well as more traditional tools, such as sewing machines and wood working materials. Many makerspaces incorporate art with STEM (Science, Technology, Engineering and Mathematics) to create a STEAM-charged participatory culture that encourages people who were not previously inclined to code or solder to interact with science and technology in ways they had not before. Only one study has explored public library makerspaces thus far (Slatter & Howard, 2013), and more exploration is needed to understand the uses and impacts of such spaces, as well as how they align with more traditional library services.

## 2 Method

This poster synthesizes three qualitative studies of public library creative spaces. Using Vaughan's (1992) theory elaboration methods, each study builds on the other, though the units of analysis, participants, and research methods vary. The studies' research questions overlap to explore different perspectives of the makerspace experience.

The studies include:

- An ongoing ethnographic exploration of how users of a rural library makerspace interact with tools and each other. This study asks how users ages 12 and older understand and use makerspaces, and explores their feelings of creativity, agency, and social capital.
- An interview-based study of librarians in eight small Wisconsin communities explores their reasons for planning or adding makerspaces services. This study asks librarians how they position makerspace services in terms of intellectual freedom and access.
- A content analysis of six limited life histories (Barnhurst, 1998), of makers ages 12 and older who have used library makerspace equipment or participated in arts programs, describing their memories

of making things. This study asks how makers experience creativity and how they position public libraries in their creative lives.

The data from each phase has been analyzed using Charmaz's (2006) constructivist grounded theory methods. The results present an emerging view of libraries as innovative creation spaces, even in the smallest communities, and describe a mandate for facilitating participatory engagement with ideas and knowledge-building.

## 3   The Literature

The theoretical perspective of intellectual freedom and access to knowledge ground this study in Library and Information Studies (LIS), as well as in the disciplines of education, communication, and art, a few of which are highlighted here. Ribot and Peluso (2003) frame access as both the ability to interact with things as well as the social relationships and processes that allow a person to derive opportunity benefits. This is a positive perspective of intellectual freedom and access, the flip side of the coin of the negative justice concept that opposes censorship, as is operationalized in the ALA's Library Bill of Rights.

The digital divide literature also touches on the need for access that is based not only on equipment or bandwidth, but on the networks that make the use of digital tools possible (Chen, 2013; Warschauer, 2002). These system-based concepts of access intersect with the systems theory of creativity (Csikszentmihalyi, 2009), participatory culture (Gauntlett, 2011; Jenkins, 2009), and the STEAM model of contextualized learning (Boy, 2013; Madden, et al, 2013). The concepts of library-as-place and social capital are relevant as well (e.g. Britton & Considine, 2012; Charmaraman, 2013; Vårheim, 2009).

## 4   The Themes

The sorted data from the three studies falls into four broad categories (affordances, social interactions, instrumentality, and access), broken down here into twelve themes that show how the patrons, library staff, and the tools and space itself interact to co-construct the experience of public library makerspaces.

### 4.1   Tools & Space

DISPLACEMENT: Enabling new skills to displace old, by using digital tools to create
AFFORDANCES: Erecting or opening boundaries around the possible uses of the space and tools

### 4.2   Librarians

ACCESS: Offering another way to access information, allying this access with the mission to ensure intellectual freedom
ENGAGEMENT: Encouraging community, social, and creative engagement with library, each other, and technology
RELEVANCE: Marketing library as technologically leading-edge, and demonstrating relevance in users' lives
INSTRUMENTALITY: Offering pathways to economically valuable skills, civic engagement, other goals "more important" than making

### 4.3   Makers

COLLABORATION: Sharing knowledge, revealing hidden talents, bringing together disparate groups and institutions
SURPRISE:  Finding the only outlet for creative activities outside one's home in an unexpected place, enjoying a new perspective of library possibilities
CREATIVITY: Describing a joy in the process of creating and sharing, which "makes life worth living"

MATERIALITY: Working with one's hands, "turning ideas into physical things," responding to a feeling of alienation from technology

DISCOVERY: Learning new things that one would never have otherwise tried, from soldering LEDs to cooking new types of food

AGENCY: Having power over the things and processes in one's life, feeling able to impact one's community and library

## 5    Discussion of Key Findings

### 5.1    Access

Participant in all three studies framed their interaction with the makerspace in terms of access. Patrons say they could not otherwise access the tools or community they enjoy, without the library providing it freely. One maker described the distinction as providing access not to the old "grocery store" model of libraries, but as a "kitchen," where knowledge was as readily created as consumed. Librarians considered the provision of access to knowledge as an intellectual freedom and social justice issue. Instead of leveraging the intellectual freedom mission to oppose censorship and ensure access, these librarians actively facilitate access to tools and knowledge as a social justice issue. This finding has implications for LIS scholarship and policy.

### 5.2    Social Spaces

All participants described the makerspace as a social space where makers could share the discovery process, support each other, and engage socially. Residents of small rural communities described few opportunities to gather, to learn from one another, or to work together. Makerspace tools, while interesting and exciting, were often considered less important to the act of collaborative creation and knowledge-building. This finding has implications for funders or policy-makers who might otherwise focus on the technology instead of the social interactions at the heart of these spaces.

### 5.3    Instrumentality

Some librarians spoke to the educational or economic impacts of offering high-tech makerspaces, including luring businesses in with opportunities to prototype designs, marketing the library as tech-savvy, or attracting people that would never enter the library otherwise. In fact, patrons expressed surprised pleasure in the role of the library as creation space. Some only came to the library to use the makerspace. While patrons also noted that interacting with the makerspace could allow others to learn useful skills for jobs, they focused more on their enjoyment in their personal use of the space. This finding describes the alignments and discontinuities of how stakeholders envision the impacts of the library differently.

### 5.4    Diving in

Study participants described an exhilarating sense of "diving in" and trying things outside their comfort zones, along with an attendant sense of agency and power. Users, especially women, who participated in a soldering workshop, expressed a new empowered relationship to electronics. That said, not everyone engaged with the spaces equally, with females preferring to add new technology-based skills by incorporating them into more traditional craft skills, as with e-textiles.

The affordances of the spaces interact to allow some activities while prohibiting others. For example, the use of a makerspace by one age group may preclude use by other age groups, and privileging high-tech tools may marginalize those who prefer to use more familiar technologies, while rules about quiet or mess may act as barriers to engagement. Librarians played a critical enzymatic role in cultivating a culture of play, intergenerational sharing, and willingness to fail, which helped patrons who were more hesitant to try

new things. This finding offers insight for practitioners as they plan and implement their spaces, especially in terms of promoting participatory culture in the library.

## 6    Conclusion

A librarian said,

> Magic is what the library needs to do … Neil Gaiman [said] … if he could write something on the wall of every library … he would just, in the children's section, write "And then what happened?" He was talking about that magic of the imagination and the spark. I think that having something material really makes it magic. It's less like "Yeah, I'm imagining something," and that's great, than "I have this thing in my hand now that wasn't there 20 minutes ago."

The initial results of these studies show that when small libraries offer potentially disruptive technologies such as 3D printing, magic can happen. However, makerspace tools alone are not enough. Librarians play a key role in creating a culture of engagement with the makerspaces and between patrons. The affordances of the space, policies, tools, and programs encourage users to try the tools of production and participatory culture to which they would otherwise have no access or, sometimes, interest. These tools need not be expensive or high-tech to support access to knowledge.

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