

THE BUBBLER AS SYSTEMWIDE MAKERSPACE: A DESIGN CASE OF HOW MAKING BECAME A CORE SERVICE OF THE PUBLIC LIBRARIES

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In this article, we introduce the case of a makerspace program that provides a *systemwide approach to making* rather than a singular face-to-face or online place. This makerspace, called Bubbler, extends across a public library system of a mid-sized Midwestern city (Madison, Wisconsin) and incorporates nine neighborhood libraries and numerous community spaces. Since 2011, Bubbler has come to be known as a physical place, a series of programs, and an approach to working with patrons of all ages. We aim to chronicle the development of Bubbler, describe its core features, provide examples of these features in action, and discuss victories and challenges associated with designing a systemwide makerspace in public libraries. We conclude by asserting that the library now includes making as a core service based on a model of diversity and inclusion that aligns with the basic tenets of public libraries.

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INTRODUCTION

This special issue presents a range of design cases of makerspaces. Our case is unique in that the makerspace itself is distributed across places, people, tools, and time and aims to develop an ethos of making that is diverse, inclusive, and citywide. Furthermore, the work is situated within the public libraries, an interesting context for thinking about the design of learning environments. Unlike many formal and informal educational institutions focused primarily on youth, the library is committed to lifelong learning. Thus, the range of circumstances that can be more intentionally designed towards learning and questions of who is privileged as a learner are expanded. This aligns with a commitment to knowledge as distributed across tools, time and people (Salomon, 1997) which, in this case, includes patrons as well as staff, guest artists and makers. In this design case, we highlight the ways in which Bubbler has experienced organizational, programmatic, and instructional shifts intended to create a better learning environment for all involved.

MAKERSPACES AS LEARNING ENVIRONMENTS

Research on the Maker Movement in education has exploded over the past five years and includes designing and understanding makerspaces as learning environments (Halverson & Sheridan, 2014; Martin, 2015; Peppler, Halverson, & Kafai, 2016). Makerspaces are defined as, "informal sites for creative production in art, science, and engineering where people of all ages blend digital and physical technologies to explore ideas, learn technical skills, and create new products" (Sheridan et al., 2014, p. 505). Informal sites include standalone makerspaces, museums, community centers, libraries, and environments within more formal schooling. Some of the earliest case studies of makerspaces describe unique features such as side-by-side multidisciplinary and a diverse set of learning arrangements that distinguish makerspaces from other informal learning environments and participatory cultures (Sheridan et al., 2014). Subsequent case studies have focused on the specific features of different kinds of environments including museum-based makerspaces, community makerspaces,

online makerspaces, and the development of makerspaces in schools k-16 (Litts, 2015; Pepler, et al. 2016).

One of the core challenges to the design of successful makerspaces that aim for equity and access is developing a diversity of entry points, participant structures, and leadership models. While the promise of the Maker Movement has been as a fundamentally democratizing way to create, learn, and share (Anderson, 2012; Hatch, 2013), critics have identified myriad ways in which this promise goes unfulfilled. Making is often characterized by a “hacker culture” ideal dominated by white, middle-class males (Blikstein & Worsley, 2016; Brahm & Crowley, 2016a). Specifically, the contributions of women of all ages and communities of color are often devalued (Buechley, 2013; Kafai, Fields, & Searle, 2014; Vossoughi, Hooper, & Escudé, 2016). Mainstream media also perpetuates a limited view of what counts as maker activities, focusing on product over process, and valuing “innovative” products that primarily fit comfortably within a culture of affluence (Blikstein & Worsley, 2016; Sivek, 2011). Making within the Maker Movement can lack attention to issues of culture and history (Ames & Rosner, 2014; Blikstein & Worsley, 2016). As Vossoughi et al. point out, there are embedded cultural expectations and socioeconomic associations in “seemingly neutral making activities (such as 3D-printed catapults or night-launch rockets)” (2016, p. 214). Moreover, those who identify with the maker movement may—however unintentionally—act as cultural or intellectual gatekeepers invariably leading to tensions of “assimilation and cultural self-denial consistently navigated by working-class youth and youth of color” (Vossoughi et al., 2016, p. 214). While many authors and practitioners seem interested in the integration of the Maker Movement in education, critiques flag concerns about the inclusivity of the movement proving that there is much work to be done in realizing the promise of making as a set of democratizing practices that offer learning opportunities for diverse communities.

Making and Makerspaces in Public Libraries

Public libraries have long been known as spaces that promote inclusivity for all: they are free, public, and aim to provide their communities with access, information, and assistance. In recent years, public libraries have extended this ethos to makerspaces. The Institute of Museum and Library Services has provided leadership through continuing education initiatives such as the ILEAD project (“Innovative Librarians Explore, Apply and Discover”) and by funding “21st Century Learning Labs” resulting in the creation of makerspaces and maker programs at libraries nationwide. Case studies focus on the benefits and challenges of implementing makerspaces in public libraries (e.g., Bagley 2014; Burke 2014; Moorefield-Lang 2014). Specifically, these studies indicate ways public library makerspaces address access issues: (a) provision of materials and tools that are otherwise unavailable (Bagley 2014; Fourie & Meyer 2015);

(b) access to knowledge, resources, and technologies (Burke 2014; Honey & Kanter 2013); and (c) facilitation of community partnerships (Willett, Lakind, & Halverson, under review). Many authors explicitly align makerspaces with the mission of public libraries regarding education and access to information and resources (see Willett, 2016a). Public library makerspaces are also described as a way of promoting economic goals, such as bridging information divides and supporting STEM skills and job readiness (Bagley 2014; Burke 2014; YALSA 2014). While some research documents tensions between non-economic and economic aims of library makerspaces (Barniskis, 2015; Lakind, under review), much of the literature in the field suggests that public libraries are well placed to consider democratization through access and diversity in makerspace programs.

THE CHOICE TO DEVELOP A SYSTEMWIDE MAKERSPACE

In 2011-2012 Madison Public Libraries (MPL) garnered public support for the remodeling of the largest branch library in the city (Central Library), promising to create “a library transformed for the 21st Century” (MPL, 2011, p. 8). At the same time, the teen services librarian teamed up with library supervisors and staff to develop a media lab; they secured funding from a local foundation for stop-motion animation equipment and a part-time instructor. A pivotal trip to visit a local cooperative makerspace led to a program built around people rather than dedicated to equipment. In the words of one librarian, “Why would the library buy a 3D printer when they could hire someone to bring one over *and* teach a course?” The goals soon included programs for patrons of all ages, now called *Bubbler*. In Wisconsin, water fountains are colloquially referred to as bubblers, so this name reflects the commitment to locality, cultural relevance, and a metaphorical bubbling up of creativity already present in the city that the library hoped to harness and support.

When Central Library closed for remodeling, a library assistant, who was also a practicing artist, asked to “throw a party” in the empty building—an event MPL called *Bookless*¹. The term *Bookless* was literal; the building was empty and represented plans to highlight the “changing role of libraries” partially by moving away from the definition of library-as-books. During that same year, the Library Board passed a new MPL vision: “Your Place to Learn, Share, and Create” (MPL Strategic Plan, 2012). *Bookless* solidified connections with artists and gave the library confidence that maker programming was worth the effort.

1. *Bookless* took place on Jan 28, 2012. From the patrons’ clear indication of excitement and appreciation, hype from the press—and head-count—it was clear that *Bookless* was a hit. This invigorated internal commitment to finding a way to capture and maintain this energy, creativity, and the elusive demographic that had attended: young adults and what the MPL director calls “creatives.”

Fueled by the success of Bookless (over 5,000 people attended), MPL aimed to embrace the “create” component of their vision by rebuilding the physical library space with ways to encourage patrons to think of the library as a place for making. The organizer and visionary behind Bookless was appointed “Head Bubblerarian,” manager of spaces and programming related to MPL’s maker initiatives, alongside the teen services librarian who had prior experience designing library maker programs. Two meeting rooms were repurposed: (a) a server closet became the digital “Media Lab” with computers, a green screen, and a sound studio; and (b) a meeting room became the “Bubbler Room,” revamped for people to engage in artistic making, with a sink, drains, easy-to-clean flooring, big glass windows, and moveable furniture including tables that can be lowered or raised². Bubbler design choices are indicative of the initial goal to attract the “elusive 20 and 30 somethings” who rarely used the library. It was meant to signify “creative,” “new,” and “cool.” While the newness inspired excitement, to some, it implied a disregard of past programs (Willett et al., under review) as children and youth services librarians had long provided hands-on activities.

At this point, Bubbler also focused on branding, through logo design (see Figure 1) and social media. Work began on a website, distinct from the library’s, that could attract new patrons and share resources and documentation (see <http://madisonbubbler.org>). These designs have become integral to the Bubbler brand and provide a starting point for ongoing conversations about how to expand beyond the initial target demographic. Design is always a normative process, components are prioritized and selectivity is necessarily exclusionary. Thus, the logo cannot cater to all demographics at once. One of the moves to address this has been to continue to use the logo while inviting new designs for Bubbler Junior (programs aimed at children school-aged and younger) and Teen Bubbler. Artists and patrons have also been encouraged to make their own logos that resonate with their aesthetics (see Figure 1).

In 2013, library managers began to carve out more comprehensive goals to have “highly visible, culturally relevant systemwide programming,” expand Bubbler to all library locations, and expose patrons to a variety of local experts to



FIGURE 1. Logos, Bubbler, Bubbler Jr., and Logo designed by a teen artist.

promote a culture of content creation. This would become a continued conversation full of tensions and pluralities about program goals and vision, which circle around recurring themes of creativity, learning, and diversity. What formed in MPL was the marrying of the Head Bubblerarian’s vision with a team of managers and librarians who understood the landscape of public librarianship. Bubbler emerged as a hybrid arts-based maker program stretched across nine libraries and numerous off-site locations.

As of the writing of this article, Bubbler has four dedicated staff, one librarian with a 30% Bubbler appointment, Bubbler “Reps” from each library (0% Bubbler appointment), multiple interns, and a programming budget of \$60,000 annually³. The Bubbler is also part of a design-based research collaborative of library staff and university researchers, including the authors of this piece (see The Presence of a University Partner section). Though it is identified as a living document, the vision and mission of Bubbler currently aims “to foster creative expression amongst people of all ages” and act as “a community access point for hands-on making, art creation

2. While we know from the design of makerspaces in museums that having materials and tools visible and available is crucial for innovation and creativity (Brahms & Wardrip, 2014), additional constraints exist in a public library. Since it is a free and open space, closets and drawers that lock were a requirement for design. This is necessary both to protect the artists’ and makers’ work and for the safety of patrons who may not be familiar with the range of making tools available.
3. While it is difficult to determine the full budget, because many operating expenses are integrated into the MPL system, we estimate a total annual budget of \$375,000.

and appreciation, and engagement with digital and analog technology.”

Rather than walk through the evolution of Bubbler from 2013 to the present, we will discuss thematically three core design features that have emerged from the creation of a systemwide approach to makerspace design. We call them “design features,” because we believe these ideas shape and enable the possibility of thinking at the systems level, across time and place, and could be of use to future research-practice partnerships that aim to build makerspaces systemwide. In the following sections, we focus on these key features:

- The presence of *multiple constructions of diversity*, often simultaneously;
- The importance of *external partnerships* particularly bringing different partner groups together at the same time; and
- The specific *structural features* that mark a commitment to a systemwide perspective that can be absent from loosely coupled systems (e.g., Boyd & Crowson, 2002).

We will describe each of these emergent features, often discussing development over time with examples of each feature in action.

MULTIPLE CONSTRUCTIONS OF DIVERSITY

Diversity has been a core agenda item since Bubbler’s inception in 2013 and a regular topic of conversation, writing, and design. But what does “diversity” mean in relation to Bubbler? In meeting notes, MPL defines diversity in terms of serving populations that are socioeconomically disadvantaged and “underserved,” including “at-risk children and their families; college students and young professionals; empty nesters and seniors; new readers; and technology leaders” (MPL, 2012). Data collected as part of our research demonstrates that teams of managers, administrators, and librarians have engaged in talking through multiple conceptions of diversity that expand beyond patron demographics. In design, rather than trying to narrow what diversity might mean to Bubbler, we find that one of the values of a systemwide space is that *multiple constructions of diversity can be attended to simultaneously* and that these multiple conceptions are part of what keeps the system productive. Unsurprisingly, creating space for different constructions of diversity seems to create diversity—diversity of people, programs, and therefore definitions of what counts as making and who counts as a maker.

Case Example: Artist-in-Residence Program

As a brief example of how intentional designs for multiple constructions of diversity have developed, we describe the artist-in-residence program. First and foremost, this program strives for diversity through accepting a range of artists who use different mediums and tools and can share different artistic processes and practices. The goal is to expose patrons

to various art-making activities and opportunities to see into many arts practices. Beginning in 2013, an artist or a group of artists has set up shop in the Bubbler room for one to three months at a time to make their own work and to offer workshops to patrons. This is a public-facing residency; glass walls mean that people are always coming in to talk to the artists and observe their process. Much like the importance of visible tools and materials in makerspaces to promote creativity and learning (Brahms & Wardrip, 2014), the walls allow for a visible process. When Bubbler began, the identity, culture, and design of the programming were heavily influenced by these artists.

The initial lineup of artists-in-residence was selected by the Head Bubblerarian from his already robust local network of artist-peers. Given the focus on multiple constructions of diversity, Bubbler moved quickly toward an open, accessible application, a juried selection process, and to promoting and recruiting to attract a diverse array of applicants. This included outreach in other parts of the city, as well as visibly displayed signs around the libraries encouraging anyone who wanted to apply. It also meant clearly stating what the aims of the program were so that people could apply with an understanding of expectations. This design responds to a social capital model which favors word of mouth, insider knowledge, and smaller, often less diverse, networks.

One of the outcomes of valuing multiple perspectives on diversity is that there is less of a need to define what is meant by “diverse.” Instead of attending to broad categorizations to identify commonalities across a range of individuals, the goal is to see many possible paths towards diversity. These pathways challenge whose notions are privileged and provide structures for participation and feedback. If diversity is defined in terms of cultural relevance, someone can always ask “relevant for whom?” When diversity is defined in terms of making as a democratizing force, someone can ask, “whose definition of making?” More voices mean more answers. In elucidating diversity as a fluid concept, it seems that articulating program goals in relation to diversity and thinking more broadly about diversity can lead to more inclusive programming. For example, we interviewed one librarian who was unhappy with the artist-in-residence program, wanting greater cultural diversity represented in the artists. She attended Bubbler meetings where representatives were encouraged to provide critique, feedback, and suggestions. She then actively recruited at a local event for Hispanic artists, and as a result, Bubbler offered targeted programs to Spanish-speaking patrons.

As the program respects visions of anyone involved, the direction can change depending on who is around. While the program is more able to design towards diversity and remain responsive to circumstance and opportunity, sustaining Bubbler as a fixed programming model with a steady stream of regular programming is not the goal. Thus, tensions are



FIGURE 2. An example of ARTInside Installation.

not navigated with prescribed models but through pathways for collaboration, conversation, and compromise. Even though dialogue takes time, keeping those with competing perspectives in the conversations is of utmost importance.

THE IMPORTANCE OF EXTERNAL PARTNERSHIPS

The Bubbler has thrived in large part because of the partnerships that have been built with a range of organizations. Bubbler serves as a hub to bring multiple partners together to create a network harnessed to support intersecting and overlapping missions. In this section, we describe partnerships with community artists and organizations as well as with the research university—all of which are instrumental in the design and implementation of Bubbler. We briefly describe each of these partnerships and then discuss Bubbler’s Making Justice program as a paradigmatic example that engages multiple partners simultaneously.

Partnering With a Variety of Community Artists

Unlike schools where teachers often maintain their status as the sole adult expert in a room of younger learners, community arts organizations ascribe to a distributed model of teaching and learning that stretches across people, tools, and time (Halverson, Lowenhaupt, & Kalaitzidis, 2015). Bubbler has embraced this distributed model of instruction, calling on artists to serve as facilitators across the range of places, patrons, and programs that comprise the makerspace. Knowing that many professional artists have not served in instructional roles, Bubbler designed supports for artists who have limited experience in teaching. These supports include reflective worksheets before, during, and after residency; one-on-one support for developing workshops; a training session for the facilitation of maker activities; and

gatherings for new and returning community artists and artists-in-residence to connect. This provides space for artists to share experiences, failures, and successes in the program.

Community artists have stepped into all the places that Bubbler calls its makerspace. Take the example of a community artist who goes by the name USgathering and does sculptural work using recycled materials. Weeks before workshops began, bins were placed in locations citywide advertising the need for materials including Tetra Pak packages and 100,000 metal pop-tops. USgathering then offered workshops in Spanish and English to all age groups at several library locations to collectively make installations displayed throughout the buildings. The artist also did an 8-week Bubbler residency housed at the Dane County Juvenile Detention Center. During this residency, teens worked with the artist and Bubbler staff to transform the empty spaces of the detention center, creating site-specific installations (see Figure 2) that were developed by the group using their inorganic debris, such as juice cups, milk cartons, and cereal containers. This artist is typical of Bubbler, crossing over programs and continuing work with community organizations after the official Bubbler program has ended.

The Presence of a University Partner

In addition to the community artists and organizations, Bubbler has partnered with the major research university co-located in the city. The partnership was small at first; in consultation with a university professor who has expertise on the Maker Movement in education, the Bubbler team received an “Our Town” grant from the National Endowment for the Arts (NEA) for 2013-2014. NEA funding, coupled with matching dollars from the city and private donors, provided seed money for Bubbler programs, including staffing costs. The collaboration deepened when a team of Bubbler staff,

university professors, lecturers, graduate students, and MPL leadership worked together on three different grant efforts, totaling over \$600,000 in funding from federal and university sources. These grants all required research-practice partnerships, where collaborators were expected to design and realize programming and conduct research on the range of practices. The grants provided time for discussions and interventions, and monetary support for a multitude of endeavors.

The Institute of Museum and Library Services (IMLS) National Leadership Grant, which began in January 2015, led to many of the decisions described in this article, such as the development of the vision, the facilitation supports for artists, and the structural features discussed in the next section. Because the grant required program and research activities, the processes co-evolved iteratively with attention to reflexivity in research (Maxwell, 2013). A design-based research methodology allowed the research team to create new interventions, study the impact of those interventions, iterate on design choices, and for the design choices to inform our understanding of how people learn (e.g., Barab & Squire, 2004). The partnership was inspired by Gutiérrez and Penuel's (2014) depiction of successful, rigorous design-based research in education as demonstrating "relevance to practice." The research-practice partnership is grounded in reciprocal work aligned with the design philosophy for Bubbler, which honors multiple viewpoints within a supportive structure. The collaborative team has worked on the following:

- Developing programs at all scales, from becoming a Maker Education Initiative summer Maker Corps site to making decisions about how to hire artists-in-residence;
- Engaging national leaders in the academic and the library worlds for mentorship, feedback, and advice; and
- Creating sustainability of staffing, programming, and space beyond the life of these start-up grants.

The research-practice partnership has been marked by the use of meeting and dialogue as a method for engaging in jointly negotiated activity (Bevan, Gutwill, Petrich, & Wilkinson, 2015). Additionally, the research team collaborated by (a) facilitating professional development workshops with staff; (b) utilizing research findings to shape future practice; (c) holding one-on-one meetings about learning goals and assessment practices; (d) hosting a community of practice for artists and teachers to learn about maker pedagogies; and (e) providing direct input on various designs, such as the artist-in-residence program. From the research perspective, learners included librarians, artists, staff, and volunteers, as well as patrons. This allowed the project team to engage in a collaborative design process connected directly to learning and practice for all.

Case Example: Making Justice Partnerships

Led by the Bubbler teen services librarian and through the development of partnerships with makers, community organizations, and the university, a suite of programs has come to be known as "Making Justice." These projects began in Fall 2014 with programming designed to connect court-involved teens with artists, activists, and university students and faculty. Making Justice focuses on culturally relevant pedagogy for youth negatively affected by the achievement gap, poverty, and racial injustice (see <http://teenbubbler.org/programs/making-justice>). Making Justice started as a partnership between MPL, the university, two county programs, and a non-profit group working with children and teens in the area. These partnerships have continued to provide a range of programs in the public library, a temporary juvenile detention center, a court-run shelter home for teens, a neighborhood crime intervention program, and numerous field trips to offsite locations. Programs include cooking, sewing, designing a personal brand, creating graphic and 3D art, and producing music.

In the first years of Making Justice, the university faculty member helped run sessions, brought in community leaders and artists, and involved university students in the program—thus expanding existing Bubbler programs the teen services librarian had been offering prior to 2014. In addition to weekly programs, Making Justice developed its own artist-in-residence for the Juvenile Detention Center and the Juvenile Court Shelter Home to provide more culturally relevant programming. For example, in line with the aim of providing relevant making experiences, a textile artist helped teens in the Shelter Home make backpacks and pillows using a variety of printed fabrics including ones referencing media cultures (see Figure 3). These projects were popular in the Shelter, partly because teens made objects that they could keep in their temporary accommodations, use in their everyday lives (backpacks were particularly useful as a private space to store their belongings), and/or give as gifts to family and friends. Although funding was initially for two years, the project continues through existing Bubbler funding, a small grant from the University, and through the structures and community connections initiated during the initial grant period.

STRUCTURAL ELEMENTS THAT MARK THE SYSTEM

As a result of the work described in the previous two sections, several structural features have emerged as hallmarks of Bubbler that are unique to this makerspace approach within the library system. These features have developed in response to the often-competing demands for multiplicity and clarity. On the one hand, the conversations about diversity and making demonstrate that the Bubbler community (staff, patrons, artists, collaborators) value multiple



FIGURE 3. Backpack made during Making Justice.

perspectives and strive to engage in the kinds of social design experiments that are, “subject to revision, disruptions, and revisions. . . [and] that open-up new pathways and social futures for youth, particularly, youth from nondominant communities” (Gutiérrez & Penuel, 2014, p. 20). On the other hand, Bubbler staff across the Libraries struggled with the lack of programmatic structure and wanted more direct guidance around who, what, how, and when. The resultant features aimed to capture this tension and to afford multiplicity while providing structure.

The Bubbler Reps

The Bubbler Representatives group formed to ensure that every library would have someone to coordinate Bubbler activities and to enable more locally relevant programming. While many of the staff were eager to develop Bubbler programs and connect to makers in their neighborhoods, funding was the only resource provided to them. This left Reps tasked with devising and implementing programming without adequate support structures to do so.

Interviews conducted with Reps 18 months after Bubbler’s launch showed they were not entirely clear about the goals or scope of Bubbler. While the lead Bubbler staff decided—intuitively—what fit with Bubbler, the new team members were not clear about what constituted making as defined



by Bubbler. Programs featuring experts outside of the arts in STEM, for example, led to questions about what kind of making was valued in the program. Reps also had questions about defining Bubbler as any program featuring making, or limiting Bubbler to programs that featured making with outsiders or “experts.” Was programming about the activity or the facilitator? For example, a guest teaching sewing is Bubbler, but what if a librarian also happens to know how to teach sewing? Is that maker activity a Bubbler program? It quickly became clear that the Reps’ position had to be accompanied by more time, support, and an understanding of the scope of Bubbler.

Core Bubbler staff had voiced the desire to have Reps embrace their own vision for programming in their specific location, but Reps felt they lacked either the time, the staffing, or the expertise to do so. Core staff began to create programming for the local Reps. While this new approach was logistically successful, it seemed to lack attention to neighborhood needs. As a compromise, Reps were invited to give regular feedback on centrally-designed programs so that what is offered continuously reflects the needs of local actors without putting the full burden of design and implementation on the Reps from specific libraries.

The Menu

Many current Reps are youth services librarians, selected because of prior experience with hands-on programming and paid time for planning. Based on an existing model of programming, and to ensure easy implementation of workshops across the system, the Reps asked for a menu of suggested facilitators, letting them choose artists recruited and vetted centrally. The menu, sent out seasonally, provides descriptions of programs Reps can select. The menu serves a few functions. First, it ensures a more equitable distribution of programming not reliant on library staff's time or expertise. Some staff already see themselves as skilled makers, and their libraries are rich with programming including Minecraft clubs, audio recording, and craft arts. Others feel intimidated by the maker moniker and/or are unable to take time away from other duties. The menu ensures that those who do not have the interest or time can provide their patrons with maker programs. Second, the menu offers increased opportunities for artists and presenters who are already part of the Bubbler community to continue their relationship; and the menu generates a broader array of programs, including more crafting, STEM, and digital programming. Through the menu, a more diverse range of makers are facilitating workshops because (a) it does not require the maker to be an artist, (b) it is far less competitive than becoming an artist-in-residence, and (c) it supports more amateur makers and facilitators in creating one-off workshops that can be repeated in multiple locations.

Case Example: Maker Corps and Maker Kits

In summer 2016, Bubbler was chosen as a site for Maker Corps, a professional development program run by the Maker Education Initiative that combines online training with hands-on practice to create maker programming within youth-serving organizations (see <https://makered.org/makercorps>). Participation in this program meant committing to hiring two part-time artist-educators to create and deliver both drop-in and sustained programs in the Bubbler Room, at all the libraries, and at several outreach sites around the city. To ensure that programming was (a) doable for these two part-time employees, (b) equitably accessible by all the communities the programming aimed to serve, and (c) aligned with maker learning goals, Bubbler staff and Maker Corps members created nine different Maker Kits that they deployed in rotation at all the sites. The kits represented a range of making activities. Some kits were built from already existing Bubbler workshops; the "sock monsters" kit, for example, is a simplified version of a workshop designed by a former artist-in-residence. Other kits were designed from popular maker activities that had not been in regular rotation at Bubbler, including MaKey MaKey and circuit blocks built in-house.

Maker Corps members used the kits during drop-in times at all nine libraries and ran more organized programs at several

outreach sites. The drop-in times at the libraries functioned similarly to maker programs within museums where patrons are invited to tinker with available materials alongside more expert facilitators (Bevan et al., 2015; Brahms & Crowley, 2016b). This programming often took place in open library spaces to address barriers to participation that come from the literal and figurative walls that separate spaces allocated for programming, where a patron must decide to enter from open spaces. Unlike museums, which require makers to pay admission fees to access tools, materials, and processes, the libraries' tradition of free access treated maker kits as community resources. In the Maker Corps program, library regulars engaged in making and tinkering as did summer program groups and families that came specifically to work with the new materials and tools. The outreach programs continued into the school year, and the kits were available for librarians and Bubbler Reps to "check out" and house temporarily at their libraries.

HOW THE BUBBLER HELPS US BETTER UNDERSTAND MULTIPLE CONSTRUCTIONS OF DIVERSITY IN DESIGN

In this section, we return to the concept of "multiple constructions of diversity" to share specific considerations used to diversify programming and expand the notion of diversity beyond the inclusion of underserved populations. As we described earlier, the promise of making as a fundamentally democratizing movement in education is rhetorically important but practically unfulfilled. The reality of who gets to be called a maker, what forms of making are valued in popular discourse and to what end, reinscribes the straw man position of white, middle-class males as the innovators of tomorrow (Blikstein & Worsley, 2016; Vossoughi et al., 2016). Many public libraries, however, because of their physical locations in all neighborhoods regardless of socioeconomic status, their ability to offer services for free to their publics, and their efforts to solicit community feedback to maintain local relevance are well situated to challenge the status quo. In the case of Bubbler, attention to issues of inclusion and diversity grew at MPL alongside the development of a systemwide makerspace.

MPL has defined their mission of equity in relation to a conception of justice not as an equal distribution of resources, but as an evaluation of whether outcomes are in accordance with patrons' varying desires and needs. Differences can be expressed in people's cultural or socioeconomic identities as well as in the variety of ways people learn and create. For Bubbler, equity arises from a more inclusive space made possible only by inviting more voices in and embracing diversity to inspire a program and programming that can be utilized by a broad range of patrons. Attending to multiple constructions of diversity can increase access by providing multiple entry points for different types of patrons.

Diversity of People

Early Bubbler programming grew out of the success of “Bookless” and the follow-up event “Stacked,” which targeted “20 and 30 somethings” to provide adults access to creative expression. The Head Bubblerian then continued with this programmatic vision with the Night Lights series, aimed at bringing artists into the spotlight. Once per month on Friday nights, an art opening coincides with music, storytelling, and making activities. Our interviews with Bubbler-affiliated staff revealed that their descriptions of diversity were primarily focused on the age of patrons. Perhaps this initial focus on attracting patrons who are not traditionally frequent library users shaped the direction. Or perhaps the division of labor at the libraries (children’s services, teen services, adult services) encouraged this framework.

Regardless, through continued conversations and professional development to provide support for facilitation and organizational design, the concept of diversity has expanded to include issues of cultural inclusion and access. Instead of narrowly defining the term diversity, Bubbler-affiliated staff opted in favor of clearly articulating various definitions to clarify what Bubbler is striving towards and when. Thus, one of the unique qualities in this makerspace is the range of definitions of diversity, and the commitment to articulating various goals that broaden their range of who counts as a maker in the Bubbler.

Diversity of Programming

Diversity as a multiple construct takes us beyond the difference amongst the people taking part in a specific set of activities to the maker programming itself. Bubbler focuses on valuing a range of programming using three primary mechanisms: (a) what counts as making, (b) who facilitates, and (c) where programming happens. While definitions of making often focus on the use of computational and digital technologies (Halverson & Sheridan, 2014; Martin, 2015), Bubbler has embraced analog and digital forms of making in genres as varied as food science, photography, sewing, and spoken word poetry. Even within a single genre—sewing—we find that “making” includes prescribed activities such as “sock monsters” and drop-in activities such as mending. Additionally, since the Head Bubblerian self-identifies as an artist, Bubbler shies away from the narrative of making as a gateway to STEM careers that scholars find limits appeal and access (Blikstein & Worsley, 2016). By broadening what counts as making, Bubbler brings a broader range of participants under the tent and potentially exposes them to practices outside of their comfort zone.

The expansion of what counts as making, coupled with the library’s tradition of offering in-house programming and supporting community-initiated endeavors, means that who facilitates—and how they facilitate—the experiences is also diverse. In the Bubbler model, facilitators of making

experiences include paid artists, volunteers, community members, and library staff. Opening up who leads maker activities and communities, what activities are included, and how activities are facilitated reifies a diverse set of making activities and draws in a diverse set of Bubbler participants.

Finally, Bubbler constructs diversity in terms of where programming takes place. In a traditional conception of a makerspace, what is known as the “Bubbler Room” would house the majority of maker programming; attendance in this space would be required to become part of the community. But Bubbler is committed to distributing programming across spaces to include the Media Lab and the other eight libraries in the system, where making is stretched across children’s sections, open areas, and more traditional programming rooms to engage people who may not otherwise join in. A public, online calendar monitors programming across libraries so that patrons can attend programs at any location or stick to their preferred location.

More importantly, perhaps, are the outreach efforts to bring making to communities that cannot or do not come to library locations. For example, led primarily by the teen services librarian, Bubbler has committed to bringing the full range of programming and facilitators to underserved youth, with a focus on court-involved teens (see Making Justice section). By expanding where making happens Bubbler constructs diversity, in part, about place. Therefore, Bubbler reaches different audiences to create new opportunities for engagement. As a result, Bubbler constructs diversity across all of the following: facilitation styles; facilitators’ cultural background; making activities; artistic practices, mediums, processes, and tools; programming; age; neighborhood; and the visions and goals of multiple librarians, guest facilitators, and collaborators.

DISCUSSION: VICTORIES AND STRUGGLES IN A SYSTEMWIDE MAKERSPACE

The Bubbler as a systemwide makerspace is a work in progress. The emergent design features—multiple constructions of diversity, external partnerships, and the presence of structural elements—are the outcome of a five-year development process and continue to shape the Bubbler. Here we discuss the resultant victories and struggles as a way to interpret how these design features have played out across the library system.

Victories

Perhaps the biggest victory of the Bubbler design has been the hiring of permanent full-time and part-time staff to support systemwide activities. The federal grant that supported the development of a research-practice partnership included funding for a part-time graduate student to assist the Head Bubblerian. The “Assistant Bubblerian”

became a central actor across the system (Daley, 2010), facilitating communication, developing programs, writing grants, and creating opportunities for collaboration. When the funding ended, Bubbler staff and library management secured a new permanent position from the city for a full-time Assistant Bubblerian. Not only did this ensure that the workflow created by this central actor would continue, but it also demonstrated that the libraries value the systemwide approach and what a network hub contributes to success. Also, a part-time librarian was given an additional 30% appointment to continue Bubbler work. Grants have been secured to support other part-time Bubbler staff including two Maker Corps educators. Another victory is the way in which the Bubbler is seen as a hub for making activities across the city, community organizations, and the public school system. The stop motion animation workshops that Bubbler supports are a regular fixture at many of the city's middle schools and is a popular summer camp in the Media Lab—many local groups come to Bubbler's media lab staff for training, exposure, and tinkering. The lead teacher of one of the court-involved teen programs identifies Bubbler as the highlight of every week with her students and has engaged former artists-in-residence as regular features at her program independent of their visits to the Bubbler Room. The teen services librarian who planned in 2014 to do more work with court-involved teens over time, describes "hitting the seven-year plan in two years," marking the possibility to aim even higher for programming, citywide integration, and outreach.

Struggles

Creating a space that stretches across places, people, and values is clearly not straightforward. The Bubbler purposely lacks a singular place, set of facilitators, and perspectives on what counts as making or even what counts as diversity. Alongside the library system, Bubbler has stretched definitions of diversity to include participants of all ages, from all socioeconomic backgrounds, and with an emphasis on recruiting new perspectives and participants—reaching out to those who may not have access, and expanding the notions of what constitutes making, and who makes those decisions. This uncertainty has caused problems with library staff unsure of which programs fall under the Bubbler umbrella or feel that their expertise is not leveraged in conjunction with a guest expert with a specific skill—such as a screen-printer or papermaker. Who is defining what counts as a successful program, a successful facilitator, a worthwhile experience? Options have included Bubbler leadership, guest artists, librarians, and the researchers. Moreover, whose perspective is heard can vary from program to program depending on who was most involved. Some library staff prefer the consensus rule while others are comfortable with the plurality rule. This messy process is likely to continue to include tensions as staff compromise as to how to maintain diversity and create cohesion.

The commitment to making has also meant that many people involved with Bubbler felt that additional attention ought to be paid to learning and assessment. As librarians increasingly take on the role of informal educators, many see themselves as contributing to a learning ecology where young people are being prepared for academic work through their interactions in the library⁴. This perspective extended to maker programming; librarians often wanted to discuss how to measure what patrons (children, in particular) were getting out of their participation in Bubbler programs and how these outcomes could relate to their library's goals. The Maker Movement has helped to revitalize the concept of learning by doing, specifically by focusing on the creation of digital and physical artifacts as the object of learning (Martinez & Stager, 2013), and a large part of the appeal of Bubbler has been for libraries to contribute to this learning ecology. But given the diversity of what counts as making and who provides programming, how can learning goals be developed? Should they? What counts as an assessment of learning in Bubbler programs? Who is responsible for assessment? The Bubbler staff and research team have developed some assessment tools that can be used across programs (Willett, 2016b) but the distributed and diverse nature of the programming means that these tools are not widely used. Conversations among the research-practitioner teams continue, with researchers bringing tools developed in the making and learning community to assess participation and learning (e.g., Petrich, Wilkinson, & Bevan, 2013), and practitioners bringing their experiences in maker programs and ideas for what they want their participants to get out of their time in the Bubbler. This collaborative effort will hopefully result in a range of assessment practices that meet the needs of the facilitator and provide documentation of learning that helps the team to communicate participant outcomes.

CONCLUSION: MAKING AS A CORE SERVICE OF PUBLIC LIBRARIES

Over the past decade, scholars of education leadership have embraced hybrid models of systems that involve both "loosely coupled" interactions among actors and centralized administrative structures (Boyd & Crowson, 2002). Though public libraries and makerspaces have not been subjected to the same administrative models as schools, a hybrid structure that maintains some centralized features while allowing individual people and places to maintain autonomy is an apt description of how the Bubbler as a systemwide makerspace has been built, adapted, and maintained. In fact, many of the individual features that can be frustrating to the Bubbler community come together to afford a diversity of programs,

4. Our interviews with librarians often veered into topics beyond Bubbler to include the other kinds of programming they offer. Children's librarians, in particular, talked often about their early literacy programming as "preparing kids for kindergarten" or "helping to close the achievement gap" that is prevalent in the city's schools.

perspectives, participants, and locations. The fact that there are multiple meanings to the terms “making,” “learning,” and “diversity” is an asset—so long as there is clear articulation to ameliorate confusion or tensions with varying goals and expectations. In the design of inclusive maker programming that serve various people in different contexts, multiple meanings—all equally true and worth striving for—have led to an expanded commitment to diversity in all its meanings and forms.

When Bubbler was first conceived it was unclear where it belonged. Yet, as MPL staff began to see Bubbler in the overall library vision—learn, share, create—Bubbler became integrated across the system as a core component of what it means to “do” libraries. This integration is visible in the disintegration of needed boundaries for who gets to decide what constitutes Bubbler. Bubbler has created connections with an increasing number of makers and artists; community partners; and sites across the city, including all nine libraries, schools, and neighborhood organizations.

To democratize making, this program was designed within a system of governance that values feedback, pledges a commitment towards equity and community relevance, and encourages local partnerships and participation. To incorporate a systemwide approach to making, Bubbler decided to address issues of inclusion head on through the lens of diversity—broadly construed. In this model equality is not sameness, nor access to what was decided unilaterally, but an approach towards the integration of multiple, and sometimes competing, perspectives, values, and visions.

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REFERENCES

Anderson, C. (2012). *Makers: The new industrial revolution*. New York: Random House.

Ames, M. & Rosner, D. (2014). From drills to laptops: Designing modern childhood imaginaries. *Information, Communication & Society*, 17(3), 357-370.

Bagley, C. (2014). *Makerspaces: Top trailblazing projects—A LITA guide*. Chicago: ALA Tech Source.

Barab, S. & Squire, K. (2004). Design-based research: Putting a stake in the ground. *Journal of Learning Sciences*, 13(1), 1-14.

Barniskis, S. (2015). Metaphors of privilege: Public library makerspace rhetoric. *Proceedings of the iConference 2015*. Retrieved from https://www.ideals.illinois.edu/bitstream/handle/2142/73726/39_ready.pdf?sequence=2.

Bevan, B., Gutwill, J., Petrich, K., & Wilkinson, K. (2015). Learning through STEM-rich tinkering: Findings from a jointly negotiated research project taken up in practice. *Science Education*, 99(1), 98-120

Blikstein, P. & Worsley, M. (2016). Children are not hackers: Building a culture of powerful ideas, deep learning, and equity in the Maker Movement. In K. Peppler, E. Halverson, & Y. Kafai (Eds.), *Makeology: Makerspaces as learning environments*, (pp. 64-80). New York: Routledge.

Boyd, W. L. & Crowson, R. L. (2002). The quest for a new hierarchy in education: From loose coupling back to tight? *Journal of Educational Administration*, 40(6), 521-533.

Brahms, L. & Crowley, K. (2016a). Making sense of making: Defining learning practices in MAKE magazine. In K. Peppler, E. R. Halverson, & Y. B. Kafai (Eds.), *Makeology: Makers as learners, Vol. 2*, (pp. 13-28). New York: Routledge.

Brahms, L. & Crowley, K. (2016b). Learning to make in the museum: The role of maker educators. In K. Peppler, E. R. Halverson, & Y. B. Kafai (Eds.), *Makeology: Makerspaces as learning environments, Vol. 1*, (pp. 15-29). New York: Routledge.

Brahms, L. & Wardrip, P. (2014). *The learning practices of making: An evolving framework for design*. Pittsburgh, PA: Children's Museum of Pittsburgh. Available at: http://makeshoppgh.com/wp-content/uploads/2015/02/MAKESHOP-Learning-Practices-formatted_FINAL_Feb-2015.pdf

Buechley, L. (2013). Closing address. *FabLearn*. Stanford University, CA. Retrieved from <http://edstream.stanford.edu/Video/Play/883b61dd951d4d3f90abeec65eead2911d>

Burke, J. (2014). *Makerspaces: A practical guide for librarians*. London: Rowan & Littlefield Publishers.

Daley, A. J. (Ed). (2010). *Social network theory and educational change*. Cambridge, MA: Harvard University Press.

Fourie, I. & Meyer, A. (2015). What to make of makerspaces. *Library Hi Tech*, 33(4), 519-525.

Gutiérrez, K. D., & Penuel, W. R. (2014). Relevance to practice as a criterion for rigor. *Educational Researcher*, 43(1), 19-23.

Halverson, E. R., Lowenhaupt, R., & Kalaitzidis, T. J. (2015). Towards a theory of distributed instruction in creative arts education. *Journal of Technology & Teacher Education*, 23(3), 357-385.

Halverson, E. R. & Sheridan, K. S. (2014). The maker movement in education. *Harvard Educational Review*, 84(4), 495-504.

Hatch, M. (2013). *The maker movement manifesto: Rules for innovation in the new world of crafters, hackers, and tinkerers*. Columbus, OH: McGraw-Hill Education.

Honey, M. & Kanter, D. (2013). *Design-make-play: Growing the next generation of science innovators*. New York: New York Hall of Science.

Kafai, Y. B., Fields, D. A., & Searle, K. A. (2014). Electronic textiles as disruptive designs in schools: Supporting and challenging maker activities for learning. *Harvard Educational Review*, 84(4), 532-556.

Lakind, A. (under review). *Public libraries as sites of collision for arts education, the maker movement, and neoliberal agendas in education*.

- Litts, B. (2015). *Making learning: Makerspaces as learning environments* (Unpublished doctoral dissertation). University of Wisconsin-Madison, Madison, WI.
- Madison Public Library (MPL). (2011, April 7). *MCPL design review*. Available at: http://www.madisonpubliclibrary.org/sites/default/files/MCPL_Public_7APRIL2011.pdf
- Madison Public Library (MPL). (2012). *Strategic plan 2012-2014*. Available at: <http://www.madisonpubliclibrary.org/sites/default/files/general/vision-and-mission-statements/Madison%20Public%20Library%20Strategic%20Plan%202012-2014.pdf>
- Martin, L. (2015). The promise of the maker movement for education. *Journal of Pre-College Engineering Education Research*, 5(1), 30-39.
- Martinez, S. L., & Stager, G. S. (2013). *Invent to learn: Making, tinkering, and engineering in the classroom*. Constructing modern knowledge press.
- Maxwell, J. (2013). *Qualitative research design: An interactive approach*. Thousand Oaks, CA: SAGE Publications.
- Moorefield-Lang, H. (2014). Makers in the Library: Case Studies of 3D Printers and Maker Spaces in Library Settings. *Library Hi Tech*, 32(4), 583-93.
- Peppler, K., Halverson, E. R., & Kafai, Y. B. (2016). *Makeology: Makerspaces as learning environments, Volume 1*. New York: Routledge.
- Petrich, M., Wilkinson, K., & Bevan, B. (2013). It looks like fun, but are they learning? In M. Honey & D. Kanter (Eds.), *Design, make, play: Growing the next generation of STEM innovators* (pp. 50-70). New York: Routledge.
- Salomon, G. (1997). *Distributed cognitions: Psychological and educational considerations*. London: Cambridge University Press.
- Sheridan, K. M., Halverson, E. R., Litts, B., Brahms, L., Jacobs-Priebe, L., & Owens, T. (2014). Learning in the making: A comparative case study of three makerspaces. *Harvard Educational Review*, 84(4), 505-531.
- Sivek, S. (2011). We need a showing of all hands': Technological utopianism in MAKE magazine. *Journal of Communication Inquiry* 35(3), 187-209.
- Vossoughi, S., Hooper, P. K., & Escudé, M. (2016). Making through the lens of culture and power: Toward transformative visions for educational equity. *Harvard Educational Review*, 86(2), 206-232.
- Willett, R. (2016a). Making, makers, and makerspaces: A discourse analysis of professional journal articles and blog posts about makerspaces in public libraries. *Library Quarterly: Information, Communication, Policy*, 86(3), 1-17.
- Willett, R. (2016b, June). *Lessons from learning spaces: What are patrons really learning?* Paper presented at the American Libraries Association Annual Conference. Orlando, FL.
- Willett, R., Lakind, A., & Halverson, E. R. (under review). The Maker Movement in public libraries: An analysis of librarians' perspectives. *On the Horizon*.
- YALSA (2014). *Making it in the Library: 2014 Makerspace resource task force*. Chicago: American Library Association.