Open Portfolio Project

RESEARCH BRIEF 6

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SURVEY OF MAKERSPACES, PART I

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Surveying Makerspaces

While makerspaces are beginning to pop up all over the globe, we currently know little about them and how they view themselves as educational spaces. Consequently, as part of the Open Portfolio Project, we reached out to an array of makerspaces, including hackerspaces, school-based makerspaces, and other community-based organizations with maker programming, to learn more about where they're situated, who they serve, and the kinds of activities in which their members regularly engage. In addition, we sought to better understand how they connect to the current policy landscape—particularly the alignment with science, technology, engineering, and mathematics (STEM) fields. This brief summarizes the responses to several sections of a broader survey (see Appendix B for a full copy of the survey) that was sent out to Maker Education Initiative field sites and allied institutions and is Part 1 of a three-part brief series summarizing the survey's results.

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FIGURE 1: Map of survey responses, depicting the location and relative size of the makerspaces in terms of their estimated daily number of participants/visitors.
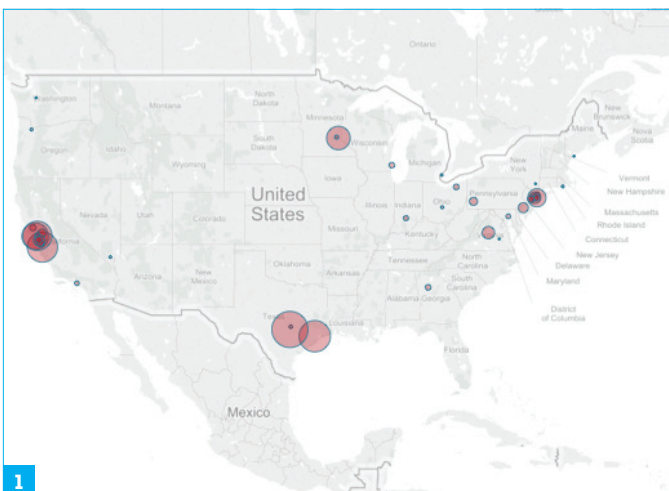
Who Are the Respondents?

A total of 51 youth-oriented makerspaces from across the United States responded to our survey, in addition to one site from Korea. The makerspaces reported serving a median of 450 visitors annually, with a wide range—from 50 to 850,000—of annual participants. The participating makerspaces reported that they involve a total of approximately 1.8 million annual visitors in their makerspace programming—a testimony to the growing popularity of the Maker Movement here in the United States. See **Figure 1** for a visual map of the locations of the makerspaces participating in the survey and their relative sizes.

The responding makerspaces identified as being located in one or more physical spaces, including 35% in schools (of which 2% of respondents were homeschools, 6% charter schools, 16% independent schools, and 10% public schools, and 1% international schools), 26% in after-school programs, 28% in community-based organizations, and the remaining 22% were found in a range of other settings, including low-profit, limited liability (L3C) businesses, international schools, science museums, libraries, city institutions (i.e., local government institutions), and other types of nonprofit institutions. Of these, 77% responded that they were nonprofit organizations, and an additional 6% of sites responded that they were situated in for-profit institutions.

The majority of respondents have provided maker programming for two years or less, with 16% in existence less than one year, 41% in existence for one to two years, 18% in existence for three to five years, and 26% in existence for more than five years. This bimodal distribution reflects the relative newness of many makerspaces nationally, as well as a group of maker-type organizations that have been in existence for some time but are well aligned with the larger goals and ethos of the Maker Movement.

A Makerspace by Many Names

In this report, we call all 51 sites by a general name: "makerspace." However, we note that the sites refer to themselves by a variety of names and descriptive titles of services. In fact, only around half the sites (53%) consider themselves to truly be a "makerspace," with sites commonly calling themselves by one or more other terms, including "drop-in space" (23.5%), teen/youth center (24%), innovation lab (22%), design lab (14%), hackerspace (10%), Fab Lab (8%), idea lab (8%), and science lab (6%), as well as a host of other titles including the following terms used by three or less of survey respondents (see **Figure 2**).

This diversity in naming is reflective of the larger Maker Movement. Making encompasses a wide variety of categories, activities, and learning approaches, which are seen in the many different naming conventions that tend to be embraced in today's landscape. This wide range of names also highlights some of the unique foci of each space or program. However, this does raise challenges for visitors, policymakers, and researchers seeking to easily identify a relevant population of sites with programming. For our purposes, we asked sites that self-identified as makerspaces to respond to our survey.

Whom Do Makerspaces Serve?

Across all makerspaces surveyed, 42% of program participants were White, 20% were Black/African-American, 18% were Hispanic/Latino(a), 14% were Asian, 0.3% were Native American, and 5% did not fall in the given categories. While these represent the mean across all makerspaces responding, the sites vary widely in the populations they serve (see **Table 1**). This also demonstrates greater diversity than the current U.S. population, based on findings from the U.S. Census data in 2010. Additionally, the sites surveyed reported serving individuals with mental/physical disabilities, which was an average of 8.1% of the total populations served, ranging from 0–66% of the population served across sites.

» Active-Play
» After-School Program
» Art Center
» Arts Camp
» Audio Studio
» Children's Creativity Museum
» Club Home
» Community Space
» Creativity Lab
» Design-Based
» DJ Studio
» Gallery Space
» Hands-on Learning Space
» Idea Lab
» Informal Learning Environment
» Lab
» Learning Lab
» Make Space
» Maker Art
» Maker Lab
» Makery
» Media Lab
» Museum
» Museum as Play
» Place for Collaboration and Creation
» Production Studio
» Robotics Learning Lab
» Sandbox
» School
» Science Lab
» Studio
» Tech Center
» Teen Media Lab
» Teen Tech Studio
» Tinkering Space
» Workshop

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Collectively, this paints a picture that stands in stark contrast to the adult demographics (i.e., predominantly middle-aged, White males) attending Maker Faires or subscribing to *Make:* magazine (Maker Media, 2012, 2013a/b) that has been subject to a great deal of recent scrutiny (Buechley, 2013). We believe that the prior statistics are representative of the current demographics found in STEM fields, which have had a hard time attracting women and people of color into these fields (Intel, 2014). However, this new generation of makers looks to be more diverse and holds a great deal of transformative potential as we think about supporting these young makers across their lifespan.

What Tools and Materials Are Maker Sites Using?

Over half of the makerspaces (51%) reported laptops and computers as core tools for making and 25% also

TABLE 1: Race and Ethnicity Across All 51 Makerspaces

	US CENSUS	MAKER SITE SURVEY		
		Mean	Median	Standard Deviation
ASIAN	4.80%	14.00%	7.00%	19.00%
AMERICAN INDIAN & ALASKA NATIVE	0.90%	0.30%	0.00%	0.90%
BLACK/AFRICAN AMERICAN	12.60%	20.00%	10.00%	21.00%
HISPANIC/LATINO	16.30%	18.00%	10.00%	24.00%
WHITE	63.70%	42.00%	44.00%	30.00%
OTHER	9.30%	5.00%	0.00%	16.00%

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mentioned tablets, which hints at a large proportion of making that includes digital processes or products. On these tools, 22% of the sites run multimedia software, including Adobe Creative Suite, GarageBand, and ProTools; 14% coding tools including Scratch and Code. org; and 12% 3D modeling software such as Tinkercad, Maya, and 3DTin.

Nearly 40% of the makerspaces mentioned 3D printers as frequently used tools, 26% reported using laser cutters, and 8% mentioned vinyl cutters. Everyday crafting tools and supplies—including cardboard and paper, scissors and other cutting tools, tape and glue, as well as popsicle sticks and googly eyes, among others—were reported by 39% of the sites.

To document and record making activities, 22% reported using cameras, including video, DSLR, HD, point-and-shoot cameras, and camcorders. Of these, 4% reported using smartphone cameras to record making activities.

These findings and a range of other tools and materials are summarized in **Table 2**.

Makerspace Programming

Among after-school or out-of-school programming (18% of sites), youth used these tools and materials to work on projects for an average of one to two hours per week, every day of the week or during weekends. Another 18% of other sites reported a variety of camp programs, including six to eight-week-long summer camps, school-break day programs, and one-week day camps, all that offer a diverse range of project involvement opportunities as well as access to a mix of tools, use instructions, directed challenges, and open-ended projects. Ten percent (10%) integrated maker clubs (related to robotics and design) into their flagship offering, and 8% others reported interactive exhibits (gallery spaces, activity tables, self-guided activities, etc.).

Presentation of work created by the youth at the sites was an important aspect of core maker programming. Sixteen percent (16%) reported opportunities to present work to the public on-site or through interactive family nights, exhibiting youth work at the site, organizing school-wide year-end festivals, or public workshops several times during the year. Twelve percent (12%) reported private exhibitions of youth work, such as portfolio defenses and presentations open only to a specific audience. Off-site public presentation of work (defenses) was reported by 5.9% of the responding sites. These types of sharing events included Maker Faires, Mini Maker Faires, and other local fairs and events.

Professional development opportunities, where educators shared program development insights and practiced skills with educators from other schools, were reported by 16% of sites. Eight percent (8%) reported facilitating outreach programs and workshops in neighborhoods, libraries, and other community facilities.

TOOLS, EQUIPMENT, AND MATERIALS	PERCENTAGE OF SITES
Laptops And Computers	51%
3D Printers	40%
Everyday Crafting Materials	39%
Laser Cutters	26%
Tablets	25%
Multimedia Software	22%
Soldering Irons	22%
Photo And Video Cameras	22%
Hot Glue Guns	20%
Saws, Wood, and Wood Scraps	20%
Circuitry Tool Kits	18%
Coding Tools	14%
Drills	14%
Makey Makey Kits	12%
General Hand Tools	12%
3D Modeling Software	12%
Robotics Kits	10%
Sewing Machines/Sewing Materials	10%
Metalworking Tools And Materials	8%
Vinyl Cutters	8%
Smartphone/iPod Touch	4%

TABLE 2: Most Commonly Reported Tools and Materials Across Sites

Other programs (12%) included offering internship programs, such as residency and volunteer opportunities at the site and small apprenticeship programs in coordination with other local organizations.

Conclusions

Our Open Portfolio Project site survey helped to frame our continued research and strongly informed the site visits and findings that arose from the greater field. While making is adopted as a theme, emphasis, or focus for youth educational programming at a variety of settings, it remains important to recognize and pay attention to what the field is doing, which audiences are served, and what gaps still remain. As seen through the many different materials being used and the diversity of race and ethnic backgrounds of youth at these makerspaces, both the breadth and the current inclusivity of making forms a firm foundation for future policy and educational efforts seeking to deepen learning in these spaces over time.

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Acknowledgements

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