



SHORT SUBJECTS

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MakeHERSpaces: STEM, Girls, and the Maker Movement

Few innovations have galvanized libraries, schools, and museums like the maker movement. *Makerspaces* are community centers that combine manufacturing equipment with education in a way that lets people collaborate, explore and innovate. In makerspaces, people apply scientific and engineering principles in a hands-on environment to create things such as robots and 3D models. The excitement of freestyle innovating lends itself to interest in Science, Technology, Engineering and Mathematics (STEM). This Short Subject discusses the interface between makerspaces and STEM and the ways in which women and girls are seizing opportunities presented by the maker movement.

THE ORIGINS OF MAKERSPACE

In 2006, *Make Magazine*, a do-it-yourself periodical, launched *Maker Faire* in San Mateo, California. Makers of all ages now convene at *Maker Faires* around the country to show off their projects. These projects combine art, crafts, engineering, science and technology. In 2009, *Maker Faire* organizers piloted the *Young Makers Program*, where 20 children were teamed with mentors in a workshop setting and encouraged to make things for the upcoming *Maker Faire*. The pilot was deemed a great success, and other *Young Maker* programs were quickly developed in the San Francisco Bay Area.¹

Makerspaces are not your parents' woodshop classes. Yesterday's routers and planers have been replaced with laptops, laser cutters, Arduino open-source electronics platforms, 3D printers and even bookbinding machines. The Internet provides the means for makerspaces to share project ideas and blueprints. Makers can take advantage of new technology while working independently or together. Some makerspaces are general interest while others specialize in robotics or engineering; some are geared toward all ages, while others team students and mentors in an afterschool setting. In any case, the guiding principle behind the makerspace movement is

“Think of all the advances made over the last 50 years; weather satellites that track hurricanes and GPS directions, implantable heart defibrillators....

How much more would we have accomplished if we had been operating on all cylinders with the potential of all of our citizens—both genders, all races and all ethnic backgrounds—that's powerful.”

Dr. Mae Jemison: astronaut, physician, and chemical engineer
(source: Mediaplanet for STEM Education News)

freestyle innovation.

MAKERSPACE AND STEM EDUCATION

The maker movement has become very popular with libraries and schools for the simple reason that it naturally aligns with their educational goals. Libraries have arguably been in the “making” business for a long time, offering free space for workshops, classes and discovery zones for all ages. The American Association of School Librarians' Standards for the 21st Century encourage learners to demonstrate mastery of technology tools, collaborate, use resources to guide their own inquiry process and draw conclusions.² Makerspaces are becoming one more outgrowth of the mission of libraries to encourage learning and innovation.

Schools are looking for ways to encourage students to go into STEM-related fields. Lackluster test scores in the areas of math and science have resulted in criticism over STEM education practices in the United States. Inquiry-based group projects may prove to be a viable supplement to traditional, theory-based instruction, helping to increase science literacy. “Hands-on” curricula, introduced to students in junior high and early high school, would reach children at an age range where they are at their most inquisitive and eager to learn, encouraging students to get excited about

STEM.³ In fact, hands-on innovation is a keystone of the Obama administration's "Educate to Innovate" campaign. In his November 2009 speech, the president described the future of STEM education as one in which students "see the promise of being the makers of things, and not just the consumers of things."⁴

WOMEN AND GIRLS AS MAKERS

Many organizers in the maker movement are attempting to directly engage women and girls and motivate them in a maker environment. One such organization is Techbridge, a makerspace in Oakland. Launched in 2009, its mission is to inspire girls in the fields of engineering, science and technology. Techbridge's afterschool program serves 500 girls annually in grades 5 through 12 in underserved communities. In 2012-13, 81 percent of the girls in Techbridge said they could see themselves eventually working in technology, science or engineering.⁵

DIY Girls is another maker program that "provides a continuous pathway to a technical career for girls from 5th grade to high school graduation." DIY Girls works with a high-need, low-income school in Pacoima in Los Angeles County. In an afterschool program, girls work with mentors to create wearable electronic projects, video games and toys. They use power tools and work with a 3D printer on site.⁶

GETTING INVOLVED

Here are a few ways schools and libraries are raising funds to start their own makerspaces:

Government grants

The federal Institute of Museum and Library Services (IMLS) program supports 123,000 libraries in the 50 states. IMLS offers Library Services and Technology Act (LSTA) grants to libraries with "well-designed projects" to "advance innovation, lifelong learning, and cultural and civic engagement." For FY 2015, IMLS has declared it intends to focus on STEM learning. To that end, IMLS is pledging to offer \$152 million in LSTA grants to states.

In California, LSTA grants are administered by the State Librarian. The funds are used to promote, through a competitive grant process, improvements in services to all types of libraries. Several current and forthcoming projects in community libraries all over the state have been awarded LSTA grants, including MakeX: Teen Mobile Makerspace at the Palo Alto City Library, IDEA Lab at the San Diego Public Library,

and Makerspace in a Box at the Sacramento Public Library.⁷

Company scholarships

Private firms often have scholarship and grant programs to encourage STEM education in their communities. For instance, Edutopia's website lists several such scholarships.⁸ Organizations such as the Maker Education Initiative in San Francisco provide funds, resources and support to educators who "create more opportunities for all young people to develop confidence, creativity, and interest in science, technology, engineering, math, art, and learning as a whole through making."⁹

Campaign for funds

Crowdfunding platforms help organizations campaign for donations right in their communities. Many makerspaces raise funds through private grants, reach out through social media and even hold "make sales."

ENDNOTES

1. Young Makers Program – Makers Club Playbook, Spring 2012. <http://tinyurl.com/q7kk9h7>
2. American Association of School Librarians, "Standards for the 21st-Century Learner."
3. McNally, Thomas, "Innovative Teaching and Technology in the Service of Science: Recruiting the Next Generation of STEM Students." Journal of the Scholarship of Teaching and Learning, vol. 12 no. 1, February 2012, pp. 49-56.
4. President Barack Obama, speech on the "Educate to Innovate Campaign," Nov. 23, 2009.
5. <http://techbridgegirls.org/>
6. <http://diygirls.org/>
7. <http://www.library.ca.gov/grants/lsta/>
8. <http://tinyurl.com/la275o5>
9. <http://makered.org/about-us/mission/>

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