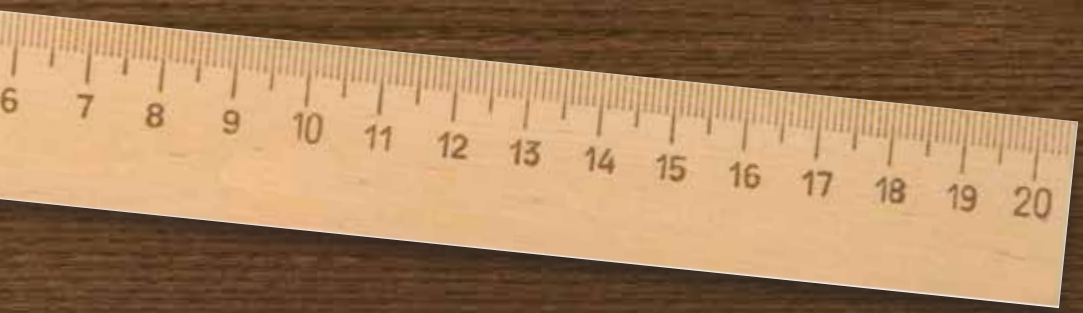
FEATURE



Creativity Through "Maker" Experiences and Design Thinking in the Education of Librarians

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Makerspaces are an increasingly prominent feature within libraries—moving the library environment from a space for consumption to a place of creation (Austin et al. 2011; Bagley 2012; Britton 2012a, 2012b; Britton and Considine 2012; IMLS 2012; Scott 2012). A makerspace is a physical place in the library where informal, collaborative learning can happen through hands-on creation, using any combination of technology, industrial arts, and fine arts that is not readily available for home use. The underlying goal of a makerspace is to encourage innovation and creativity through the use of technology—to offer a place where everything from STEM learning to critical expression to future start-ups can be nurtured.

Akin to a laboratory, the kind of learning that happens in a makerspace is hands-on, iterative, and experimental and touches a wide array of literacies.

Proponents of makerspaces argue that such environments target a unique package of complementary 21st-century skills and aptitudes such as creativity, innovation, transmedia navigation, visual literacy, and (if based in technology) computational thinking. These are the kinds of skills identified by the Institute of Museum and Library Services in their 2009 report on museums, libraries, and 21st-century skills and by the Partnership for 21st Century Skills <www.p21.org>.

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Coupled with this congruence between makerspace benefits and 21st-century skills is a growing interest in design thinking: an open-ended, nonlinear, and often messy way to generate innovation and creative solutions. Creative confidence comes when people are given the opportunity to think like a designer. The hands-on, learning-by-doing experiences afforded by makerspaces implicitly require a design approach to problem solving.

New as the maker movement is, there is little in the literature that investigates it in relation to the education and training of librarians. As someone who trains future librarians, I wondered if there was a way to integrate meaningful "making" experiences with tangible technology into the professional training of librarians so they can, in turn, effectively establish or manage a library-based makerspace that asks young people to think in new, creative ways. What skills, knowledge, and aptitudes do librarians need to implement makerspaces that reflect the core mission and goals of the library?

To address these questions, I pilot-tested a "maker" experience with Library and Information Science (LIS) students, some of whom are training to be school librarians, at the University of Pittsburgh. These students participated in the Bots and Books Design Challenge, an extra-curricular event held each spring during the School of Information Sciences iFest. Working in teams of two or three, students were challenged to select a children's story and interpret it through a robot that embodies the following characteristics: it should provide a deeper understanding of a children's story, provoke an emotional response, make the viewer think, and demonstrate careful craftsmanship, elegance in design, and technical complexity in both the engineering and computer programming. The robots were then judged by a panel of faculty and one librarian from the Carnegie Library of Pittsburgh.

The technical platform used for the robots was the Hummingbird controller and visual programming language (see figure 1), both developed by Carnegie Mellon University's Community Robotics, Education and Technology Empowerment Lab (CREATE Lab). Each robot kit includes a set of motors, LEDs, sensors, and electronics for building and programming

Figure 1. The Visual Programming Language used to design and build robots with the Hummingbird controller.

an interactive, expressive robot. Tutorials, ideas, and documentation are provided through the Hummingbird website <www.hummingbirdkit.com>.

The visual programming language was specifically designed for children and has been successfully used with students in elementary school. We expected that most of the students at the School of Information Sciences, including librarians-in-training, would be able to jump into the programming with relative ease. Nevertheless, a brief one-hour introduction was offered, explaining each of the components connected to the Hummingbird controller and demonstrating how to use the visual programming language.

The students' robots interpreted traditional tales such as Hans Christian Anderson's *Little Ida's Flowers* and the *Ballad of Mulan*. Makers also turned to much-loved children's books and built robots depicting *Giraffes Can't Dance*, *Corduroy*, and *The Very Hungry Caterpillar*.

In our interviews with the students, several of them mentioned their surprise at the iterative nature of prototyping their designs, having erroneously believed that the design process was completed as soon as they had conceptualized the project. In actuality, the project was an exercise in design thinking, which typically involves trial and error, multiple design/test stages, figuring out workarounds, "good enough" solutions, and ongoing cost/benefit analysis. Despite the participants' frustration in not having planned for trial and error, they all found the Bots and Books Design Challenge rewarding. One participant who claimed to have had little experience in crafting or programming suggested that the activity would be a nice "gateway making" experience for other LIS students. Her experience gave her confidence, leaving her with the thought that if she could do this (program and build a robot), she could complete a more technical challenge in the future.

Robotics are a key component in the emerging DIY/maker movement in libraries and help to support the school library's mission by promoting STEM learning, critical expression, and 21st-century literacies such as pro-

Figure 2 (Left): Dancing giraffe robot, inspired by Giles Andreae's picture book Giraffes Can't Dance. *(Right): LED lights "cry" in response to the wrong song.*

gramming. The design challenge described here demonstrates a unique method for harnessing technology in ways that encourage creativity and technical practices while, at the same time, respecting library science's humanist roots in literature. The design challenge also called for design thinking and a constructionist approach to learning (learning by making), experiences unfamiliar to some LIS students.

The next steps will be to integrate the design challenge into a regular LIS class and shift our research attention to questions of where and how "maker" experiences might fit into a formal LIS curriculum. My hope is that librarians can bring these opportunities for creativity to children and youth in school and public libraries.

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