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Tinkering with Technology: A Library Workshop to Support 4-H Youth Development

Abstract

When University of Idaho (UI) Extension brought the Idaho 4-H Teen Conference to UI's main campus, the conference organizers collaborated with UI librarians to organize a workshop in the library's newly established makerspace, the Making, Innovating, and Learning Laboratory (MILL). In the MILL, the students used cutting-edge technology to foster new or existing interests in science, technology, engineering, and math (STEM). This article describes how Extension and 4-H youth development professionals can team with librarians to use library makerspaces to introduce 4-H high school students to STEM technologies and digital literacies that will be necessary for jobs of the future.

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Introduction

The 2016 Idaho 4-H Teen Conference held on the University of Idaho (UI) main campus coincided with the opening of the UI Library's new makerspace, the Making, Innovating, and Learning Laboratory (MILL). As members of a land-grant institution, UI librarians look for opportunities to help fulfill the mission to serve all Idahoans. Thus, a call to host workshops for the 4-H conference seemed like an ideal opportunity to partner with Extension in serving Idaho's young people. While an academic library may seem an unexpected site for a high school 4-H workshop, we felt it was a great chance to put the MILL to work and make an impact on digital literacy and awareness of the science, technology, engineering, and math (STEM) concepts that will be necessary for future careers.

Background

UI Extension provides hands-on learning for 4-H youths throughout Idaho, supporting development of new skills for college and career. These experiences often enhance interest in STEM fields (Dillivan & Dillivan, 2014), such as robotics (Barker & Ansorge, 2006) or agri-science (Horton, Krieger, & Halasa, 2013). The Idaho 4-H Teen Conference is an annual statewide gathering sponsored by UI Extension that enables teens to participate in educational workshops, experience campus life, and learn about opportunities at UI (University of Idaho [UI] Extension, 2016c). The event brought hundreds of high school students to campus in June 2016, providing a perfect opportunity to use the freshly opened MILL. Consequently, we approached the conference organizers with

a proposal for a librarian-led, hands-on workshop that would take place in the MILL and incorporate the mission and vision of Idaho 4-H Youth Development as a framework for success (UI Extension, 2016a). The workshop would introduce students to 3-D printing, electronics, and programming in a friendly and inclusive environment within the technology-rich space of the MILL. We hoped to provide a positive experience that would foster STEM education while strengthening Extension's connection with the UI Library. The conference organizers accepted our proposal, and the workshop was offered twice during the conference as an elective activity.

Implementation

The 2-hr workshop, titled Tinkering with Technology: Explore, Learn, and Create in the MILL, began with a brief orientation to the library and the MILL. The students engaged in a discussion of new uses for technology in agriculture, including applications for 3-D printing. They were then introduced to the 3-D printer by starting a print of a customized coin with the 4-H logo on one side and the UI logo on the other. As the students were enthralled by the machine, it was a good opportunity to meaningfully introduce STEM concepts such as open-source hardware and advances in manufacturing. The students also watched a live demonstration of the process of creating a 3-D model and finding existing models in web repositories (handout available at http://www.lib.uidaho.edu/services/workshops/resources/3d_print_intro.pdf). Batches of the coin were printed in advance so that the students would see one being printed, learn how the model was created, and receive a physical copy to take away.

During the second half of the workshop, the students participated in a hands-on electronics project using Arduino, an open-source microcontroller platform (<https://www.arduino.cc/>). In small groups, the students built a light theremin, an interactive electronic "musical" instrument (handout available at http://www.lib.uidaho.edu/services/workshops/resources/arduino_lightTheremin.pdf). They assembled a simple circuit on a breadboard and modified a basic Arduino program to control a piezo buzzer with light. Group instruction, illustrated step-by-step directions, and one-on-one interaction were combined to support a broad range of learning styles. The small-group structure encouraged peer-to-peer learning (Porter, Guzdial, McDowell, & Simon, 2013).

With one input and one output, the simple light theremin project provided concrete, instantaneous feedback while the students modified the circuit and code. The project was an exciting and engaging introduction to complex technology skills that are otherwise highly abstract. For example, it was an important moment when students with no previous coding experience understood that the language `digitalWrite(LED_BUILTIN, HIGH), delay(1000), digitalWrite(LED_BUILTIN, LOW), delay(1000)` made a light blink! Students also were able to make connections with technology in their day-to-day lives. The web and smartphones are not magic; they are just slightly more complicated than an Arduino project. We understood that few of the workshop participants were likely to go on to become computer engineers, but the digital literacy element of the workshop ensured that students of all skill levels were able to gain something meaningful from the experience.

Evaluation

At the end of the 2-hr workshop, 20 participants completed brief evaluation surveys. Responses revealed that students who selected the Tinkering with Technology workshop as part of their conference schedule were already inclined to have interest in STEM fields. Participants listed science as their favorite subject in school, and agriculture was the most popular career interest, followed by medicine and technology. All but one participant said it was their first time in a makerspace, reinforcing the uniqueness of the experience. Student feedback

included such comments as "I learned to program" and "it was fun and cool building something I had no idea about." Also, a newsletter article published by 4-H students at the end of the conference reported that the Tinkering with Technology workshop was a positive first experience with electronics and programming (UI Extension, 2016b).

Conclusion

Because many high school students lack exposure to digital literacies in the classroom, an experience in a makerspace, such as the Tinkering with Technology workshop, can help demystify technology and develop a basis for further exploration. The successful implementation of this workshop demonstrates the relevance of library makerspaces that offer hands-on learning to support the work of Extension and 4-H youth development professionals (Hill, Francis, & Peterson, 2015).

Libraries, especially academic ones, are often overlooked as potential partners with resources and missions that can complement Extension's efforts. We believe there is potential for more collaboration and support between libraries and Extension.

Many state library commissions offer resources and directories of makerspaces, such as the Idaho Library Commission's Make It at the Library resource (<http://libraries.idaho.gov/page/make-it-library-where-idaho-makers-meet>). Extension 4-H youth development personnel could replicate the workshop described here, or explore numerous other possibilities, by contacting makerspaces in their areas. Good first steps would be contacting a liaison librarian and advertising involvement opportunities to library faculty. Together, librarians and Extension personnel can use library makerspaces as effective engagement tools for introducing students to STEM careers, teaching digital literacy, and supporting a university's land-grant mission to provide educational opportunities for all.

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