UNIVERSAL DESIGN in Higher Education
PROMISING PRACTICES

Promoting the Design of Accessible Informal Science Learning

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To fill increasing numbers of positions in science, technology, engineering, and mathematics (STEM), the US must draw from a talent pool that includes all demographic groups (American Association for the Advancement of Science, 2001; Committee on Equal Opportunities in Science and Engineering, 2011; National Science Foundation, 2011; Office of Science and Technology Policy, 2006). Today, individuals with disabilities experience far less success in STEM programs and careers (National Science Foundation, 2012). However, success stories in STEM fields demonstrate that opportunities exist for those who successfully overcome barriers imposed by (a) inaccessible programs and technology/media, insufficient accommodations, and low expectations as well as (b) inadequate self-advocacy skills (DO-IT, 1993-2012; Stern & Woods, 2001). Informal STEM learning (ISL) can play an important role in increasing STEM interest and knowledge (Bell, Lewnstein, Shouse, & Feder, 2009; Fenichel & Schweingruber, 2010), as prerequisites to pursuing STEM degrees and careers. However, people with disabilities can receive these benefits only if ISL offerings are accessible to them.

BACKGROUND

Many traditional efforts to include people with disabilities in programs focus on the deficit of the individual. In a medical model of disability, for example, efforts are made to cure, medicate, or otherwise medically treat the individual with a disability. A model centered around functional limitations also focuses on the deficit of the individual with a disability, as well as on how accommodations can be made so that this person can fit into an established environment. In contrast, the "social model" of disability (DePoy & Gibson, 2008) considers variations in abilities—just like gender, race/ethnicity—to be a natural part of the human experience and makes efforts to design products and environments that are welcoming and accessible to all potential users (Gabel & Peters, 2010; Loewen & Pollard, 2010). Universal design (UD)—defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design" (Center for Universal Design, n.d.)—is an approach that is consistent with the social model of disability, addresses other diversity issues as well, and has the potential to minimize the need for individual accommodations (Burgstahler,

2011). For example, if a science facility contains a height-adjustable work surface, then an accommodation will not be needed for a wheelchair user whose chair is too high for standard-height workstations. This workstation will also be comfortable for a visitor who needs to remain seated in a chair or for a very tall or short individual.

Since 1992, the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center at the University of Washington (UW) has promoted the success of individuals with disabilities in postsecondary education and careers, using technology as an empowering tool. With support from the National Science Foundation, the U.S. Department of Education, the state of Washington, and numerous other funding sources, DO-IT has engaged students, parents, educators, and technology leaders to complete dozens of projects to further this goal. This article reports on one of these projects. Starting in 2010, the DO-IT Center has offered high school and college students with disabilities the opportunity to learn about universal design and conduct accessibility reviews of informal science education programs. The project's objectives are

- to increase awareness of access issues and universal design solutions among students with disabilities and
- to enhance the student's ability to advocate for STEM learning environments that are welcoming and accessible to a diverse audience.

RECRUITING AND TRAINING PARTICIPANTS

Participants are recruited through online e-mentoring communities that DO-IT supports for students with disabilities. They are invited to complete an accessibility review of an informal science program (e.g., the Pacific Science Center) in their community. They are offered a $100 stipend plus the cost of the visit for themselves and up to two guests and an opportunity to win a prize if their review is judged to be one of the best with respect to identification of accessibility issues and recommendations for improvements.

Students interested in completing a review receive guidance in selecting a facility or program, background reading, and instructions for submitting their report. Guidelines are available online (DO-IT, n.d.b).

EVALUATING AN INFORMAL SCIENCE PROGRAM

Participants read the publication *Universal Design: Process, Principles, and Applications* (Burgstahler, 2012) to learn about two approaches to making informal science education offerings accessible to people with disabilities—accommodations and universal design. They learn that

- an accommodation is an alternate format, assistive technology, or other adjustment that allows a person with a disability to use an existing product or environment.
- the goal of universal design is to create products and environments that are usable by everyone, regardless of ability or other characteristics, to the greatest extent possible, without the need for adjustments.
- making accommodations is reactive, whereas universal design is proactive.

A worksheet (DO-IT, n.d.c) guides participants in evaluating how welcoming and accessible the facility or program is for people with disabilities. It asks participants to consider accessibility issues related not just to their own disability but also to other disabilities as they review components such as the website, publications, physical environments, exhibits, activities, and staff knowledge. Examples of items on the worksheet follow:

- Does the website say how you can request disability-related accommodations?
- Are brochures available in any alternative formats such as large print, Braille, or electronic file?
- Are all levels of the facility connected via a wheelchair accessible route of travel?
- Are equipment/exhibit labels in large print with high contrast?
- Can buttons and other controls be reached by individuals who stand at a wide range of heights or by those who use wheelchairs or other mobility devices?
- Are videos captioned?
- Are audio directions and content transcribed?
- Are staff members familiar with how a person with a disability can request an accommodation?

As part of their review, participants also make recommendations for improving the accessibility of the facility or program. They submit their review to project staff who then read each review and determine if it is complete and otherwise acceptable or requires additional information. Once participants submit an acceptable review to project staff, they can request permission to conduct a review of another program.

RESULTS

Thus far, forty-two students from thirteen high schools and sixteen postsecondary institutions have contributed accessibility reviews. Of these participants, twenty were female and twenty-two were male, and they disclosed disabilities that included Asperger's syndrome, visual impairments, learning disabilities, mobility impairments, health impairments, and traumatic brain injuries. The forty-two participants conducted seventy-nine accessibility reviews of facilities and programs in Washington state, including the Seattle Aquarium, the Pacific Science Center, the Museum of Flight, and Woodland Park Zoo (all in Seattle), and the Port Townsend Marine Science Center.

Participants reacted positively to their experiences conducting accessibility reviews, making comments such as, "I learned a lot about how to look at a program and figure out if other people with disabilities can fully participate," and "This was a lot of fun because we got to go to a cool place and contribute to making it better."

Participants made a wide range of observations about the accessibility of the facilities and programs they visited and recommendations for improvements. Some of their suggestions were to:

- Provide alternative formats (Braille, large print, audio) for brochures and exhibits.
- Caption videos.
- Provide multiple-height vantage points for exhibits.
- Ensure that steps or benches for children to view an exhibit can be moved or are positioned to allow a wheelchair user to get close to the exhibit.

- Clearly indicate on the website, in brochures, and at the site how to request disability-related accommodations.
- Include more images of individuals with disabilities in materials.
- Train staff about the types of accommodations available and how to offer assistance.

RECOMMENDATIONS FOR ACTIVITY REPLICATION AND EXPANSION

The success of the reported project—with respect to the enthusiasm, increased knowledge of accessible design, and advocacy skills of the participants—has led the DO-IT Center to offer this activity on an annual basis. We're also encouraging others to replicate the practice. Organizations that are interested in evaluating and improving the accessibility of their local informal science education programs can use the model developed by the DO-IT Center, as well as the guidelines and worksheet on our website (DO-IT, n.d.a).

The activity reported in this article could be developed further into a more comprehensive effort that includes informal science programs in a region as well as a museum science program at a university. Students in the museum science program and students with disabilities in STEM could work with the informal science programs, conducting accessibility reviews and engaging in joint projects to apply what is learned in making the programs more welcoming and accessible to people with disabilities. The project could also take steps to improve museology programs by creating a more welcoming atmosphere towards students with disabilities and integrating universal design content into its curriculum.

CONCLUSION

The DO-IT Center at the UW undertook a project to design an activity that can be used to increase awareness of access issues and universal design solutions among students with disabilities and to enhance their ability to advocate for STEM learning environments that are welcoming and accessible to a diverse audience.

Activities like the one we've described can ultimately contribute to the increased participation of students with disabilities in STEM and improve these academic fields with the perspectives and talents of this underrepresented population.

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