Engagement of Student Interns to Address Disability-Related Issues in Informal Learning Opportunities and Academic Courses (Practice Brief)

Scott Bellman[1]
Sheryl Burgstahler[1]
Meena Selvakumar[1]

Abstract

The University of Washington's (UW) *Access to Informal STEM Learning (AccessISL)* project employs a student-centered approach and potentially transformative practices that embrace the social model of disability, social justice education, disability as a diversity issue, intersectionality, and universal design. A leadership team of interns—each member a UW student with a disability or a museology graduate student—along with project staff engage with the UW Museology program to identify and implement strategies for making ISL activities and courses more welcoming and accessible to individuals with disabilities. Initial outcomes of *AccessISL* intern engagement include specific changes within ISL programs, increased awareness and implementation of universal design principles in the Museology graduate program, and expanded skills about the accessible/universal design of informal learning within future professionals who served as interns in *AccessISL*

Keywords: informal learning, STEM, disabilities, universal design, accommodations, interns

Summary of Relevant Literature

To fill increasing numbers of positions in science, technology, engineering, and mathematics, the U.S. must draw from a talent pool that includes all demographic groups (American Association for the Advancement of Science [AAAS], 2001; Congressional Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development, 2000). Today, individuals with disabilities experience far less success in STEM (National Council on Disability and Social Security Administration, 2000; Office of Disability Employment Policy; 2001), and those who are also minorities, female, and/or veterans face multiple challenges (AAAS, 2001; Leake, et al., 2006). However, success stories in STEM fields demonstrate that opportunities exist for students with disabilities who can successfully overcome barriers imposed by inaccessible programs and technology, insufficient accommodations, low expectations, underdeveloped skills in self-advocacy, and reduced access to STEM role models with disabilities (Disabilities, Opportunities, Internetworking, and Technology [DO-IT], 1993-2022; Bellman & Burgstahler, 2016; Bellman et al., 2018; Stern & Woods, 2001).

Informal STEM learning refers to learning outside of the traditional classroom setting, such as learning at museums, science centers, public websites, and summer camps. Such learning can play an important role in increasing the interest and knowledge (Bell, et al., 2009; Fenichel & Schweingruber, 2010) of people with disabilities, but only if it is accessible to them. Since 1992, the DO-IT Center has worked to increase the STEM degree and career attainment of students with disabilities through a variety of projects, including national alliances called *AccessSTEM* and *AccessComputing*. Within these projects, students with disabilities at the University of Washington (UW) and partner institutions have engaged in peer and mentor support and career, self-determination, work-based learning, and leadership skill-building activities (Bellman, et al., 2014). The evidence base for DO-IT practices comes from literature reviews, student outcome data, and input from students with disabilities and practitioners (DO-IT, n.d.). Over the course of DO-IT projects, effective student interventions were organized into a model of inputs to promote movement through critical junctures (Burgstahler, 2006)—e.g., STEM degree completion—that have also been iden-

tified as effective ways to bring students from other underrepresented groups into STEM fields (Allen, et al., 2006; Valentine, et al., 2009).

Funded by the National Science Foundation, the UW's *Access to Informal STEM Learning (AccessISL)* project builds on a previous pilot project to have students with disabilities conduct accessibility reviews of local ISL sites (DO-IT, 2013). In this effort, high school and college students with disabilities conducted accessibility reviews of ISL programs including the Seattle Aquarium, the Pacific Science Center, Museum of Flight, Burke Museum, and the Woodland Park Zoo (Burgstahler & Crawford, 2012). In these pilot activities, 46 students with disabilities from 13 high schools and 16 postsecondary institutions contributed a total of 79 accessibility reviews while developing a tool called the *Checklist for Making Informal Learning Accessible to Students with Disabilities* (AccessISL, 2021). Participants, whose disabilities included autism, blindness and low vision, deafness and hard of hearing, learning disabilities, mobility and health impairments, traumatic brain injuries, and mental health disabilities, increased their awareness of access issues, access solutions, and advocacy strategies.

AccessISL is a collaboration between the DO-IT Center and the UW Museology graduate program, which reflects the interdisciplinary nature of the museum field by purposefully sitting at the intersection of various disciplines on campus and by integrating evaluation and research related to multiple disciplines. *AccessISL* employs a student-centered approach that embraces the social model of disability, social justice education, disability as a diversity issue, intersectionality, and universal design. A leadership team of interns—each member a UW student with a disability or a museology graduate student—along with DO-IT and UW Museology staff and faculty work to identify and implement strategies for making ISL activities and courses more welcoming and accessible to individuals with disabilities.

AccessISL staff and faculty leaders engage in an online Community of Practice (CoP) that includes key stakeholder groups that impact efforts to make ISL environments accessible and usable by everyone. The project encourages all stakeholders promoting accessible ISL to adopt principles of universal design (UD). According to the Center for Universal Design, UD is "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" (Connell, et al., 1997).

Setting and Participant Demographics

AccessISL provides internship opportunities for postsecondary students to increase their knowledge and skills about the accessible/universal design of ISL, promote the inclusion of disability-related content within academic departments, and engage in activities to make ISL offerings more welcome and inclusive for everyone.

Fifteen UW students participated in *AccessISL* internship activities. Interns identified as having a variety of disabilities, including those related to learning, autism, attention, mobility, speech, blindness, mental health, and chronic fatigue. Three interns disclosed the existence of multiple disabilities. In the intern group, 2 identified as male and 13 as female. Students were recruited through the Museology Program, the Disability Resources for Students Office, the d/Disability Cultural Center, the Disability Studies Program, and the DO-IT Center. Interns received hourly compensation for participation in activities; Museology students received tuition reimbursement and academic credit. Intern participation was based on the academic quarter system at UW. Participation was flexible based on intern interest and availability. Eight interns participated in a 21-week internship from January 2020 to June 2020, four interns participated in a 21-week internship from January 2021 to June 2021, two interns participated in an 11-week internship from January 2021 to March 2021, and one intern participated in an 11-week internship from January 2021 to March 2021 and an 8-week internship during Summer 2021.

From January 6 to March 16, 2020, internship activities took place on-site at the UW campus, the Living Computer Museum, the Pacific Science Center, the Burke Museum of Natural History, and the Seattle Aquarium. Thereafter, nearly all activities took place online due to the COVID-19 pandemic.

Depiction of the Problem

Informal STEM learning can play an important role in increasing the interest and knowledge of people with disabilities, but only if it is accessible to them (Bell, 2009; Fenichel & Schweingruber, 2010). In a 2012 issue of *Dimensions*, Christine Reich, vice president of exhibit development and conservation at the Museum of Science, Boston, stated "As institutions known for their interactive and self-directed activities, science museums already exhibit many of the principles of universal design for learning that foster equitable learning environments for all… Looking back, I see evidence that science museums have become more inclusive of people with disabilities over time. Looking ahead, however, I believe much more

work remains" (Reich, 2012) Examples of existing resources include accessibility resources through the American Alliance of Museums (2022); *Inclusion, Disabilities, and Informal Science Learning* from the Center for Advancement of Informal Science Education (CAISE) (Reich et al., 2010); and the recent book *The Art of Access: A Practical Guide for Museum Accessibility* (Pressman & Schulz, 2021).

Description of the Practice

Through weekly modules, interns developed problem-solving, self-determination, and communication skills as they worked to enhance their learning about accessible ISL, promote the inclusion of disability-related topics within academic departments, and engage in activities to make ISL offerings more welcoming and inclusive. Several products and resources were created, co-developed, or enhanced by *AccessISL* interns. They included a video production; a publication called Equal Access: Universal Design of Informal STEM Learning (DO-IT, 2021); reports describing accessibility within museology courses; a presentation at the American Association of Museums Expo; content within the AccessISL Knowledge Base; and collaborations with ISL programs.

Observed Outcomes
Impacts on Informal STEM Learning Programs

Accessibility reviews at the Seattle Aquarium, the Pacific Science Center, the Burke Museum of Natural History, and the Living Computer Museum. In small groups, *AccessISL* interns conducted on-site visits to four local ISL programs to conduct accessibility reviews in areas such as policies, facility and exhibit access, staff training, and information technology. Their reports were shared with each program along with suggestions for improving accessibility and suggestions for specific projects. All programs stated that the information was helpful for improving accessibility and that information would be utilized in program planning.

For example, the Seattle Aquarium shared that the site visit and follow-up correspondence from *AccessISL* interns "is really great and helpful and is producing to be a jumping off point for us to rebegin conversations around accessibility at the Aquarium and think about what type of standards we would like to have for guests in person and virtually. This letter has been shared with our Community Engagement and Inclusion Manager, the Diversity Equity and Inclusion Council, and our Director of Facilities and Operations. All have expressed gratitude for their recommendations, which are being reviewed to determine what actions can be taken. We are also con-

sidering how this is something we could incorporate into our 2022 institutional initiative surrounding a renewed focus on the guest experience." Similarly, the Living Computer Museum shared, "We appreciate the information shared by the *AccessISL* interns. We're already looking at ways to incorporate some of their ideas to further make our space accessible to everyone. We're excited they were able to visit."

Website review with the Pacific Science Center. An intern helped explore the Pacific Science Center website for accessibility as well as inclusive and welcoming language. This work supplemented a more in-depth report about web accessibility provided by AccessISL. The Pacific Science Center stated, "by summer of 2022, PacSci will have launched a new website with improved functionality and accessibility."

Minigrant with Riverside Art Museum (RAM). One intern worked with RAM to support the development and piloting of a desert-themed RAM "KickstART" Kit utilizing universal design to increase accessibility to STEAM lessons for children who are blind or low vision, neurodiverse, non-English speaking, or deaf/hard of hearing. The museum's director of art education and community engagement stated, "This was an exciting time for the Riverside Art Museum to be able to work with (the intern) for the first time and work on universal design. She was able to set the framework that we can use when developing new projects as well as expanding access to existing museum projects."

Minigrant with Port Townsend Marine Science Center (PTMSC). An intern worked with PTMSC to assist in the development of three sets of Salish Sea plankton models to improve tactile accessibility across all plankton programming and exhibits. The PTMSC program director stated that the *AccessISL* intern's activities "made possible the 3D printing of several species of zooplankton and phytoplankton as greatly enlarged plastic models that can be handled and examined by students and visitors. These are remarkable teaching tools…Our education team can now create new opportunities for all students to explore life in the ocean through this unique tactile experience." PTMSC staff appreciated working with the intern on captioning activities for their "Story of Hope" video, and are making efforts to ensure captioning continues on other museum video presentations.

Impacts on the UW Museology Program

Six interns provided analysis of four courses in the UW Museology program to identify strengths related to accessible offerings, as well as opportunities to further incorporate principles of UD. Courses included Introduction to Museology, Collaborative

Exhibits, Learning in Museums, and Careers and Social Capital.

In response to one intern's feedback for Learning in Museums, the instructor shared "This quarter when I taught the class, I made sure that each video that I showed had captions. I made sure that the PDF readings were converted into screen-reader friendly versions. Next year when I teach the class, I'll create a calendar specifically for students in the class and ask them to meet with me at some point during the first two weeks. Such a great idea!"

Two interns provided feedback for the Introduction to Museology course, arranged in the topical areas of accommodation disclosure, learning modalities, and accessibility of course materials. In response, the instructor of the course shared information about course redesign, which included faculty communication practices regarding accommodations, the utilization of a course assistant to help ensure access, physical access considerations, expanded learning modalities, enhanced guidance and advising for all students, live captioning for lectures, and books made available online to all students. The instructor shared, "Modeling these accommodations for the class reinforced a commitment to access for all."

One intern provided feedback for a course called Collaborative Exhibits, while another provided feedback for a course called Careers and Social Capital. The Museology program reported that the two classes are being redesigned and the feedback will be utilized to help inform the accessibility of the redesigned courses.

Resource Development: Access to Informal STEM Learning Video

Student interns created a video in collaboration with the UW's media development office, UWTV, called *Increasing Access to Informal STEM Learning* (Bellman et al., 2021). The video, submitted to the National Science Foundation's annual STEM for All Video Showcase (TERC, 2021), featured the interns talking about important facets of accessible informal STEM learning. The Showcase is designed for principal investigators of federally funded projects, practitioners, administrators, researchers, policymakers, industry, students, and the public at large. The AccessISL intern video has been viewed over 1,900 times and spawned 18 discussions.

Resource Development: AccessISL Knowledge Base

Interns contributed to the *AccessISL* Knowledge Base by creating articles, suggesting topics, and helping edit content. Examples of articles developed include the following.

1. Visitor Voices: Sharing perspectives of museum visitors with disabilities
2. Intrepid Museum: A promising practice in providing accessibility information
3. Where can I learn more about accessibility and UD of informal STEM learning programs?
4. ALT-text as Poetry: A promising practice in reimagining ALT text
5. How do I include deaf students in informal learning conversations?
6. Where can I find accessible downloadable museum exhibits?

Changes in Intern Skills and Knowledge: Empowering Future Professionals

AccessISL interns were asked to complete post-internship surveys so that the evaluation team could assess the impact the project had on them overall as well the extent to which learning outcomes were reached. When asked to describe how participation in the internship changed their knowledge or skills regarding accessible ISL, responses included the following:

- "Prior to this internship I was unfamiliar with the principles of universal design. Through readings and discussion boards, I had the opportunity to consider specific implementations of UD within museums and informal STEM learning organizations as well as the theoretical foundation for UD."
- "I think that I am better equipped to have discussions about creating accessible spaces and implementing better practices when creating and delivering these STEM programs."
- "Working within these real-world constraints gave me a deeper understanding of how museums and ISL organizations can implement UD in education within the capacity of the institution and how institutions can work to build out that capacity."
- "In this internship I was introduced to several institutions that are working to improve accessibility in their ISL programs. By considering how these organizations are doing the work, what is working, and what needs improvement, I identified promising practices as well as mistakes to avoid in application."
- "One of the most important takeaways that I've gained from this internship is that accessibility work cannot be done without a diversity of voices from community members living with disabilities. This is a practice I hope to take with me as I move through my career in museum leadership."

- "I plan to develop my thesis project with UD and accessibility at the forefront."

Implications and Transferability

Implementation of *AccessISL* activities will help bring about systemic changes in the practices of ISL programs that are engaged in project activities and by those who use the resources on the project website, including the *AccessISL* Knowledge Base and videos, thus continuing to impact practices after project funding has expired. Project leaders will continue to share project outcomes and lessons learned, and online resources through conferences, training, publications, and the project community of practice. A replication package regarding the utilization of interns is being developed for the *AccessISL* website for those who wish to learn more about conducting similar activities.

References

AccessISL. (2021). *Checklist for making informal learning accessible to students with disabilities.* DO-IT, University of Washington. https://www.washington.edu/doit/checklist-making-informal-learning-accessible-students-disabilities

Allen, W., Bonous-Hammarch, M., & Teranishi, R. T. (2006). *Higher education in a global society* (Vol. 5). Achieving diversity, equity and excellence. (Advances in education in diverse communities: Research policy and practice). Greenwich, CT: JAI Press.

American Alliance of Museums. (2022) *Accessibility.* https://www.aam-us.org/category/diversity-equity-inclusion-accessibility/accessibility/

American Association for the Advancement of Science. (2001). *In pursuit of a diverse science, technology, engineering, and mathematics workforce.* Washington, DC: Author.

Bell, P., Lewnstein, B., Shouse, A. W., & Feder, M. A. (Eds.). (2009). Learning science in informal environments: People, places, and pursuits. *The National Academies Press*. Retrieved from http://www.nap.edu/catalog.php?record_id=12190

Bellman, S., & Burgstahler, S. (Eds.). (2016). *Perspectives of STEM students with disabilities: Our journeys, communities, and big ideas*. Seattle, WA: The DO-IT Center.

Bellman, S., Bowyer, R., Burgstahler, S., & Kravets, E. (2021). *Virtual access to informal STEM learning* [Video]. 2021 STEM for All Video Showcase. https://stemforall2021.videohall.com/presentations/2243

Bellman, S., Burgstahler, S. & Chudler, E. (2018) Broadening participation by including more individuals with disabilities in stem: promising practices from an engineering research center, *American Behavioral Scientist, 5*(62), 645-656.

Bellman, S., Burgstahler, S., Ladner, R. (2014). Work-based learning experiences help students with disabilities transition to careers: A case study of University of Washington projects. WORK: A *Journal of Prevention, Assessment & Rehabilitation, 48,* 399-405.

Burgstahler, S. (2006). *AccessSTEM: Progress of teens with disabilities toward STEM careers: Positive inputs leading to critical junctures*. Seattle: University of Washington. http://www.uw.edu/doit/Stem/flowchart.html

Burgstahler, S., & Crawford, L. (2012). *Engaging students with disabilities in accessibility reviews.* Dimensions, November/December.

Congressional Commission on the Advancement of Women and Minorities in Science, Engineering, and Technology Development (2000, September). *Diversity as America's competitive edge in science, engineering and technology*. Washington, DC: Author.

Connell, B. R., Jones, M., Mace, R. Mueller, J., Mullick, A., Ostroff, E., Sanford, J., Steinfeld, E., Story, M., and Vanderheiden, G. (1997). *The principles of universal design*. Raleigh, NC: The Center for Universal Design. https://projects.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm

Disabilities, Opportunities, Internetworking, and Technology (DO-IT). (1993-2021). *DO-IT snapshots.* Seattle: University of Washington.

DO-IT. (2013). *Facilitating accessibility reviews of informal science education facilities and programs.* University of Washington: Author. Retrieved from https://www.uw.edu/doit/sites/default/files/atoms/files/Facilitating_Informal_Science_Review.pdf

DO-IT. (2021). *Equal access: Universal design of informal learning*. https://www.washington.edu/doit/equal-access-universal-design-informal-learning

DO-IT. (n.d.). *Evidence-based practices of DO-IT.* Seattle: University of Washington. Retrieved from http://www.uw.edu/doit/Research

Fenichel, M., & Schweingruber, A. (2010). *Surrounded by science: Learning science in informal environments.* National Research Council, The National Academies Press. Retrieved from http://www.nap.edu/catalog.php?record_id=12614

Leake, D., Burgstahler, S., Rickerson, N., Applequist, K., Izzo, M., Arai, M., & Picklesimer, T. (2006). Literature synthesis of key issues in supporting culturally and linguistically diverse students with disabilities to succeed in postsecondary educa-

tion. *Journal of Postsecondary Education and Disability, 18*(2), 149-165.

National Council on Disability and Social Security Administration. (2000). *Transition and post-school outcomes for youth with disabilities: Closing the gaps to post-secondary education and employment*. Washington, DC: Author.

Office of Disability Employment Policy. (2001, November). *Improving the availability of community-based services for people with disabilities*. Washington, DC: Author.

Pressman, H., & Schulz, D. (2021). *The art of access: A practical guide for museum accessibility*. Rowman & Littlefield Publishers. https://rowman.com/ISBN/9781538130506/The-Art-of-Access-A-Practical-Guide-for-Museum-Accessibility

Reich, C. (2012). Changing practices: Inclusion of people with disabilities in science museums. *Dimensions, 6*, 22-27. Retrieved from http://www.astc.org/DimensionsPDFS/2012/NovDec.pdf

Reich, C., Price, J., Rubin, E., & Steiner, M. (2010). *Inclusion, disabilities, and informal science learning*. A CAISE Inquiry Group Report. Washington, D.C.: Author.

Stern, V., & Woods, M. (2001). *Roadmaps and rampways*. Washington, DC: American Association for the Advancement of Science.

TERC. (2021). *2021 STEM for all video showcase.* https://stemforall2021.videohall.com/

Valentine, J. C., Hirschy, A. S., Bremer, C. D., Novillo, W., Castellano, M., & Banister, A. (2009). *Systematic reviews of research: Postsecondary transitions identifying effective models and practices*. Louisville, KY: National Research Center for CTE. http://136.165.122.102/mambo/component/option,com_remository/func,fileinfo/id,193/

About the Authors

Scott Bellman received a Master's Degree in Rehabilitation Counseling from the University of Iowa. His experience includes working as a mental health counselor and rehabilitation professional, as well as management of the many grant-funded projects of the University of Washington's Disabilities, Opportunities, Internetworking, and Technology (DO-IT) Center. His career interests include the career development of individuals with disabilities and their equitable inclusion in all aspects of society. He can be reached by email at: swb3@uw.edu.

Sheryl Burgstahler received a Master's degree in mathematics and a Ph.D. in Governance and Administration of Higher Education from the University of Washington. Her experience includes teaching in secondary and postsecondary education, directing the Accessible Technology Services unit and the DO-IT Center at the University of Washington, and publishing many articles and books related to accessible offerings and universal design. She can be reached by email at: sherylb@uw.edu.

Meena Selvakumar received a Ph.D. in molecular biology from Stony Brook University and a post-graduate diploma in Environmental Science from the Indian Institute of Ecology and Environmental Sciences. Her experience includes award winning work in scientific communication; work related to informal science education, community engagement, and program development; and teaching at the University of Washington's Museology Master of Arts Program. She can be reached by email at: meenas2@uw.edu.

Acknowledgement