Including Disability in Diversity

3 authors, including:

R.E. Ladner
University of Washington Seattle
293 PUBLICATIONS   **11,605** CITATIONS

Sheryl Burgstahler
University of Washington Seattle
87 PUBLICATIONS   **1,342** CITATIONS

Some of the authors of this publication are also working on these related projects:

Project Eyes free interaction View project

Project Accessible IT policies and procedures View project

Including Disability in Diversity

Brianna Blaser
DO-IT
University of Washington
Seattle, USA
blaser@uw.edu

Richard E. Ladner
Paul G. Allen School of Computer
Science and Engineering
University of Washington
Seattle, USA
ladner@cs.washington.edu

Sheryl Burgstahler
DO-IT
University of Washington
Seattle, USA
sherylb@uw.edu

Abstract— **For over a decade, AccessComputing has worked to increase the participation of people with disabilities in computing fields. A key component of this work is to influence institutional change in educational institutions, computing organizations, government labs, and industry companies. This paper considers lessons learned in working with these partners in ensuring that disability is included in larger conversations around diversity.**

Keywords—disability, broadening participation, institutional change

I. Introduction

For over a decade, *AccessComputing* has worked to increase the participation of people with disabilities in computing fields. Through National Science Foundation (NSF) funding, *AccessComputing* has helped students with disabilities successfully pursue degrees and employment in computing fields and worked to increase the capacity of postsecondary institutions, employers, and other organizations to fully include individuals with disabilities in computing education and careers. We've previously documented lessons learned in engaging computing students with disabilities [1]. This article considers lessons AccessComputing has learned in work with organizations including educational institutions, computing organizations, government labs, and industry.

Demand for computing professionals is outpacing supply. The underrepresentation of women, racial/ethnic minorities, and people with disabilities [2]–[6] contributes to the current shortage. Individuals with disabilities are less likely than their nondisabled peers to succeed in careers [5]–[8]; complete degrees [5]–[10]; and pursue science, technology, engineering, and mathematics fields [11], [12].

To be successful in a computing career, individuals with disabilities must overcome barriers imposed by inaccessible facilities, curricula, and information technology; inadequate academic supports; and lack of encouragement and role models. Students with disabilities in computing fields report issues including difficulty navigating technical interviews, inaccessible programming environments and hardware, disability disclosure in the classroom and the work environment, and additional complications related to relocation for internships or employment [1].

AccessComputing began in 2006 as a joint effort between the Allen School of Computer Science and Engineering and the DO-IT (Disabilities, Opportunities, Internetworking, and Technology) Center at the University of Washington (UW) as a multi-objective national project with the goal of increasing the number and success of people with disabilities in computing fields. The objectives included direct interventions for students, institutional change for organizations, and creation and curation of resources for individuals and organizations. In the process we have engaged over fifty academic and organizational partners who share our goals and commitments. In 2015, the UW Information School joined the effort and our objectives were expanded to include promoting the teaching of accessibility and working with computing industry to help them become more equipped to recruit and retain more people with disabilities as interns and permanent employees. Evaluation results of *AccessComputing* activities suggest that computing departments, professional organizations, and employment opportunities have become more welcoming and accessible as a result of engagement with *AccessComputing* [13].

II. Impact on Educational Institutions

AccessComputing has impacted computing education both at the K-12 level and the postsecondary level. At the K-12 level, this includes development of a Web Design and Development course (WebD2) by our information technology accessibility specialist Terrill Thompson in collaboration with K-12 teachers [14]. WebD2 integrates accessibility and universal design (UD) principles and methods throughout the curriculum, thereby increasing accessibility awareness, knowledge, and skills among future computing professionals. The curriculum has been used extensively—over six thousand users worldwide have created instructor accounts and over one thousand individuals have subscribed to a discussion list created to support teachers with the curriculum.

In 2014, we received a complementary grant from NSF, *AccessCS10k* to increase the participation of students with disabilities in computing education at the K-12 level. It is

important to ensure that students with disabilities are included in the current movement to bring computing education into K-12 schools [15]. In collaboration with Andreas Stefik at the University of Nevada, Las Vegas, this project has taken a two-pronged approach. Because many popular tools used in K-12 computing are inaccessible to students who are blind or have mobility impairments, this project develops and promotes the Quorum programming language, an accessible alternative [16]. The project also provides professional development for individuals who develop trainings for K-12 teachers. This professional development includes information about accessible tools as well as information about how universal design of learning (UDL) can make a classroom more welcoming and accessible to students with a variety of disabilities [17]. Starting in 2018, through an additional grant, *AccessCSforAll*, we will hold professional development workshops for teachers of students who are blind, deaf, or have learning disabilities so that they can offer an accessible Advanced Placement Computer Science Principles (CSP) course. *AccessCSforAll* will develop an accessible CSP curriculum that employs the Quorum language and emphasizes the impact of accessible technology on society.

At the postsecondary level, *AccessComputing* works with a nationwide network of computing departments at thirty-five colleges and universities each represented by a committed individual partner. These partners engage with each other via phone meetings, online communities of practice (CoPs), and in-person capacity building institutes (CBIs) and commit to taking steps that will make computing courses, resources, programs, and/or project activities more welcoming and accessible to individuals with disabilities. Several of these partners have disabilities, others have research interests related to accessibility, and some are interested more generally in broadening participation in computing.

Through project activities, *AccessComputing* helps partners identify steps they can take to increase the participation of people with disabilities in computing. As a result, partners have recruited student team members, hosted interns with disabilities, included students with disabilities in outreach activities, and made their websites more accessible and welcoming. Several of our partner institutions, including Carnegie Mellon University, Georgia Tech, New Mexico State, and Landmark College have worked with *AccessComputing* to host CBIs at their institutions. These collaborative meetings include a variety of stakeholders and focus on actionable steps their institution can take to more fully include people with disabilities in computing fields, make resources accessible, and incorporate disability-related content in courses. In addition, *AccessComputing* has developed and disseminated a large collection of online resources that educators can use to make their courses, departments, and schools more welcoming and accessible to students with disabilities [18]. This includes publications related to UDL, accessibility of computing labs, and information technology as well as videos on related topics.

Since 2015, *AccessComputing* has been working to increase the inclusion of information related to accessibility and disability in postsecondary computing courses. Tech companies report that they need more employees with an understanding of accessibility [19], [20]. Additionally, acknowledging disability in the curriculum may serve to make computing more welcoming and accessibility to individuals with disability and other diverse backgrounds. When people with disabilities are involved with the development of technology, it can help to ensure that technology is accessible from its inception [21]. Many, though certainly not all, individuals with disabilities are interested in accessibility and may be more interested in careers in technology when exposed to this content [22], [23]. In CBIs and other presentations, we have promoted the inclusion of accessibility in computing courses and offered strategies for doing so. We have also partnered with Teach Access in a variety of activities with similar goals. Teach Access is an initiative of tech companies and educational institutions interested in expanding what undergraduates are taught about accessibility in computing fields [20]. At the UW, *AccessComputing* co-PI Andrew Ko has worked with instructors in the Information School to integrate information about accessibility into existing courses. As a result, large groups of UW undergraduates are learning about the topic. As of Fall 2017, accessibility is officially part of the curriculum in the Information School. All sections of INFO 200 (Intellectual Foundations of Informatics) now include at least one day of accessibility content in the 10-week quarter, reaching 900 students per year.

III. IMPACT ON ORGANIZATIONS

In addition to postsecondary partners, *AccessComputing* also works with a network of organizational partners that include computing associations, broadening participation groups, and groups focused on disability. Through this work, we have seen several groups make changes that have had a positive effect on individuals with disabilities in computing fields. At the inception of the Center for Minorities and People with Disabilities in Information Technology (CMD-IT), *AccessComputing* PI Richard Ladner advocated for the inclusion of people with disabilities along with other underrepresented groups to be part of its mission. Ladner is a founding member of the Board of Directors of CMD-IT. For the past several years, the Tapia Celebration of Diversity in Computing has been presented by CMD-IT. Because of this and *AccessComputing*'s involvement, there has been an increased focus on disability at the event. Recent years have seen multiple keynotes from individuals with disabilities including Annie Anton of Georgia Tech, Chieko Asakawa of IBM, Shaun Kane of the University of Colorado, and Daniel Sonnenfeld of Salesforce. Disability has had an increased presence at the conference in terms of attendees and program content.

AccessComputing has impacted other conferences as well. We have worked with the Grace Hopper Celebration's Women from Underrepresented Groups committee to ensure that women with disabilities are represented in their tracks, and we send students to the conference annually. In conjunction with Jonathan Lazar from Towson University, we have worked extensively with the Association for Computing Machinery (ACM) Special Interest Group on Computer-Human Interaction (SIGCHI) to make their conference more accessible. We worked with the ACM Special Interest Group on Computer Science Education (SIGCSE) to implement an

accessibility chair at their conference and presented multiple sessions in recent years related to disability.

AccessComputing plays an important role with the ACM Special Interest Group on Accessible Computing (SIGACCESS). We have supported people with disabilities attending ASSETS, their conference. Over the past ten years, the number of people with disabilities attending ASSETS has increased remarkably, with many of them being *AccessComputing* partners or student participants.

Each summer *AccessComputing* funds research experiences for undergraduates (REUs) for about five students wtih disabilities per year. Most often, these students work with faculty members at their home institutions and are not part of a larger REU site. We partner with the Computing Research Association Distributed REU (DREU) program to track and provide structure for these students. Through these REUs students with disabilities gain research experience and faculty members gain experience working with students with disabilities.

Since 2010 *AccessComputing* has worked with CMD-IT, the Computing Alliance for Hispanic-Serving Institutions (CAHSI), and the Coalition to Diversify Computing to coordinate the Academic Careers Workshop, which brings together senior graduate students and young faculty members in computing from underrepresented groups with senior mentors. Every year, students and faculty members with disabilities attend to learn about networking, grant writing, and the tenure and promotion process.

AccessComputing has worked with a variety of other computing organizations to help them include accurate information about disabilities in their own resources or to make their resources more accessible. Examples include csteachingtips.org, NCWIT (the National Center for Women in Information Technology, ncwit.org), and the ACM (acm.org).

IV. IMPACT ON INDUSTRY

Since 2015, *AccessComputing* has begun working more directly with industry via our partnership with Teach Access mentioned above, as well as by creating strategies to increase the participation of people with disabilities in the computing workforce. We work with a network of industry partners interested in recruiting, onboarding, and retaining employees with disabilities. Partners include Lawrence Livermore National Labs, Microsoft, Salesforce, and Oath. In June of 2016, we held a CBI for our partners. Proceedings are available online [23]. Industry partners engage with *AccessComputing* staff and partners via regular telephone conferences; work towards creating a welcoming and accessible environment for interns and employees with disabilities; have access to a resume database of computing students who have disabilities for potential internships and permanent employment; and explore opportunities for *AccessComputing* students to test products for accessibility.

Interactions with industry partners have varied. Salesforce has organized recruiting events for students with disabilities and partnered with *AccessComputing* to recruit interns and employees with disabilities. We have worked closely with Microsoft and Oath on initatives related to increasing the amount of accessibility content in the computing curriculum, such as designing and holding a workshop for faculty at the UW. Teach Access has replicated this workshop in other settings.

V. LESSONS LEARNED

Based on our experiences with *AccessComputing*, we offer the following lessons learned:

Disability is a part of diversity. People with disabilities encounter many of the same barriers as other underrepresented groups, including women and racial and ethnic minorities. Including disability in diversity conversations enriches our understanding of broadening participation.

Meet partners and collaborators where they are. Different partners and collaborators have different needs, which means that we engage with each of our partners differently. Determining what a partner might be interested in doing and working with them on that can lead to effective change rather than approaching all partners in a cookie cutter approach.

Develop a strong infrastructure to expand your impact. The administrative and staffing infrastructure that the DO-IT Center has developed has allowed us to apply for related grants, namely *AccessCSforAll* and *AccessEngineering*, to expand our impact on the representation of people with disabilities in K-12 computing and engineering, respectively.

Be persistent. Some organizations can be slow to change and require continued effort. Once change has been made, persistence is necessary to ensure that organizations don't revert, particularly as leadership changes.

Adapt to stakeholder shifts over time. Over time, we have added new partners to our network, allowing us to reach new schools and organizations and expand our work into industry. In addition, we've seen individual partners increase or decrease their involvement based on myriad factors. Regardless, the overall work and efforts to change move forward.

Leverage existing networks. Many of our partners were existing contacts within our PIs' networks, including collaborators, students, and others who work in similar research areas. Many of them joined our efforts because of these existing relationships.

Engage diverse communities to promote change. Within our project, we work with computer scientists, social scientists, industry engineers, disability service professionals, and others. This diversity allows participants to learn from one another and leads to rich conversations and change.

Build community through different interactions. We engage with partners at our CBIs, at national conferences, in phone meetings, and via our CoPs. Each interaction is a chance to build community, have conversation, and find ways to collaborate and make change. Different partners are more active in different arenas depending on their own preferences.

AccessComputing has also learned from challenges that we have encountered.

Be mindful of small numbers. When we formed targeted CoPs that included individuals interested in specific disabilities, we found that the communities never took off. The groups were small and segmented our community too much. Our CoPs have been more effective with a larger yet more diverse group.

Engaging in a common activity with diverse partners may be difficult. We hoped to engage with our university partners to collect data on students with disabilities on their campus. Not all partners wanted to participate. Others were unable to obtain the data. Data that we did obtain varied across institutions.

Take time to learn about new groups. We have tried to engage with veterans with disabilities over time with mixed results. Many veterans have disabilities related to their service and yet many veterans are reticent to identify as an individual with a disability. Learning more about military culture has been critical to engaging with veterans.

Over the last decade, *AccessComputing* has been changing the conversation about diversity in computing by working to ensure that disability is included through our work with a variety of stakeholders including individuals with disabilities, educators, computing organizations, and industry. We look forward to continuing to do this work and seeing disability become a more prominent part of the conversation about broadening participation in computing.

We encourage others who are interested in increasing the participation of individuals with disabilities in computing to get involved. Faculty members can refer computing students with disabilities, join our online mentoring community as a mentor, or host an intern in their lab. Educators can find ways to make change within their departments by becoming a partner, joining one of our online CoPs to engage in online conversations, including information about accessibility in their courses, and utilizing our online resources to find ways to make their departments and schools more welcoming and accessible to individuals with disabilities. Industry professionals can also become partners and utilize our resume database of students with disabilities in computing to recruit interns and employees to their organizations.

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