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This publication shares promising practices of the Center for Sensorimotor Neural Engineering (CSNE) at the University of Washington (UW) to engage people with disabilities in all aspects of the Center. On the back of this brochure is a list of practices explained further throughout the following paragraphs. It is hoped that this content will stimulate conversations with other National Science Foundation-funded Engineering Research Centers (ERCs) about how we can increase the engagement of individuals with disabilities.

Recruitment

Recruiting individuals with disabilities is a challenge to any program. Multiple methods are employed to attract people with disabilities to all aspects of the CSNE.

Develop strategic partnerships, including those with disability and veteran service units, and employ joint recruitment strategies.

The CSNE fosters partnerships with individuals and organizations that help the Center meet its diversity goals with respect to disability. The Diversity Director and Manager for the CSNE are leaders in the international DO-IT Center (where DO-IT stands for Disabilities, Opportunities, Internetworking and Technology), which is housed at the UW. DO-IT, largely funded by the NSF, helps students with disabilities succeed in college and careers, offering a large pool of students with disabilities to be recruited to CSNE activities. CSNE staff members also work with disability and veterans service offices at the UW and CSNE partner institutions. The Center creates email announcements of CSNE opportunities that disability service offices distribute to students registered with their office. In addition, the CSNE publishes an article in a bi-annual newsletter for students with disabilities, inviting them to engage in CSNE events, internships, and other opportunities—a strategy that identified an undergraduate student with a disability working

in a CSNE research lab for over two years. Similarly, the veterans' center provides access to many individuals who acquired disabilities during military service. The CSNE also developed a highly-rated "Research Experiences for Veterans" program, now in its fourth year (*www.csne-erc.org/content/veterans*).

Recruit people with disabilities, including veterans, onto advisory boards and leadership teams.

Members of the CSNE community work with strategic partners to recruit individuals with disabilities onto advisory boards, where they can play key roles in helping define the direction of Center research and identify funding sources and collaborators. They bring unique expertise, such as knowledge about accessible facilities, alternative ways of using technology, and the challenges and abilities of individuals with disabilities with respect to Center products and activities.

Develop outreach activities and programs especially for students with disabilities, including veterans, and also recruit individuals with disabilities into programs for all students.

The CSNE has hosted hundreds of students with disabilities in neuroscience awareness activities and recruits students with disabilities into internships and other work-based learning opportunities. Outcomes have included five high school students with disabilities participating as researchers in summer programs. In collaboration with the DO-IT Center, the CSNE hosted a learning lab for nine college students and sixteen high school students with disabilities that included hearing, vision, and mobility impairments, learning disabilities, and autism. During the learning lab, students were introduced to CSNE staff and learned about the field of sensorimotor neural engineering and collaborative research facilitated by the CSNE.



Communication

Several communication strategies have been implemented to help the CSNE meet its diversity goal with respect to individuals with disabilities.

Promote disability awareness.

CSNE staff members look for opportunities to promote the inclusion of people with disabilities through center-wide communication. For example, the CSNE diversity team delivers presentations about disability inclusion annually. Another activity, informally referred to as the “October Letter,” invites the entire CSNE community to recruit individuals with disabilities into Center offerings in recognition of Disability Employment Awareness Month in October. The email message, with subject line “Embracing Disability at the CSNE,” includes a proclamation from the president of the United States of America about the great potential of individuals with disabilities in the work place. Part of this annual message from the CSNE diversity team reads

In the spirit of National Disability Employment Awareness Month, I would like to challenge all CSNE members to look around your department and in your labs. Talk to undergraduate and graduate students, fellow researchers, your staff, and advisers. Think about the clinicians and rehabilitation specialists that you know. Let people know that CSNE-related opportunities exist for individuals with disabilities. For students, the CSNE can offer mentoring, help finding internships and research opportunities, neuroscience courses and presentations, networking through the CSNE Student Leadership Council, and other activities. Opportunities for non-students abound. Their unique perspective and expertise lends itself well to discussions about ethics and new technologies.”

One faculty researcher responded to the email message, saying “I am disabled... no reason for it to be kept in confidence. I prefer that people know since my disability is hard to understand. ...Having people know about the nature of my disability is analogous to someone with diabetes needing to inform people they have to periodically check their blood sugar.”

Highlight the achievements of people with disabilities.

The education and diversity team at the CSNE highlight the achievements of participants with disabilities in multiple ways. For example, in a video produced by CSNE and prominently linked from the Center website, a summer program participant talks about her visual impairment and her research experiences in a CSNE-affiliated electrical engineering lab, focusing on security as it relates to medical devices (www.youtube.com/watch?v=MvaELcQ8aY0). She shares “I have a visual impairment. It’s called Stargardt’s [disease], and it’s a genetic condition. So, basically the center of my vision is really blurry compared to ‘normal’ people but I’ve had it for so long that my vision is normal to me, so I don’t really even know what ‘normal vision’ is.”

The CSNE includes images of people with disabilities and information on requesting accommodations in promotional materials. When hosting individuals with disabilities during outreach activities and summer programs, CSNE staff members take photographs of students in action, including students with disabilities. Images are used in promotional materials and web pages. For example, the front panel of a CSNE brochure features a student who uses a wheelchair engaged in a hands-on session about an EMG-controlled device. Students with disabilities may be more interested in CSNE if they see images of other people with disabilities in promotional materials and expect that the CSNE will welcome their engagement. Include a statement regarding how a person can request a disability-related accommodation from the ERC.

Encourage faculty, staff, and student leaders to engage in disability-related conferences and training opportunities.

The CSNE education and diversity team looks for opportunities to send faculty and others to disability-related conferences. For example, one faculty member at a CSNE partner campus was provided free registration and travel to the California State University Northridge’s Annual International Technology and Persons with Disabilities Conference to learn about accessibility issues as they relate to emerging technology.



Share disability-related practices at conferences.

The CSNE executive director and diversity manager presented a session at a national conference titled *Promoting the Successful Participation of People with Disabilities in STEM* (www.uw.edu/doit/promoting-successful-participation-people-disabilities-stem-2014). Their presentation called “Engaging Individuals with Disabilities in an Engineering Research Center” shared the promising practices described in this publication. The more than fifty attendees included postsecondary faculty, disability service providers, individuals who have led projects funded by NSF, and representatives from professional organizations. At the 2014 NSF-ERC Biennial Meeting, CSNE staff also brought up issues about the inclusion of individuals with disabilities and promoted accessible design of websites and facilities during discussion sessions.

Accessibility of Facilities, Information Resources, and Activities

In order for individuals with disabilities to fully engage in Center activities and benefit from its resources and programs, facilities, technology, curriculum materials, and activities must be designed to be accessible to them.

Apply universal design and provide reasonable accommodations.

Universal design (UD) challenges the conventional approach of designing for the average user, instead promoting the design of all products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. In the CSNE the principles of UD are applied to presentations, information technology, physical spaces, and more. CSNE uses UD publications, videos and web resources developed by the DO-IT Center’s many NSF-funded projects that are collected in its Center for Universal Design in Education (www.uw.edu/doit/programs/center-universal-design-education/overview). Those most relevant to the CSNE include *Equal Access: Universal Design of Engineering Departments*, *Equal Access: Universal Design of Engineering Labs*, and *Equal Access: Universal Design of ERCs*.

Consult with individuals with disabilities in lab/facility design.

Several students with disabilities participated in the design phase of the CSNE headquarters. They toured the facility under construction and met with members of the architectural firm and CSNE leadership. They recommended floor plans and surfaces, the location of door opener buttons, and other accessible design features.

Students with disabilities associated with the CSNE have also conducted accessibility reviews of lab spaces. For example, during summer 2015, four students partnered with one CSNE researcher to conduct an accessibility review of the UW’s new “CoMotion Makerspace” facility in collaboration with DO-IT’s NSF-funded *AccessEngineering* project (www.uw.edu/doit/programs/accessengineering/overview). The reviewers reported the appeal of the open and flexible spaces and the wide range of materials and tools that allowed people with differing abilities to find things to work with. They created a list of suggestions for making that space more welcoming and usable by people with disabilities, which included large print and braille labels for tools; adjustable-height tables with push-button adjustments to accommodate individuals using wheelchairs; multiple mouse and keyboard options; guards on sharp objects so people who use their fingers to “see” won’t inadvertently cut themselves; high-contrast, large-print instructional and safety signs; and making tools and safety equipment accessible from a seated position. An article published in UW Today shared their findings (www.uw.edu/news/2015/08/05/how-makerspaces-can-be-accessible-to-people-with-disabilities/).

Conduct website, document, and video accessibility reviews and remediate.

The CSNE website is regularly reviewed by DO-IT staff, using the Web Accessibility Content Guidelines 2.0 (www.w3.org/TR/WCAG20/), published by the World Wide Web Consortium, to make web content accessible to people with sensory and mobility impairments and other disabilities. CSNE staff members also regularly

review the accessibility of their PDF files and other documents. When documents for promoting summer programs are available in accessible formats, people who are blind or have learning disabilities can use screen reader technology to read the text presented in documents aloud. Similarly, CSNE curriculum materials are offered in multiple, accessible, formats and otherwise created with accessibility in mind, and CSNE videos are captioned. More information can be found at the UW Accessible IT website (www.uw.edu/accessibility).

A Climate of Inclusion

In all of its undertakings, the CSNE strives to create a community where individuals with disabilities feel welcomed and supported at all levels.

Consider disability as a diversity issue.

Although disability is a component of human diversity, when it comes to campus and workplace diversity and inclusion efforts, it is often ignored. People with disabilities face many challenges that are common to women, racial/ethnic minorities, and other underrepresented groups, such as lack of encouragement and role models. In the CSNE, students with disabilities benefit because their access issues are considered along with those of other underrepresented groups.

All CSNE applicants are asked “Will you need any accommodations to participate in laboratory or classroom activities?” Collecting this information helps CSNE staff be ready to support students, faculty, and staff with disabilities and work with other units on campus as appropriate. For example, at the CSNE, when a student with a vision impairment was accepted into a summer research position in a biorobotics laboratory, staff members consulted with the Disability Resources for Students office. They worked together with the student, teaching assistants, and faculty associated with the lab to tour the lab and identify possible access barriers and determine reasonable accommodations for the student. Specifically, trip hazards were identified and screen/text enlargement tools for computer

access were explored. Staff members also helped orient the student to the campus by walking important routes and identifying landmarks. A second example from the CSNE involved a student with a hearing impairment who was accepted into a summer research program at the UW’s Human Ability and Engineering Lab. Before the student arrived for the summer, CSNE staff helped her connect with the Disabilities Resources for Students office to obtain information about technology on campus that could interface with her cochlear implant (e.g., FM hearing systems and loop systems).

Provide mentoring opportunities for individuals with disabilities.

The CSNE, largely through its partnership with the DO-IT Center, provides opportunities for individuals with disabilities to receive mentoring from individuals with disabilities that encourages them to learn science and engineering, persist in their pursuit to degree completion and continue into science and engineering careers. Mentoring is provided through electronic communities, at events, and within lab settings. DO-IT’s e-mentoring community is also available to students with disabilities from any ERC who join the *AccessSTEM* Team (www.uw.edu/doiit/accessstem-team-application).

Address disability-related issues in grant proposals to enhance and expand ERC initiatives.

After the CSNE was funded and activities were underway, staff members explored opportunities to seek additional funding that can benefit individuals with disabilities. For example, supplemental funding from the NSF allowed the creation and growth of the Research Experiences for Veterans program that resulted in support for a veteran with a disability. A supplemental CSNE grant created the *AccessERC* project (www.uw.edu/doiit/programs/accesserc) to help all ERCs engage people with disabilities and make their offerings welcoming and accessible to participants with disabilities. Supplemental funding from the Kavli Foundation (www.kavlifoundation.org/) allowed the CSNE to highlight the concerns and

expertise of individuals with disabilities interested in the CSNE mission through presentations and discussions. A post in the CSNE *Engage and Enable* blog called “Lawyer, cyclist and person with a spinal cord injury” describes one such event. (csne-erc.org/engage-enable/post/lawyer-cyclist-and-person-spinal-cord-injury).

Data Collection

Several strategies have been implemented to improve the quality and quantity of data collected regarding the participation of individuals with disabilities at the CSNE.

Collect disability status along with other demographic information in application and evaluation forms.

The following statement appears on CSNE program applications: “Information you choose to provide about your race/ethnicity, disability status, age, or national origin is optional and will remain confidential. This information is, however, valuable to us and to the NSF in tracking participation of various groups in NSF-funded programs. Please check all categories that apply to you.” The demographic data collected is not shared with the team evaluating applications; rather it is used later to explore how selected students identify themselves and how best to support them. In addition, each year, a centralized, NSF program-level data collection system called ERCWeb solicits data from all ERCs. During this time, CSNE participants with disabilities are encouraged to disclose the existence of their disabilities to the NSF, as the ERCWeb system uses the demographics collected to generate graphs and data that speak to the inclusiveness of ERCs with respect to diversity.

Analyze data to determine the effectiveness of activities for people with disabilities.

The CSNE educational team has worked closely with project evaluators to develop a “common assessment tool” to evaluate the effectiveness of offerings. The tool can be used by CSNE staff at all partner institutions for a wide variety of educational and outreach activities. The use of the common assessment tool, which asks about

disability status, allows evaluators to compare the experiences across institutions of participants who disclose disabilities to those who do not.

In a post-activity survey of a CSNE learning lab for 25 students with disabilities, 92% of the students stated that activities like the CSNE learning lab can motivate youth with disabilities to pursue science and engineering fields. When asked if participation in the learning lab increased their own interest in sensorimotor neural engineering, 80% of students said “yes.” Comments included “I want to learn more about implant-able devices”; “It is cool, almost science fiction, to control something with your brain!”; “I want to know more about this field. Before I had no interest in this field”; and “The ‘carbot’ was awesome, and I want to learn how to make one of those.”

About AccessERC

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CSNE Promising Practices

The Center for Sensorimotor Neural Engineering (CSNE) at the University of Washington promotes engaging people with disabilities in all aspects of the Center. The following are a set of promising practices CSNE uses and encourages other engineering research centers to practice.

Recruitment and Engagement

- Develop strategic partnerships, including those with disability and veteran service units, and employ joint recruitment strategies.
- Recruit people with disabilities, including veterans, onto advisory boards and leadership teams.
- Develop outreach activities and programs especially for students with disabilities, including veterans, and also recruit individuals with disabilities into programs for all students.

Communication

- Promote disability awareness.
- Highlight the achievements of people with disabilities.
- Include images of people with disabilities and information on how to request accommodations in promotional materials.
- Encourage faculty, staff, and student leaders to engage in disability-related conferences and training opportunities.
- Share disability-related practices at conferences.

Accessibility of Facilities, Information Resources, Products, and Activities

- Apply universal design and provide reasonable accommodations.
- Consult with individuals with disabilities in lab / facility design.
- Conduct website, document, and video accessibility reviews and remediate.

An Inclusive Climate

- Consider disability as a diversity issue.
- Provide mentoring opportunities for individuals with disabilities.
- Address disability-related issues in grant proposals to enhance and expand ERC initiatives.

Data Collection and Evaluation

- Collect disability status along with other demographic information in application and evaluation forms.
- Analyze data to determine the effectiveness of activities for people with disabilities.