

Broadening Participation of People with Disabilities in Computing Fields

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Abstract - Individuals with disabilities are significantly underrepresented in both postsecondary academic programs and careers in computing, even though demand for employees in some information technology (IT) fields remains high. This presentation will describe access challenges for individuals with disabilities who wish to pursue IT fields, share promising practices for attracting people with disabilities to these fields, and provide information about *The Alliance for Access to Computing Careers (AccessComputing)*. *AccessComputing* is funded by the National Science Foundation and serves to increase the participation of people with disabilities in computing careers that include those in computer science, information systems, software development, computer engineering, systems management, and teaching. *AccessComputing* is a collaboration of the Department of Computer Science and Engineering and DO-IT (Disabilities, Opportunities, Internetworking and Technology) at the University of Washington (UW). Partners include Gallaudet University, the National Technical Institute for the Deaf (NTID) at the Rochester Institute of Technology, Microsoft, the NSF Regional Alliances for Persons with Disabilities in STEM (hosted by the University of Southern Maine, New Mexico State University, the University of Wisconsin-Madison, and the UW), and SIGACCESS of the Association of Computing Machinery (ACM).

THE NEED FOR ACCESSCOMPUTING

Data from the Computing Research Association shows the number of newly declared computer science majors declined 32% from 2000 to 2004. As reported by a Microsoft executive in the *Chronicle of Higher Education* (May 27, 2005, p. A32), "It's a major concern for us because we're a company that runs on people. Our hiring has continued to go up, but unfortunately, what we're seeing right now is a decline in the potential supply." There is wide recognition that innovation in computing requires a diverse workforce of qualified systems designers, computer scientists, information professionals, software developers, information systems analysts, technology teachers, computing faculty, and other computing professionals. The inclusion of individuals from underrepresented groups—including women, racial/ethnic minorities, and people with disabilities—is a potential

contributor to the success of the computing industry in the United States.

Individuals with disabilities are less likely to pursue academic studies and careers in high tech fields such as those in computer science and engineering and the dropout rate of those who do is high [1] [2] [3]. However, the relative few individuals with disabilities who are successful in computing fields and recent advancements in assistive technology products that provide computer access to individuals with disabilities [4] suggest that opportunities exist for people with disabilities who develop academic, technical, and self-determination skills.

Concern for including individuals with disabilities in IT fields is not just a matter of quantity, but of quality as well. As stated eloquently by William A. Wulf - "I believe that engineering is a highly creative profession. Research tells us that creativity does not spring from nothing; it is grounded in our life experiences, and hence limited by those experiences. Lacking diversity on an engineering team, we limit the set of solutions that will be considered and we may not find the best, the *elegant* solution." [5]

Increasing the participation of people with disabilities in computing careers will involve efforts by multiple stakeholder groups, including students with disabilities, educators, and employers. The objectives of the NSF-funded *Alliance for Access to Computing Careers (AccessComputing)* are:

- to increase the capacity of postsecondary computing departments to fully include students with disabilities in computing courses and programs.
- to increase the number of students with disabilities successfully pursuing undergraduate and graduate degrees and lifelong careers in computing fields.
- to create a nationwide resource to help students with disabilities pursue computer fields and computing educators and employers, professional organizations, and other stakeholders develop more inclusive programs and share effective practices.

AccessComputing will reach project objectives through (A) activities for faculty, administrators, and employers, (B) activities for students with disabilities, and (C) development of a national resource. The following three sections describe *Alliance* activities and share signs of success by the end of its first year of operation.

A. ACTIVITIES FOR FACULTY, ADMINISTRATORS, EMPLOYERS

Alliance activities include those described in the following paragraphs.

Communities of Practice

Communities of Practice (CoPs) share perspectives and expertise and identify practices that promote the participation of people with disabilities in computing fields. Collaborators may request *Alliance* funding for registration fees and publications for conferences for which their *Alliance* presentations/exhibit proposals are accepted, on-campus events, and computing internships for students with disabilities. Three *Alliance* CoPs are described below.

The Computing Faculty, Administrator, and Employer CoP engages computing professionals—faculty and administrators as well as representatives from industry and professional organizations—to increase their knowledge about disabilities and to make changes in computing departments that lead to more inclusive practices. Specifically, members of this CoP introduce *Alliance* staff to administrators of professional computing organizations so that staff can help these organizations make their websites accessible to visitors with disabilities and conferences accessible to attendees with disabilities; help identify, field test, and validate Computing Department Accessibility Indicators (discussed below) to make computing departments more accessible to students with disabilities; help plan and/or recruit others to *Alliance* events and identify campus/community computing events to which students with disabilities might be invited; help staff target articles to computing publications; and provide connections with computing faculty and industry for internships for students with disabilities.

The Broadening Participation CoP includes *Alliance* collaborators who administer projects that serve to broaden participation in computing fields and typically focus on increasing the representation of women and racial/ethnic minorities.

The Disability Services CoP includes disability service professionals from community/technical colleges, community colleges, and universities nationwide, together with their networks of postsecondary and elementary and secondary schools.

The Deaf and Hard of Hearing CoP includes practitioners who support individuals who are deaf or hard of hearing and have an interest in encouraging these individuals to pursue computing fields.

Capacity-Building Institutes

Capacity-building institutes include CoP members and draw in other members of relevant stakeholder groups. In these institutes participants meet 1-2 days, usually as a pre-conference sessions of relevant conferences. Agendas include presentations by experts followed by discussions in small groups. Participants identify strategies for recruiting and retaining students with disabilities in computing fields, making courses and departments more accessible, including accessibility topics in computing curriculum, implementing faculty training, and identifying directions for research. Proceedings are developed to inform *Communities of Practice* and policy makers.

Computing Department Accessibility Indicators

Computing Department Accessibility Indicators for postsecondary computing departments were drafted by *Alliance* staff and are located at http://www.washington.edu/accesscomputing/equal_access_csd.html. The Indicators continue to be reviewed and updated by *Alliance* collaborators with expertise and experiences in computing fields as students, educators, employers, and disability service providers.

Signs of Success

In the first year of *Alliance* operations, signs of success in reaching the objective to increase the capacity of postsecondary computing departments to fully include students with disabilities in computing courses and programs have emerged. More than 120 educators, employers, and other stakeholders have joined CoPs and the groups are active in sharing perspectives and expertise and identifying practices to promote the participation of people with disabilities in computing fields. More than 150 individuals participated in Capacity-Building Institutes, including an Equal & Accessible Technology Institute at Florida State University, an activity on Disabilities Mentoring Day at the University of Wisconsin-Madison, and presentations at several professional conferences. Preliminary data suggests that *AccessComputing* activities have increased participant knowledge and skills related to accessible technology and/or issues that impact the inclusion of individuals with disabilities in computing careers.

Project staff surveyed 170 computer science departments for website accessibility and are conducting a follow-up survey in year two of the *Alliance*. In addition, an *Alliance* staff member is working with ten computer science departments to improve website accessibility and address other accessibility issues on the *Computing Department Accessibility Indicators* checklist for postsecondary computing departments.

B. ACTIVITIES FOR STUDENTS WITH DISABILITIES

Student activities sponsored by *AccessComputing* include those described in the following paragraphs.

Transition and Bridge Academies and Workshops

College transition and bridge academies and workshops have been implemented by the *Alliance* at many institutions, that include Gallaudet University, the University of Southern Maine, New Mexico State University, the University of Wisconsin-Madison, Seattle Central Community College, the University of Minnesota, the University of Southern Florida, the University of Washington, and the University of Southern Connecticut. In these activities, students with disabilities learn about careers in computing and college opportunities; role-play on working with faculty and employers; practice self-advocacy skills; explore options for internships and jobs after college; take computing-related field trips; meet computing professionals, including those with disabilities; learn about resources; interact with peers and mentors; and/or are invited to participate in *Alliance* e-mentoring communities, internships, and other work-based learning activities described below.

Internships

Research and industry internships within computing fields are offered to postsecondary students with disabilities. The *Alliance* covers a limited number of participant salaries for cases where a computing professor or other employer has a good research or industry work experience, but does not have funding to pay the student. *Alliance* staff work with each supervisor and student to identify appropriate accommodations; this interaction improves the participant's opportunity for success and strengthens the institution's capacity to work successfully with individuals who have disabilities.

E-Mentoring Community

An e-mentoring community of high school and college students with disabilities includes computing professors, postsecondary students, and other adult mentors in computing academic and career fields; many have disabilities themselves. In the e-mentoring community, staff and mentors:

- give psychological support and help protégés develop self-determination skills and a positive identity.
- provide students with opportunities for leadership development (e.g., by assisting with a conference exhibit or participating on a panel in a summer program).
- lead conversations about opportunities in computing fields and encourage, advise, and assist students with transition between academic levels and from school to work.
- help participants identify fields of interest and steps toward IT careers.

- encourage members to participate in *Alliance* academies, workshops and internships, and in other programs that promote computing careers.
- suggest that students use campus academic and career support services in computing.

Signs of Success

After one year of *Alliance* activities, there are already signs of success toward increasing the number of students with disabilities pursuing degrees and careers in computing fields. More than 200 students with disabilities have participated in *AccessComputing*-supported activities, including a College Transition Academy in Computing at Gallaudet University, a Summer Computing Institute at the University of Southern Maine, and a transition and introduction to computing/engineering event at the University of Minnesota-Duluth. Thirty high school, college, and graduate students with disabilities engaged in the e-mentoring community and twenty computing students with disabilities completed internships. Preliminary evaluative data suggests that computing interests and career awareness of participants increased as a result of these events.

C. A NATIONWIDE RESOURCE

Alliance staff members have created and continue to expand a searchable *AccessComputing* Knowledge Base of questions and answers (Q&As), promising practices, and case studies (See "Search Knowledge Base" link from <http://www.washington.edu/accesscomputing/>). The Knowledge Base provides educators with strategies for creating more inclusive computing courses programs, where students with disabilities are encouraged to pursue computing fields. It serves as a similar resource for employers. It also helps students with disabilities interested in computing fields find e-mentoring communities, internships, scholarships, job listings, undergraduate and graduate school information, and other useful resources. All printed and electronic materials are provided in accessible formats; multi-media will be captioned and audio described for viewers who have sensory impairments.

Signs of Success

By the end of the first year of *Alliance* activities, the *AccessComputing* Knowledge Base included a total of more than two hundred articles relevant to the inclusion of individuals with disabilities in computing fields. Examples of article titles are:

- Q&A. How can people who are blind use computers?
- Case Study. Web Access: A Case Study on Making Content Accessible to a Student who is Blind
- Promising Practice. ImagineIT Workshop: A Promising Practice in Engaging Students with Visual Impairments

Access to the articles in the Knowledge Base in year one grew to more than 10,000 "hits" per month.

CONCLUSION

The *Alliance* assures nationwide, long-term impact because it:

- supports local and regional workshops, academies, capacity-building institutes, and internships to recruit and retain students with disabilities into computing fields;
- helps computing departments, professional organizations, and alliances that serve women and racial/ethnic minorities make their activities and resources accessible to students with disabilities;
- collaborations among individuals with disabilities, computing professionals, faculty, employers, professional organizations, and disability service providers; and,
- collects and publishes research and practice data to support the inclusion of people with disabilities in computing fields.

AccessComputing outcomes will benefit society by making computing opportunities available to more citizens and enhancing computing fields with the perspectives of people with disabilities.

PARTICIPATION

Consider participating in *AccessComputing*:

- Join a *CoP*.
- Test *Computing Department Accessibility Indicators* and suggest improvements to project staff.
- Work to make your project accessible to people with disabilities (for suggestions, see <http://www.washington.edu/doit/Brochures/Programs/design.html>)
- Refer students with disabilities to project staff for mentoring and internships.
- Receive funding to sponsor an *AccessComputing* event on your campus.
- Contribute questions or promising practices to the *AccessComputing* Knowledge Base.

If you are interested in participating in these or other ways consult <http://www.washington.edu/accesscomputing> or send an inquiry to accesscomputing@u.washington.edu.

REFERENCES

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