

CEOSE Mini-Symposium on Institutions Serving Persons with Disabilities in STEM – October 15, 2007 Report

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2/26/08

The purpose of the mini-symposium was to learn about institutions and programs that serve students and faculty with disabilities in STEM (Science, Technology, Engineering, and Mathematics) fields in order to determine the appropriate role for NSF in fostering increased participation of individuals with disabilities in STEM fields.

The mini-symposium had representatives from institutions such as Gallaudet University, National Technical Institute for the Deaf, and Landmark College; Principal Investigators from NSF funded alliances that focus on students with disabilities; leaders from organizations such as American Association for the Advancement of Science, Association on Higher Education and Disability, Center for Applied Special Technology, and National Federation of the Blind; employers like NASA and IBM. Representatives from NSF spoke about their policies and programs, and some revealing statistics like that fact that only 1% of doctoral recipients report themselves as disabled, while 10% of the overall workforce is disabled. A highlight of the meeting was the panel of three Ph.D. students, one deaf, one blind, and one with attention deficit hyperactivity disorder (ADHD). Their stories showed how they overcame the common belief that people with disabilities are limited in what they can achieve in academia. There is a vast diversity among disabilities so that one solution does not fit all. There were 23 speakers and panelists among the 60 who attended and participated. The Agenda is attached as Appendix A. Organizers are found in Appendix B.

Data about Students with Disabilities in STEM

The Division of Science Resources Statistics, NSF, has a good grasp on data about students with disabilities. Approximately 11% of the population, ages 15-24, have disabilities. More than half of these students with disabilities have learning disabilities. Interestingly, the same percentage, 11%, of enrolled STEM undergraduates have disabilities. This percentage reduces to only 7% of enrolled STEM graduate students that have disabilities. There is evidence that students with disabilities are much more likely not to complete their bachelor's degrees, which may account for the drop off in percentage from undergraduate to graduate enrollment. Finally, only 1% of the STEM Ph.D. recipients have disabilities. As an example, in 2005, out of nearly 28,000 Ph.D. in STEM fields only 307 reported having a disability. If you look at specific disabilities the number of Ph.D.s is strikingly low. For example, 2.5% of the population have significant vision impairments, while only 0.1% of Ph.D.s in STEM fields are so impaired. The factor of 25 difference is similar for the hearing impaired population.

The data on persons with disabilities is often incomplete because people with disabilities often do not disclose it. In addition because much of the data at the K-12 level comes from different states with conflicting reporting rules, there is inconsistency in the data. At least within NSF, the reporting should be as complete as possible including PIs, reviewers, advisory committees, committees of visitors, and employees. (See recommendation 4.)

Institutions That Serve Large Populations of Students with Disabilities

Gallaudet University and National Technical Institute for the Deaf (NTID) primarily serve the deaf and hard of hearing population, and Landmark College that serves students with learning disabilities and attention deficit disorders. Gallaudet is a four year liberal arts university located in Washington D.C. It has about 1,200 undergraduate students and 550 graduate students. NTID is part of the Rochester Institute of Technology in Rochester, New York. NTID has about 1,350 undergraduate students. Some are in the two year program of NTID and some are RIT students who continue to be supported with NTID services after their first two years at NTID. Landmark College is a two year liberal arts college located in Putney Vermont with the primary mission of preparing its students for mainstream four year institutions. It has about 475 students.

NSF supports a number of programs at these institutions. The following are examples. The Science of Learning Center on Visual Language and Visual Learning (VL2) at Gallaudet University brings together deaf and hearing researchers and educators from multiple disciplines and universities. The Center is investigating how humans acquire and use language and develop literacy when hearing is not an available mode for learning. The Deaf Initiative In Technology (DiiT) at the National Technical Institute for the Deaf provides computer, graphic communication, and business-based training workshops in sign language to deaf and hard-of-hearing adults. The project Universal Design in College Algebra: Customizing Learning Resources for Two Year Students with Learning Disabilities at Landmark College is designing and evaluating effective algebra resources for two year colleges.

In spite of these valuable research projects at these institutions, the number and scope of NSF-funded research and education projects is limited by the fact that these institutions do not enjoy the status of Minority Serving Institutions (MSI). NSF programs such as Louis Stokes Alliances for Minority Participation (LSAMP) and Bridge to the Doctorate do not target students with disabilities and these institutions are not sought out as partners for these programs. Unlike MSIs, they are not eligible for research partnerships with Research I universities. A remedy would be to treat institutions that principally serve students with disabilities in a manner similar to MSIs. (See Recommendation 1.)

Research and education programs at these institutions are aligned with the needs of students with disabilities. However, it is not always the case that NSF-funded projects intending to improve the lives of persons with disabilities have consulted with their disability groups. As a result, these projects do not meet the needs of the groups they intend to help. Having persons with disabilities as reviewers of NSF proposals and well informed program directors will help assure that NSF-funded projects are aligned with the needs of the disability community. (See Recommendation 6.)

Practices for Increasing the Quantity and Quality of Students with Disabilities in STEM

There are a number of national or regional programs that support students with disabilities. The NSF supports these students through several programs including the Regional Alliances for Persons with Disabilities (RAD) in STEM sponsored by the Human Resource Development (HRD) within the Education and Human Resources (EHR) Directorate. There are currently four Regional Alliances that cover about 14 states. The Alliances directly support transition programs and mentoring activities for students. They also work with disability service offices and faculty at colleges and universities to improve the environment for students.

In addition to these NSF-funded alliances there are other programs with more limited missions. For example the American Association for the Advancement of Science (AAAS) support the EntryPoint program for matching students with disabilities with internships in industry, universities, and government.

Statistics indicate that students with disabilities are more likely to drop out of college than their able-bodied counterparts. The RAD transition programs have proven to be effective in helping students with disabilities succeed in college. These programs should be increased to cover more of the country. (See Recommendation 5.)

Supporting Students with Disabilities in Post-Secondary STEM

Students with disabilities find support from Disability Resources and Services (DRS) offices found at most universities and many colleges. These centers coordinate and pay for accommodations such as note takers, sign language interpreters, Braille texts, and other needs of students with disabilities. In addition, they work with faculty to make sure that students with learning disabilities get needed extra time on exams or other accommodations. Personnel in DRS offices are often members of the Association of Higher Education and Disability (AHEAD) whose mission is to promote full participation of persons with disabilities in colleges and universities.

The central concept of universal access to education is designing curricula that enable all students, regardless of disability, to have equal access to learning. There are a number of examples that are quite simple to implement. One example is to make class notes available electronically before class, so that all students, even blind student, can follow the lecture on an equal footing. The Center for Applied Special Technology (CAST) is a national leader in the development of universal design for education tools and technologies. Organizations like CAST that specialize in research and innovation to improve access to education are important resources for advancing students with disabilities in STEM fields.

The National Federation of the Blind (NFB) is the largest organization of blind people in the United States with about 50,000 members. They have a variety of programs including one to promote blind youth to enter STEM fields. As an example, in summer 2007, the NFB sponsored the NFB Youth Slam, a four day academy to engage and inspire about 200 blind high school students to enter STEM careers. Through its International Braille and Technology Center for the Blind, the NFB has the most complete evaluation and demonstration center for adaptive technology used by blind

people. The advancement of Blind students in STEM fields depends greatly on the quality of the adaptive technologies used in their colleges and universities.

Students with disabilities are fortunate to have organizations like AHEAD, CAST, and NFB whose missions include their advancement in STEM fields. These efforts are well aligned with the needs of these students and should be supported. (See Recommendation 6.)

Information on Disabilities from the Perspectives of Graduate Students

A highlight of the mini-symposium was the panel of three Ph.D. students, who described their challenges as students with disabilities and how they overcame them. The first student is a Ph.D. student in biochemistry and molecular biophysics at Columbia University. She had a late diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) after starting college. Because of the close attention of her parents she was able to succeed in high school but the transition to college was very difficult. Once she was diagnosed with ADHD, prescribed medications, and received services from the DRS office, she was much more able to manage and succeed in college. The diagnosis also allowed her to participate in the EntryPoint program that got her an internship at NASA Goddard. The transition from college to graduate school was equally difficult because of the different expectation of graduate students. She fully disclosed her disability in her applications to graduate school so her professors would be aware of it. She continues to work with the DRS office at Columbia to obtain services like audio translations of journal articles.

The second student is a deaf Ph.D. student in Chemistry at Stanford University. His preferred mode of communication is American Sign Language. He uses interpreters and writing to communicate with peers, students (he has been a TA), and his faculty mentors. He is not a proficient lip reader. For most of his education he was mainstreamed, meaning that he was in regular classes with hearing students and used sign language interpreters. This worked very well until entering graduate school where the classes are fast paced and the vocabulary is much more specialized. He was able to work out a plan through his DRS office to spend time with the interpreter out of class to work on development of a sign vocabulary for his field.

The third student is a blind Ph.D. student in Chemistry at Penn State University. He described his experiences in high school when he wanted to take calculus to prepare for a career in some STEM field. A group that included his guidance counselor, math teacher, and other met with him to explain that no blind person in the school had ever taken calculus before, and that they would not support him if he decided to take it. Later the guidance counselor recommended that he not try to get into science or engineering, but instead go into something like psychology. In the transition from high school to college he realized that he was not prepared very well in terms of Braille reading skills and even basic navigation skills. Through the National Federation of the Blind he finally met blind scientists and mathematicians and attended a summer “boot camp” to prepare him for college. He felt he was very fortunate to find a transitional program that really understood his potential and helped him achieve his goals.

Even with the examples of these three highly successful students, we can see that the needs of different disabilities groups are quite varying. No one solution fits all. One

common thread is the need for transition programs for students between high school and college, and college and graduate school. (See Recommendation 5.) In addition, there is a need for scholarships, fellowships, and research internships targeted at students with disabilities. (See Recommendation 2.) Students and faculty with disabilities often need services to attend conferences and workshops. For example, deaf students may need interpreters or captioners, and some persons with mobility disabilities may need to bring attendants. Without these services, these students and faculty could not successfully attend. Having easy access to funding to support these needs will open doors for students and faculty with disabilities. (See Recommendation 3.)

Hiring and Placement Practices for People with Disabilities within the STEM Workforce

Exemplars in recruiting, hiring, and supporting employees with disabilities over the years are IBM Corporation and NASA. IBM has been a leader in innovation for persons with disabilities starting with its Braille Printer in 1954 to the IBM Homepage Reader, a screen reader in 1999. It is one of the few large companies with an active research lab in accessible technology. IBM works with different programs including EntryPoint, Project Able, Lift Program, and Project View to recruit summer interns and regular employees with disabilities. NASA supports a number of programs for students with disabilities to help create a pipeline as early as middle school. The programs are typically four to ten weeks in length and students are part of a cohort that works together to improve their ability to be successful employees and scientists. Both IBM and NASA provide accommodations for their employees with disabilities including sign language interpreters, readers, note takers, and assistive technologies needed on the job. Other large organizations should be looking at IBM and NASA as role models for how they can successfully engage persons with disabilities in their organizations. Both organizations recognize the benefits of having a diverse workforce in many dimensions including disability.

Recommendations

Based on the information presented at the mini-symposium and discussions by CEOSE at their meeting following the mini-symposium the organizers have arrived at the following recommendations from this mini-symposium were officially adopted by CEOSE on February 26, 2008..

1. Institutions such as Gallaudet, NTID, Landmark College, and maybe others should have a designation similar to Minority Serving Institutions (MSI) so that they can benefit from transition programs and partnerships with majority institutions on large research initiatives.
2. NSF sponsored Scholarships, Fellowships, and Research Internships should be targeted to support STEM students with disabilities.
3. The Facilitation Awards for Scientists and Engineers with Disabilities (FASSED) should be broadened to include all STEM graduate students and faculty who are disabled and want to attend conferences or workshops. This could be accomplished through the SGER program or the regional alliances (RADs).

4. Data related to disability should be collected on a regular basis.
 - a. Numbers of disabled PIs, successful and unsuccessful.
 - b. Numbers of disabled panelists, reviewers, COV members, and Advisory Committee members.
5. Funding for programs that help increase the number and success of students and faculty with disabilities in STEM fields should be increased.
 - a. Regional Alliances.
 - b. National Alliances based on discipline and/or disability.
6. Research in technology for persons with disabilities should be strengthened by making sure projects are aligned with the actual needs of persons with disabilities.

Appendix A

CEOSE Mini-Symposium on Institutions Serving Persons with Disabilities in STEM

Agenda

October 15, 2007
8:30 A.M.

National Science Foundation
Stafford II, Room 555
Arlington, Virginia

Opening Statement and Introductions
Dr. Richard Ladner
Mini-Symposium Moderator and Chair
CEOSE ad hoc Subcommittee on Persons with Disabilities,
CEOSE Liaison to the NSF CISE Advisory Committee, and
Boeing Professor in Computer Science and Engineering
University of Washington
Seattle, Washington

Welcome Address
Dr. Kathie L. Olsen
Deputy Director
National Science Foundation
Arlington, Virginia

Panel Focus: Institutions That Serve Large Populations of Students with Disabilities

Panel Facilitator

Dr. Kathie L. Olsen
Deputy Director
National Science Foundation
Arlington, Virginia

Panelists

Dr. Michael Moore
Provost's Office
Gallaudet University
Washington, DC

Dr. T. Alan Hurwitz
Vice President
Rochester Institute of Technology for National Technical Institute for the Deaf
and CEO and Dean of National Technical Institute for the Deaf
Rochester, New York

Dr. Steve Fadden
Director of Research
Landmark College
Putney, Vermont

**Panel Focus: Practices for Increasing the Quantity and Quality of
Students with Disabilities in STEM**

Panel Facilitator

Dr. Cora B. Marrett
Assistant Director
Directorate for Education and Human Resources
National Science Foundation
Arlington, Virginia

Panelists

Dr. Mark H. Leddy
Program Director
Research in Disabilities Education/HRD
Education and Human Resources Directorate
National Science Foundation

Dr. Sheryl Burgstahler
Principal Investigator, AccessSTEM
University of Washington
Seattle, Washington

Dr. William C. McCarthy
Principal Investigator, RASEM-Squared
New Mexico State University

Las Cruces, New Mexico
CEOSE Member
CEOSE Liaison to the EHR Advisory Committee

Dr. Virginia Stern
Director
Project on Science, Technology and Disability, and the ENTRY POINT! Program
American Association for the Advancement of Science
Washington, DC

Panel Focus: Supporting Students with Disabilities in Post-Secondary STEM

Panel Facilitator

Dr. Ted A. Conway
Professor and Associate Dean for Research Services
School of Education
Virginia Commonwealth University
Richmond, Virginia

Panelists

Dr. Mark A. Riccobono
Executive Director
Jernigan Institute
National Federation of the Blind
Baltimore, Maryland

Dr. J. Trey Duffy
Director
Disability Resource Center
and Past President of Association on Higher Education and Disability (AHEAD)
California Polytechnic State University
San Luis Obispo, California

Dr. David H. Rose
Founder, Chief Education Officer, and Chief Scientist
Cognition & Learning Center for Applied Special Technology (CAST)
Wakefield, Massachusetts

What the Data Show about Students with Disabilities in STEM

Dr. Joan S. Burrelli
Senior Analyst, SRS
Social, Behavioral and Economic Sciences Directorate
National Science Foundation
Arlington, Virginia

Panel Focus: Information on Disabilities from the Perspectives of Graduate Students

Panel Facilitator

Dr. William C. McCarthy
Principal Investigator, RASEM-Squared
New Mexico State University
Las Cruces, New Mexico
CEOSE Member
CEOSE Liaison to the EHR Advisory Committee

Panelists

Mr. Ron Painter
Graduate Student, Chemistry Department
Stanford University
Stanford, California

Ms. Nichole E. O'Connell
Graduate Student, Department of Biochemistry and Molecular Biophysics
Columbia University
New York, New York

Mr. Cary Supalo
Graduate Student, Chemistry Department
Pennsylvania State University
University Park, Pennsylvania

Panel Focus: Hiring and Placement Practices for People with Disabilities within the STEM Workforce

Panel Facilitator

Dr. Samuel L. Myers, Jr.
CEOSE Member
CEOSE Liaison to the SBE Advisory Committee
Roy Wilkins Professor of Human Relations and Social Justice
Hubert H. Humphrey Institute of Public Affairs
University of Minnesota
Minneapolis, MN

Panelists

Ms. Denna S. Lambert
NASA Goddard Space Flight Center
Equal Opportunity Program Office

Mr. William E. Stern

Manager
SGT Web Enablement – Development
IBM STG Department A64A
IBM Corporation
Research Triangle Park, NC

Appendix B

Organizers:

Richard E. Ladner, University of Washington, CEOSE Member
William C. McCarthy, New Mexico State University, CEOSE Member
Samuel L. Myers, Jr., University of Minnesota, CEOSE Member
Mark Leddy, Program Director, Division of Human Resource Development, NSF

Local Arrangements:

William E. McHenry, Executive Director, e-Center, Jackson State University

NSF Support:

Margaret E.M. Tolbert, Senior Advisor, Office of Integrative Activities, NSF
Kamille Williams, Program Assistant, Office of Integrative Activities, NSF
Amanda Roberts, Science Assistant, Office of Integrative Activities, NSF
Daniel Turshon, IT Specialist, Office of Integrative Activities, NSF
Lawrence Upson, Facilities and Services Specialist, DAS/OIRM, NSF
Katherine Otts, Supervisor, Meeting Management, DAS/OIRM, NSF