Proceedings—Access to Science: Accommodations and Universal Design *Capacity-Building Institutes*, 2006 Washington and Oregon

Two *AccessSTEM Capacity-Building Institute*s (*CBI*s) were conducted by the Northwest Alliance for Access to Science, Technology, Engineering, and Mathematics (*AccessSTEM*). Directed at the University of Washington and funded by the Disabilities Research in Education program at the National Science Foundation (NSF) (cooperative agreement #HRD-0227995), the purpose of the *CBI*s was to increase the capacity of participants and institutions to make science, technology, engineering, and mathematics (STEM) classes and programs accessible to students with disabilities.

The ultimate goal of *AccessSTEM* is to increase the successful participation of people with disabilities in STEM careers. To reach this goal, it is critical that all STEM educators encourage the participation of students with disabilities in STEM courses and employ strategies that make these courses accessible to everyone. The *AccessSTEM Capacity-Building Institute*s were for K-12 mathematics, science, and special education teachers and administrators; college science, technology, and mathematics instructors; and postsecondary faculty who teach teacher inservice/preservice courses. Institute participants took part in hands-on science experiences and left with useful instructional tools and resources.

The *CBI*s were offered in cooperation with the annual conferences of two state science teacher associations: the Washington Science Teachers Association (WSTA) and the Oregon Science Teachers Association (OSTA). The first *CBI* was held October 12, 2006, in Spokane, Washington; the second, October 14, 2006, in Roseburg, Oregon.

Participants

Participants in the *CBI*s were:

- 26 K-12 educators
- 1 science outreach educator
- 6 preservice teachers
- 2 postsecondary educators

Instructors/facilitators of the *CBI*s were Sheryl Burgstahler, *AccessSTEM* Director, and Lyla Crawford and Val Sundby, Program Coordinators. These organizations sponsored the *CBI*s were:

- The Washington Science Teachers Association (WSTA) *http://wsta.net/*
- The Oregon Science Teachers Association (OSTA) *http://www.oregonscience.org/*

Handouts and Videos

Most of the handouts and videos used in the *Institutes* are freely available on DO-IT's *AccessSTEM* website at *http://www.washington.edu/doit/Stem/*. They include the comprehensive publication entitled *Making Math, Science and Technology Instruction Accessible to Students with Disabilities—A Resource for Teachers and Teacher Educators which can be found at http://www.washington.edu/doit/MathSci/.*

Agenda

The *CBI*s took participants through a series of presentations, hands-on activities, and discussions that focused on approaches to the inclusion of students with disabilities in science instruction. The typical approach is to provide accommodations (e.g., handouts in large print or Braille, adapted science equipment, a personal assistant) to specific students with disabilities once they enroll

AccessSTEM CBI Agenda

8:30-9:00am Registration, continental breakfast

9:00-10:30am Introduction to Science Access Issues
- View video *Working Together: Science Teachers and Students with Disabilities.*
- Presentation: Access Barriers, Access Solutions—Accommodations and Universal Design.
- View video *The Winning Equation: Access + Attitude = Success in Math & Science.*
- Activity: Complete a *Student Abilities Profile.*

10:45-12:00pm Making Science Activities Accessible
- Activity: Discover accommodation and universal design strategies for a hands-on science activity.
- View video *Equal Access: Universal Design of Instruction.*
- Presentation: Making Science Labs Accessible to All Students.

12:00-12:45pm Lunch

12:45-2:00pm Applying Universal Design
- Discuss: What can individual stakeholders (e.g., a student, teacher, parent) do to increase the success of students with disabilities in STEM (science, technology, engineering, and mathematics)? Consider both accommodations and universal design approaches.
- Activity: Create personal plan for implementation of universal design of your instruction: In *Equal Access: Universal Design of Instruction*, cross out items that do not apply; insert implementation date for others.
- Report: What steps will you take to make your courses more accessible?

2:15-3:30pm Technology Access
- View video *Computer Access: In Our Own Words* (Note additional technology videos in packet)
- Presentation: Overview of Technology Access Barriers and Solutions—Assistive Technology and Universal Design.
- Discuss: What can institutional stakeholders (e.g., schools; districts, state agencies) do to increase the success of students with disabilities in STEM? What systemic change efforts would you recommend? Consider both policies and practices.

3:30-4:00pm Next Steps
- Stay involved with *AccessSTEM*.
- Search the *AccessSTEM* Knowledge Base (*http://www.washington.edu/doit/Stem*) for questions and answers, case studies, and promising practices.
- Report & Evaluation: What did you learn and how will you apply it?

Making Science Activities Accessible to all Students

Example: *Making Gak!*

To practice applying universal design and developing accommodation strategies, *CBI* participants participated in a hands-on science activity, *Making Gak!* The goals of the activity were to increase student understanding of chemical reactions, observe the polymerization of chemical elements, and gain experience following step-by-step directions. Directions included measuring the ingredients (glue, Borax, and water); mixing, measuring and pouring the Borax solution; and combining the Borax solution with glue to create the putty-like substance called Gak. Each group developed ideas for making the activity more accessible to students with a type of specific disability (e.g., learning disability, mobility impairment, sensory impairment). Participants made the following suggestions for accommodating specific students.

Visual Impairments

- Use black measuring device with white glue to create contrast.
- Provide Braille and/or large print instructions.
- Use tactile measuring spoons and cylinders.
- Use measuring devices with large print.

Hearing Impairments

- Speak facing students so they are able to read lips.
- Include all steps in clear written instructions.
- Periodically check the pace of speaking with students to determine if you need to slow down.

Learning Disabilities/Attention Deficit and Hyperactivity Disorder

- Model the activity for the students.
- Minimize distractions.
- Have someone in each group read aloud directions to students.
- Use a consistent system (metric/English measurements), unless teaching conversions.
- Use clear, step-by-step instructions, including telling students what to do with products when done.
- Use figures within directions.
- Use name tags with individual roles indicated.
- Delegate jobs and find accessible roles for each person.
- Have students write down what they are going to do.
- Provide a vocabulary list.

Mobility Impairments

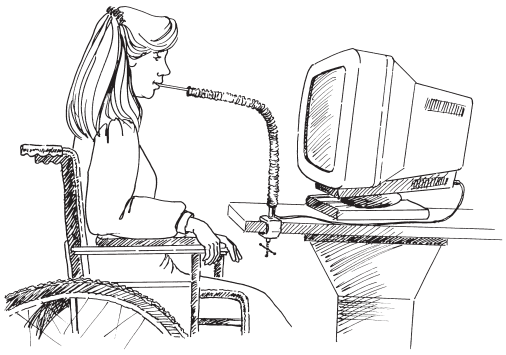
- Hold equipment for a student (if necessary).
- Use zip-lock bags.
- Measure ingredients ahead of time.
- Have a person with a mobility impairment contribute by reading the directions.
- Use an automatic stirrer.

Participants were asked to suggest ideas that teachers could employ that would make the activity more accessible to all students, regardless of abilities and disabilities. This approach is called universal design. Following are suggestions made by participants:

- Provide clear, step-by-step directions.
- Model the activity for the students.
- Encourage cooperation between group members and delegate tasks to everyone.
- Allow students extra time, assuring that students who are finished have something to do (e.g., answer open-ended questions). This way (1) some students can have more time to finish the required activity and (2) students who complete the activity quickly will have something productive to do.
- Minimize distractions.
- Provide a vocabulary list.
- Use figures as well as printed directions (multi-modal).
- Periodically, check with students to assure that you are presenting material at the right pace.

in a course. The field of universal design offers a more efficient and inclusive approach where teachers plan for a student group with a wide range of characteristics with respect to race, ethnicity, stature, reading level, physical and sensory abilities, etc, rather than design courses and activities for the average student. This approach builds in accessibility features and thus minimizes, but does not eliminate, the need for accommodations; for example, schools/programs will still need to provide specialized services for Braille production and sign language interpreters if a blind or deaf student, respectively, enrolls in the course. Throughout the *CBI*s the perspectives of students with disabilities were brought in through panels and video presentations.

The following sections summarize the discussions that took place at the *CBI*. They are provided here as a record of our work and to share ideas that can help teachers make STEM activities accessible to all students.



Action Steps for Individual Stakeholders

Participants were asked to share what individual stakeholders (e.g., students with disabilities, teachers, parents) can do to promote the success of students with disabilities in STEM studies and careers. Following are their responses:

Students can

- Learn to articulate specific accommodations.
- Self-advocate.
- Communicate with others about their disabilities and be proactive.
- Promote the cooperation of others.
- Develop strategies for self-promotion.
- Ask questions and express individual needs.
- Take responsibility for their learning.
- Meet grade level expectations.
- Know their strengths and limitations.
- Participate in their Individual Education Programs (IEPs).

Teachers can

- Know about resources for students with disabilities.
- Require framed (step-by-step) note taking.
- Highlight or bold requirements on assignments.
- Simplify handouts.
- Be flexible.
- Have a positive attitude towards students.
- Use technology in presentations.
- Use email as a communication option.
- Require that all group participants are actively engaged.
- Encourage students to participate.
- Make the classroom environment/arrangement accessible to all students.
- Teach to a variety of student strengths.
- Have large print materials as an option.
- Help students be proactive. Help them become their own advocates.
- Encourage communication between special education and regular education departments.
- Encourage parent involvement.
- Recognize abilities of students with disabilities.
- Apply universal design in preparing lessons.
- Offer different modes of assessment (e.g., tests in multiple formats, presentations, projects).

Parents can

- Encourage and support the student.
- Coordinate with the teacher and student regarding accessibility and accommodations.
- Locate mentors and role models for the student.
- Avoid being an enabler.
- Learn to let go.
- Help the student set up a study group.
- Go to IEP meetings and give feedback.
- Encourage the student to participate in IEP meetings.
- Recognize the "abilities" within the disability.
- Tap into special talents of the student.
- Ask questions and be flexible.
- Be an advocate for the student.
- Provide the student with needed school materials at home.
- Allow students to increase in independence.

Action Steps for Institutional Stakeholders

Participants were asked what steps that institutional stakeholders (e.g., schools, districts, service agencies) can take to increase the successful participation of people with disabilities in STEM studies and careers. Their responses included the following items:

Schools can

- Make the school physically accessible.
- Provide teachers with opportunities for professional development.
- Apply for grants to increase accessibility.
- Build a library of resources for the teachers.
- Provide students with disabilities with technical support needed for hardware and software.
- Include students with disabilities in general education classes.
- Make environments (e.g., the playground, classrooms, buses) safe.
- Have meetings with parents about the availability of programs and resources.
- Teach teachers to address students holistically.
- Provide reasonable accommodations for standardized tests.
- Facilitate communication and collaboration between the different grades.
- Increase the number of business partners.
- Encourage the application of universal design throughout the school.

Districts can

- Help schools with writing and applying for grants.
- Make all schools physically accessible.
- Provide funding to schools for equipment.
- Increase the number of business partners.
- Outfit libraries with assistive technology to help kids with visual impairments and/or slow reading skills.
- Give priority to publishers with universally designed textbooks and products.
- Encourage district-wide universal design practices.

States can

- Increase the number of business partners.
- Increase funding for special programs.
- Make standardized test accommodations easier to obtain.
- Have statewide clearinghouse for adaptive technologies and programs.
- Encourage statewide adoption of universal design.

Action Steps for Participants

When participants were asked to list things they would take back and use in their classes, programs, and/or schools, responses included the following:

- Encourage parents and students and other teachers to empower students with disabilities to learn about STEM and gain confidence in getting the help they need.
- Use the great resources and materials distributed at the *CBI*.
- Apply the universal design concept to instruction for all students.

When asked how they will use the materials responses included the following:

- Prepare my own presentation on this for Oregon Museum of Science of Industry (OMSI) volunteers and staff. Pass on the information to our technology staff to ensure our website and computer lab is accessible. I'll review our education programs to see if they can be upgraded to universal design, and reproduce the worksheets and information to be available for all OMSI staff and volunteers.
- Increase the amount of visual, tactile, and auditory stimuli I use.
- Write better instructions for labs.
- Improve the format of my website.
- Use the list of resources.
- Increase inclusiveness in labs.
- Implement new ideas in our labs.
- Use the materials given by the Institute.
- Share what I learned with my department.
- Write a grant for technology.
- Use technology options.
- Use tactile ideas such as fabric, paint, and wikki sticks.
- Make lab accommodations and use examples.
- Apply for a minigrant.
- Encourage students to advocate for themselves.
- Invite some special education graduates to come back and talk to current students.
- Take back ideas to help a specific student.
- Share the materials with my school.
- Use my new knowledge of grant options.
- Use resources of *AccessSTEM* and DO-IT.
- Give the resources to students.
- Use the checklist of best practices for my own teaching.
- Have groups check on another's progress before handing in work.
- Use the Gak experiment.
- Use the CSI fingerprinting assignment.
- Make activities address multiple learning styles and capacities.
- Do a presentation at the National Aeronautics and Space Administration, and Aerospace Education Services Program.
- Help teachers who I work with implement practices described when using NASA materials.

CBI Evaluations

When asked what was best about the *CBI*, participant responses were:

- The resources. Everything was so clearly laid out and explained. Tons of resources so I can go out and share my knowledge.
- Multiple ideas for improving existing experiments that would benefit all students.
- Learning about all the different abilities and resources to aid people with the different abilities.
- The thing I liked best about this *CBI* was the opportunity to break into small groups

and discuss ways that we, as teachers, could help make things more accessible for our students. I also loved the fact that the session was specific to science.

- Learning about what resources are available.
- It was easy to learn a lot, even though we were tired. Different activities, lots of information and ideas to take back to school. I thought it was great!
- The wonderful handouts. Also the PowerPoint handouts, so that we didn't have to take any notes. The hands-on group activities thinking specifically in terms of different groups (ADD vs. mobility vs. sensory issues) helped put me in the right frame of mind.
- I think it was great!
- Students with disabilities empowered to train the adults in their educational environment, and the videos showing these students. Also, the activities. Thinking with other teachers about the accessibility of the tasks.
- I felt both Sheryl and Val were very prepared and thoroughly knowledgeable about this topic. I have not thought very much about what accommodations must be made for students in the science lab. Most of my concerns have been about classroom adaptations.
- Learn useful information and practices (some which were new) to best facilitate the learning experiences of students with disabilities in the classroom.
- The group activities, videos, and doing a science lab while considering the different types of disabilities.

Conclusion

These *CBI*s helped participants gain awareness and skills in making STEM accessible to people with disabilities. As they work with colleagues, parents, administrations, and students, their increased awareness and skills

will serve to increase the success of people with disabilities in STEM courses and careers.

Further Information

For more information about promoting the success of people with disabilities in STEM fields, consult *http://www.washington.edu/doit/Stem/*.

AccessSTEM

NSF Regional Alliances for Persons with Disabilities in STEM Education

Contact information for each NSF-Funded Regional Alliance is listed below.

AccessSTEM
University of Washington
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206-685-3648
206-221-4171 (FAX)
http://www.washington.edu/doit/
doit@u.washington.edu

EAST
University of Southern Maine
37 College Avenue
Gorham, ME 04038
207-780-5449

207-780-5129 (FAX)
http://research.usm.maine.edu/East/
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MIDWEST Alliance
University of Wisconsin, Madison
338 Goodnight Hall, 1975 Willow Drive,
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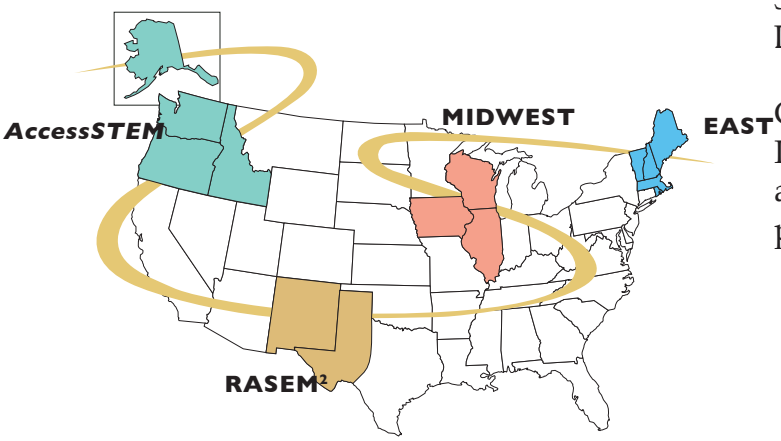

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