



Building Capacity



to include
students with disabilities in
science, technology, engineering,
and mathematics fields



Supported by
Research in Disabilities Education
program at the
National Science Foundation



Introduction

A series of activities were undertaken to understand the underrepresentation and increase the participation of people with disabilities in science, technology, engineering, and mathematics (STEM) careers. These activities were funded by the Research in Disabilities Education (RDE) program of the National Science Foundation (NSF). They were coordinated by the Northwest Alliance for Access to Science, Technology, Engineering, and Mathematics (*AccessSTEM*), which is directed by Sheryl Burgstahler.

Capacity Building Activities

AccessSTEM collaborated with three other Regional Alliances for Persons with Disabilities (RADs) to

- conduct a *Capacity-Building Institute (CBI)*,
- share results of the *CBI* with NSF projects and other stakeholders,
- provide an electronic forum to continue discussion of accessibility issues and provide support for accessibility efforts, and
- extend resources to other programs and promising practices via an online searchable Knowledge Base.

AccessSTEM is a project of DO-IT (Disabilities, Opportunities, Internetworking, and Technology) at the University of Washington in Seattle. *AccessSTEM* serves to broaden participation in STEM fields through the inclusion of individuals with disabilities.

Goal and Outcomes

All of these activities support an NSF goal: “Working to broaden participation in science and engineering reinforces NSF’s mandate to fund the best ideas from the most capable researchers and educators, now and in the future” (*Investing in America’s Future: Strategic Plan FY 2006–2011*, NSF, http://www.nsf.gov/publications/pub_summ.jsp?ods_key=nsf0648, p. 3). *AccessSTEM* Capacity Building outcomes benefit society by making STEM opportunities available to more citizens and enhancing STEM fields with the perspectives of people with disabilities.



Audiences for These Materials

This booklet was created for people who:

- participated in the *AccessSTEM Capacity-Building Institute*.
- want to conduct their own *Capacity-Building Institute* at their institution, in their region, or in a nationwide or international forum.
- seek to increase their understanding of issues surrounding the underrepresentation and participation of individuals with disabilities in STEM studies and careers.
- are motivated to join an electronic community to continue discussion of these issues.
- are NSF project directors and program officers interested in increasing the participation of people with disabilities in all NSF projects.
- would like to get connected to resources to help them make their project resources and activities accessible to people with disabilities.
- have promising practices to share with others.



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Background

The National Science Foundation reports that people with disabilities are underrepresented in science, technology, engineering, and mathematics (STEM) studies and careers. The National Science Foundation (NSF), the National Organization on Disabilities, and other leaders have identified barriers to STEM success to include

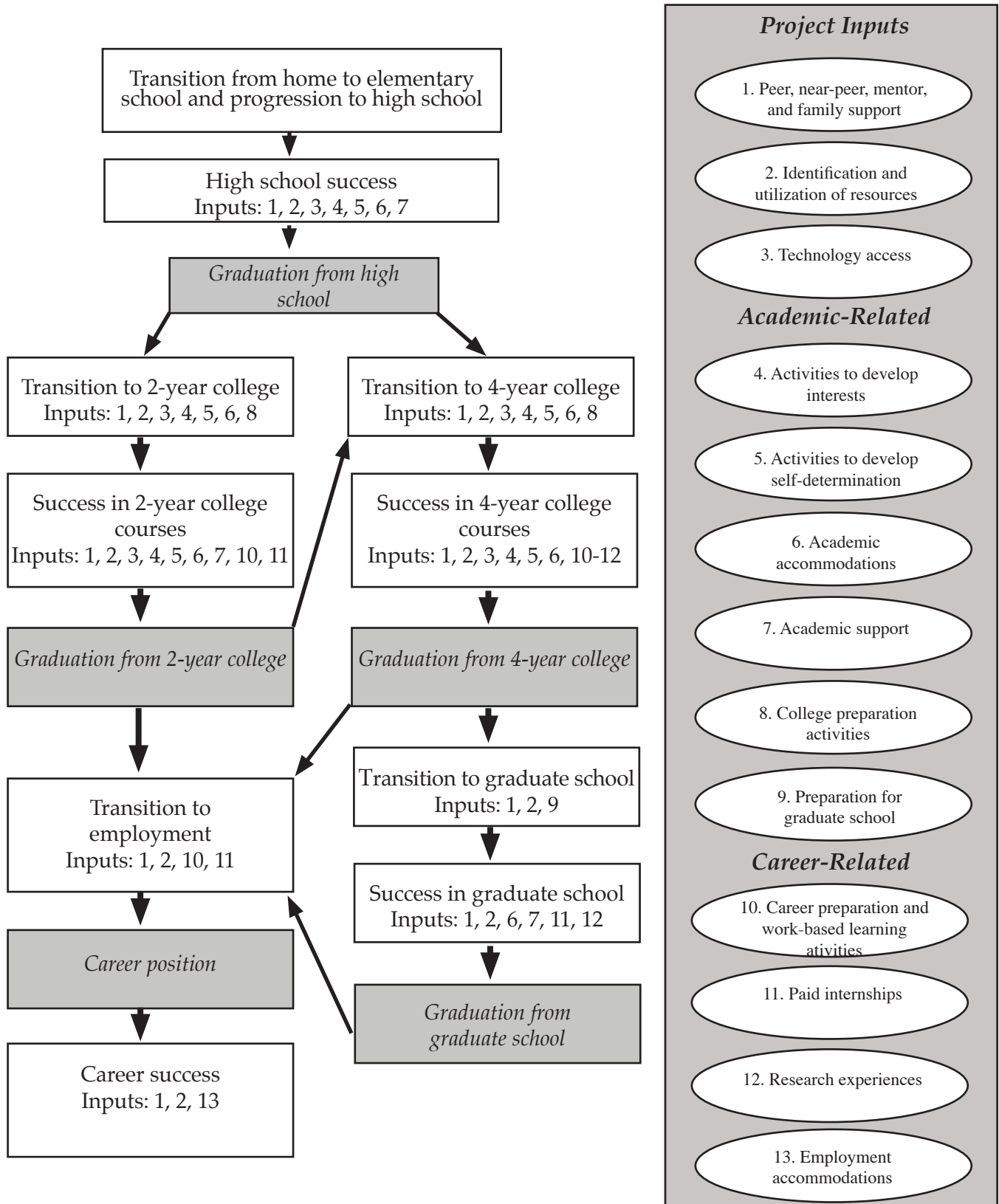
- diminished support systems after high school,
- little access to successful role models,
- lack of access to technology,
- inadequate self-advocacy skills,
- inadequate accommodations, and
- low expectations and other negative attitudes on the part of people with whom they interact.

The National Science Foundation and others report evidence-based practices to increase the participation of underrepresented groups in STEM to include

- technology access;
- hands-on STEM activities;
- self-determination skill building;
- college and career preparation activities;
- bridges between academic levels and careers;
- work-based experiences, including research;
- peer, near-peer, and mentor support;
- tutoring; and
- preparing educators and employers to work with people who have disabilities.

The following figure presents a model of how *AccessSTEM* project interventions are used to lead students with disabilities through critical junctures to pursuing STEM careers.

Progress of Teens with Disabilities Toward Careers in STEM: Project Inputs Leading Students to Critical Junctures





AccessSTEM Capacity-Building Institute (CBI)

The *AccessSTEM Capacity-Building Institute (CBI)* took place January 10-12, 2007, in Seattle. Its overall purpose was to explore ways to increase the participation of people with disabilities in all STEM projects and, ultimately, in careers.

Participants in this two-and-one-half day event included leaders of NSF projects that promote the participation of women, racial/ethnic minorities, and people with disabilities in science, technology, engineering, and mathematics. Hosted by the University of Washington, the *AccessSTEM CBI* provided a forum for comparing recruitment and access challenges, sharing successful practices, developing collaborations, and otherwise increasing the capacity of all NSF-funded projects to serve individuals with disabilities.

The ultimate goal of the *AccessSTEM CBI* was to increase the participation of individuals with disabilities, particularly those who are also members of other underrepresented groups, in STEM fields. Speakers and panelists were also *CBI* participants; many have disabilities and/or are women or racial/ethnic minorities. Broad issue areas discussed included

- K-12 education,
- recruitment/transition to higher education,
- retention in higher education,
- graduate school enrollment and retention, and
- employment.

In this *CBI*

- experts in all topic areas were in the audience and others “visited” the *CBI* via video.
- all participants were actively engaged.
- participants didn’t just present predetermined professional development; participants requested and offered content as the meeting evolved.
- “handouts” were online.
- participants explored ways to “build capacity” to reach the goal of the *Institute*, within their projects or organizations and beyond.



Participants discussed barriers encountered by individuals with disabilities (e.g., access to science labs, field trips, technology, information resources), how to eliminate or reduce these barriers, successful strategies for recruiting and retaining individuals with disabilities into STEM fields, how projects that support other underrepresented groups can work with projects that support individuals with disabilities to maximize outcomes, and how all STEM programs can be made more inclusive of individuals with disabilities by applying universal design principles. Successful strategies discussed extend from K-12 through college and employment within two categories:

- the delivery of direct services to students with disabilities, and
- the creation of more accessible learning and work environments to assure long-term impact.



Four specific questions were addressed by CBI participants:

1. How are STEM access issues for people with disabilities the same as those for other underrepresented groups (e.g., racial/ethnic minorities, women)? How are they different?
2. In what ways do making STEM activities accessible to students with disabilities benefit other students?
3. What can STEM projects do to increase the participation of students with disabilities?
4. How can projects best measure the outcomes and impacts of their interventions to increase the participation of underrepresented minorities, women, and people with disabilities in STEM?

Presentations and panels at the CBI were followed by small group interactions regarding the topics presented. Group representatives reported to all participants and notes were incorporated into the proceedings. In addition to CBI participants, and other NSF project directors, the results of these efforts are shared through the *AccessSTEM* Knowledge Base at <http://www.washington.edu/doi/Stem/kb.html>.

The agenda for the CBI is printed on the next few pages and includes web addresses for the event handouts.



CBI Agenda

Tuesday

7:00-9:00 p.m. **Evening Social and Time to Get Acquainted**

Wednesday

8:00-8:50 a.m. **Buffet Breakfast, Networking**

9:00-9:50

Welcome

Dr. Sheryl Burgstahler, University of Washington

Introductions

Students with disabilities share STEM access perspectives in video *Working Together: Science Teachers and Students with Disabilities*.

(Online video and handouts: http://www.washington.edu/doi/Video/wt_sci.html)

9:50-10:30

Pursuit of a STEM Career: A Personal Story

Dr. Imke Durre, Scientist, National Climatic Data Center

10:30-10:45

Break

10:45-11:15

Broadening Participation in STEM

Dr. Mark Leddy, National Science Foundation

11:15-11:55

Access Barriers, Solutions—Accommodations and Universal Design

Teachers and students share ideas for assuring access to STEM courses for students with disabilities in video *The Winning Equation: Access + Attitude = Success in Math and Science*.

(Online video and handouts: <http://www.washington.edu/doi/Video/winequ.html>)

11:55 a.m.-12:00 p.m.

Introduction to Small-Group Discussion Format

12:00-1:30

Lunch and Working Group Discussions

Question 1: How are STEM access issues for people with disabilities the same as those for other underrepresented groups (e.g., racial/ethnic minorities, women)? How are they different?



- 1:30-1:50 **Working Group Reports:**
Question 1: Each group shares one way STEM access issues for people with disabilities are (1) the same as and (2) different from those for other underrepresented groups (e.g., racial/ethnic minorities, women). *Note: See pp. 11-12 for findings of this working group.*
- 1:50-2:45 **Discover Accommodation and Universal Design Strategies for a Hands-on Science Activity**
Valerie Sundby, Lyla Crawford, Project Coordinators, *AccessSTEM*
Activity: Educators share universal design instructional strategies in video *Universal Design of Instruction: Definition, Principles, and Examples*.
(Online video and handouts: http://www.washington.edu/doiit/Video/ea_udi.html)
- 2:45-3:00 **Break**
- 3:00-3:50 **Critical Junctures Panel**
Projects to increase participation of people with disabilities in STEM share experiences and insights.
- 3:50-4:30 **Working Group Discussions**
Question 2: In what ways does making STEM activities accessible to students with disabilities benefit other students?
- 4:30-4:50 **Working Group Reports**
Question 2: Each group shares one way making STEM activities accessible to students with disabilities benefits other students.
Note: See pp. 14-15 for findings of this working group.
- 4:50-5:00 **Preview of Tonight's Activity and Tomorrow's Agenda, Daily Feedback**
- 5:00 p.m. **Adjourn**
- 6:30-8:30 **Dinner, Network and Discuss Future Collaborations**
Meet Dr. Paul Miller, Professor of Law and Director, UW Disability Studies



Thursday

- 8:00-8:50 a.m. **Buffet Breakfast, Networking, Discussion**
- 9:00 **Overview of Agenda**
- 9:10-10:25 **Panel**
Projects that increase the participation of underrepresented minorities and women in STEM share lessons learned in broadening participation in STEM. How can those lessons be applied to increase the participation of people with disabilities in STEM?
- 10:25-10:40 **Break**
- 10:40 a.m.-12:00 p.m. **Experiences of Students with Disabilities**
Students with disabilities share transition strategies in video *Taking Charge II: Stories of Success and Self-Determination*.
(Online video and handouts: http://www.washington.edu/doit/Video/charge_2.html)
- Panel**
People with disabilities who are also racial/ethnic minorities or women share their stories. With what communities do they identify? What promotes and what inhibits the pursuit of STEM courses and careers?
- 12:00-1:30 **Lunch and Working Group Discussions**
Question 3: What can STEM projects do to increase the participation of students with disabilities?
- 1:30-1:50 **Working Group Reports**
Question 3: Each group shares two things STEM projects can do to increase the participation of people who have disabilities.
Note: See pp. 16-17 for findings of this working group.
- 1:50-2:30 **Information Technology Access Barriers and Solutions: Assistive Technology and Universal Design**
Students demonstrate assistive technology in video *Computer Access: In Our Own Words*.
(Online video and handouts: http://www.washington.edu/doit/Video/comp_acc.html)



	<p>Accessible Web Design Terry Thompson, Technology Specialist, <i>AccessSTEM</i> (Online video and handouts: http://www.washington.edu/doi/Video/www.html, http://www.washington.edu/doi/Brochures/Technology/web_admin.html)</p>
2:30-3:05	<p>Science Lab Access Barriers and Solutions: Accommodations and Universal Design Dr. Samantha Langley-Turnbaugh, Associate Professor and Chair, Department of Environmental Science and Policy, University of Southern Maine (Online video and handouts: http://www.washington.edu/doi/Video/ea_sci_sensory.html)</p>
3:05-3:15	<p>STEM students with sensory impairments and educators share experiences in video <i>Equal Access: Science and Students with Sensory Impairments</i>. (Online handout: http://www.washington.edu/doi/Brochures/Academics/equal_access_sci.html)</p>
3:15-4:00	<p>Break</p>
4:00-4:30	<p>Working Group Discussions Question 4: How can projects best measure the outcomes and impacts of their interventions to increase the participation of underrepresented minorities, women, and people with disabilities in STEM?</p>
4:30-4:55	<p>Working Group Reports Question 4: Each group shares one way to measure the increase of minorities, women, and people with disabilities in STEM. <i>Note: see p. 18 for findings of this working group.</i></p>
4:55-5:00	<p>Preview of Tomorrow's Agenda, Daily Feedback</p>
5:00 p.m.	<p>Adjourn</p>
5:00-onward	<p>Dinner on Your Own Explore Seattle cuisine.</p>



Friday

8:00-8:50 a.m.

Buffet Breakfast, Networking, Discussion

9:00-10:00

Making Your Project Accessible to Participants with Disabilities: A Checklist

Activity: Begin personal plan for implementation.

In *Equal Access: Universal Design of Your Project*, cross out items that do not apply and put implementation date for others.

(Online handout: <http://www.washington.edu/doi/Brochures/Programs/design.html>)

Discussion

How can the checklist be adapted for use in NSF STEM projects?

10:15-10:30

Break

10:30-11:45

Communication within *Communities of Practice (CoP)* *AccessSTEM* Minigrants

For members of *CoPs* to increase participation of people with disabilities in STEM; format of proposal distributed on *CoP* lists. Up to \$4,000 for AT; conference fees; refreshments, room rental, travel/honorarium costs for speakers, panelists at local/regional *Capacity-Building Institute* or presentation. Recipients must report outcomes of projects.

Discussion

What can we do as a group to promote access to STEM for people with disabilities?

- Publish proceedings?
- Create a publication to help other projects make their activities and resources accessible?
- Publish an article in the *Review of Disability Studies* and/or other journals?
- Deliver a presentation or poster at NSF's Joint Annual Meeting (JAM) and/or other meetings?

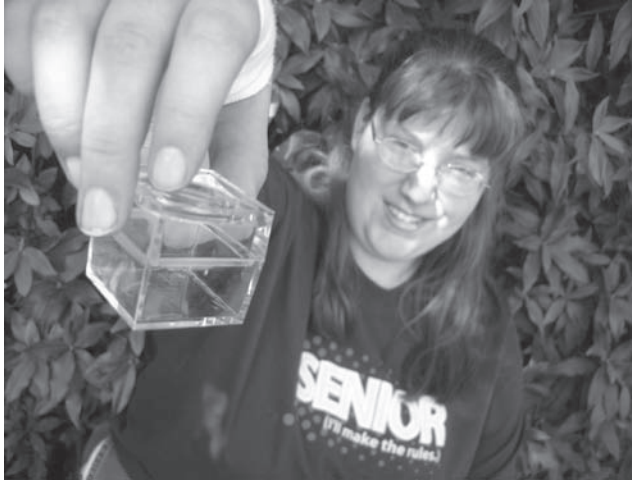
11:45

CBI Evaluation

Lunch and further discussion

Have a safe trip home!

Visit the *AccessSTEM* website, including a Knowledge Base of Q&As, case studies, and promising practices, at <http://www.washington.edu/doi/Stem/>.



Reports from *CBI* Discussion Groups

Following are responses of participants to questions presented in small-group discussions.

Question 1: How are STEM access issues for people with disabilities the same as those for other underrepresented groups (e.g., racial/ethnic minorities, women)? How are they different?

Access issues faced by students with disabilities that are similar for other underrepresented groups include the following:

- All underrepresented groups, including people with disabilities, are subjected to biases and negative attitudes that may block access.
- All underrepresented groups may encounter barriers caused by a lack of understanding of what they need.
- Lumping all underrepresented groups together under the term “diversity” can mask individual needs/issues.
- Many people have a need/desire for a community with which to identify.
- Members of underrepresented groups are often underprepared, especially in math and science.
- Changes made to accommodate one underrepresented group may help other groups.
- There are multiple subcultures within each group, but attempts at change often target the big umbrella group and not the unique subgroups.
- Many members of underrepresented groups lack mentors and role models with whom to identify.
- They experience feelings of isolation—a sense of being “the only one.”
- Students may lack social supports.
- Some assume lowered standards are necessary to accommodate underrepresented groups.
- There are lower expectations in school.
- Group members often lack confidence that they can compete in STEM fields.
- Students from underrepresented groups (especially low income) are often not prepared and are not encouraged to become prepared to succeed in college and STEM.



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- Many lack self-advocacy skills.
- There may be a glass ceiling in employment for members of these groups.
- Language and communication challenges can create problems for individual members of many different groups, including English-language learners and/or students who are deaf.

Access issues that are unique for students with disabilities include the following:

- The traditional diversity definition often only encompasses race, gender, class, ethnicity, and culture; disability is frequently excluded, and people with disabilities don't see themselves represented in this definition.
- Diversity offices and efforts frequently do not include or are unprepared to work with students with disabilities.
- Cultural pressure may prevent some students with disabilities from disclosing their disabilities and receiving help.
- Disabilities often need to be diagnosed, unlike other minority status.
- There are sometimes negative reactions from teachers and peers to accommodations, especially those for invisible disabilities such as learning disabilities.
- Students with disabilities have to request accommodations and provide documentation of their disabilities prior to receiving services.
- The pressure to represent your race/culture/gender well also exists for some people with disabilities—having a disability is sometimes considered being part of a special culture group.
- People with disabilities are often scrutinized for needing major physical and facility changes, whereas the other groups are perceived as just needing early preparation.
- Overall, physical access is a much greater problem for people with disabilities than for other minority groups.
- The nature of discrimination against people with disabilities is more open; it is still “socially acceptable” to say that students with disabilities can't participate in STEM.
- Students with invisible disabilities must decide when and how to disclose.
- There may be more earmarked funds for students with disabilities than for other underrepresented groups.
- Teachers may be enablers by doing too much for students with disabilities, demanding too little, and/or setting expectations too low.
- Inaccessible curriculum, materials, and facilities can create barriers for students with disabilities.
- People with disabilities who are of a Caucasian background have had a long history of Caucasian role models who are of the same race and gender in STEM fields.



Summary of Access Issues

Participants in the *AccessSTEM CBI* found that most access issues for people with disabilities are similar to those for other underrepresented groups. The following is a list of barriers to STEM studies and careers for all of these groups.

- Biases and negative attitudes affect all groups.
- There is a lack of understanding of their needs.
- Lumping groups together under the term “diversity” can mask individual needs/issues.
- Attempts at change often target the big umbrella groups and not unique subgroups.
- Some are underprepared and discouraged to pursue STEM.
- Some feel isolated and lack social supports.
- Some lack confidence that they can compete in STEM fields.
- Some have inadequate self-advocacy skills.
- Some lack mentors or role models with whom to identify.
- There are language and communication challenges.
- There is a glass ceiling in employment.

Issues unique to individuals with disabilities pursuing STEM include those listed below.

- The traditional definition of diversity often only encompasses race, gender, class, ethnicity, and culture; students with disabilities are not represented in this definition.
- Diversity offices and efforts frequently do not include work with students who have disabilities.
- Cultural pressure may prevent some students with disabilities from disclosing their disabilities and receiving help.
- Disabilities often need to be diagnosed, unlike other minority status.
- Students with disabilities must decide when and how to disclose.
- They have to request accommodations and provide documentation of their disabilities prior to receiving accommodation services.
- It is more “socially acceptable” to say that students with disabilities can’t participate in STEM.
- There may be more earmarked funds for students with disabilities to cover accommodations.
- Teachers may do too much for students with disabilities, not demand enough, and/or set expectations too low.
- Curriculum, materials, and facilities may be inaccessible to students with disabilities.



Question 2: In what ways do making STEM activities accessible to students with disabilities benefit other students?

- Reaching out in multiple ways allows you to recruit a more eclectic group.
- More diversity results in more creative and diverse ideas and solutions.
- Bringing people with disabilities into the classroom educates all students and faculty about the capabilities of people with disabilities.
- A mix of students helps students without disabilities find their own career paths as they are challenged in new ways and given opportunities to assist others.
- Fully including students with disabilities in classes helps students without disabilities be more sensitive to issues faced by people with disabilities.
- Group work makes students and instructors take the time to consider things you would typically take for granted (What if you couldn't hear/see/move?).
- There are opportunities for leadership for all students, even those who don't traditionally volunteer for such roles.
- Teaching using multiple modalities benefits all learners.
- Universal design strategies create materials that can be easily adapted and distributed in multiple formats in a timely manner.
- Making courses accessible to students with disabilities helps instructors become more organized, thoughtful, systematic—better teachers!
- It encourages instructors to ask questions about what “good instructors” do to help students learn.
- It reminds us that teaching is about people first.
- Providing clear instructions and more time to complete activities benefits all students.
- When instructors spend time thinking about accommodations, it can help them reshape and clarify the goals of the course: What are they trying to teach? What concepts or skills do they want the students to leave with? What alternatives are available to students for gaining knowledge and skills?
- Other students are encouraged to discern the strength of each member that can make the collective group stronger.
- Some technology and facility changes allow everyone to maximize productivity (e.g., a work table at an adjustable height, a spectrometer that can provide data about color without the student actually needing to see color).
- Everyone brings life experiences to draw on for problem-solving. When students with disabilities do this, they enhance learning for everyone.
- Sometimes assistive technology drives positive changes in mainstream technology.
- Accommodations and universal design help the professor teach the material more effectively to all students.
- Universal design brings about different/new teaching modalities and materials for an instructor to consider.
- Efforts to fully include students with disabilities result in a paradigm shift in education and bring all our thinking to a new level.



- Putting a syllabus and other important information online increases accessibility to all students, making it possible for them to easily review.
- Making facilities accessible architecturally (seating, etc.) helps all students access the learning environment more comfortably.
- Universally designed office hours, by offering hours physically within the office plus online to increase accessibility, benefits all students.



Summary of Benefits to Other Students

The following points were made by *CBI* participants regarding how including individuals with disabilities in STEM activities benefits all students:

- More diversity results in more creative and diverse ideas and solutions.
- Having students with disabilities in class encourages instructors to become better teachers and take time to consider things they might typically take for granted.
- Using multiple modalities in teaching makes content more accessible to everyone.
- Providing clear instructions and more time to complete activities benefits everyone.
- Some technology and facility changes allow everyone to be more productive.
- Sometimes assistive technology drives positive changes in mainstream technology.
- Posting syllabi and other important information online increases accessibility and adaptability for all students.



Question 3: What can STEM projects do to increase the participation of students with disabilities.

- Increase the visibility of researchers with disabilities at disciplinary meetings.
- Increase the visibility of students with disabilities as role models.
- Increase the visibility of scientists and engineers with disabilities through marketing materials, web pages, curricula, seminars, etc.
- Make an effort to recruit STEM faculty with disabilities.
- Use institutional networks to find and place new faculty who have disabilities.
- Educate search committees (e.g., for faculty) about recruiting and accommodating applicants with disabilities, and include people with disabilities on search committees.
- Connect with staff at disability services offices to provide opportunities and information for students. Collaborate on ideas for resources and accommodations students with disabilities in STEM may need.
- In program materials, websites, applications, etc., encourage people with disabilities to apply and include information about procedures for requesting accommodations.
- Have your provost/ dean chair your annual meeting or key activities to help ensure more people will attend.
- Tap into existing mentor networks. For example, the vice chancellor at UC Irvine has a group called “100 Black Men of Orange County” that connects African-American students to community leaders.
- Involve parents in recruiting minority students—taking a child who brings income into the household off to college can be challenging for the family.
- Reevaluate admissions standards and look at work history, special challenges, and community involvement in addition to GPA.
- Have student ambassadors go to high schools and talk to students about socially relevant issues related to STEM fields; they should go to English, history, and social studies classes in addition to science and math classes.
- Make an effort to reach students where they are at. In some minority communities, for example, image is incredibly important, so bring in role models that dress and look “cool” to recruit kids so STEM doesn’t look so “geeky” and “uncool.”
- The people you use to recruit students with disabilities need to make sure they use person-first language and have had some positive experiences on campus.
- Often students don’t want to be part of the programs targeted at underrepresented groups, so you have to be savvy in recruiting them. You need to connect to shared experiences like “the black first” and “take back the night.” People with disabilities need to have a shared experience to create a pipeline and path for recruitment.
- Make social gatherings easy to come to, “cool,” and focused on common interests.

**Summary of Strategies to Increase Participation of Students with Disabilities**

CBI participants suggested the following strategies for fully including students with disabilities in their STEM projects:

- Increase the visibility of scientists, engineers, researchers, and students with disabilities in meetings, in marketing materials, on web pages, etc.
- Recruit STEM faculty with disabilities.
- Connect with staff at disability services offices.
- In program materials, include information about procedures for requesting accommodations.
- Reach students where they are at, with people they can relate to, and in a style that is respectful and engaging.
- Have your provost/dean endorse and/or participate in key activities to help ensure more people will attend.
- Locate mentors for students with disabilities.
- Involve parents in recruiting efforts.
- In admissions standards consider special challenges and community involvement in addition to GPA.
- Have student ambassadors go to high schools and talk to STEM and non-STEM classes about socially relevant issues related to STEM fields.
- Make social gatherings easy to come to, “cool,” and focused on common interests.



Question 4: How can projects best measure the outcomes and impacts of their interventions to increase the participation of underrepresented minorities, women, and people with disabilities in STEM?

- Include control groups in the design of research projects whenever possible.
- Collect data on undergraduate degree completion and enrollment for students in all underrepresented groups. Collect graduation numbers for students with disabilities; the American Association for the Advancement of Science (AAAS) can help with this—they've been successful in similar work regarding other underrepresented groups.
- Evaluate retention rates.
- Louis Stokes Alliances for Minority Participation (LSAMPs) provide a good model in collecting participant data that includes disability status; projects could cooperate to convince LSAMPs to begin disclosing data for annual tracking.
- NSF could provide additional funding for data collection.
- Find ways to collect outcomes/data beyond self-report (e.g., more than “students indicate that...”); this is more expensive and more involved and will need to involve formal external evaluation of programs that can collect data to show productivity.
- An NSF-funded external evaluator could be funded to monitor a data collection system for RDE projects, as is done with LSAMPs and Alliances for Graduate Education in the Professoriate (AGEPs) already.

Summary of How Projects Can Measure Outcomes

CBI participants suggested the following ways to measure the increase of minorities, women, and people with disabilities in STEM:

- Include control groups in research projects.
- Institutions could collect data on undergraduate degree pursuit and completion for all underrepresented groups.
- Projects could evaluate enrollment, retention, and graduation rates.
- All NSF-funded programs to broaden participation in STEM could cooperate in collecting data.
- Secure additional funding for data collection.



CBI Participants

Stakeholder groups represented in the CBI included:

- projects/organizations that serve people with disabilities, especially STEM;
- projects/organizations that promote STEM to minorities and women;
- people with disabilities; and
- STEM educators.

The following individuals participated in the CBI:

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Community of Practice

Among the strategies for meeting *AccessSTEM* objectives is a *Broadening Participation Community of Practice (CoP)* for stakeholder groups. Communicating using email and other electronic tools, *CoP* members share perspectives and expertise and identify practices that promote the participation of people with disabilities in STEM fields. Collaborators receive support from project staff in making their project activities more accessible (e.g., assistance in the design of an accessible website, suggestions for recruiting and accommodating participants with disabilities).

The *Broadening Participation CoP* is populated with *AccessSTEM* collaborators who administer alliances and projects that serve to broaden participation in STEM fields by encouraging and supporting women, racial/ethnic minorities, and/or people with disabilities.

Members

- discuss how to recruit participants with disabilities and accommodate them in their programs and activities and to make their STEM offerings more accessible overall;
- recruit their participants with disabilities into *AccessSTEM* e-mentoring, internships, academies, and workshops to complement their activities;
- identify, recruit, and accommodate eligible *AccessSTEM* participants;
- cosponsor events, discuss potential new projects, and share funding possibilities;
- disseminate *AccessSTEM* information and information about their projects and results through the Knowledge Base; and
- help plan and recruit participants for *Capacity-Building Institutes*.

You can join the *Broadening Participation CoP* by sending the following information to doit@u.washington.edu:

- Name
- Position / title
- Institution
- Postal address
- Email address



***AccessSTEM* Website and Searchable Knowledge Base**

The *AccessSTEM* website is a space where K-12 teachers, postsecondary educators, and employers learn to make classroom and employment opportunities in STEM accessible to individuals with disabilities. It includes six primary areas.

Universal Design

Strategies for creating academic environments that maximize the learning of students with a wide range of abilities and disabilities.

Accommodation Strategies

How educators and employers can assure access to academic and employment opportunities in STEM for individuals with disabilities.

Rights and Responsibilities

The rights and responsibilities of educators, student support staff, and students with disabilities.

Resources

Resources to help instructors more fully include students with disabilities in course activities.

Presentations

Streaming video presentations with accompanying publications that share strategies for working with students with disabilities in mathematics and science classes.

Searchable Knowledge Base

A searchable database of frequently asked questions, case studies, and promising practices related to how educators and employers can fully include students with disabilities in STEM activities.



Individuals and organizations are encouraged to propose questions and answers, case studies, and promising practices. In particular, the promising practices articles serve to spread the word about practices that show evidence of improving the participation of people with disabilities in STEM. The Knowledge Base is an excellent resource for ideas that can be implemented in other programs. Contributions and suggestions can be sent to doit@u.washington.edu.

DO-IT Home
DO-IT Knowledge Base Home
Glossary

DO-IT Knowledge Base

DID YOU KNOW?

Consider special needs when making field trip vehicle reservations.

Search Knowledge Base

Knowledge Base Articles by Topic

About DO-IT Knowledge Base

W3C WAI-AAA WCAG 1.0

W3C HTML 4.0

W3C CSS

Search the DO-IT Knowledge Base

This Knowledge Base is continually growing to include answers to common questions, case studies, and promising practices regarding accessibility of technology, college, graduate school, and careers for individuals with disabilities. Use the following form to locate specific information in our Knowledge Base, or browse our complete list of [Knowledge Base articles by topic](#).

Please select your search criteria:

Enter search text:

Select item(s) below if you would like to focus your search:

- Number of days since published:
- Type of article:
- Academic Area:
- Disability:
- Life Phase:
- Issue:
- Technology:

How would you like your results sorted?
(Leave blank to sort by article relevance)

1. Primary Sort:
2. Secondary Sort:

Examples of Knowledge Base questions include the following:

- What lab safety issues need to be considered for a student who is deaf? who has a visual impairment? who has a mobility impairment?
- Where can I find vendors who specialize in assistive technology and materials for science laboratories?
- Do fume hoods exist that are accessible to people with mobility impairments?
- How can I help a student who is blind or has low vision make measurements in a science lab?
- How can I help a student record and analyze data in a science lab?

Examples of Knowledge Base case study and promising practice titles include the following:

- Kim & Biology: A Case Study in Accommodations for Learning Disabilities
- Earth Science: A Case Study on Teaching Concepts to a Student with a Visual Impairment
- Orofino High School: A Promising Practice for Hands-on Science for Everyone



Checklist for Making Projects Accessible to All Students

The following paragraphs provide suggestions for making NSF-funded and other STEM project resources and activities welcoming and accessible to all participants, including those with disabilities. The content is adapted from the DO-IT publication titled *Equal Access: Universal Design of Your Project* which can be found at <http://www.washington.edu/doit/Brochures/Programs/design.html>.

Basically, there are two approaches to access:

1. accommodations, and
2. universal design.

Accommodations include alternate formats, assistive technology, and other adjustments for specific students. Universal design is “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” (The Center for Universal Design, <http://www.design.ncsu.edu/cud/>).

Universal design means that rather than designing for the average user, you design for people with a broad range of characteristics. Potential participants include people with a variety of native languages, men, women, people with different racial and ethnic backgrounds, and those who have learning disabilities and/or visual, speech, hearing, and/or mobility impairments. Make sure that project staff and volunteers are trained to support people with disabilities, respond to specific requests for accommodations in a timely manner, and know who to contact regarding disability-related issues. The universal design of your project offerings will make everyone feel welcome and minimize the need for special accommodations for individual participants.

Examples of questions to address in order to make your facility, information resources, and project activities universally accessible are listed below. The complete list can be found within the publication noted above.



Planning and Evaluation

Consider diversity issues as you plan and evaluate services.

- Are people with disabilities, racial/ethnic minorities, men and women, younger and older students, and other groups represented in the project-planning process in numbers proportional to those of the whole campus/community?
- Are disability-related access issues and other diversity issues addressed in program evaluation plans and instruments?

Information Resources

Assure that publications and websites welcome a diverse group of prospective members and that the content is accessible to people with a variety of abilities.

- Do pictures in your publications and website include people with diverse characteristics with respect to race, gender, age, and disability?
- In key publications of your project, do you include a statement about your commitment to access and procedures for requesting disability-related accommodations? For example, you could include the following statement: "Our project's goal is to make materials and activities accessible to all participants. Please inform organization leaders of accessibility barriers you encounter and request accommodations that will make project activities and information resources accessible to you."
- Are all printed publications available (immediately or in a timely manner) in alternate formats such as Braille, large print, and electronic text?
- Do videos developed or used in the project have captions? Are they audio described? For more information, consult *Creating Video and Multimedia Products That Are Accessible to People with Sensory Impairments* at <http://www.washington.edu/>

[doit/Brochures/Technology/vid_sensory.html](http://www.washington.edu/doit/Brochures/Technology/vid_sensory.html). For making distance learning accessible, consult *Real Connections: Making Distance Learning Accessible to Everyone* video and publication at http://www.washington.edu/doit/Video/real_con.html.

Project and Activity Facilities

Assure physical access, comfort, and safety within an environment that is welcoming to visitors with a variety of abilities, racial/ethnic backgrounds, genders, and ages.

- Are all levels of the facility connected via an accessible route of travel?
- Are aisles wide and clear of obstructions for the safety of users who have mobility and/or visual impairments?
- Is at least part of a service counter/desk at a height accessible from a seated position?

Computers, Software, and Assistive Technology

If computers are used in sponsored programs, make sure that the technology is accessible to all visitors. The organization will not need to have special technology on hand for every type of disability but should have available commonly used assistive technology and have a system in place for timely response to participant requests for assistive technology. Purchasing the following products for computer workstations is a good way to start.

- Is an adjustable-height table available for each type of workstation to assist participants who use wheelchairs or are small or large in stature?
- Do you provide adequate work space for both left- and right-handed users?
- Do you provide a trackball to be used by someone who has difficulty controlling a mouse?



Staff

Make sure staff members are prepared to work with all program participants.

- Are all staff members familiar with the availability and use of a TTY/TDD, the Telecommunications Relay Service, assistive technology, and alternate document formats?
- Do all staff members know how to respond to requests for disability-related accommodations, such as sign language interpreters?
- Are project staff and contractors in specific assignment areas (e.g., web page development, video creation) knowledgeable about accessibility requirements and considerations?

Presentation, Exhibit, and Other Communication Hints

Treat people with disabilities with the same respect and consideration with which you treat others. There are no strict rules when it comes to delivering a presentation, hosting an exhibit, and otherwise relating to people with disabilities. However, here are some helpful hints.

General

- Ask a person with a disability if he/she needs help before providing assistance.
- Talk directly to the person with a disability, not through the person's companion or interpreter.
- Refer to a person's disability only if it is relevant to the conversation. If so, mention the person first and then the disability. "A man who is blind" is better than "a blind man" because it puts the person first.
- Avoid negative descriptions of a person's disability. For example, "a person who uses a wheelchair" is more appropriate than "a person *confined* to a wheelchair." A wheelchair is not confining—it's liberating!
- Provide information in alternate means (e.g., written, spoken, diagrams).
- Ask for permission before you interact with a person's guide dog or service dog.

Blind or Low Vision

- Be descriptive. Say, "The computer is about three feet to your left," rather than "The computer is over there."
- Speak all of the content presented with overhead projections and other visuals.
- When guiding people with visual impairments, offer them your arm rather than grabbing or pushing them.

Learning Disabilities

- Offer directions/instruction both orally and in writing. If asked, read instructions to individuals who have specific learning disabilities.

Mobility Impairments

- Sit or otherwise position yourself at the approximate height of people sitting in wheelchairs when you interact.

Speech Impairments

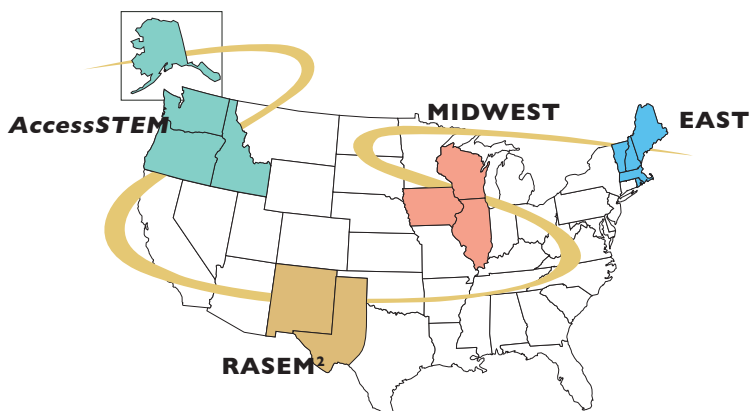
- Listen carefully. Repeat what you think you understand and then ask the person with a speech impairment to clarify and/or repeat the portion that you did not understand.

Deaf or Hard of Hearing

- Face people with hearing impairments so they can see your lips. Avoid talking while chewing gum or eating.
- Speak clearly at a normal volume. Speak louder only if requested.
- Repeat questions from audience members.
- Use paper and pencil if the person who is deaf does not read lips or if more accurate communication is needed.
- When using an interpreter, speak directly to the person who is deaf; when an interpreter voices what a person who is deaf signs, look at the person who is deaf, not the interpreter.

Psychiatric Impairments

- Provide information in clear, calm, respectful tones.
- Allow opportunities for addressing specific questions.



NSF Regional Alliances for Persons with Disabilities in STEM Education

AccessSTEM is one of several regional alliances funded by the National Science Foundation (NSF) to increase the successful participation of people with disabilities in academic studies and careers. Each Regional Alliance for Persons with Disabilities in Science, Technology, Engineering, and Mathematics Education (RAD) sponsors STEM activities, transition to college/careers programs, mentors, summer programs, and other activities for youth with disabilities. They also provide training and support that can help teachers, postsecondary faculty, employers, and project directors make their STEM courses and resources accessible to students with disabilities. In summary, RAD activities

- prepare students through transition workshops, summer programs, on-line mentoring, peer support, internships, etc., and
- improve accessibility and acceptance in courses, employment, technology, programs, etc.

Regional Alliances

The following is contact information for each RAD. A map of their locations can be found above and on the back cover of this publication.

AccessSTEM

University of Washington
 Box 355670
 Seattle, WA 98195-5670
 206-685-3648
 206-221-4171 (FAX)
<http://www.washington.edu/doit/>
doit@u.washington.edu

Key Staff:

Sheryl Burgstahler, Director
 Scott Bellman
 Lyla Crawford
 Michael Richardson
 Valerie Sundby

EAST

University of Southern Maine
 37 College Avenue
 Gorham, ME 04038
 207-780-5449
 207-780-5129 (FAX)
<http://research.usm.maine.edu/East/llovewell@usm.maine.edu>

Key Staff:

Lynn Lovewell, Director
 Libby Cohen
 Samantha Langley-Turnbaugh



MIDWEST Alliance

University of Wisconsin – Madison
338 Goodnight Hall
1975 Willow Drive
Madison, WI 53706
608-262-6467
608-262-6466 (FAX)
<http://www.stemmidwest.org/>
midwest@mailplus.wisc.edu

Key Staff:

Alice Anderson, Director
Alicia Blegen
Amy Fruchtman
Jay Martin
Josh Morrill
Greg Stefanich

RASEM²

New Mexico State University
PO Box 30001 / Dept 3CE
Las Cruces, NM 88003
888-646-6051
505-646-3367 (FAX)
<http://rasem.nmsu.edu/>
belowery@nmsu.edu

Key Staff:

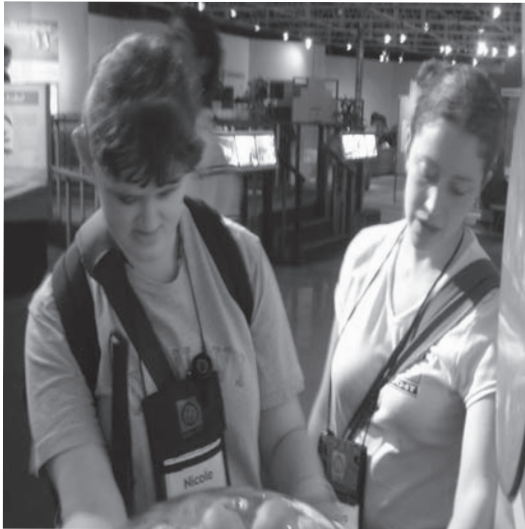
William McCarthy, Director
Randy Larry
Belen Lowery
Ed Misquez
Jackie Sanders
Richard Turietta

RDE

Contact information for RDE is listed below.

Research in Disabilities Education

National Science Foundation
Mark Leddy, Program Director
703-292-4655
703-292-9018 (FAX)
http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5482&org=NSF&sel_org=N
mleddy@nsf.gov



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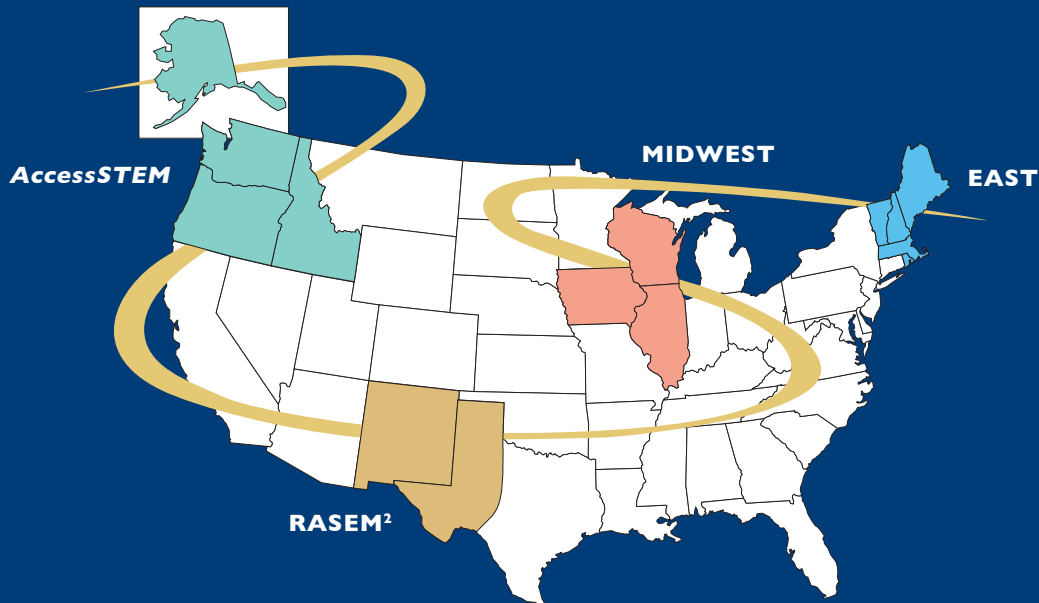
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Electronic versions of this book are available in print-ready and accessible formats at <http://www.washington.edu/doiit/>.

National Science Foundation Regional Alliances for Persons with Disabilities in Science, Technology, Engineering, and Mathematics Education on Disability



AccessSTEM, MIDWEST, EAST, and RASEM² are Regional Alliances funded by the Research in Disabilities Education program at the National Science Foundation. Outreach and dissemination efforts extend nationwide.

For more information consult <http://www.washington.edu/doi/Stem/>.



DO-IT (Disabilities, Opportunities, Internetworking, and Technology)

College of Engineering and Computer Science
Computing & Communications
College of Education
University of Washington

www.washington.edu/doi/

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