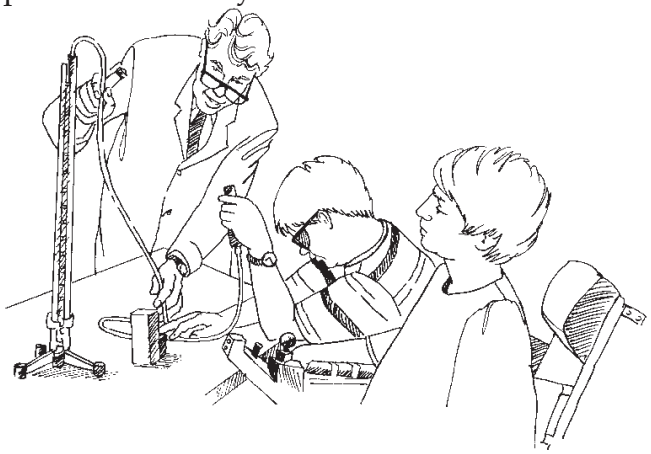
Working Together: Science Teachers and Students with Disabilities

Engaging students with disabilities in science
by Sheryl Burgstahler, Ph.D.

As scientific fields make increasing use of technology, new opportunities emerge for people with a broad range of abilities and disabilities. When students with disabilities and science teachers form learning partnerships, the possibilities for academic and career success multiply.

Some students with disabilities have conditions that are invisible; some are visible. Since each person's situation is unique, the best solutions for maximizing participation come about when the student and teacher work together to develop creative alternatives for challenges faced by students with disabilities. Such challenges include gaining knowledge and demonstrating knowledge. In most cases, it takes just a little creativity, patience, and common sense to make it possible for everyone to learn and contribute.



Gaining Knowledge

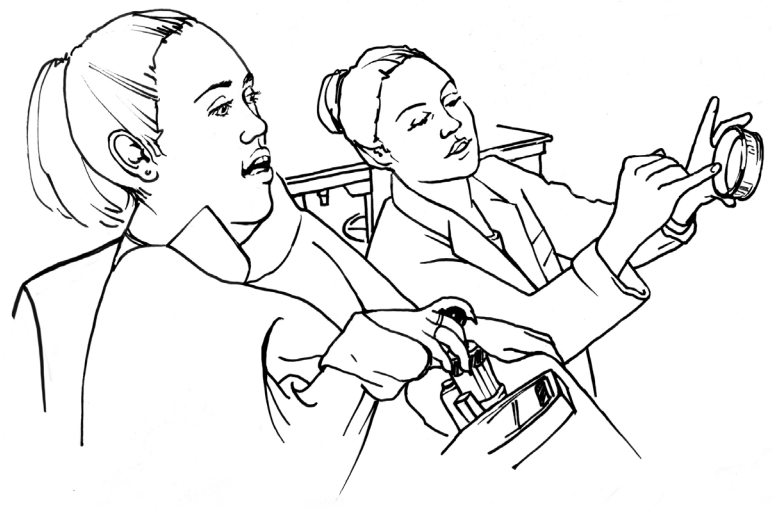
Many students with disabilities face challenges to gaining knowledge. Examples of specific challenges and accommodations follow.

The student who has difficulty:	can be accommodated with:
• reading standard text or viewing graphic images due to visual impairments	• materials in large print or Braille, on tape, or via computer; enlarged or tactile drawings; access to assistive technology that provides enlarged, voice, or Braille output.
• seeing materials on blackboard or overhead projector due to visual impairments	• binoculars; verbalization of the content and oral descriptions of all visually displayed materials.
• reading output from standard equipment because of a visual impairment	• interfacing lab equipment with computer and providing large print or speech output; scientific equipment with Braille and large print markings.
• hearing presentations and instructions due to hearing impairments	• FM system; interpreter; printed materials; facing student for lip reading; overhead projector or blackboard.

continued

Gaining Knowledge, *continued*

The student who has difficulty:	can be accommodated with:
• hearing multimedia presentations due to hearing impairment	• captioned presentations; sign language interpreter.
• participating in class discussions due to hearing or speech impairment	• electronic communications (e.g., email) where the ability to hear or speak is not required; portable computer with speech output.
• understanding concepts due to a specific learning disability	• visual, aural, and tactile demonstrations incorporated into instruction.
• reading because of a specific learning disability	• extra time and access to materials via a computer equipped with speech and large print output and Internet access.
• taking notes in class because of mobility or visual impairment	• in-class access to a computer with assistive technology and a word processor.
• operating lab equipment and conducting lab experiments due to mobility impairment	• accessible facility; adjustable-height tables; lab partner; scribe; computer-controlled lab equipment with alternative input devices (e.g., speech, Morse code, alternative keyboard); modified scientific equipment.
• seeing demonstrations while seated in a wheelchair; viewing lab experiments	• adjustable-height tables and flexible seating arrangements.
• completing an assignment or lab because of a health impairment	• flexible scheduling arrangements.
• doing research	• information accessible on computer (e.g., disk, Internet) with assistive technology.



Demonstrating Knowledge

Some students with disabilities cannot demonstrate mastery of a subject by writing, speaking, or by working through a problem in a lab. Many of the accommodations for gaining knowledge can help the student demonstrate mastery of a subject as well. Examples of other accommodations follow.

Demonstrating Knowledge

The student who has difficulty:	can be accommodated with:
• completing and submitting worksheets and tests because of visual impairment or specific learning disability	• worksheets and tests in large print or Braille, on tape, or via computer; access to assistive technology that provides enlarged, voice, or Braille as well as standard print output.
• completing a test or assignment because of a disability that affects the speed at which it can be completed	• extra time or alternative testing arrangements.
• completing a test or assignment because of the inability to write	• in-class access to a computer with alternative input devices (e.g., Morse code, speech, alternative keyboard).

Universal Design

Some of these suggestions (e.g., incorporating visual, aural, and tactile demonstrations in instruction) benefit all students, not just those with specific disabilities. Universal design of instruction is an approach to teaching that involves consideration of students with a wide range of characteristics, including disabilities. First applied in the field of architecture, universal design is "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaption or specialized design" (*www.ncsu.edu/project/design-projects/udi/center-for-universal-design/the-principles-of-universal-design/*). Universal design can be applied to class climate; physical access, usability, and safety; delivery methods; information resources; interaction; feedback; and assessment.

For more information about applications of universal design consult *www.uw.edu/doit/Resources/udesign.html* or *The Center for Universal Design in Education* at *www.uw.edu/doit/CUDE/*. The book *Universal Design in Higher Education: From Principles to Practice* published by Harvard Education Press shares perspectives of UD leaders nationwide. To receive a 20% discount, visit *www.uw.edu/doit/UDHE/coupon.html*.

Additional Resources

- For more information, publications, videos, and a searchable database of questions and answers, case studies, and promising practices in the field of science, technology, engineering, or mathematics, visit the *AccessSTEM* website at *www.uw.edu/doit/Stem/*.

- To contact staff, request electronic copies of *DO-IT NEWS*, request publications or ask questions about the program, email *doit@uw.edu*.

- To discuss issues pertaining to individuals with disabilities and their pursuit of science, engineering, and mathematics (sem) academic programs and careers, subscribe to the *doitsem* discussion list at *mailman.uw.edu/mailman/listinfo/doitsem/*.

Video

A 13-minute video, *Working Together: Science Teachers and Students With Disabilities*, may be freely viewed online or purchased at *www.uw.edu/doit/Video/wt_sci.html*.

About DO-IT

DO-IT (Disabilities, Opportunities, Internetworking, and Technology) serves to increase the successful participation of individuals with disabilities in challenging academic programs and careers such as those in science, engineering, mathematics, and technology. Primary funding for DO-IT is provided by the National Science Foundation, the State of Washington, and the U.S. Department of Education.

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Acknowledgment
Much of the content of this publication appeared in the article T*eaching Lab Courses to Students with Disabilities* by Sheryl Burgstahler, in *Information Technology and Disabilities*, *3*(2), 1996, at *staff.washington.edu/sherylb/itd.96.html*; it has been modified and reproduced with permission. This material is based upon work supported by the National Science Foundation (Grant #9255803, #9550003, and Cooperative Agreement #0227995).

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