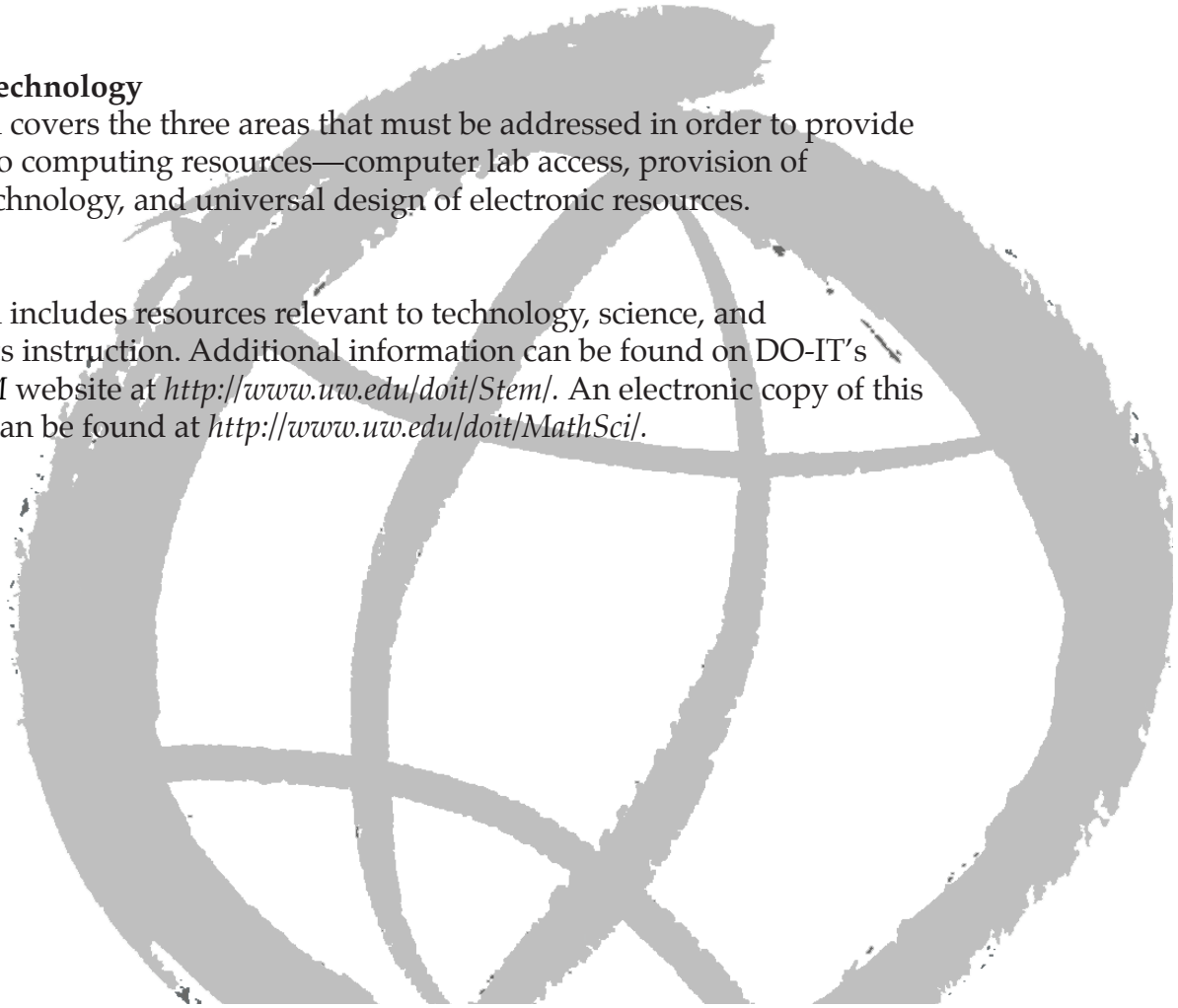
PART I: MAKING INSTRUCTION ACCESSIBLE

Part I of the notebook includes the three sections described below:

- **Access Issues and Strategies**
  This section covers issues related to access to education for individuals with disabilities—legal and attitudinal issues as well as general teaching strategies. It also shares principles of universal design and suggestions for making educational activities accessible to all students, including those who have disabilities.

- **Access to Technology**
  This section covers the three areas that must be addressed in order to provide full access to computing resources—computer lab access, provision of adaptive technology, and universal design of electronic resources.

- **Resources**
  This section includes resources relevant to technology, science, and mathematics instruction. Additional information can be found on DO-IT's *AccessSTEM* website at *http://www.uw.edu/doit/Stem/*. An electronic copy of this document can be found at *http://www.uw.edu/doit/MathSci/*.



ACCESS ISSUES AND STRATEGIES

Recent advancements in assistive technology, greater reliance on computers, and increased job specialization have resulted in employment opportunities in fields that were once considered unsuitable for individuals with disabilities. These career fields include science, technology, engineering, and mathematics (STEM). Many of these careers require knowledge and skills obtained through postsecondary education.

The number of individuals with disabilities seeking postsecondary education has increased over the last decade. Reasons cited for this increase include those listed below:

- Advances in medical technology and techniques result in greater numbers of people who survive traumatic accidents and problematic births.
- Improvements in technology make it possible for more people with disabilities to live independently and have productive lives.
- The creation of federal- and state-mandated precollege academic support programs helps more students with disabilities complete high school and consider postsecondary education options.
- Publicity of federal disability-related legislation increases awareness of rights to accommodations and equal opportunities in education and employment.

However, people with disabilities are still underrepresented in some academic and career areas, including STEM.

"For far too long," wrote Dr. Larry Scadden, past senior program officer for the National Science Foundation's Program for Persons with Disabilities, "we've been closing disabled people out of science and math, in the classroom, the laboratory, and the workplace. There are a vast amount of intelligent people who simply don't know how to accommodate the disabled. They don't have any idea how disabled men and women do science. They don't really realize that they can do science. In some instances, students don't want persons with disabilities in their classrooms or labs. They're afraid they'll be slowed down by them. They don't want competition for their time at the lab bench. These attitudes, the myths and the ignorance, have created a major barrier that must be removed" (Scadden, 2001).

Scadden—totally blind himself—alludes with great pleasure to such historical figures as Galileo, who became blind, and Einstein, who was thought to have been Dyslexic, as well as to the renowned contemporary physicist Stephen Hawking, whose movement and speech are severely affected by amyotrophic lateral sclerosis. Society cannot afford to deprive itself of the potential for scientific progress

that resides—and all too often remains untapped—in the minds of people with disabilities.

It should be noted that in the past, society has benefited from innovations that were originally conceived to benefit people with disabilities. For example, captions on television programming were created for people with hearing impairments but are now used by millions of people who need to watch TV in noisy places or with the sound turned off so others are not disturbed. Sidewalk curb cuts, intended at first to help people using wheelchairs negotiate intersections, are a welcome accommodation for the elderly, parents pushing baby strollers, delivery people, and skateboarders. "Generally," reports Dr. Scadden, "if you design a product—whether it's a consumer product or a classroom curriculum—in a way that it can be used by people with disabilities, it will be a better product for everybody" (Scadden 2001).

An earlier version of the following article was published in *Journal of Information Technology and Disabilities* in December of 1994. It can be found at *http://staff.washington.edu/sherylb/itd.94.html*. The content below has been updated and reprinted with permission. References cited can be found in the *Resources* section of this binder.

Increasing the Representation of People with Disabilities in Science, Engineering, and Mathematics

by Sheryl Burgstahler, Ph.D.
University of Washington

Abstract

Individuals with disabilities experience far less career success than their nondisabled peers. Three main factors cause individuals with disabilities to be underrepresented in STEM fields: preparation of students with disabilities; access to facilities, programs, and equipment; and acceptance by educators, employers, and coworkers. Technology can have a positive effect on all of these factors and help to open doors to new areas of study and employment. This article explores the role of information technology, describes a campus program designed to positively influence each of the factors, and makes a series of recommendations for action.

Introduction

Individuals with disabilities experience far less career success than their nondisabled peers (Blackorby & Wagner, 1996; National Organization on Disability, 1998; Office of Disability Employment Policy, 2001). Access to higher education can enhance the employability and vocational success of individuals with disabilities. A bachelor's degree or higher is a prerequisite for many challenging careers, including those in science, technology, engineering, and mathematics (Price-Ellingstad & Berry, 1999/2000). Although the number of individuals with disabilities attending postsecondary institutions is increasing, few of these individuals pursue academic careers in science and engineering, and for those who do, the attrition rate is high (Malcom & Matyas, 1991; National Science Foundation, 2000; Office of Disability Employment Policy, 2001).

Individuals with disabilities are also under-represented in science and engineering professions, and scientists and engineers with disabilities experience higher unemployment rates than do other scientists and engineers (National Science Foundation, 2000; Malcom & Matyas, 1991). However, the success stories of individuals in STEM fields (Burgstahler, 2001; Unger, Wehman, Yasuda, Campbell, & Green, 2001) demonstrate that opportunities do exist for people with disabilities who successfully overcome the barriers imposed by

- inaccessible facilities;
- curriculum materials;
- computers, scientific equipment, and electronic resources;
- lack of encouragement;
- inadequate academic preparation;
- lack of access to role models;
- inadequate academic supports to bridge precollege education, undergraduate education, graduate programs, and employment; and
- negative attitudes and lack of knowledge about accommodations on the part of precollege and postsecondary educators.

(Brazier, Parry, & Fischbach, 2000; National

Science Foundation Task Force on Women, Minorities, and the Handicapped in Science and Technology, 1989; Presidential Task Force on Employment of Adults with Disabilities, 1999; Womble & Walker, 2001).

Individuals with disabilities who are also racial/ethnic minorities, female, from rural areas, or living in poverty face additional challenges to pursuing STEM careers (Atkins, 1998; Kundu, 1995; Schmidt-Davis, Hayward, & Kay, 1999/2000; Walker, 1991).

Steps to STEM careers for students with disabilities include gaining a college education (Horn & Berktold, 1999) and participating in relevant work experiences (Luecking & Fabian, 2000; National Council on Disability, 2000; National Council on Disability and Social Security Administration, 2000; Stodden & Dowrick, 2000a, 2000b; Unger, Wehman, Yasuda, Campbell, & Green, 2001). High-tech careers are particularly accessible to individuals with disabilities because of advancements in assistive technology that provide access to computers and scientific equipment (Smith & Jones, 1999). However, the inaccessible design of software, web pages, distance learning courses, and facilities continues to erect barriers (Burgstahler, 2002b; National Center for Education Statistics, 2000a, 2000b; Schmetzke, 2001). STEM academic programs and employment opportunities must be accessible in order for people with disabilities to succeed.

National Science Foundation projects for people with disabilities, racial/ethnic minorities, and women have identified promising practices for bringing students from underrepresented groups into STEM fields. Key among these activities are

- hands-on science experiences in precollege environments,
- work-based and research experiences,
- bridge programs between academic levels,
- tutoring and mentoring, and
- preparation of precollege and postsecondary educators and support staff.

Further, comprehensive projects that integrate most or all of these elements are more successful in recruiting, training, and retaining students with disabilities in STEM fields than isolated efforts (American Association for the Advancement of Science, 2001; Doren & Benz, 1998; Leyser, Vogel, Wyland, & Brulle, 1998; Malcom & Matyas, 1991; National Science Foundation, 2001; Phelps & Hanley-Maxwell, 1997).

Discussion of the Problem

Individuals with disabilities are underrepresented in STEM educational programs and professions. Causes of this problem can be found in three areas: preparation of students with disabilities; access to facilities, programs, and equipment; and acceptance by educators, employers, and coworkers.

Preparation

For an individual with a disability to experience life to the fullest, independent living and self-advocacy skills must be developed (Bremer, Kachgal, & Schoeller, 2003; Izzo & Lamb, 2001). As the end of high school approaches, so does the termination of a structured environment and precollege support systems. Adolescents with disabilities who wish to attend college are often faced with responsibilities that they are unprepared to meet because they are conditioned to

depend on others. Once enrolled, students with disabilities often hesitate to request the specific accommodations they need. The levels and types of resources available to students with disabilities in precollege programs, on postsecondary campuses, and in employment situations are different, and programs to help bridge the gaps between these critical stages are rare.

Students with disabilities are rarely encouraged to prepare for STEM fields. Since they do not consider a career in STEM an achievable goal, they do not take the courses necessary to prepare for postsecondary studies in these areas. High school and college students with disabilities, counselors, social service agency staff, and special education teachers often lack an understanding of the content and requirements of STEM programs in higher education and of the technology and other resources that make it possible for students with disabilities to pursue these fields.

Students with disabilities lack access to role models with similar disabilities who are successful in careers that they might otherwise have thought impossible for themselves (Seymour & Hunter, 1998; Summers, 2003). Potential role models are often great distances away, leaving individuals with disabilities isolated from those facing similar obstacles in school and work (Brown & Foster, 1990).

To prepare for STEM studies, students need to be able to use the powerful tools of the trade at an early age. Although network technology can reduce social isolation and allow independent access to information resources, these tools are not often readily available to precollege students with disabilities.

Access

Computers, assistive technology, and network resources can bridge the communication and accessibility gaps for people with disabilities. Electronic communications provide options for independent access to people and resources. Computer and network access can increase levels of independence and have a positive impact on the academic progress and career success of individuals with disabilities (Burgstahler, 1992). Unfortunately, many individuals with disabilities and people in their primary support systems are unaware of the tremendous contributions technological innovations can make to the lives of individuals with disabilities. Students with disabilities are not guaranteed access to computing and networking technology in precollege and college programs (Burgstahler, 1992; Horn & Shell, 1990). Likewise, lab facilities and electronic resources are often designed in such a way as to be inaccessible to students with disabilities.

Those who wish to pursue STEM fields need access to publications in these fields, yet

STEM publications are not always readily available in alternate formats. Making them available in an accessible electronic format is desirable, but some barriers still exist in making mathematics and scientific symbols and graphic images accessible to those who are blind. Universal access to publications will require the creation of new products, as well as promotion of the use of existing methods. Webmasters also need to apply standards, such as those used by the U.S. government, in order to take steps toward making their resources accessible to individuals with disabilities, including those who are blind and use text-to-speech technology.

Acceptance

Negative attitudes have been identified as the single most significant barrier faced by individuals with disabilities pursuing careers in science and engineering (Task Force on Women, Minorities, and the Handicapped in Science and Technology, 1989). Faculty and employers lack information about the rights and needs of students with disabilities and their potential contributions to society; they often have negative attitudes about including students with disabilities in academic programs and employment, and are unaware of the best practices for teaching students with disabilities and the role that technology can play (Anderson-Inman, Knox-Quinn, & Szymanski, 1999; Blackhurst, Lahm, Harrison, & Chandler, 1999; Dona & Edminster, 2001; Leyser, Vogel, Wyland, & Brulle, 1998; National Center for the Study of Postsecondary Educational Supports, 2000a, 2000b; Vogel, Leyser, Burgstahler, Slinger, & Zecker, 2005).

Professors are particularly reluctant to accommodate students with specific learning disabilities and have little knowledge of the characteristics and needs of students with these types of disabilities (Dodd, Fischer, Hermanson, & Nelson, 1990; Houck, Asselin, Troutman, & Arrington, 1992; Vogel, Leyser, Wyland, & Brulle, 1999). Faculty in science, engineering, and mathematics are less accepting than those in social sciences and education (Burgstahler, 2002a; Nelson, Dodd, & Smith, 1990). However, faculty attitudes have been found to be more positive when faculty members have previous contact and more information about students with disabilities. Clearly, there is a need for faculty training to help faculty members become more skilled at fully including students with disabilities in their courses.

The Role of Information Technology

Information technology plays a key role in the three areas addressed in this article. In order for students with disabilities to prepare for careers in STEM fields, they must begin to use computing and networking tools at a young age. These tools can help them access resources,

communicate with others, and perform academic tasks independently. The importance of the availability of assistive technologies for individuals with disabilities cannot be underestimated. Such tools are required if individuals with disabilities are to compete with their nondisabled peers. For all students and employees, the ability to perform tasks efficiently and professionally can earn the respect of educators, employers, and peers alike. The ability to control powerful technological tools can thus contribute to the acceptance of a person with a disability as an equal partner in learning and working situations.

One University's Efforts

At the University of Washington, the DO-IT Center is working to increase the participation of individuals with disabilities in STEM programs and careers. DO-IT began in 1992 and is primarily funded by the National Science Foundation, the U.S. Department of Education, and the State of Washington. Below, some of the DO-IT programs and activities that address the areas of preparation, access, and acceptance are discussed.

Preparation

The *DO-IT Scholars* program offers high school students with disabilities opportunities to study science, engineering, and mathematics; experience campus living; develop self-advocacy skills; interact with mentors; and use technology to pursue academic interests.

Internetworking

DO-IT Scholars learn to use computers and the Internet to explore academic and career interests. Computer and assistive technologies are selected for each participant; local Internet connections are established; and in-home training is provided. One *Scholar* who is blind reports, "Getting access to the Internet was the best thing that ever happened to me. In a way, my computer and access to the net have become my eyes to the world." A DO-IT industry partner reports, "Network communication is a liberating experience for many of these kids, since their disabilities aren't visible in their email. They have been quick to exploit the technology, both to communicate among themselves and to explore worlds that were previously inaccessible to them." A parent points out that too often, without a special program like DO-IT, students with disabilities have "inferior and inadequate equipment, and if they can get the right technology there is nothing that can stop them in what they want to do with their lives."

Mentoring

Through electronic communications and personal meetings, *DO-IT Scholars* are brought together with postsecondary students and *Mentors* to facilitate academic, career, and personal achievements. *DO-IT Mentors* study and work in a variety of fields, including computer programming, postsecondary education, statistics, physics, engineering, computer science, computer consulting, and biology. One *Scholar* describes *Mentors* as people who "provide us with useful contacts in academics, career, and personal areas. . . . They help participants find their talents and interests and confirm their goals."

Experienced *Scholars* practice communication and leadership skills as peer *Mentors* for new *Scholars*. *Scholars* and *Mentors* are encouraged to reach out and help others. For example, they communicate with patients at a children's hospital

through an email account and computer system established at the hospital through DO-IT. A parent reports that her son, a *Scholar* with Attention-Deficit Disorder (ADD), "has already passed on some of what he got to another ADD child, by taking the boy to register for high school and showing him around so he will know where things are the first day of class."

Summer Study
During live-in programs held during the summer at the University of Washington, each *Scholar* studies STEM by participating in lectures and labs and using computer applications and the Internet. Subjects include oceanography, heart surgery, chemistry, virtual reality, geophysics, material sciences, engineering, mathematics, biology, physics, and astronomy. Accommodations are made in each activity to ensure that all participants remain as active as possible.

In the words of *Scholars* after attending Summer Study, "I'm excited about many different careers I could go into," and "I learned what college life is all about." A mother of one of the *Scholars* pointed out how the Summer Study program boosted her son's "belief in himself and his abilities. . . . This experience has changed the course of his life." *Scholars* learn self-advocacy skills as part of the summer curriculum. One parent reported her son's plans to "talk to the math department head about challenging the math class he has been put into. He says it's too easy and he wants a more difficult class where he can learn something new. He is not asking for me to help. He has the courage to go and work on this on his own. Him being his own advocate has been coming, but this jump in ability is a direct result of the DO-IT experience." After observing two summer programs, a corporate partner noted, "We repeatedly hear the comment that these kids have never experienced a situation like this before where the focus is on their abilities (rather than their disabilities)."

Special Projects and Events
Throughout their involvement in DO-IT, *Scholars* have opportunities to pursue projects of special interest, using *Mentors* and staff as resources. Options include collecting scientific resources, administering computer systems, publishing articles in the newsletter, teaching in the summer program, and helping with other DO-IT events. *DO-IT Scholars* and other precollege and college students with disabilities and their families, teachers, counselors, and service providers are invited to participate in special events, including regional and national education and technology conferences. These events generate a lot of interest and often attract children with disabilities and their parents, who, after meeting *DO-IT Scholars* and *Mentors*, are encouraged to use technology and to pursue STEM interests.

DO-IT sponsors one-day college transition workshops and assistive technology

seminars open to on- and off-campus individuals with disabilities, their families, service providers, and educators. These programs extend the impact of DO-IT projects to a large audience, helping more students with disabilities transition and adjust to college life and make effective use of information technologies.

Involvement of corporate sponsors in *DO-IT Scholar* activities is expected to pay off in terms of more accessible workplaces for individuals with disabilities. A Microsoft representative states, "I sincerely hope and expect to someday count DO-IT graduates among my colleagues at Microsoft." For Battelle Pacific Northwest Laboratories, involvement in the DO-IT project has "provided a way for our staff scientists and educators to learn firsthand what we can do to ensure that our working environment welcomes diverse students, including those with disabilities. The overarching goal of our participation is to enrich science and technology by opening the door to a diverse, highly talented work force. Through DO-IT, we have been able to link students to our scientists via the Internet, and provide opportunities for scientists to interact in person with students with disabilities. Our in-person activities have included hosting DO-IT students for a tour of our laboratories, and providing a summer internship for a selected DO-IT student."

Access and Acceptance

DO-IT works to create barrier-free campuses and worksites for individuals with disabilities, particularly in STEM fields. On the UW campus, the latest assistive technologies are available in convenient locations. Students with disabilities have been surveyed to assess the barriers they have faced, and staff have addressed issues identified.

One of the most effective ways DO-IT improves access and attitudes towards students with disabilities is to invite university faculty to teach in the Summer Study program for *DO-IT Scholars*. Staff provide assistance in making presentations and labs accessible to all *Scholars*. Without exception, instructors come away with a positive impression of the capabilities of students with disabilities and a better understanding of access requirements.

Disability awareness presentations are delivered regularly to faculty. These programs increase awareness of the potential of students with disabilities, improve attitudes towards students with disabilities, and provide creative and practical approaches for ensuring access to educational opportunities. Three short videos, *Working Together: Faculty and Students with Disabilities, Building the Team: Faculty, Staff, and Students Working Together,* and *Equal Access: Universal Design of Instruction* introduce viewers to faculty and postsecondary students with disabilities demonstrating successful techniques for full participation in academic programs and careers.

Online tools allow DO-IT participants, *Mentors*, and staff to reach a worldwide

audience. Electronic discussion lists facilitate communication on issues related to participation of individuals with disabilities in science, engineering, and mathematics. Web content and printed materials also promote the inclusion of individuals with disabilities in STEM fields.

In summary, DO-IT helps students with disabilities transition to postsecondary studies and careers in STEM and creates a positive and accessible learning environment. The long-term outcome of projects like DO-IT will be to increase the number of individuals with disabilities in STEM professions. To learn more about the successful practices employed by DO-IT, view the videos and read the publications titled *How DO-IT Does It*, *Opening Doors: Mentoring on the Internet*, *DO-IT Pals*, *DO-IT Scholars*, and *DO-IT Snapshots*.

Recommendations and Conclusion

A review of the literature and of the experiences at the University of Washington leads to several recommendations to promote the inclusion of people with disabilities in STEM academic programs and careers.

Preparation

To help students with disabilities become prepared to pursue these fields, efforts should be undertaken to do the following:

- Help students with disabilities develop independent-living and self-advocacy skills and facilitate transitions to college and employment.
- Encourage students with disabilities to take mathematics and science classes in high school and college so that they can pursue careers in science, engineering, and mathematics.
- Establish positive, motivational, and lasting interactions between high school and college students with disabilities and practicing engineers and scientists who have disabilities.
- Make sure students with disabilities begin to use computers, electronic communications, and network resources to increase their independence in pursuing academic studies at an early age.
- Ensure that students with disabilities have full access to the general education curriculum in the early grades and keep pace academically with their peers, so that they will be prepared to pursue challenging classes in middle school and high school.

Access

To improve access to STEM fields, we must do the following:

- Make facilities, computers, science equipment, and programs accessible to people with a variety of disabilities.

- Ensure that scientific and mathematics publications are readily available in appropriate alternative formats.

Acceptance
In order to create a positive environment for learning and working, efforts should be undertaken to do the following:

- Increase the awareness of precollege and college educators regarding the potential contributions and accommodation needs of people with disabilities.

- Help employers and coworkers appreciate the potential contributions of people with disabilities and create a flexible work environment where productivity can be maximized.

In all of these efforts, successful individuals with disabilities should be given opportunities to share the specialized expertise they have developed through their own personal experiences. Individuals with disabilities can be empowered with opportunities to apply their skills in efforts to promote the participation of other individuals with disabilities in science, engineering, and mathematics academic programs and careers.

We must continue to increase the understanding of factors affecting the underrepresentation of individuals with disabilities, implement creative programs to address problems, and share successful practices. Many small steps taken locally can, together, create a substantial impact and move us closer to a shared vision where people with disabilities have equal access to opportunities in science, engineering, and mathematics.

Tips: Teaching Access Challenges

Disability-related content can be incorporated into a course that prepares participants to teach science, mathematics, and technology in many ways. Consider some of the access barriers and solutions for students with disabilities as you prepare for and deliver instruction to pre-service and in-service teachers.

A few ideas are described below:

- Discuss disability-related issues when other areas of diversity (e.g., gender, race/ethnicity) are discussed.

- If students in your postsecondary class visit local schools and observe classes being taught, have them take notes on teacher interactions with students who have disabilities, as well as access barriers they observe in the school setting.

- Discuss general strategies for fully including students with disabilities in elementary, secondary, and postsecondary STEM courses.

Ethical and Legal Issues

Providing an appropriate education to all students can be argued on ethical grounds. For some people, however, legal mandates are more convincing. Federal legislation requires that students with disabilities have access to appropriate educational opportunities.

The publications *Working Together: Faculty and Students with Disabilities* and *Working Together: K-12 Teachers and Students with Disabilities* provide short overviews of legal rights and responsibilities and examples of accommodation strategies at postsecondary and precollege levels, respectively.

View the videos *Working Together: Faculty and Students with Disabilities* and *Building the Team: Faculty, Staff, and Students Working Together* and read the publications *Working Together: Faculty and Students with Disabilities* and *Working Together: K-12 Teachers and Students with Disabilities* to learn about how students with disabilities can work with K-12 and college instructors in order to achieve success.

Section 504, ADA

According to Section 504 of the Rehabilitation Act of 1973, "no otherwise qualified individual with a disability shall, solely by reason of his or her disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity of a public entity." This idea is also included in the Americans with Disabilities Act (ADA) of 1990. Both K-12 and postsecondary education institutions are covered entities with respect to this legislation.

So what exactly does "person with a disability" mean? "Person with a disability" means "any person who has a physical or mental impairment which substantially limits one or more major life activities including walking, seeing, hearing, speaking, breathing, learning, and working; has a record of such impairment; or is regarded as having such an impairment."

Disabilities covered by legislation include but are not limited to spinal cord injuries, loss of limbs, multiple sclerosis, muscular dystrophy, cerebral palsy, hearing impairments, visual impairments, speech impairments, specific learning disabilities, head injuries, psychiatric disorders, diabetes, cancer, and AIDS. The examples listed here are conditions that may limit the ability of people to perform certain tasks. Some of these conditions are readily apparent; some are invisible.

IDEA

A requirement of the Individuals with Disabilities Education Act of 1990 (IDEA) and the 2004 Individuals with Disabilities Improvement Act (IDIA) is that K-12 students with disabilities be educated in

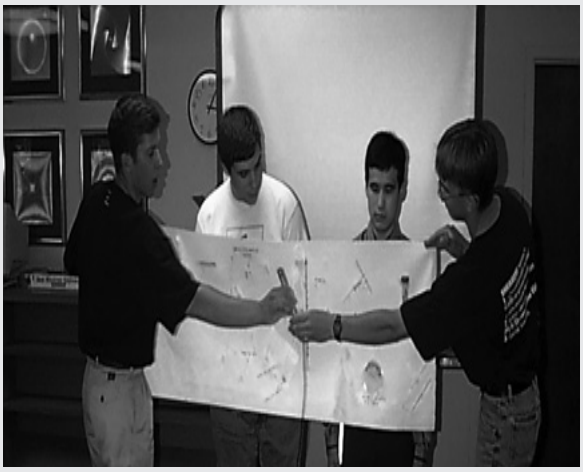
the least restrictive environment and, to the maximum extent appropriate, with students who do not have disabilities. Over the past few years, there has been a steady increase in the number of students with disabilities placed in general education classrooms. Not all students covered under Section 504 and the ADA are covered under IDEA. Those who are covered under IDEA have Individualized Education Plans (IEPs) that specify modifications to their educational programs.

Accommodations

Students who have conditions with the same diagnosis may have very different abilities when it comes to performing specific tasks. For example, one student who has cerebral palsy may have difficulty walking. For another student, cerebral palsy may result in no functional use of her hands and voice. Ultimately, a student who has a disability requires alternative arrangements only when faced with a task that requires a skill that the disability precludes.

A teacher should not assume that a student who has a disability cannot successfully participate in the course simply because of the disability. Instead, the teacher and student, together with parents, support staff, and other professionals, should anticipate what course activities may be problematic and determine which strategies and resources are available to minimize barriers and maximize participation. Sometimes an effective solution can be found by thinking creatively about how the learning environment can be modified. Involving precollege students in this process helps them develop self-advocacy skills and prepares them for leading self-determined adult lives.

Inclusion of students with disabilities in the general education classroom offers both a challenge and an opportunity for educators.



Tip: Legal and Ethical Issues

While teaching a course for pre-service or in-service teachers, make participants aware of legal mandates that require them to provide an appropriate education for all of their students, including those with disabilities. It is also important that participants understand that providing full access to instruction is the right thing to do.

When teachers work with students who have disabilities in their classes, they should talk with them about how their disabilities affect their learning and performance and discuss accommodation options. These students are (or should be becoming) experts on their disabilities. Including them in the accommodation process will help them develop skills that are essential as they transition to self-determined adult lives.

The challenge is to effectively provide an education for students with a wide array of learning styles and accommodation requirements. The opportunity is to create a society that allows everyone to participate and contribute. With growing numbers of students with disabilities joining general education classes and with legal and ethical directives to provide an appropriate and integrated education for all citizens, it is important for educators to know how to fully include students with disabilities in classroom activities.

Listen to the Experts

Participants in the *DO-IT Scholars* program develop problem-solving skills while still in high school. Following is an example of an activity that helped them develop self-determination skills during a Summer Study session at the University of Washington.

After a long day of activities on a hot summer afternoon in the DO-IT Summer Study program, *DO-IT Scholars* came together to discuss learning strategies. All of the participants in this group were dealing with learning issues as a result of their disabilities. Disabilities represented included specific learning disabilities, attention-deficit disorder (ADD), attention-deficit/hyperactivity disorder (ADHD), Tourette's syndrome, and head injury. First, *Scholars* shared ways in which their disabilities have impacted their ability to learn. Impacts *Scholars* mentioned included that they

- are slow at taking tests,
- read slowly,
- have messy handwriting,
- have difficulty expressing thoughts in writing,

- feel frustrated,
- are unorganized,
- are easily distracted,
- feel stupid, and
- feel overwhelmed.

They all agreed that although their disabilities impact their ability to learn in a typical classroom, they have the ability to learn. They listed strategies that help them succeed in academics in spite of their learning challenges. These strategies allow them to work to their full potential and demonstrate their abilities. Solutions *Scholars* mentioned during this brainstorming session included

- asking the instructor to suggest strategies for succeeding in the class,
- working in an environment with a minimum of distractions,
- studying during times of the day when they have the most energy,
- arranging for extended time on tests,
- taking tests orally,
- outlining ideas and information while reading or reviewing notes,
- using different colored pens to highlight key points,
- using colored transparent screens to cover pages or computer screens while reading,

- using a computer (especially word processors, spelling checkers, and grammar checkers),
- using a large-print font on the computer,
- utilizing study groups,
- taking breaks from reading to keep their minds fresh,
- recording lectures,
- reading aloud or having someone else read to them,
- getting notes from the teacher or another person in the class, and
- using a class planner.

The participants in the group discovered that they have some shared solutions and some unique ones. They found that a solution that makes a difference for one person might not help another. They also learned that they need to take an active role in figuring out what works for them and determining which strategies they can implement and which accommodations need to be requested from a teacher. Although others can make suggestions, it's important for students with disabilities to try out accommodations and decide whether or not they are effective. They need to become experts in their disabilities and the unique accommodations that will work for them. Additionally, it is critical that educators work with them to further develop accommodation and self-advocacy skills.

Teaching Students to Take Charge

We often hear about the problems young people with disabilities face—physical obstacles, social rejection, academic failure, and medical crises. Yet some people do overcome significant challenges and lead successful lives. What does success mean to them, and how do they achieve it? What internal characteristics do these individuals possess, and what external factors have been present in their lives? What advice do they have to help young people build personal strengths to overcome the challenges they no doubt will face?

Read the publication and view the video *Taking Charge: Stories of Success and Self-Determination* for insights from successful young people and adults with disabilities. These insights can help you understand how people can learn to lead self-determined lives.

What is self-determination? There are many definitions to choose from. The following definition is concise and incorporates a number of common themes found in other definitions.

> Self-determination is a combination of skills, knowledge, and beliefs that enable a person to engage in goal-directed, self-regulated, autonomous behavior. An understanding of one's strengths and limitations together with a belief in oneself as capable and effective are essential to self-determination. When acting on the basis of these skills and attitudes, individuals have greater ability to take control of their lives and assume the role of successful adults (Field et al., 1998, p. 115).

Gaining control over your life involves learning and then successfully applying a number of self-determination skills, such as goal setting, understanding your abilities and disabilities, problem solving, and self-advocacy. The personal process of learning, using, and self-evaluating these skills in a variety of settings is at the heart of self-determination.

The content in the *Taking Charge: Stories of Success and Self-Determination* publication and video is organized around the following advice synthesized from hundreds of responses by successful young people and adults with disabilities:

1. Define success for yourself.
2. Set personal, academic, and career goals.
3. Keep your expectations high.
4. Understand your abilities and disabilities.
5. Play to your strengths.
6. Develop strategies to meet your goals.
7. Use technology as an empowering tool.
8. Persevere.
9. Be flexible.
10. Work hard.
11. Develop a support network. Look to family, friends, and teachers.

Young people with disabilities can find the experiences of others useful as they set their course toward successful, self-determined lives.

Mentoring

Most of us can think of people in our lives, more experienced than ourselves, who have supplied information, offered advice, presented a challenge, initiated friendship, or simply expressed an interest in our development as a person. Without their intervention, we may have remained on the same path, perhaps continuing a horizontal progress through our academic, career, or personal lives.

Adult mentors can help students with disabilities achieve success in STEM. Mentors provide direction and encouragement. They instill values and promote achievement. They can also help students develop self-advocacy and leadership skills. However, constraints imposed by time, distance, and disability make such relationships difficult to initiate.

View the video and read the publication *Opening Doors: Mentoring on the Internet* to hear firsthand about the value of mentoring and about how using the Internet for communication can overcome challenges imposed by time, distance, and disability. View the video and read the publication *DO-IT Pals* to learn about a DO-IT program for online peer and mentor support available to any teen with a disability.

DO-IT has conducted a research study on the nature and value of electronic mentoring (Burgstahler & Cronheim, 2001). More than 12,000 email messages were coded and analyzed, surveys were distributed, and focus groups were conducted. Results of the study suggest that computer-mediated communication can be used to initiate and sustain both peer-peer and mentor-protégé relationships. On the Internet, young people can receive support from peers and adults otherwise difficult to reach, as well as connect to a rich collection of science and math resources. Participants experience benefits over other types of communication, including the ability to communicate over great distances quickly, easily, conveniently,

and inexpensively; the elimination of the barriers of distance and schedule; the ability to communicate with more than one person at one time; and the opportunity to meet people from all over the world. Students with disabilities also report the added value that people treat them equally because they are not immediately aware of their disabilities.

To help teenagers with disabilities meet other students with disabilities and develop mentoring relationships with adults who have disabilities, encourage them to join the DO-IT electronic community. They can check into the *DO-IT Pals* program, in which teens with disabilities communicate year-round with each other and with mentors via the Internet. For information about these and other programs, select Programs at *http://www.uw.edu/doit/*, or send email to *doit@uw.edu*.

For more information about self-determination and related topics, consult the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/*.

Preparing Students for College and Careers

Because of their disabilities, some adults do not share many of the experiences that are common among their nondisabled peers, including attending college and attaining a career. Increased awareness of the rights and contributions of individuals with disabilities has resulted in a growing concern about expanding their postsecondary options.

Transitions from high school to college and careers include three phases:

1. preparing for college, including preparations that occur in high school;
2. staying in college, which requires numerous self-management skills; and
3. preparing for moving beyond college and to a career.

Read the publication and view the video *College: You Can DO-IT!* for ideas regarding how you can help prepare students for college. For guidance on preparing students for successful transitions from two-year to four-year postsecondary institutions, view the video and read the publication *Moving On: The Two-Four Step*. In addition, the videos and handouts *Learn and Earn: Tips for Teens* and *Learn and Earn: Supporting Teens* (relevant to precollege programs), as well as *It's Your Career: Work-Based Learning Opportunities for College Students with Disabilities* and *Access to the Future: Preparing College Students with Disabilities for Careers* (relevant to college programs) provide guidelines for helping students with disabilities prepare for careers and making career development services accessible to students with disabilities. Information about fully including students with disabilities in work-based learning programs can be found in the video and publications titled *Finding Gold: Hiring the Best and the Brightest*.

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 relating to people with disabilities. However, here are some helpful hints.

General

- ← Ask a person with a disability if he or 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!
- ← Do not interact with a person's guide dog or service dog unless you have received permission to do so.

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 or instructions 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 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.
- ← Use paper and pencil if the person who is deaf does not read lips or if more accurate communication is needed.
- ← In groups raise hands to be recognized so the person who is deaf knows who is speaking. Repeat questions from audience members.
- ← 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.

Tips: The Importance of Self-Determination

When instructing pre-service or in-service teachers, emphasize the importance of promoting self-determination for all students but particularly for students with disabilities. Teachers can help students prepare for postsecondary studies and adult life by

- involving students in the accommodation process, thereby helping them become experts on their disabilities, good problem solvers, and self-advocates;
- keeping expectations high for students with disabilities;
- talking to students about college and career goals and steps for reaching them; and
- encouraging students to actively participate in academic and career preparation activities and use assistive technology as an empowering tool.

Students come from a wide variety of cultural, ethnic, racial, and socioeconomic backgrounds. For some, English is not their first language. Represented in most classes are many types of learning styles, including both visual and auditory learners. In addition, increasing numbers of students with disabilities are participating in regular precollege and postsecondary education courses. Their disabilities include blindness, low vision, hearing impairments, mobility impairments, learning disabilities, and health impairments.

Students want to learn, and instructors share this goal. How can you design instruction to maximize the learning of all students? The field of universal design (UD) can provide a starting point for developing an inclusive model for instruction. You can apply this body of knowledge to create courses for which lectures, discussions, visual aids, videos, printed materials, labs, and fieldwork are accessible to all students. Consider the examples in Table 1.2, which provides examples of universal design of instruction (UDI) for eight areas of instructional practices and products that faculty may apply to curricula (Burgstahler, 2008b, p. 34).

Universal Design

Universal design is defined by the Center for Universal Design (CUD) at North Carolina State University as "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" (Center for Universal Design, 1997). The field of UD can provide a framework for developing instruction to maximize the learning of all students, including students with a variety of abilities and disabilities, cultures, learning styles, and ages (Bowe, 2000).

The UD principles developed by the CUD provide guidance in the design of products and environments (Connell, Jones, Mace, Mueller, Mullick, Ostroff, et. al., 1997). In Table 1.1 each UD principle listed is followed by an example of its application to instruction (Burgstahler, 2008b, p. 27).

When UD principles are applied to teaching, an inclusive and equitable learning environment is created. UD design concepts can be used to aid in selecting and developing curricula, choosing and implementing teaching methods, and developing assessments. UDI can increase content accessibility for most students and minimize the need for specific accommodations (Burgstahler, 2008b; Durre, Richardson, Smith, Shulman, & Steele, 2008; Higbee, 2008; Scott & McGuire, 2008; Thurlow, Johnstone, & Ketterlin-Geller, 2008).

Of particular application to technology-based learning environments, the term universal design for learning (UDL) has been used to describe a research-based instructional framework using technology to maximize the learning of all students (Rose & Meyer, 2002; Rose, Harbour, Johnston, Daley, & Abarbanell, 2008). The three principles of UDL are multiple means of representation, expression, and engagement.

View the video and read the publication *Equal Access: Universal Design of Instruction* for more information on UDI applied to onsite instruction and to tutoring and learning centers. For information on applying UD principles to make

postsecondary student services accessible, view the video and read the publication *Equal Access: Universal Design of Student Services.*

For an example of UD principles applied to online learning, view the video and read the publication *Real Connections: Making Distance Learning Accessible to Everyone*.

Tip: UD of Instruction

In the *Presentations* section of this notebook, you will find guidelines and materials for delivering a presentation on universal design of instruction (UDI).

Table 1.1 Applications of the Seven Principles of Universal Design of Instruction

UD Principle from CUD	*Example of How UD Might Be Applied to Instruction*
Equitable use. The design is useful and marketable to people with diverse abilities.	A professor's website is designed so that is is accessible to everyone, including students who are blind and use text-to speech software.
Flexibility in use. The design accommodates a wide range of individual preferences and abilities.	A museum, visited as a field trip for a course, allows each student to choose to read or listen to a description of the contents of display cases.
Simple and intuitive. Use of the design is easy to understand regardless of the user's experience, knowledge, language skills, or current concentration level.	Control buttons on science equipment are labeled with text and symbols that are simple and intuitive to understand.
Perceptible information. The design communicates necessary information effectively to the user regardless of ambient conditions or the user's sensory abilities.	A video presentation projected in a course includes captions.
Tolerance for error. The design minimizes hazards and the adverse consequences of accidental or unintended actions.	Educational software provides guidance and/or background information when the student makes an inappropriate response.
Low physical effort. The design can be used efficiently and comfortably and with a minimum of fatigue.	Doors to a lecture hall open automatically for people with a wide variety of physical characteristics.
Size and space for approach and use. Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility (The Center for Universal Design, 1997).	A flexible science lab work area has adequate workspace for students who are left- and right-handed and for those who need to work from a standing or seated position (Burgstahler, 2008b, p. 27).

Table 1.2 DO-IT Universal Design of Instruction Guidelines and Examples

UDI Guideline	*Examples of UDI Practice*
Class climate. Adopt practices that reflect high values with respect to both diversity and inclusiveness.	*Avoid stereotyping.* Offer instruction and support based on student performance and requests, not simply on assumptions that members of certain groups (e.g., students with certain types of disabilities or from a specific racial/ethnic group) will automatically do well or poorly or require certain types of assistance.
Interaction. Encourage regular and effective interactions between students and the instructor and ensure that communication methods are accessible to all participants.	*Promote effective communication.* Employ interactive teaching techniques. Face the class, speak clearly, use a microphone if your voice does not project adequately for all students, and make eye contact with students. Consider requiring a meeting with each student. Supplement in-person contact with online communication. Use straightforward language; avoid unnecessary jargon and complexity; and use student names in electronic, written, and in-person communications.
Physical environments/products. Ensure that facilities, activities, materials, and equipment are physically accessible and usable by all students, and that all potential student characteristics are addressed in safety considerations.	*Arrange instructional spaces to maximize inclusion and comfort.* Arrange seating and encourage participation, giving each student a clear line of sight to the instructor and visual aids and allowing room for wheelchairs, personal assistants, sign language interpreters, captionists, and assistive technology. Minimize distractions for students with a range of attention abilities (e.g., put small groups in quiet work areas). Work within constraints to make the environment as inclusive as possible. Encourage administrators to apply UD principles in facility design and renovation.
Delivery methods. Use multiple, accessible instructional methods that are accessible to all learners.	*Provide cognitive supports.* Summarize major points, give background/contextual information, deliver effective prompting, provide scaffolding tools (e.g., outlines, class notes, summaries, study guides, and copies of projected materials with room for notes), and other cognitive supports. Deliver these materials in printed form and in a text-based electronic format. Provide opportunities for gaining further background information, vocabulary, and different levels of practice with variable levels of support. Encourage and support students to develop their own scaffolding materials.

Table 1.2 (cont.) DO-IT Universal Design of Instruction Guidelines and Examples

UDI Guideline	*Examples of UDI Practice*
Information resources/technology. Ensure that course materials, notes, and other information resources are engaging, flexible, and accessible for all students.	*Select materials early.* Choose printed materials and prepare a syllabus early to allow students the option of beginning to read materials and work on assignments before the course begins. Allow adequate time to arrange for alternate formats, such as books in audio format or in Braille (which, for textbooks, can take longer than a month).
Feedback. Provide specific feedback on a regular basis.	*Provide regular feedback and corrective opportunities.* Allow students to turn in parts of large projects for feedback before the final project is due. Give students resubmission options to correct errors in assignments and exams. Arrange for peer feedback when appropriate.
Assessment. Regularly assess student progress using multiple, accessible methods and tools, and adjust instruction accordingly.	*Set clear expectations.* Keep academic standards consistent for all students, including those who require accommodations. Provide a syllabus with clear statements of course expectations, assignment descriptions, deadlines, and expectations, as well as assessment methods and dates. Include a straightforward grading rubric.
Accommodation. Plan for accommodations for students whose needs are not met by the instructional design.	*Know how to arrange for accommodations.* Know campus protocols for getting materials in alternate formats, rescheduling classroom locations, and arranging for other accommodations for students with disabilities. Make sure that assistive technology can be made available in a computer or science lab in a timely manner. Ensure that the course experience is equivalent for students with accommodations and those without (Burgstahler, 2008b, p. 34).

K-12 and postsecondary institutions are in the business of sharing information, and we do it in many ways, including through spoken word, print publications, videos, and online content. In our educational programs, we share information through classroom work, labs, homework assignments, library resources, and web pages.

Some methods used to impart information are not accessible to some students, including those with visual impairments, hearing impairments, mobility impairments, speech impairments, learning disabilities, and health impairments. Those whose first language is not English or who have alternative learning styles also face difficulties in accessing some types of information.

Besides being the right thing to do, for people with disabilities it is our legal obligation to provide access to all of the programs and services we offer. Section 504 of the Rehabilitation Act of 1973 requires that "no otherwise qualified individual with a disability shall, solely by reason of his/her disability, be excluded from the participation in, be denied the benefits of, or be subjected to discrimination under any program or activity of a public entity." The Americans with Disability Act of 1990 reinforces and extends this mandate. Educational institutions are covered entities under this legislation.

Access Challenges

Some of the specific ways we impart information in our schools and the challenges these modes impose are discussed below.

Spoken Word

Much information in our classes is presented via the spoken word. Below are examples of disabilities that might result in students having difficulty accessing information through the spoken word and examples of how we can ensure access.

- Hearing impairments (e.g., sign language interpretation, real-time captioning, lipreading, printed information)
- Speech impairments (e.g., computer-based communication devices, printed input that allows students with speech impairments to ask questions and participate in discussions, conducting discussions electronically)
- Health impairments (e.g., conducting discussions electronically)
- Learning disabilities, English as a second language, and visual learning (e.g., printed information, clear and well-organized information, visual cues, audiobooks, electronic text)

Print

Teachers also impart information to students via print media. Following are examples of disabilities that might result in students having difficulty accessing information through print and examples of alternatives that ensure access.

- Low vision (e.g., using a copier to enlarge materials, reformatting electronic documents in large print, sending material in an electronic format)
- Blindness (e.g., providing information in electronic form so that students can use a computer system with speech output or Braille output or so that disabled student services can arrange to create the materials in Braille or audio formats)

- Mobility impairments (e.g., having materials in electronic form if students are unable to manipulate printed materials)
- Health impairments (e.g., having materials in electronic form so students can access it remotely)
- Learning disabilities, English as a second language, auditory and visual learning (e.g., creating printed information that is clear and well-organized and that includes visuals such as overheads, graphics, and diagrams)

Video Content
People with learning disabilities, for whom English is a second language, or who are deaf or hard of hearing might have difficulty accessing video or televised information. These individuals all benefit when captioning or transcription of the content is provided. Students who are blind require audio descriptions of visual content.

Audio Information
For audio information, a written transcript can be helpful for students with hearing impairments, with learning disabilities, or for whom English is a second language.

Computer-Based Information
Another common mode for delivering information is electronically. There are two levels where access barriers can occur in this case.

The first challenge is gaining access to the computer itself. The second is gaining access to the information delivered via computer. Let's discuss the first challenge. To explore this topic, view the video *Computer Access: In Our Own Words,* in which individuals discuss the various ways that they access computers, some using adaptive (or assistive) technology. Note that this video is captioned, which makes it more accessible to individuals who have hearing impairments, for whom English is a second language, and who have learning disabilities. An audio-described version of the video is also available in which you will notice additional narration that describes the visual materials for a viewer who is blind.

The assistive technology demonstrated in the video provides access to the computer itself. However, software and websites must be designed in such a way that they can be accessed by individuals who use this technology.

Providing information on web pages in accessible format is the right thing to do. The ADA also requires that we make the content of information accessible to individuals with disabilities. A Department of Justice ruling in 1996 clarified that the ADA also applies to information delivered over the Internet. Developing web pages in an accessible format can also help us avoid expensive redesign at a later time if an individual with a disability needs access to the content.

View the video and read the handout *World Wide Access: Accessible Web Design,* to learn how websites can be designed in such a way that they are accessible to everyone, including people with disabilities and people for whom English is a second language. The content of the video and publication focuses on how we can impart information in a way that makes it accessible to everyone.

A good way to conceptualize this topic is to think about it as an application of the principles of universal design. Universal design means "the design of products and environments to be usable by all people, without the need for adaptation or specialized design" (Center for Universal Design, 1997). For every format used to present information, thinking about the variety of characteristics of individuals with whom we want to share this information is the first step toward ensuring that everyone can access the content.

Tip: Information Access

In the *Presentations* section of this notebook, you will find guidelines and materials for delivering a presentation on information access.

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, teacher, parent, and support staff (e.g., special education teacher, Individualized Education Plan team members) 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. Review the videos and handouts *Working Together: Science Teachers and Students with Disabilities* and *Equal Access: Science and Students with Sensory Impairments* for additional insights into access challenges and solutions for students who have visual or hearing impairments.

Gaining Knowledge

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

- A student who has difficulty reading standard text or graphics because of a visual impairment can be accommodated with materials in large print or Braille, audio, or via computer; enlarged or tactile drawings; and access to adaptive technology that provides enlarged, speech, or Braille output.

- A student with a visual impairment who cannot see content written on the blackboard or video projector may benefit from using binoculars. Verbalization of the content and oral descriptions of all visually displayed materials is also helpful.

- A student who cannot read output from standard equipment because of a visual impairment may benefit when the teacher interfaces lab equipment with a computer and provides large print or speech output.

- Scientific equipment with Braille or large-print markings will help maximize the participation of a student who is blind or has low vision, respectively.

- A student who is hard of hearing may use an FM system or an interpreter. Providing materials in printed format, facing a student for lip-reading, and using an overhead projector or blackboard can also be appropriate accommodations.

- For a student who cannot hear video or multimedia, make sure that presentations with an audio component are captioned or an interpreter is provided.

- A student who has difficulty participating in class discussions because of hearing or speech impairments may benefit from using email. A portable computer with speech output can give a person without the ability to speak a tool for communication.

- A student with a learning disability who has difficulty understanding concepts may benefit when visual, aural, and tactile demonstrations are incorporated into instruction.

- A student who has difficulty reading because of a specific learning disability may need extra time and access to materials via a computer equipped with speech or large print output. School support staff may arrange for this student to get audiobooks.

- When a student cannot take notes in class because of a mobility or visual impairment, provide in-class access to a computer with adaptive technology.

- A student who cannot operate standard lab equipment and conduct lab experiments because of a mobility impairment should be provided with an accessible facility. Also consider providing a lab partner or scribe, computer-controlled lab equipment with alternative input devices (e.g., speech, Morse code, alternative keyboard), and modified scientific equipment.

- For a student who cannot see demonstrations or view lab experiments while seated in a wheelchair, provide an adjustable table.

- If a student cannot complete an assignment or a lab because of a health impairment, arrange a flexible lab schedule.

Demonstrating Knowledge

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

- The student who has difficulty completing and submitting worksheets and tests because of a visual impairment or a specific learning disability can be accommodated with worksheets and tests in large print or Braille, in an audio format, or via computer with access to adaptive technology that provides enlarged, speech, or Braille as well as standard print output.

- A student who cannot complete a test or assignment because of a disability that affects the speed at which the task can be completed may require extra time or alternative testing arrangements.

- A student who cannot complete a test or assignment because of the inability to write may benefit from in-class access to a computer with alternative input devices (e.g., Morse code, speech, alternative keyboard).

In the Classroom: A Math Teacher's Experience

I am a high school mathematics teacher. Each fall I look forward to meeting new students. It is exciting for me to watch young people solve problems and gain new skills in the classroom. Over the past ten years, however, I have noticed that many students do not have access to successful experiences that lead to excellence in math. These students have special needs that are often overlooked in the regular classroom. They may have physical, learning, visual, hearing, or other types of disabilities that affect their ability to learn without some type of accommodation in the classroom.

Meeting individual needs effectively while serving all of the 150–180 students with whom I come in contact each day is difficult.

However, I have found that some strategies increase the performance of all students in mathematics while addressing the unique needs of those with disabilities. Some of these strategies are particularly effective for students with ADHD or specific learning disabilities. Here are a few of my most commonly used tricks of the trade:

- Don't make assumptions about what students can or cannot do. They almost invariably have more capabilities than the teacher asks for.
- Talk to students in private about learning styles and classroom arrangements that have worked for them in the past.
- Dim the lights when working on an overhead projector to help students direct their attention and focus on what's most important.
- Seat a student with ADHD near the teacher's desk and away from windows where outside activities may cause a distraction.
- Modify the layout of the room or move the desk of a student distracted by white noise, such as air conditioners, fans, buzzing lights, and other environmental factors.
- Encourage peer tutoring and cooperative learning situations.
- Encourage on-task behavior.
- Have pre-established consequences for behavior, and stick to your rules.
- Avoid ridicule and criticism.
- Ask the family to make arrangements at home to accommodate their child. For example, they could provide a regular study area that is free of distractions.
- Being called on in class can be very disorienting and embarrassing for some students with specific learning disabilities. Let them know ahead of time that you are going to be asking them a question in front of the group, which allows them to collect their thoughts.
- Provide students with copies of your lecture notes and outlines. They can add to the notes with their comments. This helps all students to follow the lecture and is especially helpful for students who have difficulty writing.
- Be an actor and use props in class to get a point across.
- Keep oral instructions logical and to the point. The teacher must keep on task too!
- Repeat instructions and ask the class to repeat the instructions to you.
- Provide definitions for unfamiliar mathematical terms.
- Have students underline and later discuss words they do not understand fully.
- Give assignments in written and oral forms.
- Give several days (with time for questions or feedback) for complex out-of-class assignments.

Accommodating individual needs in the mathematics classroom sets a tone for the

year that honors individual effort and values everyone. Students who respect each others' contributions in the classroom not only learn more mathematics but also learn valuable lessons about what makes them better people.

In the Classroom: A Science Teacher's Experience

I am a high school science teacher who works at a school for students with visual impairments. Drawing on my wide range of experience, I make the following recommendations to teachers who have a student who is blind in their science classes:

- The first question to ask yourself is, "How do I provide this student with a quality educational program?" Although he will need some accommodations, your good teaching skills, with some modifications, will serve this student well.

- Your school district may have an itinerant teacher who works specifically with students who have visual impairments. These professionals may provide additional resources, three-dimensional models, or Brailled materials.

- Regarding room logistics, ask the student where the best place is for him to sit. He will provide you with his insights on seating arrangements and other strategies that have worked in the past. Remember, he is, or should be becoming, an expert on his disability and accommodation needs.

- Modifications in the classroom should include tactile drawings or graphs, three-dimensional models, and a lot of hands-on learning. An example of an inexpensive solution is to buy fabric paint or get a glue gun to make raised drawings. Keep these drawings simple and free of clutter, or they will confuse rather than help. Try them yourself.

- A student who is blind may require Brailled text. Work with the special services in your district to make arrangements to have materials Brailled. Pre-recorded audio content can also be used to give information to a blind student.

- If you show movies or videos, verbally describe the action. Some videos are available with an audio description option for visually impaired viewers.

- Always be sure that a student who is blind is included in all class discussions and hands-on experiences. Participation will give the student confidence and opportunities to work closely with his sighted classmates.

Below are some specific examples of how you might accommodate students who are blind in a science classroom:

- Make a syringe tactile by cutting notches in the plunger at 5-mL increments.

- Make a triple beam balance tactile by filing deep notches for each gram increment. Add glue drops on either side of the balance line so that the student will know when the weights are balanced.

- Make graphs tactile by using glue guns or fabric paint.

- Add Braille labels to lab equipment.
- Identify increments of temperature on a stove with fabric paint.
- Use different textures like sandpaper or yarn to identify drawers, cabinets, and equipment areas.
- Make models out of clay, plaster of paris, or papier-mâché.
- For geometric shapes, use 3-D triangles or spheres.
- For maximum hands-on experiences, use a pegboard with golf tees and rubber bands to draw shapes or develop spatial awareness.
- Use styrofoam and toothpicks or molecular kits to show atoms and molecules.
- For a measurement tool, use staples on a meter stick to label centimeters.
- When measuring liquids, have glassware with specific measurements, or make a tactile graduated cylinder. Use a cork borer to make a styrofoam circle. On a plastic strip gardeners use to identify plants, cut out notches at 5-mL increments. Put a notch in the styrofoam circle, and glue the plastic strip in. When water is put in the cylinder, the styrofoam will float upwards and your student can use touch to measure the liquid.

Inexpensive supplies used creatively with a commitment to the full participation of all students can create a positive classroom experience for students who are blind.

Listen to the Experts

DO-IT student participants have taught us to look at the unique abilities of every student. In the course of developing this notebook, we asked them to share with science and math teachers ideas for working with students like themselves. Here are a few suggestions from the real experts:

- My name is Nhi. I attended high school in Washington. I am visually impaired and have limited vision in seeing details. One thing I would suggest is that the teacher describe in detail what is happening in a science lab. For instance, in a physics lab, have the student feel with their hand (if it is possible). An example would be, when we do an experiment on using the pulley and putting weight on it to make a cart on a table accelerate, it would be nice if the student like me can feel the process and have it described in detail to them. Or in biology, when it comes to dissecting a frog, have a student who is blind do the dissecting with guidance from a visual student on what and where to dissect.
- My name is Sue, and I am from New York. I have mild cerebral palsy, ataxia, and neurological impairments with perceptual problems and my motor coordination is very limited. When I took biology, my lab partners did the dissection while I wrote up the labs. To make it more accessible, we swapped duties. In college science classes, I had additional physical assistance with manual projects and extra time on tests and assignments.
- My name is Josh. I attend high school in Iowa and have spinal muscular atrophy. I am unable to walk and have limited

use of my arms. One thing that is helpful in a lab is if work areas are at the right height for wheelchair users and tools are within reach.

- My name is Bridget. I attended high school in Washington and I'm currently a college student. I'm profoundly hearing impaired and my main problem is understanding speakers. When presenting a topic or giving instructions for an activity, visual aids, especially written comments or instructions, are very helpful. I also use a microphone system to hear the speaker, called an FM system. Be aware that students with hearing impairments may not hear random and quick comments you may make during an activity. Speakers need to have the attention of everybody, including the student with a hearing impairment, before saying anything important.

- My name is Trent. I attend high school in Washington. I have seizures and coordination difficulties. Because of these disabilities I miss important parts of lectures at times and am unable to write or type fast enough to take notes. Doing math is difficult because there is not enough space on most tests for my large handwriting. The accommodations that have worked for me are getting extra time to take tests, providing enlarged test paper to write answers on, and allowing me to record lectures to listen to at home. It is also helpful for me to have a lab partner to assist in making precise measurements and writing the experiment results.

- My name is Frank. I have been blind since I was sixteen. I attended high school in Montana. I am currently an electrical engineer for Battelle Laboratories. Math and science can be difficult subjects for a student who is blind—not only because of the visual nature of graphs and much of the lab work but also because of the rushed nature of most classroom labs. Be sensitive to the need for preparation time required by the student before the class commences to get textbooks in audio or Braille format. The many adaptive technologies now available to help deal with the barriers imposed by blindness are wonderful, but nothing can replace the support of a teacher who is aware, positive, and proactive. Working with a student who is blind is neither a burden nor a blessing, just another challenge. Your attitude and the choices you make can be pivotal. Most important, remember that you need to work closely with the student as a partner in this process, letting him or her participate in the development of the approaches and accommodations that you will incorporate into your lessons. Every person who is blind is an individual and is usually the most knowledgeable resource on what specific adaptations work best for them.

Academic accommodations can make learning opportunities accessible to all students. The best accommodations result when teachers, students, and support staff work together in creative, collaborative ways. Examples of commonly used accommodations are listed below.

Low Vision
- Seating near front of class
- Large-print handouts, lab signs, and equipment labels
- TV monitor connected to microscope to enlarge images
- Class assignments made available in electronic format
- Computer equipped to enlarge screen characters and images

Blindness
- Audio, Braille, or electronic lecture notes, handouts, and texts
- Verbal descriptions of visual aids
- Raised-line drawings and tactile representation of graphic images
- Braille lab signs and equipment labels
- Auditory lab warning signals
- Adaptive lab equipment (e.g., talking thermometers and calculators, light probes, tactile timers)
- Computer with optical character reader, voice output, Braille screen display and printer output

Hearing Impairments
- Interpreter or real-time captioning
- FM system
- Note taker
- Open- or closed-captioned videos
- Visual aids
- Written assignments, lab instructions, demonstration summaries
- Use of email for class and private discussions
- Visual warning system for lab emergencies

Learning Disabilities
- Note takers or audio recorded class sessions
- Captioned videos
- Extra exam time, alternative testing arrangements
- Visual, aural, and tactile instructional demonstrations
- Computer with voice output, spelling checker, grammar checker

Mental Illness
- Note taker, copy of another student's notes, or recording of lectures
- Extended time on assignments and tests

Mobility Impairments
- Note taker/lab assistant
- Group lab assignments
- Classrooms, labs, and field trips in accessible locations
- Adjustable tables; lab equipment located within reach
- Class assignments made available in electronic format
- Computer equipped with special input device (e.g., voice input, Morse code, alternative keyboard)

Health Impairments
- Note taker
- Flexible attendance requirements and extra exam time
- Assignments made available in electronic format; use of email to facilitate communication; web-based materials and assignments

Carson Completes NASA Internship: A Success Story

The following excerpts are from email messages sent by Carson, a University of Washington student with a learning disability who worked at the National Aeronautics and Space Administration (NASA) as an intern; this opportunity was coordinated through DO-IT's AccessSTEM project.

June 7, 2005: "Some people have asked me about where I applied to get the NASA internship. It is through a program called ENTRYPOINT! at the American Association for the Advancement of Science (AAAS). I would strongly encourage you to apply if you are a college student and have an interest in a career in science or engineering."

June 19, 2005: "It has been one week since I flew into New Orleans to start an eight-week internship at the Stennis Space Center in Mississippi. I'm living in New Orleans with three other guys, one of whom is also an intern. I'm working with Boeing engineers and technicians who have been contracted by NASA to test rocket engines. This past week I have been meeting people and getting a feel for how everything fits together. One specific thing I did this week was to enter ultrasonic bolt measurements into a database. They keep track of every minute detail to the nth degree because even a small error can spell disaster. Last night we went to Bourbon Street in downtown New Orleans—it was quite a site to see."

June 23, 2005: "There are three different 'test stands,' which are very large concrete structures that cradle the engines during testing. There are several teams that facilitate the testing process. The one I am assigned to is called 'ground support and maintenance.' Their activities include making parts for maintenance purposes. We also do load testing to make sure the equipment can properly hold the engine. The test results came in yesterday and it was found there were several blowouts in the coolant tubing which lines the nozzle. Today I went over to check out the damage."

July 3, 2005: "This week I worked on two different projects, one in the office and the other on the engine test stand. The office job involved tracking down and making a list of lapping tools. They are used to smooth down joints on the engine tubing. The engine we work on is called the Space Shuttle Main Engine (SSME). I have been trying to understand how it works. Looking at its blue-print is kind of mind boggling. The other job I'm working on is on the test complex. What I am doing there is helping a mechanic take down a bunch of old tubing and components used on a project that is no longer in service. This internship is a unique chance for me to mix with really different people."

July 27, 2005: "It was determined that a piece of foam that came off the shuttle's main fuel tank about two minutes into flight was very serious. Had it come off earlier, they said, it could have caused fatal damage to the spacecraft. This is a major setback to NASA because they have been working very hard on this issue. Hopefully this problem can be fixed soon. The current mission is not in jeopardy as far as anyone knows, but we did have a close call."

Space Shuttle Discovery returned safely to earth shortly after Carson returned home, two weeks before Hurricane Katrina.

Accessible Teaching Techniques

Following are examples of teaching techniques in the classroom, the laboratory, examinations, and fieldwork that benefit all students but are especially useful for students who have disabilities.

Classroom

- Select course materials early so that there is enough time to translate them to an audio, Braille, or large print format.
- Make short assignment sheets and reading lists available in electronic format (e.g., email, website).
- Face the class when speaking. Repeat discussion questions.
- Write key phrases and lecture outlines on the blackboard, whiteboard or overhead projector.

Laboratory

- Take the student on a tour of the lab he or she will be working in. Discuss safety concerns.
- Assign group lab projects in which all students contribute according to their abilities.
- Arrange lab equipment so that it is easily accessible.
- Give oral and written lab instructions.

Examination and Fieldwork

- Ensure that exams test the essential skills or knowledge needed for the course or field of study.
- Some students will require extra time to transcribe or process test questions; follow campus policies regarding extra time on examinations.
- Consider allowing students to turn in exams electronically.
- Ask a student how he or she might be able to do specific aspects of fieldwork.
- Attempt to include a student in fieldwork opportunities, rather than automatically suggesting nonfieldwork alternatives.
- Include special needs in requests for field trip vehicle reservations.

View the video and read the publication *The Winning Equation: Access + Attitude = Success in Math and Science* as well as the publication *Working Together: K-12 Teachers and Students with Disabilities.* For further information and case studies, consult the *AccessSTEM Knowledge Base* at *http://www.uw.edu/doit/Stem/kb.html.*

Four-Step Accommodation Model

The DO-IT Center has developed a four-step accommodation model for creating effective accommodations for students with disabilities. The model involves answering the questions in the following four steps:

Step 1: What does the task or assignment require?

Break down all of the components of the experiment, assignment, or exercise. Many times as an educator, you are too close to the project to realize the various settings, tools, skills, and tasks that are required in an individual project. By analyzing

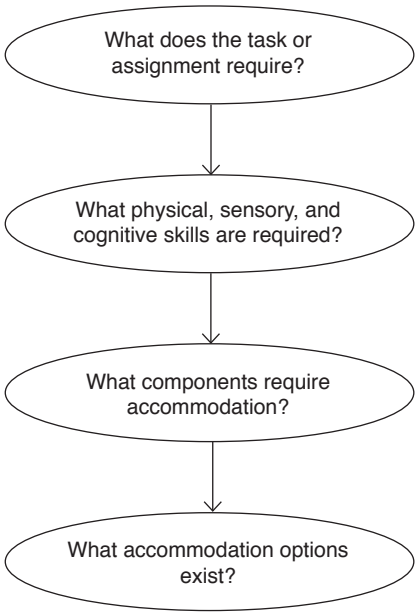
and evaluating the task thoroughly, you will be able to determine how to fully and effectively include a student with a disability.

Step 2: What physical, sensory, and cognitive skills are needed?
Compare the tasks required to the physical, sensory, and cognitive skills needed to successfully complete the project. It is easy to say, "If I had a physical, sensory, or cognitive disability, I would not be able to successfully complete this assignment," without really determining what skills are needed. Identify the requirements of the task. It is impossible to place yourself in the shoes of a student with a disability. The student may have learned many ways to solve a unique problem or task and work around the limitations his disability may pose. Communicate with the student about strategies that have worked in the past.

Step 3: What components of the task require accommodation?
Once the task has been analyzed and the skills needed are identified, determine the level of difficulty of the project and how best to make an accommodation to create an inclusive environment for a student with a disability. It is very important to first check with the student to determine what she perceives as aspects of a project in which she may need an accommodation or assistance.

Step 4: What accommodation options exist?
Now that the tasks that need accommodation have been determined, identify what resources exist for providing the needed accommodation. Call on other staff and professionals who have expertise in a specific area to provide input. The cost and time required for the accommodation may also be weighed in determining an effective accommodation. Use the most readily available resources in making accommodations. Often, having a student with a disability work with a partner is a reasonable accommodation, as long as both students actively participate.

Four-Step Accommodation Model



View the video and read the publication *The Winning Equation: Access + Attitude = Success in Math and Science.* More information about the Four-Step Accommodation Model can be found in the publication *An Accommodation Model*.

In the Classroom: A Science Teacher's Experience with the Four-Step Accommodation Model

I am a high school department chair and a chemistry and material science teacher. My classes include students with a wide variety of skills and abilities. Students with all types of cognitive, sensory, and physical disabilities are being included in my science classroom in increasing numbers and without prior notice.

I feel that it is important for teachers realize that they must teach all students, regardless of their levels of physical, sensory, and cognitive abilities. Too often science teachers say, "This student shouldn't be in here," "The lab is unsafe," "She cannot succeed," or "I don't know what to do for him." Science teachers can play a key role in halting this practice of not effectively including or of leaving out students with disabilities in classes. Teachers must provide equal opportunities for all students, even if it means changing the way they have conducted business in the past. They need to let go of some of their fears and misconceptions about students with disabilities in science classes.

A major concern to all teachers is time. Where do we find time to do all of the things we need to accomplish in a day and still make individual accommodations? I often feel like I am constantly setting up and taking down labs, managing student behavior, delivering lessons, and assessing student progress, all at the same time. On top of this, dealing with the special needs of one student can sometimes seem overwhelming.

I was part of the DO-IT team of math, science, and special education teachers who helped develop the Four-Step Accommodation Model and the Student Abilities Profile to help teachers address the unique needs of students with disabilities in classroom and laboratory settings. The model helps me break down a classroom or laboratory activity and process what needs to be done to fully include the student with a disability. Through this process, I analyze a task so that I will not be setting up myself and the student to fail.

Step 1: What does the task or assignment require?
In this initial step, I take the lab or classroom assignment or task and break it down into simple steps. I must think through the task from sensory, cognitive, and physical perspectives. By being cognizant of the process, I am able to determine how the student with a disability can participate to the highest degree possible.

Step 2: What physical, sensory, and cognitive skills are needed?
I identify the specific skills needed to successfully complete the steps of the task from a physical, sensory, and cognitive perspective. I try not to make assumptions like "There is no way a person who is blind can do this experiment." Students with disabilities often have unique ways of handling a situation that I may never have thought of.

Step 3: What components of the task require accommodation?
Now I take the tasks and compare them to the student's abilities and see if accommodations need to be made. I determine the level of difficulty of the task and how best to include the student with a disability to his or her maximum potential. I share the analysis of the task or assignment with the student. I see if he or she has suggestions for accommodations. I always try to be an active listener since I can learn a lot from the student. Listening is critical to my teaching success because the student is the expert concerning his or her disability.

Step 4: What accommodation options exist?
Finally, I identify resources that exist for providing the needed accommodations. I ask other staff members or professionals in the district for their opinions. I look for the

most readily available resources in making accommodations. Remember, expensive does not necessarily equate with good or effective. For instance, a student who is blind could enter data observations from an experiment into a computer while his or her partner describes the lab. Or a lab experiment could be broken down into components of two steps at a time for a student with ADHD or a specific learning disability. Sometimes this approach is effective in helping all students better understand the experiment. Several options may exist for an accommodation. For example, a student who is blind may need instructions in Braille, or I may need to audio record them.

Student Abilities Profile

The Student Abilities Profile is designed to guide you in determining a specific student's skills and abilities, as well as to assist you in breaking down the individual components of a science or mathematics assignment. A blank form that can be used for duplication can be found on pages 69-70 at the end of this section of the notebook. The form asks you to briefly describe the student; the classroom or laboratory environment; the equipment and supplies; the physical, sensory, and cognitive skills used in the task; possible accommodations; and resources. Preceding the blank form on pages 46-64, are examples of the first page of the form filled in for students with a variety of abilities and disabilities.

In the Classroom: A Science Teacher's Experience with Two Accommodation Strategies

So what do you do first when a student with a disability actually walks or rolls through the doorway? I use the Student Abilities Profile when working with a new student who has a disability. I take a few minutes at the beginning of the year and sit down with the student and the student's special education teacher. This meeting is well worth the time and effort. I consult with the expert, the student, when filling out the profile. Some of the accommodations that the student and I discuss may be as simple as copying lecture notes, creating a lap desk for a student who uses a wheelchair to allow her to use a microscope, providing access to safety equipment, or having handouts enlarged for a student with a visual impairment. Using this method, I am better able to understand where the student is coming from and what specific accommodations will work best for her.

The completed Student Abilities Profile gives me a record that helps me focus on what the student's abilities are and what he or she may need assistance with. I keep this document in the student's file. I refer to it during the year when setting up labs and other activities in order to make sure that the student participates to the fullest extent possible. Ethically and legally, teachers are required to meet the academic needs of all students. With appropriate accommodations, students with disabilities can be challenged to reach the same high academic standards that we expect of students without disabilities. The Student Abilities Profile and the Four-Step Accommodation Model are tools that can help teachers work with students to create an optimum learning environment.

On the following pages is an example of how I completed the Four Step Accommodation Model and the *Student Abilities Profile* (pp. 45-68) with a student named Alice, who has ADHD.

Four-Step Accommodation Model Task: Alloying Zinc and Copper

Step 1: The task requires the ability to
- use small letters
- follow directions
- follow safety procedures
- use a scale
- use a hot plate
- use a Bunsen burner
- write observations

Step 2: The physical, sensory, and cognitive skills needed for the task
Physical challenges:
- fine motor grasp/manipulation
- sitting
- walking/standing

Sensory challenges:
- vision
- touch
- smell

Cognitive challenges:
- complex thinking
- reading
- writing
- attention span
- behavior that ensures safety

Step 3: Components of the task that require accommodation for Alice
Physical:
- Alice needs no physical accommodations.

Sensory:
- There will need to be some accommodations for sensory issues, such as dimming lights, limiting external stimulation, and sitting next to quieter students.

Cognitive:
- Alice will need accommodations to help break down complex tasks and focus on the activities.

Step 4: Accommodation options
- I will make sure that Alice is near me when I explain the directions.

- If the lab is set up in advance, I will not put the items in front of Alice because she will play with the equipment rather than pay attention.

- I will make sure she has a responsible partner for the lab and give her the directions two or three steps at a time. When she finishes the steps, she can have the next set. This way I know she is following the directions and not jumping around just to get done. It also means that she is checking in with me even if I can't check on her every ten minutes.

- When the students begin to work, I will check with Alice and make sure she has heard all of the safety issues before starting.

- Every time Alice does a good job in the lab, I will make sure to tell her.

Tip: Accommodation Strategies

In the *Presentations* section of this notebook you will find guidelines and materials for delivering a presentation on accommodation strategies.

Alice

STUDENT ABILITIES PROFILE

Student Description:

Alice is a 16-year-old sophomore who comes to class on time but is rarely prepared to participate in classroom activities. She is a people person and is extremely distractible. She has an above-average I.Q. but does not follow through on assignments. She has attention-deficit/hyperactivity disorder (ADHD). Every item in the classroom becomes a tool, toy, or weapon. Noise is a major distraction for Alice. Working in a group and sitting close to a window or door and away from the teacher worsens the situation. She does not like quiet and creates verbal distractions.

Task / Assignment:

Actively participate in general science classroom and lab experiences, including lab manipulations and field trips.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

A wide range of equipment and materials are used in the science lab. Paper, pencil, chalkboard, chalk, textbook, and occasionally manipulations are used in the classroom.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Classroom work is typically performed individually, and lab work is performed in pairs. The classroom tends to be quiet, and the lab is noisy.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
None.	None.	Not applicable.

Sensory Challenges	Potential Strategies / Accommodations	Options / Resources
1. Easily distracted by external visual stimuli (windows, exits, people, etc.).	• Dim lights away from task at hand. • Close outside blinds. • Allow for individual work or work with a responsible partner. • Limit external stimulation (have only necessary items within reach during lab experiences). • Allow her to take exams in an area where external stimulation is limited.	• Explore purchasing a cubicle or study area that can be used for individual work.

Cognitive Challenges	Potential Strategies / Accommodations	Options / Resources
3. Complex tasks are difficult to complete. 12. Acts out in class. 13. Does not complete tasks and assignments.	• Talk to Alice about learning conditions that work best for her, try her suggestions, and together evaluate the results. • Praise on-task behavior. • Pair with peer. Set boundaries and do not assign less work in complexity or volume. • Seat close to teacher, with back to window, near quieter students. • Structure classroom transitions. • Plan for "down time." • Explain assignments eye to eye.	• Consult with school's ADHD specialist, IEP team member(s), and parents for possible suggestions to increase learning and appropriate participation. • Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* to find suggestions for accommodations and learning strategies.

Physical Issues	Sensory Issues	Cognitive Issues
Think of the required physical aspects of the task. What lab equipment and materials are manipulated? What will make the environment accessible, keep the student safe, and allow him/her to be an active participant?	Consider the room temperature, noise, lighting, fumes, dust, odors, allergies. What are the visual and auditory aspects of the task or assignment.	Consider the mental skills used in the assignment or task. Is it done with a group, partner, or individually? What memory & communication skills are used? What is its level of complexity?
Physical Challenges	**Sensory Challenges**	**Cognitive Challenges**
1. lift / carry 2. stamina / endurance 3. push / pull 4. kneel / squat 5. reach 6. repetitive tasks 7. fine motor: pinch / grasp 8. fine motor: manipulate / maneuver 9. gross motor 10. sit in chair 11. walk / stand 12. balance 13. bend / twist 14. stoop / crouch 15. other	1. vision 2. hearing 3. touch 4. smell 5. taste 6. oral communication 7. temperature 8. fumes 9. external stimuli 10. lighting 11. other	1. short-term memory 2. long-term memory 3. task complexity 4. reading 5. writing 6. spelling 7. string of numbers (math) 8. paying attention 9. visual, auditory, or kinesthetic learner. 10. self-esteem 11. advocacy issues 12. behavior issues / acting out 13. other

Rebecca

STUDENT ABILITIES PROFILE

Student Description:

Rebecca is a 15-year-old freshman. She has a condition that affects both motor and cognitive skills. She uses a wheelchair. Rebecca is very personable. It takes Rebecca a long time to grasp even simple concepts. Auditory input works best, but instructions may need to be repeated several times. She is most successful when labs are slow-paced and have few steps. She also needs assistance with manipulatives.

Task / Assignment:

Actively participate in science classroom and lab experiences, including field trips.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

A wide range of equipment and materials are used in the science classroom and lab.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Lab activities are often performed in groups. Field trips to science facilities and museums are taken periodically.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
6. Difficulty with repetitive tasks. 7. Difficulty pinching and grasping. 11. Difficulty walking and standing.	• Provide hand-over-hand guidance. • Provide a grabbing device and surgical gloves to increase ability to grasp. • Avoid small manipulatives. • Provide a work station that is wheelchair-accessible. • Reduce length of assignments/tasks. • Provide lab equipment with easy-to-grasp handles. • Pair with a lab partner. • Arrange wheelchair-accessible transportation.	• Obtain curriculum suggestions from special education teacher and/or therapist. • Get information on lift-equipped vans from district. • Get information on accessible lab furniture and equipment from local vendor; request purchases as needed. • Purchase word recognition software or other adaptive technology. • Talk with the student about accommodations. • Explore *AccessSTEM* site at *http://www.uw.edu/doit/Stem/* for information on accommodation and adaptive equipment.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
1. Limited short-term memory. 2. Limited long-term memory. 3. Difficulty with complex tasks. 4. Reading limitations. 5. Writing limitations. 6. Poor spelling skills.	• Talk to Rebecca about learning conditions that are best for her, try her suggestions, and together evaluate the results. • Provide audio recorded texts and other written materials. • Remind Rebecca of assignments periodically. • Allow extra time for testing. • Break assignments into small, linear steps. • Speak slowly and distinctly. • Provide clear, simple verbal descriptions. • Repeat instructions periodically.	•Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for suggestions on accommodations and learning strategies.

William

STUDENT ABILITIES PROFILE

Student Description:

William is an 18-year-old senior who has Tourette's syndrome. He exhibits frequent and inappropriate loud verbalizations during class, especially when in stressful situations. William is an athlete. He is 6' 3" tall and weighs over 200 pounds. His presence can be intimidating to others. He is being medicated for his condition. He can be manipulative and may use his disability to avoid work. William's outbursts may affect the entire classroom atmosphere, but his peers tolerate his outbursts and tend to cover for him.

Task / Assignment:

Complete mathematics activities in an algebra class.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

Textbook, paper, pencils, chalkboards, and chalk are the primary pieces of equipment for this class. Occasionally, 3-D manipulatives are used.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Math assignments are completed individually and in groups.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
15. Frequent verbal outbursts.	• When reasonable, ignore outbursts and avoid singling him out. • Invite William to explain Tourette's syndrome to the class, with your assistance as appropriate. • Reduce stressful situations as much as possible.	• Obtain curriculum suggestions from special education teacher and therapist. • Talk with the student about accommodations. • Explore *AccessSTEM* site at *http://www.uw.edu/doit/Stem/* for information on accommodations and adaptive equipment.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
8. Easily distracted. 8. Difficulty paying attention.	• Talk to William about learning conditions that work best for him, try his suggestions, and together evaluate the results. • Hold William's attention when instructing the class. • Repeat instructions directly to him. • Avoid group work that is distracting to William. • On some group assignments, it may be best for William to work in a quiet area. • Allow him to take exams in a quiet location with a proctor.	•Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for suggestions on accommodations and learning strategies.

Rocky

STUDENT ABILITIES PROFILE

Student Description:

Rocky is an 18-year-old junior. He is outgoing, tells funny jokes, and teases other students. Rocky is blind and uses a cane for mobility. He reads Braille. He is embarrassed by references to his blindness. His self-advocacy skills and self-esteem are low. He prefers to work without much assistance.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

Typical chemistry lab equipment and chemicals are used in this class. Computers are used for data entry and manipulation and report writing.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Lab work is typically performed in groups of two or three students.

Task / Assignment:

Actively participate in chemistry lab experiences, including manipulating equipment and materials.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
15. Locating equipment, materials, and other physical objects in the lab.	• Provide a thorough lab orientation that includes all safety aspects of the lab and emergency evacuation procedures. • Keep lab layout constant. • Keep room uncluttered.	• Obtain curriculum suggestions from special education teacher or therapist. • Get information on accessible lab furniture and equipment from local vendor; request purchases as needed. • Purchase speech recognition and screen reading software or other adaptive technology. • Talk with the student about accommodations. • Explore *AccessSTEM* site at *http://www.uw.edu/doit/Stem/* for information on accommodations and adaptive equipment.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
1. No usable vision.	• Provide a room orientation. • Put Braille labels on equipment and handouts. • Provide tactile models. • Provide verbal descriptions of visual objects. • Have Rocky partner with another student. • Give extra time to complete assignments because of slower Braille reading speed. • Provide assistance with manipulatives. • Equip computer with Braille and speech output. • Purchase equipment with speech or tactile output.	• Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for information about accommodations and learning strategies.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
10. Low self-esteem. 11. Poor self-advocacy skills.	• Talk to Rocky about learning conditions that work best for him, try his suggestions, and together evaluate the results. • Hold expectations high and praise accomplishments. • Support on-task behavior. • Encourage self-advocacy.	•Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for suggestions on accommodations and learning strategies.

John

STUDENT ABILITIES PROFILE

Student Description:

John, a 17-year-old junior, is a bright and intelligent student who loves science. He has aspirations of being a veterinarian. Because of a birth defect, he has only one hand; on the other arm, he has only a small residual limb below the elbow. He has a prosthesis for grasping objects. He has a grabbing device for accomplishing some tasks. He may experience difficulty manipulating small objects. He tries to be as independent as possible. John works well in groups or with a lab partner, always contributing and doing his part of the group assignment. He writes well with his hand.

Task / Assignment:

Actively participate in science classroom and lab experiences, including lab manipulation of small objects.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

A wide range of science equipment and materials are used in the science lab.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Classroom work is typically performed individually, and lab work is performed in pairs. The classroom tends to be quiet, and the lab is noisy.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
1. Difficulty lifting and carrying lab objects. 5. Difficulty reaching some objects. 7. Difficulty pinching and grasping. 8. Difficulty manipulating fingers.	• Pair with a lab partner. • Provide a C-clamp for holding objects. • Use equipment that requires only one hand to manipulate. • Provide a surgical glove for handling wet or slippery items with his hand. • Provide handles on beakers and other equipment. • Allow more time for setting up, taking notes, and completing tasks.	• Work with an occupational therapist for developing strategies for maximizing independence. • Explore *AccessSTEM* at *http://www.uw.edu/doit/Stem/* for information about accommodations and teaching strategies.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.

Merri

STUDENT ABILITIES PROFILE

Student Description:

Merri is a 16-year-old junior who has had cerebral palsy since birth. She uses a wheelchair for mobility and has significant fine-motor control difficulties. She can write with a pen or pencil but very slowly. She is quiet in class but friendly. She has difficulty expressing her thoughts verbally but can be understood when she speaks slowly. Her family is very supportive of her participation in all school activities.

Task / Assignment:

Actively participate in science and math classroom and lab experiences, including lab manipulations, field trips, classroom discussions.

Equipment/Supplies: (lab equipment, furniture, protective clothing, chemicals)

A wide range of science equipment and materials are used in the science lab. Paper, pencil, chalk, chalkboard, and computers are used in the science and math classroom.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting)

A field trip to a science museum is planned.

Physical Challenges

1. Difficulty lifting objects.
7. Limited fine motor skills make pinching and grasping difficult.
11. Cannot walk or stand.
15. Limited ability to turn head.

Potential Strategies / Accommodations

- Provide extra room to maneuver her wheelchair and an accessible lab area and desk. She needs a large flat surface for experiments that is lower and that allows 29" of clearance underneath. Her chair should be facing the board so she does not have to turn her head. A mirror above teacher demonstrations may be helpful.
- Provide a lap desk for microscope and a taller or extended eyepiece.
- Provide a lab partner or assign her to a group. The group should be instructed on how to help her participate to the highest degree possible.
- Take time to allow slower verbalization.
- Provide assistance with manipulatives.
- Sit to talk to her at eye level.
- Allow extra time for lab set up.
- Allow more time for writing on tests and written assignments.
- Provide a scribe or note taker for some tasks.
- Provide a computer with adaptive technology and a printer for writing tasks.
- Ensure that field trip locations are wheelchair-accessible.

Resources

- Explore options for accessible transportation. Get information on lift-equipped vans from district.
- Find vendors of modified lab equipment and furniture and make purchases as appropriate.
- Purchase speech recognition software or other adaptive technology.
- Explore computer software and hardware to assist in computer use and work.
- Consult the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for information on accommodations and assistive technology.

Sensory Challenges

None.

Resources

Not applicable.

Cognitive Challenges

2. Long-term memory difficulty.
3. Difficulty completing complex tasks.
4. Low reading ability.
5. Writes very slowly.
6. Poor spelling skills.
10. Low self-esteem.
11. Poor self-advocacy skills.

Potential Strategies / Accommodations

- Talk to Merri about learning conditions that work best for her, try her suggestions, and together evaluate the results; encourage self-advocacy efforts.
- Break down assignments into smaller components.
- Allow extra time on tests.
- Allow use of a computer with spelling and grammar checkers.
- Hold expectations high and praise accomplishments.

Resources

- Consult the special education teacher, IEP team members, or parents about strategies that maximize success.

Neil

STUDENT ABILITIES PROFILE

Student Description:

Neil is an 18-year-old senior with cerebral palsy. He has good upper body strength but limited fine motor skills. Manipulating small objects can be difficult. He uses a wheelchair for long distances and crutches for shorter distances. Neil is cooperative and very assertive in making his physical needs known to his instructors and strives to make his work perfect. He dislikes it when other classmates tease him. He fatigues easily.

Task / Assignment:

Actively participate in science classroom and lab experiences, including field trips.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

A wide variety of science equipment and materials are used in the science lab.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Most lab activities are conducted in groups. There are many written assignments. Field trips are planned to local science-related businesses.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
2. Low endurance and stamina. 5. Difficulty reaching equipment. 7. Limited finger manipulation and difficulty pinching and grasping. 11. Stands only for short time periods and with support. 12. Difficulty with balance.	• Provide a grabbing device and surgical gloves to increase ability to grasp. • Provide a work station that is wheelchair-accessible. • Schedule field trips in wheelchair-accessible locations. • Sit to talk with Neil eye-to-eye. • Shorten reading time and procedure for labs to avoid fatigue. • Provide audio recorded texts. • Give praise for correctly completed tasks. • Allow extra time for testing. • Provide adaptive technology for computer access.	• Consult his special education teacher, IEP team members, or parents for suggestions. • Get information on lift-equipped vans available to the school. • Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for information on adaptive equipment. • Get information on accessible lab furniture from local vendors; make purchases as needed. • Purchase adaptive technology for computer access.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.

Richard

STUDENT ABILITIES PROFILE

Student Description:

Richard is an 18-year-old junior who loves math, computers, and cooking. He is profoundly deaf and has low muscle tone and some neurological problems similar to autism. He does not speak. He is bright but reads two grade levels below his present class status. Richard communicates through sign language interpreters, written notes, and lipreading. Richard can get quite animated and disruptive at times. His self-esteem and self-advocacy skills are low.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

A wide range of science equipment and materials are used in the science lab.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Many assignments are completed in groups.

Task / Assignment:

Actively participate in science classroom and lab experiences, including lab manipulations.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
1. Difficulty lifting large objects. 3. Difficulty pushing and pulling. 12. Loses balance easily. 14. Cannot stoop or crouch easily.	• Provide assistance with manipulatives. • Have Richard work with a partner or in a group. • Repeat lab safety procedures periodically.	• Consult with his special education teacher, occupational therapists, IEP team members, and parents regarding strategies to address physical limitations. • Explore accommodation options at the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/*
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
2. Profoundly deaf. 6. No oral communication.	• Make sure you have his attention while speaking. • Speak directly to Richard. • Provide written material and explain procedures and written content. • Team him up with another student. • Provide lab safety procedures in writing. • Work with sign language interpreters.	• Consult with special education teacher and hearing specialist. • Explore accommodation options at the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/*
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
3. Difficulty working through complex tasks. 4. Low reading level. 10. Low self-esteem. 11. Poor self-advocacy skills. 12. Exhibits disruptive behavior.	• Talk to Richard about learning conditions that work best for him, try his suggestions, and together evaluate the results; encourage self-advocacy efforts. • Hold expectations high and praise accomplishments. • Pair him with a peer. Ensure active participation. • Provide materials at appropriate reading level. • Provide special assistance with abstract concepts, using manipulatives whenever possible. • Provide computer with dictionary, thesaurus, spelling-checker, and vocabulary-building components.	• Consult with his special education teacher, IEP team members, and parents regarding social and learning skills and support strategies. • Explore accommodation options at the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/*

Alan

STUDENT ABILITIES PROFILE

Student Description:
Alan is a 16-year-old sophomore who has a mild learning disability. He has extreme short-term memory loss and cannot handle complex assignments. He has difficulty processing mathematical concepts (dyscalculia). Alan is very popular and is a class leader. He demonstrates responsibility and good judgment. He hates to acknowledge that he has a disability. He can get angry when his disability affects his learning, and he does not like to receive special services or be singled out in any way. He will need some special assistance to pass the class.

Task / Assignment:
Actively participating in science classroom and lab experiences, including lab manipulations, field trips.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)
A wide range of science equipment and materials are used in the science lab. Pencils, paper, textbook, chalk, and chalkboard are the primary materials used in the classroom.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)
Typical science lab. There is much group work.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
None.	None.	Not applicable.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None	None.	Not applicable.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
1. Short-term memory difficulty. 2. Long-term memory difficulty. 3. Difficulty working through complex tasks. 4. Low reading skills. 5. Poor writing skills. 6. Poor spelling skills. 7. String of numbers (math). 13. Exhibits anger at times.	• Choose groups carefully. A supportive peer group can prevent some outbursts and hostility. Check progress frequently. • Have him take notes on each lesson. • Write down all assignments. • Encourage use of a day planner. • Verbalize carefully and repeat instructions. • Provide peer tutoring. • Use multimodal teaching techniques. • Highlight important vocabulary. • Test individually and possibly orally. • Use alternate grade reporting.	• Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for suggestions on accommodations and learning strategies.

Penny

STUDENT ABILITIES PROFILE

Student Description:

Penny is an 18-year-old senior who is extremely gifted intellectually. She quickly grasps concepts and has a whimsical and creative intellect. Penny is highly unorganized and does not keep track of or turn in assignments. She rarely does any written work on her own without much encouragement. She is noncooperative, and her parents have given up. She participates fully in physical activities but never hands in lab reports or homework.

Task / Assignment:

Actively participating in science and math classroom and lab experiences, including lab manipulations, field trips, and classroom discussions.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

A wide range of science equipment and materials are used in the science lab. Paper, pencil, chalk, chalkboard, and computers are used in the science and math classroom.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Typical lab and classroom environments. Field trips occur often.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
None.	None.	Not applicable.

Sensory Challenges	Potential Strategies / Accommodations	Options / Resources
None.	None.	Not applicable.

Cognitive Challenges	Potential Strategies / Accommodations	Options / Resources
8. Poor attention span.	• Provide one-to-one support to force the issue of completing assignments. Group work may be distracting to Penny. • Provide an assignment book with teacher signatures on a daily or bi-weekly basis. • Give lots of follow-up on assignments. Check progress frequently. • Communicate with her other teachers.	• Explore accommodation options at the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/*

Abby

STUDENT ABILITIES PROFILE

Student Description:

Abby is a 16-year-old sophomore. She sustained a head injury in a boating accident in eighth grade, which reduced her I.Q. She had to re-learn basic skills (alphabet, counting, etc.). Abby's memory is full of "blank" spots. Her social life completely changed when she had to leave honors programs. Her family is supportive, but conflict between the four siblings occurred when Abby appeared to receive more attention than the others.

Task / Assignment:

Successfully complete work in a mathematics class.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

Paper, pencil, chalk, and chalkboard are the primary tools used in the classroom.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Typical mathematics class.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
15. Facial tics and slight facial paralysis. Jerky, with some uncontrolled body movement.	• Provide extra time to respond verbally. • Provide one-to-one assistance. • Have partner assist with some manipulatives.	• Obtain curriculum suggestions from her special education teacher and therapist. • Get information on accessible lab furniture and equipment from local vendors; request purchases as needed. • Purchase word recognition software or other adaptive technology. • Talk with the student about accommodations. • Explore *AccessSTEM* site at *http://www.uw.edu/doit/Stem/* for information on accommodations and adaptive equipment.
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
None.	None.	Not applicable.
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
2. Long-term memory is lacking. 12. Experiences loss of focus. 13. Other.	• Regularly check for present knowledge level; never assume content knowledge. • Probe for information on feelings and thoughts; don't assume consistent reactions. • Have her repeat instructions back to the instructor partners to help keep her on task. • Check Abby with safety procedures, as she may have forgotten some safety basics and may have difficulty following directions. Make positive specific statements ("Put on safety goggles").	• Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for suggestions on accommodations and learning strategies.

Tyler

STUDENT ABILITIES PROFILE

Student Description:

Tyler is a 17-year-old senior enrolled in special education. He is diagnosed as having attention-deficit/hyperactivity disorder (ADHD) and has difficulty with written communication. He is friendly and works well with others. He is in constant motion and cannot sit still.

Equipment / Supplies: (lab equipment, furniture, protective clothing, chemicals, etc.)

Paper, pencil, chalk, and chalkboard are the primary tools used in the classroom.

Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)

Typical mathematics class.

Task / Assignment:

Successfully complete mathematics class.

Physical Challenges	Potential Strategies / Accommodations	Options / Resources
None.	None.	Not applicable.

Sensory Challenges	Potential Strategies / Accommodations	Options / Resources
None	None.	Not applicable.

Cognitive Challenges	Potential Strategies / Accommodations	Options / Resources
5. Has difficulty expressing himself in written form. 8. Attention span—very active and moves all the time.	• Choose groups carefully. A supportive peer group can be helpful. Check progress frequently. • Deliver tests orally; have Tyler dictate test answers. • Provide graph paper to help with writing. • Provide extra time for class tasks and assignments. • Reduce amount of written work, but check frequently for verbal understanding. • Provide peer tutoring. • Use alternate grade reporting.	• Explore the *AccessSTEM* website at *http://www.uw.edu/doit/Stem/* for suggestions on accommodations and learning strategies.

STUDENT ABILITIES PROFILE

Student Description:	**Equipment / Supplies:** (lab equipment, furniture, protective clothing, chemicals, etc.)
	Environment: (facility, fumes, odors, dust, temperature, noise, lighting, etc.)
Task / Assignment:	

Physical Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
Sensory Challenges	**Potential Strategies / Accommodations**	**Options / Resources**
Cognitive Challenges	**Potential Strategies / Accommodations**	**Options / Resources**