The Winning Equation: Access + Attitude = Success in Math and Science

DO-IT

How teachers can fully include students with disabilities

The Americans with Disabilities Act of 1990 and other federal and state legislation require that schools make programs accessible to students with disabilities. People with disabilities are underrepresented in many challenging careers, including those in science, technology, mathematics, and engineering (STEM). Negative stereotyping and attitudes are reported as the most significant factors faced by people with disabilities in these fields.

At the precollege level, students with disabilities are often discouraged from taking math and science courses and, when enrolled, are often not fully included in rigorous work in these classes. Poor high school preparation limits their options in college and careers.

Access or Attitude?

One of the greatest difficulties facing people with disabilities is created when their capacity to be educated and function in the world is evaluated solely by limitations imposed by their disabilities. They essentially become defined by their disabilities, rather than their broad range of interests and abilities. For example, many people who sustain spinal cord injuries are encouraged to participate in wheelchair basketball after they leave rehabilitation facilities. This may be fine for some people. But for those who have never had an interest in playing basketball before, why should they become basketball players now? In an example like this people are making assumptions about ability based solely upon the characteristics of a person's disability.

Another assumption is that a disability limits an individual in every aspect of his or her functioning, including the ability to be educated. To meet the intent of the Americans with Disabilities Act (ADA), educators must develop an attitude that is disability-positive. Students with disabilities can work hard and be productive and should be expected to do so.

Accommodations are Unique to the Individual

Conversations about disabilities in an educational setting are quickly dominated by the one-size-fits-all syndrome. Whether we are talking about a person who has a physical, sensory, learning, or cognitive disability, we like to have simple solutions that fit all. In truth, students with disabilities have the same variety of needs and preferences as anyone else. Although the energy and construction costs of every business could be cut dramatically by simply lowering all of the interior ceilings to a maximum height of fifty-two inches and this solution would work very well for many people who use wheelchairs or are of short stature, others might grumble when they have to maneuver on their knees as they move around the office. This kind of narrowly focused, inadequate, uniform solution is often imposed on the student with a disability, creating an educational environment that is counterproductive.

Where to Go from Here?

DO-IT has developed a model process and a *Student Abilities Profile* for creating effective accommodations in science and math classes. It can be used by any teacher and is composed of 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. As an educator, you are usually focused on the overall outcome of the project. To accommodate a student with a disability it's important to think about the specific settings, tools, skills, and tasks that are required at each step. By analyzing and evaluating the task thoroughly you will be able to determine how best to fully and effectively include a student with a specific disability.

Step #2: What physical, sensory, and cognitive skills are needed?

Match 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 complete this assignment," without really determining what skills are needed for specific aspects of the project. We need to separate the real requirements of a specific task from the fictional or perceived requirements of the project in total. It is impossible to place yourself in the shoes of the student with a disability. He or she may have learned many ways to solve a specific problem or task and work around the limitations imposed by the disability.

Step #3: What components of the task require accommodation?

Once the task has been analyzed and the skills needed are identified, determine what accommodations may be required or how the learning experience might be altered to make it more accessible. 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 consult with the student to determine what they perceive as aspects of a project which they 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(s). The student may have some good ideas, however, this is a time when other staff and professionals may have expertise in specific areas and be called on to provide input. In some cases, having students work in groups where each person is assigned a task that they have the ability to complete provides a reasonable alternative.

Universal Design

Building accessibility features into an environment or services, such as a science or math class, can make it more usable by all students. For example, having one workstation in a science lab that is adjustable in height makes the space accessible to future students who might use wheelchairs or be large or small in stature. More information and examples about universal design can be found in the brochure *Universal Design: Process, Principles, and Applications* at *www.uw.edu/doit/Brochures/Programs/ud.html*.

Following is the *Student Abilities Profile* designed to guide you in determining a student's skills and abilities as well as assisting you in breaking down the individual components of a science or mathematics assignment. The form asks you to briefly describe the student, the classroom or laboratory environment, equipment or supplies needed, available professional and external resources, possible effective accommodations and the physical, sensory, and cognitive skills needed for the task.

STUDENT ABILITIES PROFILE

Narrative Regarding Student and Accommodation Issues:	Equipment: (Lab, computer, manipulatives)
Task / Assignment:	Environment: (fumes, odors, dust, temperature, noise, group work)

Physical Challenges	Accommodations Needed	Options and Resources
Sensory Challenges	Accommodations Needed	Options and Resources
Cognitive Challenges	Accommodations Needed	Options and Resources

Physical, Sensory, & Cognitive Issues and Challenges

Physical Issues	**Sensory Issues**	**Cognitive Issues**
Think of the required physical aspects of the task. What will make the environment accessible, keep the student safe, and allow him/her to be an active participant? What equipment must be manipulated?	Think of room temperature, noise, fumes, dust, odors, and allergies. Also consider the ability to speak and/or communicate, and the visual aspects of the task or assignment.	What memory and communication skills are needed? What is the level of complexity of the task?

Physical Challenges	**Sensory Challenges**	**Cognitive Challenges**
1. lift/carry	1. vision	1. short-term memory
2. stamina/endurance	2. hearing	2. long-term memory
3. push/pull	3. touch	3. task complexity
4. knee/squat	4. smell	4. reading
5. reach	5. taste	5. writing
6. repetitive tasks	6. oral communication	6. spelling
7. fine motor: pinch/grasp	7. temperature	7. string of numbers (math)
8. fine motor: manipulate/maneuver	8. fumes	8. paying attention
9. gross motor	9. external stimuli	9. visual, auditory, or kinesthetic learner.
10. sit in chair	10. lighting	10. self-esteem/advocacy issues
11. walk/stand	11. other	11. behavior issues/acting out
12. balance		12. other
13. bend/twist		
14. stoop/crouch		
15. other		

Resources

- For a full size version of the *Student Abilities Profile*, consult the DO-IT brochure, *An Accommodation Model* at *www.uw.edu/doit/Brochures/Programs/accommodation.html*. For examples of filled in forms for specific students, consult *www.uw.edu/doit/MathSci/sap.html*.
- DO-IT created a short video presentation to accompany this publication, *The Winning Equation: Access + Attitude = Success in Math and Science*, which teaches strategies for fully including students with disabilities in science and math. An online version may be freely viewed at *www.uw.edu/doit/Video/winequ.html* purchased in DVD format.
- For information resources related to disabilities and technology, science, engineering, and mathematics, visit DO-IT's *AccessSTEM* website: *www.uw.edu/doit/Stem/*.
- The *doitsem* list is for the discussion of the use of technology and other strategies to promote the success of people with disabilities in challenging fields such as technology, science, engineering, and mathematics (STEM). For more information about the list consult: *mailman.u.washington.edu/mailman/listinfo/doitsem/*.

About DO-IT

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For further information, to be placed on the DO-IT mailing list, request materials in alternative format, or to make comments or suggestions about DO-IT publications or web pages, contact:

DO-IT
University of Washington
Box 354842
Seattle, WA 98195-4842
doit@uw.edu
www.uw.edu/doit/
206-685-DOIT (3648) (voice/TTY)
888-972-DOIT (3648) (toll-free voice/TTY)
509-328-9331 (voice/TTY) Spokane
206-221-4171 (fax)
Founder and Director: Sheryl Burgstahler, Ph.D.

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