



**Family Center on
Technology
and Disability**

FCTD Conference Series: Assistive Technology and Universal Design

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Assistive Technology and Universal Design

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Hosted by Dr. Sheryl Burgstahler

EXPERT'S CORNER

Introduction

Universal Design is any product or service designed with the many factors considered, including aesthetics, functional options, environmental issues, safety concerns, and cost. Typically, products and activities are designed for the average user. In contrast, "universal design" is the design of products and environments to be usable by all people, to the greatest extent possible, with no or limited adaptations. For example, a standard door is not accessible to everyone. If a large switch is installed in a convenient location, the door is accessible to more people, including some wheelchair users. However, applying universal design principles could lead to the installation of sensors that signal the door to open when anyone approaches. Similarly, sidewalk curb cuts, designed to make sidewalks and streets accessible to wheelchair-users, are actually more often used by children on skateboards, delivery staff with rolling carts and parents with baby strollers. Universal Design can also be applied to information technology in the classroom and computer lab. In terms of learning, universal design means the design of instructional materials and activities that make the learning goals achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Accessible technology products provide the user with alternative ways to accomplish tasks, so they can choose the method that works best for them. Universal design for learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with differing abilities. These alternatives are built into the instructional design and operating systems of educational materials-they are not added on after-the-fact. Dr. Sheryl Burgstahler's discussion will address all areas of Universal Design. Participate and learn something valuable from the forum.

Expert's Perspective

Universal Design in the Classroom and Computer Lab

Access to quality instruction, including that delivered using information technology promotes positive academic and career outcomes for students with disabilities. But, how can instructional activities and products be designed to maximize the learning of all students? The field of universal design can provide a framework for the design of inclusive environments in the classroom and the computer lab.

Universal Design

Designing any product or service involves the consideration of many factors, including aesthetics, functional options, environmental issues, safety concerns, and cost. Typically, products and activities are designed for the average user. In contrast, "universal design" is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation (The Center for Universal Design, 1997). For example, a standard door is not accessible to everyone. If a large switch is installed in a convenient location, the door is accessible to more people, including some wheelchair users. However, applying universal design principles could lead to the installation of sensors that signal the door to open when anyone approaches, making the facility accessible to everyone, including a small child, a man in a wheelchair with no hand/arm function, a weak elderly woman, a man using a walker, a person carrying a large box. Similarly, sidewalk curb cuts, designed to make sidewalks and streets accessible to wheelchair-users, are actually more often used by children on skateboards, delivery staff with rolling carts and parents with baby strollers.

Applications in the Classroom

Typically, access for students with disabilities to a specific classroom activity or educational product is considered after the activity or product has been developed. At this point in the process, access options are often limited and unsatisfactory. More accessible activities and products are created when universal design principles are applied in early stages of the design process (Bar & Galluzzo, 1999; Bowe, 2000; Burgstahler, 2001; CAST, 2002). Following is a definition of universal design of instruction developed by the Council for Exceptional Children:

In terms of learning, universal design means the design of instructional materials and activities that make the learning goals achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Universal design for learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with differing abilities. These alternatives are built into the instructional design and operating systems of educational materials-they are not added on after-the-fact.

Universal design principles can be applied to lectures, classroom discussions, group work, handouts, Web-based instruction, labs, fieldwork, and other academic activities and materials. They allow for multiple means of representation, expression, and engagement. Listed below are examples of instructional methods that employ principles of universal design (Burgstahler, 2001). They make course content and activities accessible to people with a wide range of abilities, disabilities, ethnic backgrounds, language skills, and learning styles.

1. Inclusion. Create a classroom environment that respects and values diversity. Encourage students to meet with you to discuss disability-related accommodations and other special learning needs. Avoid segregating or stigmatizing any student. Respect the privacy of all students.

2. **Physical Access.** Assure that classrooms, labs, and fieldwork are accessible to individuals with a wide range of physical abilities and disabilities. Make sure equipment and activities minimize sustained physical effort, provide options for operation, and accommodate right- and left-handed students as well as those with limited physical abilities. Assure the safety of all students.
3. **Delivery Methods.** Alternate delivery methods, including lecture, discussion, hands-on activities, Internet-based interaction, and fieldwork. Make sure each is accessible to students with a wide range of abilities, disabilities, interests, and previous experiences. Face the class and speak clearly in an environment that is comfortable and free from distractions. Use multiple modes to deliver content. Provide printed materials that summarize content that is delivered orally.
4. **Information Access.** Use captioned videotapes. Make printed materials available in electronic format. Provide text descriptions of graphics presented on Web pages. Provide printed materials early to allow students to prepare for the topic to be presented. Create printed and Web-based materials in simple, intuitive, and consistent formats. Arrange content in order of importance.
5. **Interaction.** Encourage different ways for students to interact with each other and with you. These methods may include in-class questions and discussion, group work, and Internet-based communications. Strive to make them accessible to everyone, without accommodation.
6. **Feedback.** Provide effective prompting during an activity and feedback after the assignment is complete.
7. **Demonstration of Knowledge.** Provide multiple ways for students to demonstrate knowledge. For example, besides traditional tests and papers, consider group work, demonstrations, portfolios, and presentations as options for demonstrating knowledge.

Applications in the Computer Lab

Information technology for which universal design principles have been applied minimize the need for assistive technology and are compatible with commonly used assistive hardware and software (DO-IT, 2002). Below are a few examples of accessible electronic and information technology that highlight its benefits to students with disabilities in educational settings.

- Accessible Web pages allow students with sensory impairments to access course content and other information, share their work with peers and teachers, communicate with other students in group assignments, and take advantage of distance learning opportunities.
- Accessible instructional software allows students with sensory and mobility impairments to participate side-by-side with non-disabled peers in simulations and other computer-based activities.
- Captioned videotapes let students who are deaf access the content presented, along with other students.
- Computers that are compatible with existing assistive technology make it possible for students with a wide variety of disabilities to participate in programming and other computer-based work.

These and countless other examples demonstrate the important roles electronic and information technology can play as young people with disabilities pursue postsecondary education and careers. First, they realize the same benefits as individuals without disabilities – they write articles, develop spreadsheets, access Internet-based resources and services, work side-by-side with their peers. In addition to these benefits, however, some people with disabilities use technology as compensatory tools, which allow them to do things that are otherwise impossible because of their disabilities. For

example, technology can provide a voice for those who cannot speak in the customary way; can allow people to “write” even though they do not have functional use of their hands; and can make it possible for individuals to use the telephone even though they do not have the ability to hear.

In the school computer lab, access to hardware, software, and documentation is critical. In addition, the facility itself should be designed with universal access in mind. For example, the lab should include an adjustable table for each type of workstation, wrist/forearm rests, trackballs in addition to mice, wide and uncluttered aisles, and signs with high contrast and large print. Commonly used assistive technology, such as software to enlarge on-screen images, should be readily available. In addition, policies and procedures should be developed to assure a quick response to the need for assistive technology by specific students. (Burgstahler, 2003; Burgstahler, 2002).

Conclusion

Designing inclusive environments that are accessible to everyone, with and without disabilities, minimizes the need for individual accommodations. Employing the universal design approach to the development of educational activities and products, including information technology, is a critical step towards ensuring that students with disabilities have full access to programs and activities in the school, workplace, and community. Ultimately, making all educational and employment opportunities accessible to people with disabilities will strengthen our economy and create a level playing field for everyone.

Expert’s Bio

Dr. Sheryl E. Burgstahler directs project DO-IT (Disabilities, Opportunities, Internetworking and Technology) at the University of Washington. DO-IT promotes the success of students with disabilities in postsecondary programs and careers. DO-IT employs technology to help young people with disabilities achieve success in postsecondary education and careers. It sponsors programs that increase the use of assistive technology and promote the development of accessible facilities, computer labs, electronic resources in libraries, Web pages, educational multi-media and Internet-based distance learning programs. DO-IT has been the recipient of many awards, including the National Information Infrastructure Award in Education, The President's Award for Mentoring, the Golden Apple Award in Education, and the AHEAD Program Recognition award. DO-IT is funded by the National Science Foundation, the U.S. Department of Education, the U.S. Department of Labor, the State of Washington, corporations, foundations and private donors.

Dr. Burgstahler is Co-Director of the National Center on Accessible Information Technology in Education (AccessIT). This Center, funded by the National Institute on Rehabilitation Research of the U.S. Department of Education), coordinates a nation-wide effort to assist educational and governmental institutions to reach the goal of making education-based information technology (IT) accessible to all students and employees, including those with disabilities.

Dr. Burgstahler has published dozens of articles and delivered presentations at national and international conferences that focus on the full inclusion of individuals with disabilities in postsecondary education, distance learning, work-based learning, and electronic communities. She is the author or co-author of six books on using the Internet with pre-college students. Dr. Burgstahler has extensive experience teaching at the pre-college, community college, and university levels. She is Assistant Director of Information Systems and Affiliate Associate Professor in Education at the University of Washington. Her Ph. D. Dissertation was on computing services for students with disabilities in higher education.

CONFERENCE

Transcript: Assistive Technology and Universal Design

- **Welcome!** by **Sheryl Burgstahler** (*moderator welcomes the group to FCTD's Universal Design Discussion*)
- **Parental Involvement** by **Janet Peters**
Sheryl: I often work with parents who don't really understand universal design or think they have a role to play in promoting it. How can I explain it to them so they understand its importance and how it can help their child? Thanks, Janet Peters

- **Re: Parental Involvement** by **Sheryl Burgstahler**

Janet: This is an excellent question. The concept of universal design is relatively new. You might want to even avoid using the term right away when talking to parents. I think helping a parent see a bigger picture and a way to contribute can help. For example, "your advocacy has been such a benefit to "Ben" as he has progressed in school. Imagine how much easier your journey would have been if the school had considered some basic accessibility practices before Ben came along. How could we encourage our school to create environments that are more inclusive to students with disabilities like Ben's and to students with different types of disabilities? We could start with the computer lab and make a list of suggestions that would make it more accessible to students with a wide range of abilities and disabilities (wider aisles, a few adjustable tables, etc.)."

Some parents welcome the opportunity to share what they have learned and stretch their knowledge beyond the specific needs of their children. Perhaps the PTSA could sponsor a committee of parents and others that would make universal design recommendations to the school. Any other ideas from participants?

- **Re: Parental Involvement** by **Joan**

What great suggestions for getting parents involved in solution searching! I will acknowledge that I have somewhat of a bias in my posts to this or any other list, as I work for a state education agency, as well as a strong background as an advocate for persons with disabilities. But, I would like to suggest that we consider different language rather than "Imagine how much easier your journey would have been if the school had considered some basic accessibility practices before Ben came along." This has some connotations of "school bashing" which I know was not the intent. Universal design is new for schools as well as for parents. I think what we need to do is develop some collaborative strategies to support the schools and the students. Here in MN, schools are required to submit school tech plans in order to qualify for e-rate discounts. Part of that plan mandates that schools include a plan for accessible technology. We also require that schools have representatives of students with disabilities in writing that plan. One of the lovely outcomes is the media and technology staff who suddenly are advocates for accessible tech. Clearly, some schools do a better job than others, and we still have a long way to go. But, by promoting a collaborative plan up front, in which all students' needs are considered, we operate from a position of strength.

- **Re: Parental Involvement** by **Sheryl Burgstahler**

Joan, I agree that we need to avoid sounding like we are "school bashing". Including accessibility in state tech plans is a wonderful

idea...points to the value of working BOTH bottom-up and top-down regarding this issue. - Sheryl

- **Re: Parental Involvement by Sheryl Burgstahler**

One of the ways for parents to show that they are not just trying to be critical of the school, is to join in an existing group or start one that has a broader scope than disability access.

For example, if there is there is a technology group of parents and interested parties (like the one they had at my son's elementary school), offer to join the group - - even if you don't have high tech skills - they need lots of voices in making tech plans and, too often, the loudest voices are from the how-to-set-up-the-computers-and-lots-of-bells-and-whistles-and-pull-wire-throughout-the building types (who are essential in the work), but too little is heard from the but-what-our-are-kids-going-to-learn-and-how-will-our-teachers-be-trained voices. You can be one of those! Once you have become part of the group, focus on how the technology can be used to benefit ALL students - in all grade levels, with all types of abilities and disabilities, with all types of cultural backgrounds, etc. And, there you are, preaching universal design without even using the term! Then, be true to your word and deal with these other issues along with disability-related concerns such as purchase of accessible technology, availability of AT, accessibility of the facility, accessibility of the school web pages, etc.

- **Re: Parental Involvement by Patti Bahr**

I agree that parents of students with disabilities and parents that are professionals in assistive technology can make a difference by getting involved in the general technology committees. I was at a Synections conference a few years ago. In one of the breakout sessions we discussed how we could get involved in making the general technology decisions for schools. For example, talking word processors with talking spell checkers are typically no more expensive than word processors that don't talk. Just think of all those students with LD that could benefit from a different word processor - and save the school money at the same time!

- **Re: Parental Involvement by Discussion Board Guest**

You can also get involved or get the teachers to start thinking about accessibility by encouraging your child to include accessible aspects in their projects.

My son is in the first grade and had to create a PowerPoint project in computer class. To make a long story short, while they were learning how to insert sound effects my son insisted on inserting text that would appear with the sound. The computer instructor asked him why and my son said "because if you can't hear the sound you won't understand, so I need some words in case you can't hear it."

The instructor later told me that they had never thought about addressing the issue of accessibility with the kids but they are now.

It was a small thing but it got the staff thinking. - Lyla

- **Re: Parental Involvement by Sheryl Burgstahler**
Lyla: What a great story! Imagine if we could get all our kids to include accessibility considerations in the design of their projects. They could become the best teachers of our teachers.
- Sheryl
 - **Re: Parental Involvement by Sheryl Burgstahler**
Parents: I think it is valuable to students with disabilities as well as to educational and other systems when students with disabilities not only advocate for themselves, but point out access issues for individuals with disabilities different than their own. It gives the student a broader view of accessibility issues so that they can be leaders in this area and is sometimes especially well received by administrators because their input does not appear self-serving. - Sheryl
-

- **ergonomic resource by Discussion Board Guest**

Is there a resource that addresses ergonomic standards for wheelchair users? I work with farmers on farm-site accommodations. I could use some back-up info regarding maximum reach (placement of levers, handles, controls).

- **Re: ergonomic resource by Discussion Board Guest**

You could try: <http://www.access-board.gov/adaag/html/adaag.htm>
- Doug Hayman, DO-IT Program (dhayman@u.washington.edu)

- **Re: ergonomic resource by Discussion Board Guest**

You may also want to check out:

[ADA Accessibility Guidelines for Buildings and Facilities \(http://www.access-board.gov/adaag/html/adaag.htm#4.2.5\)](http://www.access-board.gov/adaag/html/adaag.htm#4.2.5)

Here is some of the text from the web site talking about reach:

4.2.5* Forward Reach. If the clear floor space only allows forward approach to an object, the maximum high forward reach allowed shall be 48 in (1220 mm) (see Fig. 5(a)). The minimum low forward reach is 15 in (380 mm). If the high forward reach is over an obstruction, reach and clearances shall be as shown in Fig. 5(b).

4.2.6* Side Reach. If the clear floor space allows parallel approach by a person in a wheelchair, the maximum high side reach allowed shall be 54 in (1370 mm) and the low side reach shall be no less than 9 in (230 mm) above the floor (Fig. 6(a) and (b)). If the side reach is over an obstruction, the reach and clearances shall be as shown in Fig 6(c). --Scott Bellman, DO-IT (Disabilities, Opportunities, Internetworking, & Technology) www.washington.edu/doiit

- **Re: ergonomic resource by Marie**

You may also want to look to the National AgrAbility Project for some resources and information. The website is <http://www.agrabilityusa.org/>. Many states have AgrAbility Programs that help farmers on a local level to modify their farm-sites (buildings, barns, homes, etc.) to make the farm accessible for the entire family (and or hired workers).

- **shoulder injury info by Discussion Board Guest**

Is there a recent study on long-term effects of manual w/c use and shoulder injuries? I work with farmers and I am concerned about the rough terrain and long distances.

- **Re: shoulder injury info by Marie**

You may want to contact individuals at the National AgrAbility Project. Their website is <http://www.agrabilityusa.org/>. The National AgrAbility Project is involved with farming on many levels including research about farm related injuries and disabilities; therefore, they very well may have some information regarding long-term effects of manual wheelchair usage and shoulder injuries.

- **Universal Design of Instructional Activities by Annette Cerreta**

Sheryl: Could you offer some examples of how curricular activities can be structured or modified to be accessible to students with different abilities?

- **Re: Universal Design of Instructional Activities by Sheryl Burgstahler**

In this message and the next few I will provide examples of how curricular activities can be structured to be accessible to students with a variety of abilities and disabilities. The show how the principles of universal design can be applied to the classroom and computer lab. Many come from experiences we have had in DO-IT teaching students with a wide variety of disabilities in summer study programs and the University of Washington in Seattle and at Internet/college preparation summer camps nationwide.

In a hands-on lab performing bypass surgery on a sheet heart , students are assigned in teams of two or three to perform the survey. The room is large, with lots of space in which students using wheelchairs can maneuver. All of the students in the course have disabilities - visual, hearing, mobility, learning, etc. The lab instructor has taught this course for several years and has learned to describe what she is doing in demos verbally so that those who cannot see the demonstrations can understand the content. She faces students who are reading lips and speaks clearly. She is organized and repeats key points of the demonstration. Students are organized into groups of two or three; the students, with help from lab assistants, are to make sure that all students in each group participate and that, between the group members, they have all of the physical and sensory skills they need to perform the surgery (I'm glad these sheep are not alive!). For example, we might have a student who is blind paired up with a student with quadriplegia. The blind student performs the physical tasks and the student who can see provides some direction.

- **Re: Universal Design of Instructional Activities by Sheryl Burgstahler**

Here are two more examples:

- In a computer lab, students are to search Web sites for information on preparation for college. They are given a list of choices and questions to explore. In preparing for this lab activity, the instructor tested potential Web sites and assigned to the students only those that are accessible to everyone. In particular, if graphics are used, text equivalents are provided so that students who are blind can access the content with their speech output systems. Any sites that use audio output for key content must provide transcriptions or captioning for students with hearing impairments. The instructor does this research well in advance so that, if she finds a site she would like to use but it is inaccessible, she can contact the webmaster and suggest changes that can be made. In addition, the computer lab itself is designed to be accessible; it includes several tables that are adjustable in height, wide aisles,

handout bins that can be reached from a seated position, large-print signage, trackballs as well as mice, wrist and forearm rests, and software to enlarge screen images. Procedures are also in place to respond quickly to disability-related accommodation requests

- The teacher provides multiple ways for students to demonstrate knowledge. For example, besides traditional tests and papers, he uses group work, demonstrations, portfolios, and presentations as options for students to demonstrate their knowledge.

- o **Re: Universal Design of Instructional Activities by Sheryl Burgstahler**
All of the examples I gave in earlier messages employ at least one principle of universal design. Following is a definition of universal design of instruction developed by the Council for Exceptional Children:

In terms of learning, universal design means the design of instructional materials and activities that makes the learning goals achievable by individuals with wide differences in their abilities to see, hear, speak, move, read, write, understand English, attend, organize, engage, and remember. Universal design for learning is achieved by means of flexible curricular materials and activities that provide alternatives for students with differing abilities. These alternatives are built into the instructional design and operating systems of educational materials-they are not added on after-the-fact.

- **Re: Universal Design of Instructional Activities by Discussion Board Guest**

One way of thinking about universal design of instruction is for the instructor to offer learning activities for students with different types of learning strengths. For example, the instructor might plan activities targeted for visual, auditory, kinesthetic, and tactile learners. For information on these types of learners, visit:

<http://www.chaminade.org/inspire/learnstl.htm>

In doing so, the instructor will increase accessibility to individuals with disabilities as well as the general student population. The benefits would be "universal"- everyone would benefit.

This strategy, coupled with a strong disability awareness and a welcoming academic environment to students with disabilities, would provide a learning environment truly accessible to all.

I would like to hear from k-12 teachers and post secondary faculty. I am curious to know if you have been encouraged to incorporate universal design into your teaching, and what types of resources your institutions have made available to you. -- Scott Bellman, MA, LMHC, CRC (Project Coordinator, DO-IT) www.washington.edu/doiit

- **Re: Universal Design of Instructional Activities by Sheryl Burgstahler**

Scott: This is a great approach to universal design and is consistent with what teachers learn in their pre service classes even if it is not called universal design. In the K-12 teachers I interact with personally and professionally, I don't hear much talk of the idea of universal design, but the best teachers I know use multiple methods to meet the needs of kids with a broad range of learning strengths. I like the term

"learning strengths", too, sometimes when discussing how one might work with a student with a disability. For example, one student who is blind might have difficulty "visualizing" things; perhaps understanding things in text form works better for them. But I know of several students who are blind who consider themselves "visual learners"...they need lots of tactile drawings, visual descriptions and models to understand things.

- **Universal Design Vs. AT by BradB**

Sheryl: I was intrigued by your examples of UD in a classroom setting. I guess that from one angle, I view Universal Design as simply smart lesson planning. However when one considers UD in technology, I am kind of stuck on the idea that UD is essentially the act of embedding Assistive Technologies (or at least A.T. compliance) into a finished product.

I don't really have a question, but a discussion I would like to read is one that compares:

1. Assistive Technology's strength in making technology available...

versus...

2. The responsibility of software companies to incorporate UD into their products

It could be argued that software producers should be universally designing their products for use by all persons at all times. While at the same time, it is worth noting that the amount of added work that comes with built-in AT compliance, multiple interface methods, and a host of other considerations adds a lot of stress to the creation of something that is already complex, expensive, and time consuming.

Considering that there is already a viable AT community, industry, and way of life that exists...how does one convince the rest of the world that it is worth their time to accommodate those with special needs? Especially when everyone has become so used to adapting for themselves?

Where does the responsibility lie? Should companies anticipate a host of different users? Or should users continue to learn to interact with technology in whatever way works for them?

- o **Re: Universal Design Vs. AT by Deborah Leuchovius**

RE where the responsibility for UDL lies --

My view is that it lies with the developers of products -- in the case of UDL in the classroom, with the developers of textbooks and curriculum, and the purchasers of products for public use. This is the same responsibility that real estate developers have when constructing a new building to meet accessible standards. Yes, it adds more time to the development of the product on the front end, but it will save time and money and result in a much more universally accessible product on the other end. Publishers and software developers will find it more difficult while the process is new to them, but if a set of UDL standards is developed for these products it could become as common place as ramps and accessible bathrooms are in new construction. I believe that the folks CAST are working with textbook publishers on voluntary industry standards. (Sheryl B -- you probably know more about this as well.)

There is also the economics of supply and demand. Publishers will not create these products until there is a demand for them. Again, I have heard that some states are requiring that new textbooks purchased by their schools meet some UDL standards. Personally, I think this is the only way to really achieve the program access standards of ADA in school classrooms. After the fact accommodations and modifications are often poorly designed and implemented because of time limitations and in some cases a lack of expertise, on the part of school staff. Teachers don't want to leave anyone out, but they are already so busy ...

- o **Re: Universal Design Vs. AT by Joan**

Brad and Deborah raise important points. As design becomes more fluid and allows more users to access it, the need for AT will decline. As an AT specialist, I actually would welcome the chance to take the "mystery" out of technology and just simply make technology available. There will always be (for better or worse) job security for us who make our living in AT because there will be those folks with needs that exceed the parameters of accessibility. I always reference my Dad, who decided at age 80 that he needed to learn about this computer stuff. He is legally blind, but is able to read the screen using the accessibility functions of windows' control settings- we have changed the display to high contrast and have set the template parameters to a larger font and a better color set for him. I also dipped into my AT knowledge to buy him keyboard labels so he can see the keyboard better. The majority of his "fix" was through universal design.

I also am using UD in my own computer access because of my need for bifocals (how I hate middle age) Many programs allow me to quickly enlarge the screen display using the tracking wheel on my mouse combined with the control key. Saves eye strain for me- and although I am not disabled, I have FAR better access to information on my screen. Many of my co-workers are jealous, so we are sharing this tip across my division (the downside is that the younger staff here know EVERYTHING I type when they walk by!)

- o **Re: Universal Design Vs. AT by Sheryl Burgstahler**

Thanks for a thought-provoking message. Although universal design can minimize the need for AT, it certainly doesn't eliminate the need for AT. It isn't reasonable to design software that can be used by absolutely everyone right out of the box. Besides, those who use AT may want to continue to use it with all of the software they access (e.g., a speech input user). So, where to draw the line? This question is easier to answer when thinking about a specific product/feature than when thinking in the abstract.

For example, if designing educational software with voice output here and there, providing text alternatives (eg., captioning) makes sense - a simple feature addition that gives full access to students who are deaf. However, you wouldn't include speech recognition capabilities since too much development required and people who need speech recognition will need it for other applications too, so will want to have this AT. Instead, the producer needs to make sure that someone using speech input will be able to efficiently use the product. Similarly, alternative keyboards and mice will continue to be on the AT/user end when it comes to running educational software. Tech companies need to be aware of disability access issues and of standard products people with disabilities may use to access their products.

As far as, "How to convince the rest of the world that it is worth their time to accommodate special needs?" That's a pretty big question. I'll answer it in my next response. --Sheryl

- **Re: Universal Design Vs. AT by Sheryl Burgstahler**
Brad, this message is in response to: "How does one convince the rest of the world that it is worth their time to accommodate special needs?" I'm an attack-from-all-angles type of person. We need to make sure that our legislation promotes this (e.g., Section 508 requires that the federal government purchase and use accessible technology - this legislation raises awareness in all technology areas), our state/district policies demand accessibility, our school policies and procedures (including handling of IEPs) support it, our parents are well informed so that they can effectively advocate, students with disabilities have and apply self-advocacy skills to gain access to educational activities and technology in the schools, etc., etc., etc. --Sheryl

 - **Re: Universal Design Vs. AT by sbucp**
Brad: I believe it is imperative that widely used products offer built in features or at least compatibility to AT products (not cause conflict with already developed and widely used products). And why and how to convince the rest of the world? WE ALL AGE . . . our life spans have increased dramatically, and with that comes health problems or changes in our body functioning that may impair us in some way or other to do what we used to. Reading the response from Joan about utilizing screen enlargements to ease her eyes, I now rely on an ergonomic keyboard to type, I have colleagues who have or are losing their sight to diabetes . . .the possibilities go on and on. My point I suppose is that no one should take for granted their abilities, they are temporary. -SB
 - **Re: Universal Design Vs. AT by Sheryl Burgstahler**
Yes, we baby-boomers may be the best thing to happen regarding demanding the accessibility of products, including computer-based products! --Sheryl
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- **UDL and transition by Deborah Leuchovius**

I am particularly interested in UDL as it relates to transition-age students. Like many students receiving special ed services, my son was much more successfully included in elementary school than in middle and post secondary grades.

Part of the reason was that the subject matter of his classes became increasingly more sophisticated and demanding, but there are other reasons as well. One is that after-the-fact accommodations and modifications were often implemented by paraprofessionals who did not have the expertise or judgment to make some of the decisions they were called upon to make. Another is the fact the structure of the secondary school day is less well suited to individualizing instruction. Teachers teach one subject several times a day to multiple classes and may have a student only one hour a day for a single semester. Needless to say this makes it more difficult to get to know students well and more difficult to successfully individualize instruction of sophisticated subject matter. Special Ed staff may (or may not) provide the missing consistency and expertise ...

I think many students with cognitive and intellectual disabilities (and their families) opt for work experience and functional skill programs rather than staying the course in general education classrooms because the challenge of inclusive LEARNING at the high school level has not yet been met.

I would love to hear what others think about the challenges of implementing UDL in the classroom at the high school level.

- o **Re: UDL and transition by Sheryl Burgstahler**

Deborah: Your experiences with your son are consistent with many other stories I have heard and the issues you point out are right-on. My son started middle school this year, and he definitely does not have the same personal relationship he had with his elementary school teachers. It is a different environment where every child is expected to take more and more responsibility for his learning and at least some of the teachers are more focused on their content than on strategies for reaching all students... I'm generalizing of course. When I taught middle school math many years ago, 150 kids a day came through my classes. I simply did not have enough time to adjust the learning environment for individual students who had special needs because of exceptional talent, behavioral problems, disabilities, language issues, etc. My frustration: I could do a great job with the middle of the pack, but never had enough time with the students who were ready to move more quickly through the material and students who needed more help, alternative strategies or special accommodations.

Having said that, to address your question about UDL and high school, we need to continue to work with teachers (they can be found at teacher conferences across the country and in in service classes at our local colleges and universities) to be more inclusive in their thinking - to think of the diversity of learners, not just the average learner in their classes. I think we also have an opportunity here and even in middle school, to help our children with disabilities gradually become their own best advocate. ...more on this in my next message. --Sheryl

- **Re: UDL and transition by Sheryl Burgstahler**

So how can we help our students with disabilities become their own best advocate? They need to become experts on their disabilities and accommodations and to develop self-advocacy skills so that they can, eventually, mainly work directly through their teachers. But this doesn't happen at one point in time. Whenever possible, they need to be the ones to articulate their needs, sometimes to the paraprofessional and sometimes to the teacher through the paraprofessional. Sometimes, asking the parapro to develop a employer (the student) - employee (parapro) relationship with your child so that he can develop self-advocacy skills can work. This is a tough goal to reach, but I think we can take steps in that direction beginning at an early age. Any ideas in this regard?

- **Re: UDL and transition by Michael**

I agree with Sheryl - the student needs to become their own expert on what works best for them. Finding the right accommodations requires trial and error until the student determines the accommodation(s) that provides maximum benefit. It's so easy for a teacher to assume that all of his/her students with dyslexia, for example, will require the same accommodations, when in fact each of these students may have a very different and individual accommodation need. Unfortunately, some Spec Ed programs fail to provide self-advocacy skills training as part of the IEP plan. This is where a parent/student needs to speak up during IEP planning and make sure that this becomes an objective.

Another avenue to consider is to look for a role model/mentor with a similar disability who can share experiences with the student. Ideally, this mentor should be a successful college student or a professional. When I first met a deaf professional, it was a significant eye-opening experience for me and it really propelled me to further develop my self-advocacy and career preparation skills.

- **Re: UDL and transition by Sheryl Burgstahler**

Thanks, Michael.

Mentoring is a great support. You can check for opportunities by contacting organizations and surfing the Web. We at DO-IT have one called DO-IT Pals. Any pre-college student age 13 or older who has a disability and eventually wants to go to college can apply. We have a great set of on-line mentors and peers for them to get to know.

For more info, consult

<http://www.washington.edu/doi/Brochures/Programs/pals.html>. An application can be requested by [sending email to do-it@u.washington.edu](mailto:sending_email_to_doit@u.washington.edu). --Sheryl

- **Re: UDL and transition by Joan**

Michael's points about self advocacy in the use of technology/accommodations is important. Too many students leave the K-12 system with no supports in place for the technology which has served them so well. We have developed a checklist in Minn. for both planning for the student's self advocacy in his use of AT and an AT log to plan for backup, maintenance, etc of devices. The forms are part of our AT manual. The forms by themselves are posted on the web and can be downloaded and used. Find them at <http://cfl.state.mn.us/SPECED/technology/forms-7-25-02.pdf>

I know they are not a perfect solution, but I do believe they will benefit students.

- **Re: UDL and transition by Sheryl Burgstahler**

Thanks for the resource. We in post secondary institutions find too often that students with disabilities are not fully informed about technology that works for them. Freshmen in college have enough to worry about without having to learn about AT at the same time.

One group that seems to need more guidance about how technology can help them and specific programs that work best is the group of learning disabled students. It seems that technology is not used that much to support the learning for these children. Do any of you have experiences or insights in this area? --Sheryl

- **Re: UDL and transition by Sara**

I agree that UDL is more challenging at the high school level. To a great degree, I believe this is due to the teacher preparation process. While an elementary teacher spends multiple classes on methods and learning strategies, many secondary teachers are experts in their subject field with very limited methods classes. If they took any classes about special education or learning differences, it was likely a survey course that discussed types of disabilities rather than teaching strategies.

So, thanks to all you parents and students who provide in-service training to our education professionals! As you encourage teachers and other education professionals to consider Universal Design, you are often "teaching" them what is necessary as you discuss the topic and then provide the real-world challenge!

- **Re: UDL and transition by Sheryl Burgstahler**

Sara: Good points about the difference between elementary and secondary

school teacher prep and orientation. It would be great if UDL content was included in all teacher prep programs, for both levels. We can also encourage teacher in service programs to include UDL in its offerings, ideally incorporated into specific subject courses. This way those high school teachers might find out about UDL when they take a course in their subject area. We definitely have a long way to go! --Sheryl

- by **Annette Cerreta**

How do you envision a universally designed (accessible for all) school library system, including books, cataloging system, physical environment, etc.??

- **UDL and school libraries** by **Annette Cerreta**

How do you envision a universally designed (accessible for all) school library system, including books, cataloging system, physical environment, etc.??

- **Re: UDL and school libraries** by **Sheryl Burgstahler**

I think there are three broad areas to consider when designing/redesigning an accessible library:

- * the physical environment - wide aisles, wheelchair access to the room, handout bins that can be reached from a seated position, etc.

- * electronic resources - assistive technology for students with disabilities; a few adjustable tables; software, databases, websites that are designed in an accessible format, etc.

- * staff - educators and librarians who are comfortable communicating with students with disabilities and know how to make reasonable accommodations in an efficient manner.

DO-IT has a collection of resources for making libraries accessible; it is at <http://www.washington.edu/doi/UA/>. --Sheryl

- **Re: UDL and school libraries** by **Tom**

First of all, thanks for all of the great discussions. I have read them with great interest. The Alliance for Technology Access has published a manual called Access Aware: Extending your Reach to People with Disabilities. It is a manual that can help all kinds of community organizations including libraries make themselves more accessible for people with disabilities. It covers facility, programs, communications, technology and web sites and is outcome based. The user can learn about the issues, do a self-assessment and create an access plan for each area. We have been using this manual with community based organizations in California and discovered that there was still a lot of apprehension and resistance to "tackling" accessibility. As a result, we developed a companion to Access Aware called Starting Points: An Introduction to Creating Access for People with Disabilities in Community-based Organizations. It looks at the same areas, but offers the user some simple, easy to address places to start. Starting Points has been enthusiastically received and has been used by a great many organizations.

You can find more info about Access Aware and download either an HTML or PDF version of Starting Points at: <http://www.ataccess.org/resources/acaw/>

- o **Re: UDL and school libraries by Perrine Dailey**

I see that Sheryl mentioned suggestions for immediate implementation of UD for libraries. These are great goals.

However, I imagined a library far into the future - a StarTrek-esque system where information data streams can be exchanged effortlessly for everyone...

But...in the meantime, I'd like to see more virtual reality utilized and improved for education. --Perrine

- **Re: UDL and school libraries by Sheryl Burgstahler**

Perrine: Technology is developing at such a rapid pace, it is difficult to know exactly what a "library" will look like years from now. It will take a lot of effort to make sure that whatever technology is used, it is accessible to all library patrons. --Sheryl

- **7 Principles of Universal Design by Perrine Dailey**

Anyone have any comment on these seven principles? Are they still currently used? This is information I compiled a few years ago. --Perrine Dailey

According to researchers at NC State University, the Center for Universal Design, Universal design is "the design of products and environments to be useable by all people to the greatest extent possible, without the need for adaptation and specialized design." Seven principles have been established to be applied to evaluate existing designs and educate both designers and consumers about the characteristics of more useable products and environments. These principles offer designers guidance to better integrate features that meet the needs of as many users as possible.

Equitable use - The design is useful and marketable to people with diverse abilities.

Flexibility in Use - The design accommodates a wide range of individual preferences and abilities.

Simple and Intuitive Use - Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Perceptible Information - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Tolerance for Error - The design minimizes hazards and the adverse consequences of accidental and unintended actions.

Low Physical Effort - The design can be used efficiently and comfortably and with a minimum of fatigue.

Size and Space for Approach and Use - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture or mobility.

- **Going beyond the disability world by Janet Peters**

Sheryl: There has been some great information shared on the topic of Universal Design. Do you have any ideas on how we can get the word out to people beyond the disability community? PACER was involved last year in the Community Technology Center grants, and we learned that the general computer labs (at local non-profits) were not addressing accessibility at all. --Janet

- **Re: Going beyond the disability world by Sheryl Burgstahler**

Janet: A great question! We at DO-IT have been promoting accessibility within mainstream computing and educational organizations and it is an uphill road. But, the word is spreading and more people are becoming interested in the concept of universal design. I think part of the increased interest has to do with a greater awareness and support of diversity in educational settings and the workforce. Even there, though, we need to continue to make sure that "disability" is included in these diversity discussions. Lots of us, all the time, everywhere we are need to spread the word. --Sheryl

- **Re: Going beyond the disability world by Joan**

I was thinking about this on my drive to work today (I probably need a more exciting life) and keep coming back to a major selling point about UDL making life easier for everyone- that kids, teachers, others without disabilities will find tasks easier to complete if we provide multiple ways to complete said task. In essence, we make this a matter of all kids, rather than the kids in special ed- and all kids win! I understand (although I have not seen it) that kids not receiving special ed services also benefit from a UDL class. I must admit to being worried however, as education seems to be moving more towards a core knowledge/pencil and paper test world that we are at risk of losing momentum towards universal design.

- **Re: Going beyond the disability world by Sheryl Burgstahler**

Yes, it is a nice thought to have a class (a world!) where everyone was equally valued and included. I am concerned too that in education we might be moving towards a core knowledge/pencil and paper emphasis, but, even if we do, it's important that all students receive the full instruction and inclusion they need to do well on the paper and pencil tests.

- **Re: Going beyond the disability world by Sheryl Burgstahler**

This topic makes me think of a conversation I had not long ago with a technology specialist. He asked, how can we justify providing kids with disabilities assistive technology when there is no solid research base to prove that such access makes a positive difference in their academic and career outcomes? My first impulse was to give some anecdotal information that demonstrates that the provision of AT is worthwhile for students with disabilities (we have a lot of that!).

Instead, I said, wait, one of the regular complaints about investing in computers and internet connections for all students in our schools is that we do not have enough solid research to prove that such access is worth the investment; on-line instruction, for example, has not been proven more successful in teaching students than in-person instruction. It's not fair to hold a higher standard to the added value of technology to students with disabilities than to students in general. One way to look at it is technology is just simply a part of our lives and EVERYONE needs

to be comfortable using it and should use it to promote their success in modern society...we don't demand a research base to convince ourselves that kids should have access to telephones, right? So, why would we need to prove that having access to a telephone is of value to someone who is deaf or who has a speech impairment?

This is not to say that we shouldn't continue to conduct research to demonstrate how technology should best be used in educational and other settings for ALL individuals of various ages and in various activities. These studies would include individuals with disabilities.

- o **Re: Going beyond the disability world by Dave Grass**

Hi Janet and All: I have been working on material being developed by Intellitools with Universal design being the focus. Many of the new software programs that were developed for children with disabilities are now being looked at for all children.

Software supported reading programs are being designed using the four block system. These are being packaged with basic reading series, the difference being single switch scanning, enlargement capabilities, and adapted keyboard overlays are included in the package. I am going to encourage other people working on this project to get involved in these discussions as a way to identify other ways universal design issued similar to what Joan was listing in her submission.

We are also working on a large project in Illinois, California, and Massachusetts to help CTC net centers become accessible. Tom Morales is part of this project and Tom and I will be glad to keep everyone apprised of any findings or materials we might develop.

I have enjoyed reading the posts and find the information very useful on raising my knowledge of universal design.

- o **Re: Going beyond the disability world by Sheryl Burgstahler**

I think we need to get information out in conferences and through newsletters and other mailings. Consider sending these labs a copy of Equal Access: Computer Labs at www.washington.edu/doi/Brochures/Technology/comp.access.html

- **instructional materials by Joan**

I think one of the most significant ways we can move to a more universal design is by promoting improved access to instructional materials. For example, when purchasing a text book, an electronic version would also be available. This would assist students who are blind, have a learning disability or for whom English is not a primary language in having access to their text books. It could also benefit the students who has no unique needs, but who isn't willing to schlep his book back and forth to school each day. My son's science book was available on-line, accessible via a teacher assigned password. The teacher was surprised when I asked about access for students with disabilities- he had not even thought about it- but he was instinctively providing a more universally designed class.

I know some states have statute about accessible instructional materials. Do you (or other participants) know which these are, and what the limits of these statutes are? I think the federal instructional materials accessibility act is off the table for now. Is this correct?

- **Re: instructional materials** by **Discussion Board Guest**
This is a great point and I agree. Why shouldn't an electronic version of every textbook be available? I would imagine that they are all generated in electronic form to begin with. I can't imagine the authors slaving away over manual typewriters anymore. It seems to me that electronic versions would be easier and cheaper to produce as well.

I have heard that California has been very aggressive with their e-text legislation. Does anyone know more about it? --Lyla

- **Re: instructional materials** by **Discussion Board Guest**
California and a number of other states have created laws mandating that providers of textbooks to be used in their K-12 systems must also be available in an electronic format, if the schools are to use them.

The publishers would of course object to providing electronic format for fear of copyright infringement/loss of sales. As long as their fears can be dismissed and some provision made for them to sell their content in another format, with agreed upon restrictions, then the idea of electronic versions of text really doesn't meet much resistance.

Attempts to pass laws similar to the state laws at a national level have not yet been successful. The attempted legislation was the Instructional Materials Accessibility Act. --Doug

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- **Center Drafts Guidelines For Accessible Educational Software** by **Curtis Edmonds**
http://www.sedbtac.org/ed/whats_new/articles.cfm?id=2940

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- **School involvement** by **Annette Cerreta**
How can we support and encourage K-12 schools to incorporate universal design into their instructional methods and technologies?
 - **Re: School involvement** by **Joan**
This should be an expectation for all kids- not just those for kids with disabilities. So, as all of us serve on technology committees, PTA groups, etc, we can ask how that technology will help all kids. Basically, having been an activist in schools, being part of the "Mom (or Dad) corps" gives you lots of opportunity and validity. This goes back to the suggestions Sheryl made at the beginning of this discussion. Get on the curriculum committee if you can, and support the purchase of publications with electronic alternatives. When they rebuild the playground, show how it can be accessed by all kids. Lobby your state legislature to have curriculums made available in alternate formats. Lots of local as well as system options.

Resources

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