NASET Q & A Corner

Issue #7

Questions and Answers About Technology and Universal Design

What does “technology” mean?

“Technology” refers to both "electronic" and "information" technology. Electronic and information technology includes:

- Any equipment or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information
- Any equipment or interconnected system or subsystem of equipment, that is used in the creation, conversion, or duplication of data or information.

For example, computers, peripheral equipment, software, firmware, services, documentation, telecommunications products such as telephones, and office equipment such as copiers and fax machines (Office Of The Federal Register 2000, p. 80499). Throughout this topic, when the term “technology” is used, it refers to electronic and information technology.

What is “access?"

Another important term used in this topic area is “access,” as it relates to the use of computer hardware, software, and other technology. According to the National Science Foundation, “access implies the ability to find, manipulate and use information in an efficient and comprehensive manner” (Lesk, 1998). Too often even those individuals with disabilities who have a computer and Internet connection, still cannot use all features because of inaccessible features of hardware and/or software (Waddell, 1999). They have technology, but do not have full access to all of the benefits it delivers to others. For example, a person who is blind may be able to use some Web page content that is in text format, but not have "access" to the content that is displayed in only a graphics format.

What is “assistive technology?"

“Assistive technology” is defined as “any item, piece of equipment, or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve functional capabilities of individuals with disabilities.” (Section 508, 1998). Assistive technology helps people with disabilities independently complete daily living tasks, assists them in communicating with other individuals, and provides access to education, employment, and recreation. It can be used to minimize the impact of a disability. Examples of assistive technology include wheelchairs, alternated automobile controls, wheelchair lifts on vans, environmental control units, communication aids, hearing aids, and alternative input devices for computers. For the purpose of this area of the Web site, assistive technology that interfaces with electronic and information technology is of most interest.

What is “universal design?"

"Universal design" is another important concept as it relates to making technology accessible to individuals with disabilities. "Universal design" is defined by the Center for Universal Design 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: http://design.ncsu.edu/cud/index.htm) General principles of universal design include:

- The design accommodates a wide range of individual preferences and abilities.
- The design communicates necessary information effectively, regardless of ambient conditions or the users sensory abilities.
- The design can be used efficiently and comfortably, and with a minimum of fatigue.
- Appropriate size and space is provided for approach, reach, manipulation, and use regardless of users body size, posture, or mobility.

Universal design refers to designing products and environments that address the needs of a broad audience of users, as opposed to designing for the average user. It is defined by the Center for Universal Design at North Carolina State University as the "design of products and environments to be useable by all people, to the greatest extent possible, without the need for adaptation or specialized design." Applying universal design principles to technology hardware, software and services creates hardware, software and services that are accessible to people with a wide variety of characteristics, including disabilities, and decreases the need for assistive technology and other accommodations.

When producers of hardware and software apply universal design principles, their products are more usable by people with a wide range of abilities and disabilities. The need for assistive technology is minimized and, when needed, commonly used assistive technology is compatible with these products. For example, if universal design principles are applied to the development of Web pages, they will be usable by visitors who have visual impairments the require the use of speech output systems. Similarly, accessible telecommunications products make communication accessible to everyone, including those with hearing impairments.

What are the principles of Universal Design?

The principles of Universal Design (Connell et al., 1997) are:

- Equitable use: Usable by people with diverse abilities.
- Flexibility in use: Individual preferences and abilities are accommodated.
- Simple and intuitive: Easy to understand.
- Perceptible information: Information can be perceived in a range of environmental conditions and by people with differing sensory abilities.
- Tolerance for error: Difficulties resulting from accidental or unintended actions are minimized.
- Low physical effort: The design minimizes fatigue.
- Size and space for approach and use: Space and equipment can be used by people with a wide range of physical characteristics and abilities.
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How did Universal Design get started?

The Universal Design movement was founded by architect Ron Mace. In the 1970s, Mace developed the first code for building accessibility in the nation, and in 1989, he started the Center for Universal Design. (Center for Universal Design, 1998, para. 3). He was a lifelong advocate for people with disabilities, and he promoted the idea that products and built environments should be designed from the outset to be aesthetically pleasing and usable by everyone, to the greatest extent possible, regardless of ability (Center for Universal Design, 1998, para. 2)

How can Universal Design help students with disabilities gain access to the general curriculum?

Because each learner is unique, no single approach to teaching will work well for all students. The Individuals with Disabilities Education Act of 2004 (IDEA ’2004) requires that individual strengths and needs be considered in the development of each student’s Individualized Education Program, or IEP (IDEA ’97, §300.346). When classrooms and curricula are universally designed and offer flexibility to meet individual needs and preferences, students without IEPs are likely to benefit, and many students with IEPs will need fewer individualized accommodations.

How can Universal Design be applied to curriculum?

A model for applying Universal Design to curriculum was developed by Simmons and Kame’eniui (1996). They identified the following features:

1.) Big ideas. Curriculum emphasizes major concepts, principles, categories, rules, techniques, and hierarchical structures related to critical ideas and themes.

2.) Conspicuous strategies. Curriculum includes explicit instruction on steps to complete required tasks.
3.) Mediated scaffolding. Curriculum includes questioning, feedback and prompts.
4.) Strategic integration. Big ideas are explicitly linked within and across curricula.
5.) Judicious review. Previously taught content is reviewed and linked to applications.
6.) Primed background knowledge. New content is linked to and builds on students' background knowledge.

How can assessments be universally designed?

Universally designed assessments are intended to be both accessible and valid for the widest possible range of students. In order to develop a universally designed assessment, the entire test development process must incorporate aspects of Universal Design.

First, the purpose of the assessment must be clear, and the assessment should be designed specifically for that purpose. Test items should be designed to be usable with accommodations (for example, avoid using graphics that cannot be made available in Braille). A detailed discussion of universally designed large-scale assessments is available in Thompson, Johnstone & Thurlow (2002).

Why is it worth using universally designed assessments?

Using universally designed assessments has the obvious benefit of enabling all students to take the same test, thus simplifying interpretation of results. In addition, universally designed assessments can reduce the paper work needed to comply with the IDEA '97 legislation provision §300.532(c)(2), which states:

- If an assessment is not conducted under standard conditions, a description of the extent to which it varied from standard conditions (e.g., the qualifications of the person administering the test or the method of test administration) must be included in the evaluation report. (U.S. Dept. of Education, Office of Special Education Programs, 1999, Evaluation Procedures and Determination of Eligibility section, para. 4)
- If only ordinary accommodations are needed, this documentation task is simplified.