The problems you've targeted and the solutions you've brainstormed in this activity will give you a good start in making the library more accessible to people with disabilities.

You may want to insert a break at this point.

Adaptive Technology

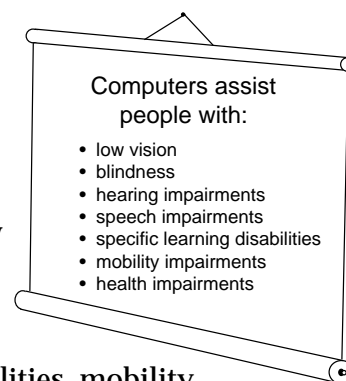| Problem		Solution
access to computers	→	adaptive technology
access to electronic resources	→	universal design principles

Put up overhead transparency.

Using computing resources can increase the independence, capabilities and productivity of people with disabilities. Access to computing resources for people with disabilities in your library involves two issues: access to the computers themselves and access to the electronic resources. Electronic resources include operational programs such as word processors and spreadsheets and information resources such as encyclopedias and databases available through local and networked computer systems.

In this section of our program we are going to look at the solutions that adaptive technology provides in enabling access to computers for people with disabilities. We will explore how the application of universal design principles can reduce or eliminate barriers to electronic resources in the next segment of our presentation.

Put up overhead transparency.

Computers assist people with:

- low vision
- blindness
- hearing impairments
- speech impairments
- specific learning disabilities
- mobility impairments
- health impairments

Access to computers assists people with low vision, blindness, hearing impairments, speech impairments, specific learning disabilities, mobility impairments, and health impairments.

We'll now watch a videotape presentation that gives an overview of computer access problems and solutions. It also highlights some of the special advantages access to computers, adaptive technology, software and the Internet provides to people with specific disabilities.

Your handout titled *Working Together: People with Disabilities and Computer Technology* summarizes the content of the video presentation and this portion of the program. Another handout you have titled *Meet the Speakers: Working Together: People with Disabilities and Computer Technology* provides information about the people featured in the videotape.

Show the videotape presentation titled Working Together: Computers and People with Disabilities.

As the individuals in the videotape demonstrate, computers help lower many barriers that people with disabilities face. They demonstrate various technologies that make it possible for people who have disabilities to use computing and networked resources. Now we will review this information and consider examples of accommodations that allow people with disabilities to effectively utilize electronic resources found in libraries.
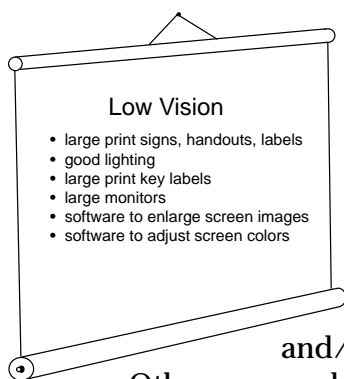
I emphasize that these are only examples, since abilities, disabilities, and learning styles are unique to individuals. Please contribute

your own experiences with specific technology as we go along. Many accommodations are simple, creative alternatives for traditional ways of doing things. You and your patrons may generate other effective ideas.

You may wish to substitute personal experiences, examples, or strategies that are more pertinent to the audience. Be sure to encourage participants to contribute ideas and experiences as well.

Low Vision

Low Vision

- large print signs, handouts, labels
- good lighting
- large print key labels
- large monitors
- software to enlarge screen images
- software to adjust screen colors

Put up overhead transparency.

For some people who have low vision, standard written materials are too small to read and/or objects appear blurry. Others may only see objects within a specific field of vision. Still others may see an image with sections missing or blacked out. Learning via a visual medium may take longer and may be more mentally fatiguing for people who have low vision than for people who have standard vision.

Examples of general accommodations for library patrons with low vision include large print books, handouts, signs, and equipment labels. The library's most heavily used handouts should be available in alternative formats including large print and electronic versions. Provide seating with good lighting. Providing areas with dim lighting may also be helpful for those who are light sensitive.
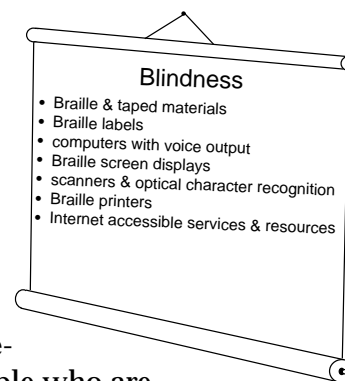
There are several computer technologies that will assist patrons with low vision as well. Computers equipped with large print keyboard labels and home-row key indicators can help users with visual impairments locate keys. Large monitors and anti-glare screens can also assist those with low vision. Computers equipped with screen enlarger software can enable a person with low vision to read characters on the screen without assistance; large monitors allow them to maximize the amount of text they can see at one time.

The ability to adjust the color of the screen or change the foreground and background colors can also help some patrons. For example, for those sensitive to light, it can be helpful to reverse screen colors from black on white to white on black. Some operating systems have accessibility options such as this built into them. There are also accessibility software packages that will perform this function in concert with standard software.

Blindness

Put up overhead transparency.

Blindness

- Braille & taped materials
- Braille labels
- computers with voice output
- Braille screen displays
- scanners & optical character recognition
- Braille printers
- Internet accessible services & resources

Blindness affects the ability to access written materials independently. Some people who are blind know how to read Braille; others do not. Materials can be taped or provided in Braille to accommodate patrons who are blind. Braille labels on equipment, keypads and books stacks can assist with general library accessibility. However, adaptive computer technology can afford a blind person with greater flexibility and independence in utilizing library and Internet resources.

Computer voice output systems can be used to read screen text to users who are blind. Special software programs "read" computer screens and speech synthesizers "speak" the text. The availability of earphones for indi-

viduals using voice output systems can reduce the distraction to others nearby.

Refreshable Braille displays allow line-by-line translation of text on the screen into Braille on a display area where vertical pins move into Braille configurations as screen text is scanned. Braille displays can be read quickly by those with advanced Braille skills, are good for detailed editing (e.g., programming and final editing of papers), and do not disrupt others in work areas because they are quiet. Braille translation software combined with Braille printers provide output for blind users who know how to read Braille.

Scanners with optical character recognition capabilities can read printed material and store it electronically on computers, where it can be read using voice synthesis or printed using Braille translation software and Braille printers. Such systems provide independent access to journals, books, and other informa- tion for people who are blind. Some hardware and software vendors also provide Braille or ASCII versions of their documentation to support blind users.

Providing the online catalog and electronic resources over the Internet, and providing electronic mail reference and circulation services can help patrons who are blind utilize the library's services independently and conveniently.

Hearing and Speech Impairments

Hearing/Speech Impairments

- computers with visual output
- electronic mail
- speech synthesizers
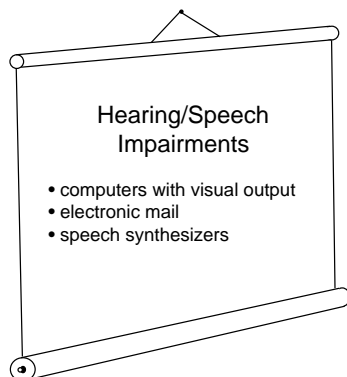
Put up overhead trans- parency.

Some people who have hearing impairments may hear at a func-

tional level with the assistance of amplifica- tion devices. Others may hear only specific frequencies, sounds within a certain volume range, or nothing at all. Some may need a quiet environment to hear effectively. Indi- viduals with hearing impairments often use some combination of lip-reading, sign lan- guage, and amplification to understand spoken information. People who are deaf from birth generally have more difficulty speaking and understanding English lan- guage structure than those who lose their hearing later in life.

For patrons who have hearing impairments, examples of accommodations include visual, as well as auditory signals, for fire alarms, library closing signals, and other alerts. Sign language interpretative services for library programs should be available when re- quested.
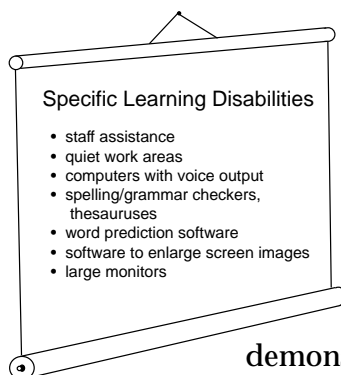
Hearing disorders and speech disorders alone do not generally interfere with computer use. In fact, libraries can use computers as commu- nication devices to assist patrons with hearing and speech impairments with reference and circulation questions by providing electronic mail access to these services.

When using a computer, alternatives to audio output can assist a user with a hearing-impair- ment. For example, a computer that produces a tone when an error is made can be pro- grammed to flash the screen instead. Word processing and educational software may also help individuals with hearing impairments develop writing skills.

Speech synthesizers can act as substitute voices and provide a compensatory tool for people who cannot communicate verbally. Individuals with portable systems can ask questions and join in conversations when adapted computers provide them with intelli- gible speaking voices.

Specific Learning Disabilities

Specific Learning Disabilities

- staff assistance
- quiet work areas
- computers with voice output
- spelling/grammar checkers, thesauruses
- word prediction software
- software to enlarge screen images
- large monitors

Put up overhead transparency.

People with specific learning disabilities may have difficulties demonstrating knowledge and understanding. For a person who has a learning disability, auditory, visual, or tactile information can become jumbled at any point when it is transmitted, received, processed, and re-transmitted. It may take longer for some who have learning disabilities to process written information. For example, some patrons with learning disabilities may have difficulty translating a call number from the numbers and letters in the catalog to the location in the library. Some individuals with learning disabilities are hyper-sensitive to background noise.

Accommodations for a person with a learning disability may include assistance in retrieving materials and filling out library forms. Quiet work areas and hearing protectors may make it easier for some individuals with disabilities to study and work in the library.

Computers can help people with learning disabilities focus and better understand information. For example, adaptive technology that provides multi-sensory experiences, such as displaying information in text while it is being read by a voice synthesis program can increase some people's reading speed.
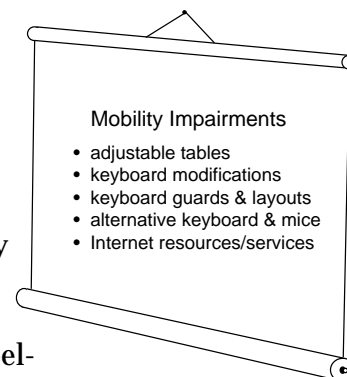
Software that aids in efficient and accurate input can also assist people with learning disabilities. Some can compensate for high rates of input errors by using spelling checkers, thesauruses, and grammar checkers. In addition, word prediction programs (software that predicts whole words from fragments) have been used successfully by students with learning disabilities. Similarly, macro software which expands abbreviations can reduce the necessity to memorize keyboard commands and can ease the entry of commonly-used text.

Some people with learning disabilities find adaptive devices designed for those with visual impairments useful. In particular, large print displays, alternative colors on the computer screen, and voice output can compensate for some reading problems. People who have difficulty interpreting visual material can improve comprehension and the ability to identify and correct errors when words are spoken or printed in large fonts.

Mobility Impairments

Put up overhead transparency.

Mobility Impairments

- adjustable tables
- keyboard modifications
- keyboard guards & layouts
- alternative keyboard & mice
- Internet resources/services

Mobility impairments range from lower body impairments, which may require use of canes, walkers, or wheelchairs, to upper body impairments which may result in limited or no use of hands. For some it may be difficult to manipulate objects, turn pages, write with a pen or pencil, type at a keyboard, or retrieve research materials.

Examples of general accommodations for patrons with mobility impairments include library assistants, adjustable tables, wrist rests, equipment located within reach, and materials available in electronic formats.

Equipment which provides flexibility in the positioning of monitors, keyboards, documentation, and table tops is useful for many individuals with disabilities. Plugging all computer components into power outlet strips

with accessible on/off switches makes it possible for some individuals to turn equipment on and off independently.

Some adaptive hardware and software assist individuals with little or no use of their hands in using a standard keyboard. Individuals who have use of one finger, a mouth- or head-stick, or some other pointing device, can control the computer by pressing keys with the pointing device. Software utilities can create "sticky keys" that electronically latch the SHIFT, CONTROL, and other keys to allow sequential keystrokes to input commands that normally require two or more keys to be pressed simultaneously. The key repeat function can be disabled for those who cannot release a key quickly enough to avoid multiple selections.

Simple hardware modifications can assist individuals with mobility impairments. For example, disk guides can assist with inserting and removing diskettes; a dedicated hard disk and/or computer network access can eliminate or reduce the necessity to do so. Keyguards can help those with limited fine motor control select keys. A keyguard is a plastic cover that fits over a standard keyboard with holes for the keys. Individuals with mobility impairments use the cover as a guide to more accurately select keys.

For individuals who need to operate the computer with one hand, left- and right-handed keyboard layouts are available. A keyboard layout is a software program that allows the letter and number key arrangement of a standard keyboard to be adapted for one-handed or other use. They allow a standard keyboard arrangement to be adapted according to the needs of those with mobility impairments.

Some hardware modifications completely replace the keyboard and/or mouse for individuals who cannot operate these standard devices. Track balls and alternative pointing devices can replace mice. Expanded keyboards (larger keys, spaced far apart) can replace standard keyboards for those with limited fine motor control. Mini keyboards provide access to those who have fine motor control but lack a range of motion great enough to use a standard keyboard.

For those with more severe mobility impairments, keyboard emulation is available, including scanning and Morse code input. In each case, special switches make use of at least one body part over which the individual has voluntary control (e.g., head, finger, knee, mouth). In scanning input, lights or cursors scan letters and symbols displayed on computer screens or external devices. To make selections, individuals use switches activated by movement of the head, finger, foot, breath, etc. Hundreds of switches tailor input devices to individual needs. In Morse code input, users create Morse code by activating switches (e.g., a sip-and-puff switch registers dot with a sip and dash with a puff). Special adaptive hardware and software translate Morse code into a form that computers understand so that standard software can be used.

Voice input provides another option for individuals with disabilities. Speech recognition systems allow users to control computers by speaking words and letters. A system is "trained" to recognize specific voices.

Special software can further aid those with mobility impairments. Abbreviation expansion (macro) and word prediction software can reduce input demands for commonly-used text and keyboard commands. For example, word prediction software anticipates entire words after a few keystrokes and increases input speed.

Internet accessible resources and services can assist patrons with mobility impairments who

cannot visit the library facility, cannot manipulate traditional book resources, or who cannot stand in lines for lengthy amounts of time.

Health Impairments

Health Impairments
- electronic mail
- Internet accessible services/resources
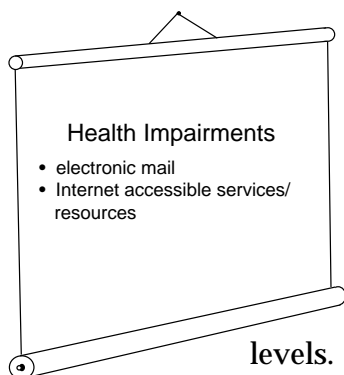
Put up overhead transparency.

Some health conditions and medications affect memory and/or energy levels. Additionally, some patrons who have health impairments may not be able to visit the library facility. Providing your online catalog and other information via the Internet and corresponding via electronic mail can benefit those who can obtain access to the Internet from their homes or the hospital.

Beginning the Process of Planning for Adaptive Technology

From ideas presented in the videotape and the examples of accommodations we've discussed, you can see how computer and network technologies can play a key role in increasing the independence, capabilities, and productivity of people with disabilities. The handout *Working Together: People with Disabilities and Computer Technology* describes some of these technologies.

Now that we've considered the various types of adaptive technology, let's think generally about some of the characteristics of adaptive technology that it will be helpful for you to understand as you plan to incorporate adaptive technology into the library.

Adaptive technology comes in many forms with different characteristics.

Put up overhead transparency.

Adaptive Technology
- hardware/software
- easy/difficult to implement
- easy/difficult to use
- inexpensive/expensive
- generic/unique
- stand alone/networked

Adaptive technology for computers comes as hardware or software or a combination of the two. In the videotape, Daniel, who has a learning disability, uses spell and grammar checking software with a standard computer and commercial software programs. On the other hand, Hollis controls his computer with a special joystick and a footswitch. He also uses special software, including a Morse code translation program, to work with these devices.

Adaptive technology can be easy to install or can require long-range planning, analysis of needs and options, and funding for implementation. For example, a track ball can be inexpensively and easily added to a workstation, assisting people who have difficulty using a standard mouse. On the other hand, Eric, one of the speakers in the videotape, uses hardware that includes a personal computer, screen reading software, speaker, scanner, Braille translation software, and Braille printer. Set up and support of such a system requires a significant financial investment, technical expertise and long term planning.

Adaptive technology can be easy to use or difficult to learn, requiring a great deal of commitment on the part of the individual user. For example, an expanded keyboard plugs into a standard keyboard holder on the computer and operates like a regular keyboard. On the other hand, a voice input system requires training to use. Then each user must train the system to recognize her voice. It typically takes 20 hours of practice to reach optimal typing speeds with a voice input system.
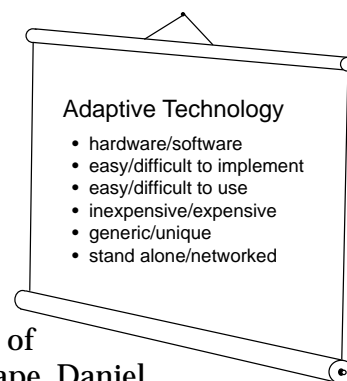
These technologies can be generic or unique to individual. For example, screen enlargement software serves people with a variety of levels of visual and learning impairments. On the other hand, the mouthstick system that Rodney demonstrates in the videotape is more specialized.

Adaptive technology software solutions, such as screen enlargement programs, can be networked so that they are available from more than one computer workstation. Solutions which incorporate hardware are often most appropriate on stand alone stations. However, if these are stored near computer workstations, they can be used at the particular station a patron is using.

Given these characteristics of adaptive technology, you should consider multiple approaches to providing accommodations. Some solutions can be implemented quickly and easily and will provide quick successes to motivate additional support for the longer process required to install more complex equipment and software.
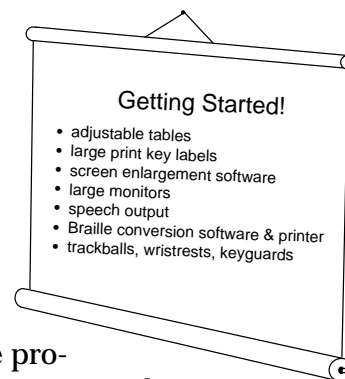
In a library, it is desirable to provide options at a computer workstation which will address the needs of a variety of users. You should also have procedures in place to deal with specific needs that these general solutions cannot address. Include the patron to come up with creative, simple solutions. In the videotape presentation you saw Mitch whose health impairment required him to lay on his side for a month. Staff turned Mitch's monitor on its side and built a holder for his keyboard.

Remember, you don't have to do everything at once. Start small and add to your collection of adaptive technology as you receive requests and as library staff gain skills in providing training and services for them. Here is a sample of some of the adaptive technology you might want to purchase in order to get started right now.

As you review this sample list, describe the types of adaptive computer technology, if any, currently available at the library. Encourage participants to share their ideas.

Put up overhead transparency.

Getting Started!
- adjustable tables
- large print key labels
- screen enlargement software
- large monitors
- speech output
- Braille conversion software & printer
- trackballs, wristrests, keyguards

- At least one adjustable table for each type of electronic resource provides access to patrons who use wheelchairs.
- Large print key labels assist patrons with low vision.
- Software to enlarge screen images provides access to patrons with low vision and learning disabilities.
- Large monitors of at least 17 inches assist patrons with low vision and learning disabilities.
- A speech output system can be used by patrons with low vision, blindness and learning disabilities.
- Braille conversion software and a Braille printer can provide Braille output for patrons who are blind.
- Trackballs provide an alternative for those who have difficulty controlling a mouse.
- Wrist rests and keyguards assist patrons with limited fine motor skills.

Resources

Put up overhead transparency.

There are many resources to assist you in your planning, purchasing, and implementing adaptive computer technology for the library. Here are a few of them.
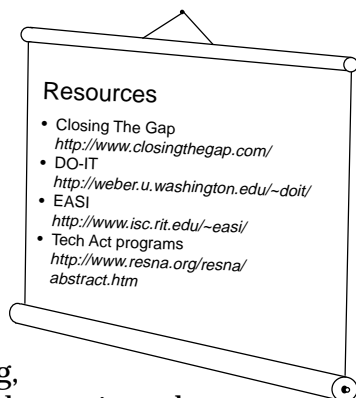
Closing The Gap is an internationally recognized source for information on innovative applications of microcomputer technology for people with disabilities and special needs. The organization sponsors an annual conference, produces an annual resource directory of commercially available hardware and software products, and publishes a bi-monthly newspaper.

DO-IT, which stands for Disabilities, Opportunities, Internetworking and Technology, produces publications and videos that help librarians and educators learn about issues related to people with disabilities and computer technology. Most of DO-IT's brochures are available at the Web site. You can also preview DO-IT's videos and training materials which are available at cost. DO-IT's site provides comprehensive listings of Web resources for accessible Web design, adaptive technology, and other disability-related issues.

EASI, which stands for Equal Access to Software and Information, has a Web site covering many issues related to serving patrons with disabilities. A section called "Libraries without Walls" shares information on making libraries accessible. EASI also produces an electronic journal that regularly includes library-related articles.

The 1988 Technology-related Assistance Act

Resources

- Closing The Gap
  http://www.closingthegap.com/
- DO-IT
  http://weber.u.washington.edu/~doit/
- EASI
  http://www.isc.rit.edu/~easi/
- Tech Act programs
  http://www.resna.org/resna/abstract.htm

and its 1993 amendments provides federal funding to help states establish programs to promote the provision of technology-related assistance. The purpose of the Tech Act programs is to serve as statewide resources that will increase awareness of the need for adaptive technology, disseminate information about adaptive technology, and facilitate the availability of adaptive technology. For more information about the Tech Act program in this state, visit RESNA's Web site.

Summary

At this point you may want to do the following or a similar interactive activity. Adjust the questions to meet the specific needs of your audience.

To summarize and help you explore some of the issues related to the provision of adaptive technology in the library, we will form small groups to consider the following questions. Each group will address one question. Choose someone to take notes and report for your group. You will have ten minutes to discuss the questions. Then we will regroup and a representative from each group will report on the ideas generated.

1. Make a short list of adaptive technology hardware and software that should be implemented immediately. Explain why each item was added to the list.

2. What two or three adaptations should the library prioritize for long-term implementation and why?

3. What processes should the library employ to best evaluate the purchase and support of adaptive technology?

4. How might the library provide staff training to support adaptive technology?

5. What local, regional, or national organizations could provide assistance in

developing a more accessible library?

6. What funding options does the library have for acquiring adaptive technology?

To move forward with the ideas you've brainstormed, you may want to locate someone outside the library who has adaptive technology expertise to answer specific questions and provide professional advice regarding appropriate adaptive technology. You may also want to designate staff to assess current services and research equipment and funding.

This section of the program has addressed adaptive technology. We viewed the videotape presentation, *Working Together: People with Disabilities and Computer Technology*, and saw how adaptive technology can assist people with low vision, blindness, hearing impairments, speech impairments, specific learning disabilities, mobility impairments and health impairments. We applied this new information to planning for the library by reviewing a list of recommended adaptive technology and a brainstorming exercise. I encourage you to use the resources listed as you continue your planning.

Problem		Solution
access to computers	→	adaptive technology
access to electronic resources	→	universal design principles

Put up overhead transparency.

The next portion of the program will address the second part of the access equation that we looked at earlier: using universal design principles to ensure that electronic resources are accessible.

Electronic Resources

Historically, libraries have been committed to providing equal access to information to their constituents, whether they be the general public, the students and faculty of a college, or the employees of a business. The rapid development of electronic information resources has changed the physical and service features of our libraries. Throughout this change, many libraries have embraced a goal of making their resources easier to access. The development of sophisticated multimedia electronic and World Wide Web resources are seen as methods of extending the reach of the library. Increasingly, however, these resources are not fully accessible to people with some types of disabilities. For example, screen reader software with a speech synthesizer used by a patron who is blind cannot interpret tables, graphics, or video clips.

Put up overhead transparency.

Some visitors:
- cannot see graphics.
- cannot hear audio.
- have difficulty with unorganized sites.
- use older equipment, slow connections.
- use adaptive technology.

Some visitors cannot see graphics because of visual impairments or cannot hear audio because of hearing impairments. Some users have difficulty when screens are unorganized, inconsistent and cluttered and when descriptions and instructions are unclear. These difficulties may occur because they have learning disabilities, speak English as a second language, or are younger than the average user. Other visitors use older equipment or slow connections or modems that limit their access to multimedia features. And