Assistive Technology
Low, Mid and High Tech Approaches

“For people without disabilities, technology makes things easier. For people with disabilities, technology makes things possible.”

International Business Machines (IBM) 1991 training manual

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Agenda

- Introductions
  - What do you want to gain from this session?
- Introduction to AT
  - Assistive Technology
  - Universal Design
- Curriculum Access
  - Hardware
  - Software
- Exploration
  - Resources for Assistive Technology
  - Materials and Equipment
- Wrap Up
  - Access for Assistive Technology
  - Questions
What is Assistive Technology?

- Any device, piece of equipment or system that helps bypass, work around or compensate for an individual’s specific physical or learning deficit in order to:
  - Participate in the least restrictive educational environment.
  - Participate in programs or activities which otherwise would be closed to the student
  - Gain access to information
  - Demonstrate knowledge
  - Support normal social interactions with peers and adults

- AT devices include the entire range of supportive tools and equipment from adapted spoons and wheelchairs to computer systems
Why Use Assistive Technology?

- It is a good teaching practice, with the use of appropriate assistive technology students show improvements in:
  - Independence
  - Self-confidence
  - Social interaction
  - Academics.

- It is legally required
Assistive Technology Law

- **Individuals with Disabilities Education Act (IDEA)** - provides the laws that govern how students with disabilities are educated in the public school system. It challenges educators to provide:
  - Access
  - Insure participation
  - Progress in the general education curriculum for all learners

- IDEA specifies that AT devices and services will be provided through an Individualized Education Plan (IEP) when necessary for the student to receive a free and appropriate education (FAPE) in the least restrictive environment (LRE).

- P.L. 100-407, The Technology-Related Assistance for Individuals with Disabilities Act of 1988 (Tech Act) was designed to enhance the availability and quality of assistive technology (AT) devices and services to all individuals and their families throughout the United States.
Functions of Assistive Technology

- Basic Functions of Assistive Technology
  - Daily Living
    - Positioning
    - Mobility
    - Access
  - Sensory Supports
    - Visual
    - Auditory
  - Communication
Assistive Technology for Daily Living

- In order to benefit from education, some students require assistance with self care activities like feeding, dressing, and toileting.

- Assistive devices which assist with self care include such things as robotics, electric feeders, adapted utensils, specially designed toilet seats, and aids for tooth brushing, washing, dressing, and grooming.

- Vendor: Therapro  www.theraproducts.com
Mobility

- Individuals who have physical impairments that limit their mobility may need a variety of devices to help them get around.

- Mobility devices include such things as
  - Self-propelled walkers,
  - Crutches
  - Canes
  - Manual or powered wheelchairs
  - Recreational vehicles such as
    - bikes and
    - scooters.

- Vendor: www.sortprice.com
Physical Positioning

- Students with physical disabilities may need assistance with their positions for seating so that they can participate effectively.

- Achievement of an upright, forward facing position may require the use of padding, structured chairs, straps, supports, to hold the body in a stable and comfortable position.

- Consideration for the student's position in relation to peers and the teacher for a variety of settings so that the student can participate in multiple activities.

  - Examples of equipment
    - walkers,
    - floor sitters,
    - chair inserts,
    - wheelchairs,
    - trays,
    - standing aids,
    - bean bag chairs,

- Vendor: Adaptive Mall http://www.adaptivemall.com
Environmental Controls

- Students with physical disabilities may need adaptive technology to achieve independent use of equipment in the classroom through various types of environmental controls, including remote control switches and special adaptations of on/off switches to make them accessible.

Switch activated toys

Adapted door opener

Power link

Electric scissors
Alternative Access

Access through switches can allow students with motor control disabilities access to toys, games and computers.

- **Spec Switch** - switch activates no matter where the student presses on it. Comes with three bases: a flange base, space saving flush base, and strap base for mounting around objects such as head rests.
  - Vendor: Ablenet, Inc.  [http://www.ablenetinc.com](http://www.ablenetinc.com)

- **Pal Pads** are flat membrane switches that are activated by applying only 1.2 ounces of force. Plug into any communication aid or battery operated assistive device.

- **Switch Adapted Trackball** The Switch Adapted Trackball operates any software that can be operated by a mouse click. Allows easy access to mouse functions.
Alternative Keyboards

- Alternative keyboards can provide students access to computer based activities with vision or motor control disabilities

- **Zoom Caps** - : Zoom Caps can be used for students with learning disabilities and/or visual impairments. These stick on keyboard labels feature large print alphabetic and numeric characters with high contrast colors.
  - Vendor: Don Johnston, Inc. [http://www.donjohnston.com](http://www.donjohnston.com)

- **TouchWindow** - : The TouchWindow allows students to select and move objects, operate pull-down menus, and draw graphics •, all with the touch of a finger
  - Vendor: Edmark [http://www.edmark.com](http://www.edmark.com)

- **IntelliKeys** - : IntelliKeys is a programmable alternative keyboard that enables students with physical, visual or cognitive disabilities to easily type, enter numbers, navigate on-screen displays, execute menu commands
Assistive Technology for Visual Impairments

- Supports to assist with vision impairments include:
  - Increasing contrast,
  - Enlarging stimuli
  - Use of tactile cues
  - Use of auditory learning.

- Devices that assist with vision include:
  - Screen readers,
  - Screen enlargers,
  - Magnifiers,
  - Large-type books,
  - Taped books & Podcasts
  - Braille
  - Light boxes,
  - Synthesizers, and scanners.

- http://www.learnoutloud.com
- Vendor:  http://www.lowvision.org
- http://www.perkins.org

Large Print
High Contrast
Assistive Technology for Hearing Impairments

- Students with hearing impairments or auditory processing problems can benefit from alternative means for getting information.

- Assistive devices to help with hearing and auditory processing problems include:
  - Hearing aids,
  - Personal FM units,
  - Sound field FM systems,
  - Phonic Ear,
  - TDDs,
  - Closed caption TV
  - Phones with amplification.

- [www.hearingplanet.com](http://www.hearingplanet.com)
- Vendor: ADCO Hearing Products, Inc.
Communication

Students who are nonverbal or whose speech is not fluent or understandable enough to communicate effectively may benefit from using sign language or some type of communication device or devices.

- Communication devices include
  - Communication boards that use symbol systems such as Boardmaker
  - Electronic communication devices that may include speech synthesizers with static and dynamic displays
Universal Design

“Consider the needs of the broadest possible range of users from the beginning”

Architect, Ron Mace

- Universal Design
  - Not one size fits all – but alternatives.
  - Designed from the beginning, not added on later.
  - Increases access opportunities for everyone
Origins of Universal Design for Learning (UDL)

- The Center for Applied Special Technology (CAST) was founded in 1984. It has defined Universal Design for Learning and is exploring practical applications through research, practice and policymaking.

- CAST believes that “barriers to learning are not, in fact, inherent in the capacities of learners, but instead arise in learners' interactions with inflexible educational goals, materials, methods, and assessments.”

  *Teaching Every Student in the Digital Age, p. vi*

- CAST defines UDL as an educational approach to teaching, learning, and assessment, drawing on new brain research and new media technologies to respond to individual learner differences.
UDL and the Learning Brain

One must recognize information, ideas, and concepts.

One must be able to apply strategies to process the information.

One must be engaged.

Vygotsky
UDL and the Learning Brain

Task is too difficult for learner

ZONE OF PROXIMAL DEVELOPMENT

Task is too easy for learner

CAST
UDL - Improving student access to the curriculum

- The cornerstone of Universal Design for Learning is flexibility.

- The only practical and affordable way to implement the requirements of IDEA is to provide flexible materials that are accessible to different kinds of learners.

- Each learner, with or without identified disabilities, presents a unique pattern of skills, interests, and needs.

- The UDL approach leverages the inherent flexibility of digital media to support individualized learning. UDL concepts form the basis of the development of adjustable materials, instructional approaches, assessment methods, and professional development that can meet IDEA's call for access to the general curriculum for students with disabilities.
Differences between Assistive Technology and Universal Design for Learning

- Assistive technologies will always have a role in the education of learners with disabilities, and Universal Design for Learning will not eliminate the need for personal assistive devices.

- Assistive technologies places the burden, one of adaptation, on the learner-not the curriculum.

- UDL materials offer options to transform content presentation and provide multimedia presentation, options for varied learning supports and modes of student expression, and varied means of building student engagement. Instead of one assumed standard with variations, variations comprise the standard.

- As UDL becomes more viable and pervasive, the power of assistive technology can be devoted to providing more efficient interaction with a curriculum that is already access-aware. It will enhance active interaction with a curriculum that has been designed at the outset to be accessible to all.
Using Assistive Technology to Meet Educational Needs

- Assistive technology can provide support for students and teachers in:
  - Reading, Writing, Math and Content Areas
  - Listening
  - Organization and Productivity
  - Cognitive assistance
  - Modification of Materials
Curriculum Access

Goals of Curriculum Access:

- **Approximate normal fluency, rate, or standards**--a level of accomplishment which could not be achieved by any other means.

- **Increase endurance or ability to persevere and complete tasks** that otherwise are too laborious to be attempted on a routine basis.

- **Concentrate on learning tasks, rather than mechanical or rote tasks**.
Universal Design has increased the possibilities for use of assistive technology with all students.

- AT doesn’t cure or eliminate learning difficulties, but it can help a student reach his/her potential because it allows him/her to capitalize on strengths and bypass areas of difficulty.

- In general, assistive technology compensates for a student’s skills deficits or area(s) of challenge.

- AT can increase a child's self-reliance and sense of independence. By using AT, kids can experience success at working independently.
Low Tech to High Tech

- Low-Tech devices require no power source
  - Pencil grips
  - Wheelchairs
  - Picture boards

- Mid-Tech devices require a power source
  - Battery operated scissors
  - Note-taking cassette recorders
  - Book on Tape, I pods
  - Simple switches

- High-Tech devices frequently incorporate some type of computer chip.
  - Word prediction software
  - Voice recognition and speech synthesizers
  - Optical character recognition (OCR)
The Assistive Technology Continuum

Devices to try if a student has problems with

- **Tasks**
  - reading
  - writing
  - spelling / grammar
  - communication
  - worksheet completion
  - math
  - mapping
  - note-taking
  - organization / planning
  - learning another language

- **Needs**
  - faster work
  - legible, understandable work
  - comprehension
  - same work as everyone else
  - modified, shortened, parallel work
  - visual / graphic / auditory presentations
  - independent work
  - fine motor practice
  - sharing of knowledge
  - correct grammar / spelling

- **Environments**
  - classroom
  - resource / study hall
  - therapy
  - home
  - community

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**Problems**

**Low Tech Tools**
- specialized pens / pencils / crayons / markers / grips
- specialized erasers, correction tapes
- raised line paper, grid paper, colored papers
- highlighters, highlighter tapes
- color coding
- Post-It notes, flags, arrows
- colored filters, page overlays (clear acetate sheets)
- NCR paper
- reading / writing guides
- slanted surfaces, eyecam, copy holder
- white board, markers, crayons
- magnetic letters, tactile letters
- magnifiers
- rubber stamps, labels
- specialized measuring and cutting tools

**Mid Tech Tools**
- tape recorders
- digital recorders
- calculators
- spell checker, dictionary / thesaurus (talking)
- dedicated word processor
- electronic organizer
- audio books
- music (tapes / CDs)
- electronic eraser, stapler
- mini-book lights
- switch operated toys and appliances

**High Tech Tools**
- alternative keyboard / alternative cursor control
- word processing
- word prediction
- brainstorming, graphic organization
- spell checker, grammar checker
- word banks (on-screen overlays)
- text readers
- on-screen math, computer calculators
- communication devices / software
- internet access
- CD reference (maps, encyclopedias)
- CAI
- environmental control devices

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**Success**

**Independence**
### Low and Mid Tech Tool Trials

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<td>Friction Stamps</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Y-Axis Stamps</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Numberline Stamp Set</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Thermometer Stamp</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Black Stamp Ink</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
<tr>
<td>Colored Stamp Ink</td>
<td>Other:</td>
<td>Other:</td>
<td></td>
</tr>
</tbody>
</table>
Reading - “Low Tech”

- **Line Markers** - to help students track
- **Colored transparent sheets** - to assist with visual processing.
- **Magnifying bars and magnifying sheets** - increase the size of text
- **Computer software programs and E-books** - that provide multi-media presentations such as “Living Books” encourage student interest in reading (www.broderbund.com) or http://www.storyplace.org/preschool/preschool.asp
- **Bookholder** - to help students with physical disabilities hold books hands free.
  - Vendor: Robert’s Bookholder
- **Page Turner Aids** - allows switch users to turn the page of books electronically. (www.touchturner.com)
Books on Tape

- **Variable speech control (VSC) tape recorders** enable the listener to play audio taped text faster or slower than it was originally recorded, without losing the actual sounds of the words.

- **Tape recorders** can be used to play audio-taped text. Taped text, such as books-on-tape, is available from many different sources—ranging from toy and record stores to the Library of Congress National Library for the Blind and Physically Handicapped, and RFB&D.

  - **Recording the Blind and Dyslexic**  [www.rfbd.org](http://www.rfbd.org) applications are available online.

  - **National Library Services for the Blind and Physically Handicapped** Applications available from the Boson Public Library or calling 202-882-5500
# Text Reader or Books on Tape
## Comparing Text Readers and Audio Technologies

<table>
<thead>
<tr>
<th>Need</th>
<th>Books on Tape</th>
<th>Text Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read back</td>
<td>Offers a “real person” voice</td>
<td>Uses speech synthesis with varying degrees of intelligibility</td>
</tr>
<tr>
<td>Speed of read back</td>
<td>Conversational (recorded rates) of 160 – 190 wpm</td>
<td>Most programs variable from 65 – 350+ wpm. Upper end variability dependent on speed of computer processor and voice chosen</td>
</tr>
<tr>
<td>Modulation of voice</td>
<td>Non-adjustable</td>
<td>Adjustable in many programs.</td>
</tr>
<tr>
<td>Volume</td>
<td>Available on most recorders</td>
<td>Available on most computers</td>
</tr>
<tr>
<td>Pitch</td>
<td>Not available</td>
<td>Available on many computers – this feature helps students with range hearing impairments.</td>
</tr>
<tr>
<td>Processing time “stops”</td>
<td>Not available unless the actual recorder is stopped and then restarted.</td>
<td>Available at the word, chunk, sentence, and paragraph level. This feature is particularly important for students who need additional processing time between “reading” each segment.</td>
</tr>
<tr>
<td>Ability to repeat text</td>
<td>Can be done inexactly with stop and rewind features.</td>
<td>Can be done with single click for segment just read or segment before that.</td>
</tr>
<tr>
<td>Reading in “chanting” voices</td>
<td>Not available</td>
<td>Available only on Macintosh with system voices (Pipe Organ and Cello)</td>
</tr>
<tr>
<td>Ability to change text font and size</td>
<td>Not available, at best student is trying to follow along in text book.</td>
<td>Full availability to fonts installed in computer.</td>
</tr>
<tr>
<td>Ability to change text, background and highlighting colors</td>
<td>Not generally available. Use of color filters in print text can be used for background colors.</td>
<td>Full availability to colors for background and text. In Macintosh, highlight colors can also be changed within the program. Most Windows programs require changing highlight color at control panel level.</td>
</tr>
<tr>
<td>Visual tracking</td>
<td>Very difficult, student must follow along in text as it is read out loud.</td>
<td>Programs use word by word highlighting to help visual tracking and attention.</td>
</tr>
</tbody>
</table>
Optical character recognition (OCR) systems, when combined with speech synthesis, might be thought of as reading machines. I

“Reading pens” are also available. These battery-operated devices use a miniaturized optical scanning system which enables the user to scan single words on a page (for example, in a textbook or magazine) and have the word read aloud by means of a built-in speech synthesizer.

Speech synthesis/Screen review systems may also serve as a reading machine, separate from an OCR system, if the text is available on a computer disk. The text can also be adjusted for size and contrast.
Written Language Technologies

- **Word processors** are computer-based writing systems that enable the user to type text onto a computer screen before printing on paper. The following features of word processors can support writing skills:

  - **Spell checkers** are part of most word processing programs. They are also available as stand-alone desktop and pocket-size tools.
  - **Proof Reading programs** are sometimes called “grammar checkers” as well. They are used in combination with word processing programs to check for errors in grammar, punctuation, capitalization and word usage.
  - **Macros** can be used for spelling difficult text, for repetitive strings of words, or for formatting paragraphs and pages.
  - **Outlining programs**, which are now included as part of many word processing programs, help the user create outlines.
  - **Dictionaries and Thesaurus** used in combination with word processing programs can enable the user to look up words quickly and find alternative words.
Positioning for Writing

- Positioning can enable students to attend better and reduce fatigue that can negatively impact attention.

- **Pencil Grips** - Simple grips can allow students to reduce the pressure and fatigue that impacts on writing.

- **Writing Slant Boards** - provides various angles for writing surfaces that can reduce fatigue.

- Vendor: Therapro [www.theraproducts.com](http://www.theraproducts.com)

- **Keyboard Adjustment Stand** - The keyboard adjustment stand allows the user to access the keyboard at various angles.
  - Vendor: Computer Stress Solutions

- **Movin' Sit Cushion** These air cushions facilitate dynamic sitting by incorporating movement with conventional seating. They provide tactile input, and have a calming/focusing effect for many children.
  - Vendor: Therapro [www.theraproducts.com](http://www.theraproducts.com)
Speech Synthesizers and Talking Word Processors

- **Speech synthesizers** together with screen review software, enable the user to hear text on a computer screen spoken aloud.

Examples:

- **IntelliTalk II** is a full-featured word processor which combines graphics, text, and speech to enhance writing and communication skills.
  

- **Write:OutLoud** is a talking word processor that supports the writing process by both highlighting and reading each word out loud as students write.
  
  Vendor: Don Johnston, Inc. [http://www.donjohnston.com](http://www.donjohnston.com)
Word Prediction Programs

- Word prediction programs work together with word processors. These programs predict the word a person wants to enter into the computer. The person types the first letter of a word, and the program offers a list of words beginning with that letter.

Example:

- **Co:Writer 4000** is a talking word prediction program used to support students who struggle with word recall, syntax, keyboarding, and spelling. It is also available as an applet for the Alphasmart.

- Vendor: Don Johnston, Inc. [http://www.donjohnston.com](http://www.donjohnston.com)
Brain Storming Programs

- **Brain storming or** mind mapping programs enable writers to create a diagram of their ideas before writing an outline.

Example:

- Kidspiration is a web-creating tool with text-to-speech, used to help plan and organize in the pre-writing process. Picture symbols can be translated into written expression from the webs and maps.

  • Vendor: Inspiration [http://www.kidspiration.com](http://www.kidspiration.com)
Portable Keyboards

- Portable Keyboards provide students with the opportunity to write anywhere without the expense of a laptop computer. Portable keyboards can be used for note taking, keyboarding and writing.

Example:

- AlphaSmart 3000 is a portable keyboard. Text can be transferred to a computer for formatting, or directly to a printer.

Vendor: Intelligent Peripherals
http://www.alphasmart.com
Math Technologies

- **Manipulatives** - hands on manipulative provide concrete visualization of problems

- **Talking calculators** - use a built-in speech synthesizer to speak number, symbol or operation keys as they are pressed. They also read back answers from completed calculations. [www.seniorstore.com](http://www.seniorstore.com)

- **Electronic math worksheets** such as “MathPad” helps students organize, align and navigate through basic math problems on a computer screen. Problems are entered and automatically aligned to the correct vertical format. Numbers on the screen can be read aloud by means of a speech synthesizer. [www.intellitools.com](http://www.intellitools.com)

- **Computer Software** - provide practice for rote recall of math facts and well as simulation programs which provide practice using materials and solving problems on the computer
Listening Technologies

- **Personal FM listening systems** bring a speaker’s voice directly into a listener’s ear by means of a small transmitter unit and an equally small receiver unit.

- **Digital voice recorders and tape recorders** are used to capture spoken information, such as a teacher’s instructions or a classroom lecture. This permanent record allows people to refer back to an oral presentation.

- Vendor: ADCO Hearing Products, Inc.
- [www.radioshack.com](http://www.radioshack.com)
- Sanyo 2 speed 2 channel transcriber
Organization

- Assistive technology can support student’s organizational abilities by using visual organizers for schedules, time management or to clarify ideas in reading and writing.
  - Graphic organizers
  - Calendars
  - Assignment books
- A “high tech” solution to organization may be a personal data manager on the computer or a handheld device or a free form data base. ‘Kidspiration’ is one software program that could support visual organization.
- A “low tech” solution may be using paper organizational materials using webbing, flow charts or items above.
Visual Organization & Behavior

- Some children find the world too chaotic and expectations and demands unclear. Verbal instructions and explanations are often not adequate to provide the information a student needs. Visual cues support students with:
  - Schedules
  - Mini-schedules
  - Task management
  - Work system
  - Communicating behavioral expectations

- The symbols can be used and removed on picture boards or in high tech computer programs

* Samples created with “Boardmaker”
Vendor:Mayor-Johnson www.major-Johnson.com
Many of the assistive technologies described previously can be combined with instructional programs to develop and improve cognitive and problem-solving skills.

Computer-based instruction can make possible independent participation in activities related to the curriculum.

There is a vast array of application program software available for instructing students through tutorials, drill and practice, problem-solving, and simulations.

Software can provide the tools for written expression, spelling, calculation, reading, basic reasoning, and higher level thinking skills.
Cognitive Support and IntelliPics Studio

- Software can be developed which mirrors the conceptual framework of the regular curriculum, but offers an alternative way of responding to exercises and learning activities.

- IntelliPics Studio is a multimedia authoring tool designed to create accessible, interactive activities with pictures using animation, text, music, and sound.

- Software programs which support curriculum are available for purchase. There is also an activity exchange at www.intellitools.com

- Vendor: IntelliTools http://www.intellitools.com
Special educators can create instructional materials or customize materials to meet the varied needs of students with disabilities using:

- **Apple I Life** - provides opportunity to develop multi-media presentations
- **PowerPoint** - provides opportunity to develop slide shows, using scanners, books can be put into PowerPoint for classroom use
- **Boardmaker/Picture This** - provides opportunities to develop picture schedules, visual cues for directions, and even increase participation in story telling by adding removable picture cues
- **www.reading A-Z.com** provides level readers that can be printed. Topics are covered in multiple levels which allows students to participate in reading activities at their own level
- **Copy Machines, Scanners, OCR**, and equipment that has been previously discussed can help teachers modify lessons and materials.

The list can go on....
Assessment

- IDEA requires all students be included in state and federal assessments. Modifications can include the use of assistive technology.

- Alternative Assessment Portfolio’s can be completed for students with severe disabilities.
Choosing Assistive Technology

Depends on:

- The specific setting
- The student’s physical needs
- The student’s current performance levels
- The particular task(s) to be accomplished
A Final Thought

- "Invest in the human soul. Who knows, it might be a diamond in the rough."
  - Mary McLeod Bethune

Assistive Technology may provide the means to reach that diamond in the rough!