Promoting Literacy through Assistive Technology for Students with Physical Disabilities

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This session is sponsored by the:

Division for Physical, Health and Multiple Disabilities

For more information, please come to the DPHMD booth or visit us on the web at

http://web.utk.edu/~dphmd/
Objectives

- Students with physical disabilities often require the use of assistive technology during literacy instruction. This presentation will demonstrate the use of low to high tech assistive technology solutions and effective instructional strategies to increase access to literacy and promote increased achievement in reading and writing for students with physical disabilities.

- Participants will acquire knowledge about:
  - Implementing low-tech to high-tech solutions for access to literacy for students with physical disabilities
  - Incorporating augmentative and alternative communication devices into literacy programming for students with physical disabilities and complex communication needs
  - Using the Nonverbal Reading Approach to teach a reading decoding strategy to students with complex communication needs
Barriers to Literacy for Students with Physical Disabilities

- Decreased access to materials due to motor limitation
- Restricted communication
- Health factors, fatigue & endurance
- Experiential deficits & differences in concept development
- Interaction of additional disabilities
- Psychosocial, attitudinal & environmental factors
Overcoming Barriers

AT!
Stumbo, Martin, and Hedrick (2009) found, for individuals with physical disabilities, that “appropriately chosen and implemented assistive technology” (p.108) is crucial for increasing the level of participation in education, employment, and independent living to levels similar to peers without disabilities.
Resources: Literacy & AT for Students with Physical Disabilities

• To document literacy needs of your students:
  – Literacy Profile
  – http://education.gsu.edu/PhysicalDis/strategies/literacy.html

• Ideas of AT solutions and devices
  – AT Checklist
Issues with AT Implementation

- 2/3 of AT devices are abandoned within the first year after purchase! (Bryant & Bryant, 2002).

- AT abandonment for students with physical disabilities:
  - Reasons
    - Inadequate assessment
    - Inadequate training
    - Inconsistent use
    - Lack of ongoing support and data collection
    - Attitudes toward technology
    - Device takes too much effort and time
Cultural & Social factors

- Cultural factors
  - Not all cultures view independence in the same way

- Social factors
  - Some students will not use a device in general education because of the impact on self-esteem or peer relationships
    - Increase the acceptability of device by
      - Decreasing the stigma of the device by introducing the device to all students in the classroom and letting them explore and understand its purpose.
      - Assigning peer helpers who are trained in the use of the device
      - Allowing the student to learn the use of the device in a separate environment in order to become comfortable and proficient with its use prior to using the device in the general education setting
Baker’s Basic Ergonomic Equation

- Developed in light of computer-human interactions (Baker, 1986); modified by King (1999) to fit AT

Motivation of AT user to pursue and complete a task

= Successful or unsuccessful AT use

Physical effort + Cognitive effort
+ Linguistic effort + Time load

Increase motivation by...

- Providing rationale
- R+
- Shaping
AT to Promote Access to Reading for Students with Physical Disabilities
Low Tech AT for Reading Access

- Stabilization or positioning of materials
  - Dycem
  - Slant Board

- Magnifiers

- Page Turners (nonelectronic)

- Book Adaptations
  - Page Fluffers
  - Other book modifications

- Book Additions
  - Reading Guides/ Typoscope
  - Colored Line Prompting Strategy
**Colored Line Prompting Strategy**

For students who lose place reading line of print

The boy then turned and saw his friend holding his puppy. He was so happy that his lost puppy was found. Tears began to swell in his eyes. He now knew how much the puppy meant to him and how he would always take good care of him.

*Fading the color line:*

The boy then turned and saw his friend holding his puppy. He was so happy that his lost puppy was found. Tears began to swell in his

*Further fading the color line:*

The boy then turned and saw his friend holding his puppy. He was so happy that his lost puppy was found. Tears began to swell in his

- [http://education.gu.edu/PhysicalDis/strategies/reading.html](http://education.gu.edu/PhysicalDis/strategies/reading.html)
AT for Access to Reading: Alternate Text

- Recorded Text
  - Tape Players
  - CD Players
  - MP3 Players

- E-text
  - Kindle – physical & visual access, some books speak
  - Specialized devices
  - Computer with text-to-speech software
AT for Access to Reading: Computerized Text (E-Text)

- Computerized Books
  - Commercially available
  - Teacher-made books
    - Classroom Suite, MyOwnBookshelf
    - PowerPoint
- Downloadable text with handheld devices or computer with text-to-speech software
PowerPoint Examples

http://web.utk.edu/~mbc/PowerPoint
AT for Access to Reading: Sources of E-text

Sites that require Student or System Account
Learning Ally
- http://www.learningally.org/
Bookshare
- http://www.bookshare.org/

Other sources: Accessible Books
Tarheel Reader
- http://tarheelreader.org/
Cast UDL Book Builder

Free (expired copyright materials)
Project Gutenberg
- http://www.gutenberg.org/
AT for Access to Reading:
Computerized Text (E-text), cont.

- Downloadable text with text-to-speech software
  - Text-Reading Software (text-to-speech software)
    - Kurzweil 3000
    - Read:OutLoud (part of SOLO)
    - Wynn
  - Free options:
    - ReadPlease or Natural Reader
ReadPlease

- [http://www.readplease.com/](http://www.readplease.com/)

- All purpose text-to-speech software. Reads any text you paste into it. FREE!

- Copy and paste text from source (e.g., Project Gutenberg) into ReadPlease for quick, free, accessible materials
Strategies for Increasing Access to Conventional Literacy for Students with Complex Communication Needs
Literacy Issues for AAC Users

- Decreased experiences
- Motoric problems interfere with access to literacy
- AAC device issues
  - Different syntax of AAC devices
  - Often not proficient with AAC
  - AAC often with limited vocabulary
  - Inability to ask questions, hear them read
Specialized Strategy: Nonverbal Reading Approach (NRA)

- Designed for students with severe speech and physical impairments

- Used in conjunction with any phonics based reading curriculum

- Specifically addresses teaching students a method for decoding words and a method for teachers to assess if their students are decoding properly
Nonverbal Reading Approach

1) GUIDED PRACTICE:
   • Teach them a strategy to decode words using inner speech

2) EVALUATE:
   • Use diagnostic distractor arrays, error analysis, corrections

3) EXPANSION:
   • Word level: automaticity
   • Decoding strategy using independently
   • Read line print, check accuracy, comprehension
   • Spell & write target words
Nonverbal Reading Approach

GUIDED PRACTICE

• Nonverbal Reading Approach: Guided Practice
  – Inner speech (internal speech)
  – Recognition of thinking linguistically (i.e., self-talk, voice in your head)

  – Strategies:
    • 1. Tell kids to say words in their heads (inner speech)
    • 2. Sing songs like BINGO
    • 3. Show picture & have them not say word aloud-prompt to say it in his/her head.
## Nonverbal Reading Approach

### GUIDED PRACTICE

<table>
<thead>
<tr>
<th>TEACHER</th>
<th>STUDENT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Say Sounds:</strong></td>
<td>1. Says it using inner speech</td>
</tr>
<tr>
<td>“Say in your head this sound”</td>
<td></td>
</tr>
<tr>
<td>“while teacher points to each</td>
<td></td>
</tr>
<tr>
<td>letter (or group of letters) and</td>
<td></td>
</tr>
<tr>
<td>teacher models sound (e.g., mmm).</td>
<td></td>
</tr>
<tr>
<td>Repeats for each sound.</td>
<td></td>
</tr>
<tr>
<td><strong>2. All Together:</strong></td>
<td>2. Says it using inner speech</td>
</tr>
<tr>
<td>“In your head, say it all together</td>
<td></td>
</tr>
<tr>
<td>without stopping between the</td>
<td></td>
</tr>
<tr>
<td>sounds” (e.g., mmmaaannn)</td>
<td></td>
</tr>
<tr>
<td><strong>3. Make it fast:</strong></td>
<td>3. Says it using inner speech</td>
</tr>
<tr>
<td>“Say it in your head fast” (e.g.</td>
<td></td>
</tr>
<tr>
<td>man).</td>
<td>(later use Mnemonic SAM)</td>
</tr>
</tbody>
</table>
NRA Evaluation

Diagnostic Distractor Array

• **Diagnostic Distractor Array Considerations:**
  – 1) Carefully choose a set of words to choose answer
  – 2) Have words with similar sounds
  – 3) Put in sounds/words confused in past after additional teaching of sounds/word
  – 4) Record exact error
  – 5) Analyze errors and correct
Examples of poor / good arrays:

Teacher says read this word:
I will give you 4 (spoken choices)

- cat dog bird mouse
- can call cat come
- cat cot can dog
NRA Evaluation
Diagnostic Distractor Array

WHY IT’S A DIAGNOSTIC DISTRACTER ARRAY:

| cat   | cot   | can   | dog |

• Carefully planned out
  – one has different vowel
  – one has different ending
  – one is very different

• Carefully analyze errors
  – If chose “cot” what could that tell you?
  – If chose “can” what could that tell you?
  – If chose “dog” what could that tell you?
## Nonverbal Reading Approach Evaluation

**TEACHER**

1. Shows student word and guides student (without providing sounds) in using inner speech with the three step process of:
   a) Saying the sounds
   b) All together (blending sounds),
   c) Make it fast (blending fast)

2. Gives student diagnostic distractor array (usually giving choices orally) to make a selection

3. If correct: praise/reinforcement
   If incorrect: correct, go through guided practice providing sounds

**STUDENT**

1. Uses inner speech to sound out letters/units blend letters/units say it fast

2. Selects answer from diagnostic distractor array

3. Receives reinforcement or engages in correction
Using Technology with the NRA

- Evaluation – student response to diagnostic distractor array
- Guided Practice & Independent Practice
- Expansion Activities
Technology: Evaluation

Student Responding to the Diagnostic Distractor Array

- **One selection response:** Student listens to auditory choices and only responds using the device when his/her choice is spoken.
  - Low tech AAC (paper board, eye gaze board): create a board with “Yes” or “That one” along with “I don’t know.”
  - Mid tech AAC (voice output communication aid such as the BigMack or LittleMack): program the device to say, “Yes” or “That one.” (Alternately, student responds to selection with a physical movement and device is programmed with, “I don’t know. I need to sound it out again.”)
  - High tech AAC (dynamic display device such as Dynavox or laptop with Speaking Dynamically Pro): Program two buttons: “Yes” or “That one” and “I don’t know.”

- **Multiple selection response:** Student listens to auditory choices that are paired with multiple “buttons” for selection
  - Low, Mid, High Tech AAC: Create a board with four buttons: A, B, C, D
Guided & Independent Practice

AAC

- Self-operated auditory prompt for remembering the strategy
  - use a Step-by-Step programmed to speak the steps aloud to the student when he/she is “stuck” on a word
  - program the steps into the student’s dynamic display AAC device (e.g., Dynavox, Speaking Dynamically Pro)
- Program words onto student’s high tech AAC device
NRA: Guided & Independent Practice

PowerPoint

- Presentation of words: Teacher-Assisted Instruction
  - Create a PowerPoint presentation with the student’s words (no voice) rather than using flashcards

- Presentation of words: Computer-Assisted Instruction
  - Create a PowerPoint presentation with the student’s words with recorded narration that models the strategy steps and the sounds
PowerPoint: Computer-Assisted Instruction

- Allows for Independent Practice
- Reduces 1:1 Adult Instruction Time
- Coleman-Martin, Heller, Cihak, & Irvine (2005) found that NRA script delivered by PPT was equal to teacher-directed instruction
  - PowerPoint presentations constructed to present words
  - Presentations set up to match script from NRA
  - Different colors used to emphasize letter(s) for sound being heard
Example:

Computer-Assisted Guided Practice: Corrective Reading Lesson 1 (Partial)
me
me
me
me
Example:

Computer-Assisted Evaluation and Additional Instruction
mad
ma
mad
mad
mad
mad
mad
Teaching Implications

- PPT may be more efficient than teacher-directed instruction
- Provides multiple opportunities to practice words with less teacher time
- Students are able to practice in multiple environments
- Computer-assisted instruction may be more motivating for some students
  - Students with autism spectrum disorders
  - Allows for independent work
Technology: Expansion of NRA

- Additional Instruction
  - Create electronic dictionary of words that have been taught
  - Sound out larger words (recognizing “chunks”)
    - Program boards on AAC device with common parts of words (prefixes and suffixes, onsets and rimes) for student to practice/refer to
  - Read a line & stop at unknown words
    - Program a page on AAC device with steps and a button to ask for help when he/she does not recognize the word
  - Check for accuracy & comprehension
    - Use software (SDPro, Kurzweil, Write:OutLoud) for student to read along with story to check himself or herself, have student write/type words he/she did not know
    - Program boards on AAC device or create PowerPoint that checks for comprehension
  - Spell & write target words
    - Using computer or onscreen keyboard on AAC device
Other AAC for Access to Literacy

- General Reading Page
- Literacy Activities on High Tech AAC Device
AT for Writing
Low Tech AT for Handwriting
Low Tech
AT for Handwriting

- Adapted paper (larger spacing, darker lines, raised lines)

- Paper stabilization/ Positioning
  - Slant board
  - Clip board

- Alternatives to handwriting
  - Magnetic words and letters
  - Letter stencils
  - Letter and name stamps
Mid Tech AT for Writing

- Dictating
  - Tape player
  - Digital recorder

- Portable Word Processors
  - Access to writing & notetaking
High Tech AT for Writing: Computer Access
Low tech devices used to assist with computer access (e.g., handpointers, headpointers, mouthsticks)

Accessibility features (e.g., Sticky Keys, Filter Keys, mouse cursor slowed down)

Adaptive keyboard (e.g., smaller, larger, onscreen)

Hand-controlled adaptive input devices (e.g., trackballs, joysticks, trackpads)

Head-controlled input device (e.g., SmartNav) or eye tracking input system

Switches with scanning software (e.g., switch with switch interface and ScanBuddy software)
Writing: Physical Access to Documents

- PDF Manipulation software
- Paperport
- PDF Annotator
Chapter 7: Cell Structure and Function

Chapter Vocabulary Review

Matching:

C

1. cell
2. cell membrane
3. cell wall
4. nucleus
5. cytoplasm
6. prokaryote
7. eukaryote
8. organelle
9. chromatin
10. phagocytosis

Matching:

a. organism whose cells contain a nucleus
b. granular material visible within the nucleus
c. the basic unit of life
d. specialized structures within a cell that perform important cell functions
e. organism whose cells do not contain a nucleus
f. strong layer around the cell membrane that protects the cell
g. process by which extensions of cytoplasm engulf large particles
h. large structure that contains the cell's genetic information
i. thin, double-layered sheet around the cell
j. portion of the cell outside the nucleus

Multiple Choice:

11. The small dense region in the nucleus where the assembly of ribosomes begins is called the __________.
   a. nucleolus  b. nuclear envelope  c. chloroplast  d. vacuole

12. The hollow tubes of protein that help maintain the shape of the cell are called __________.
   a. microfilaments  b. mitochondrion  c. microtubules  d. ribosomes

13. Which organelles can use energy from sunlight to create energy-rich food molecules?
   a. lysosomes  b. Golgi apparatus  c. vacuoles  d. chloroplasts

Labeling Diagrams:

On the lines provided, label the structures found in an animal cell that correspond with the numbers in the diagram.

1. __________
2. __________
3. __________
4. __________
5. __________
6. __________
7. __________
8. __________
9. __________
10. __________

Completion:

On the lines provided, complete the following sentences.

20. The distinct, threadlike structures that contain the genetic information of the cell are called __________.
21. Particles tend to move from an area of high concentration to an __________.
Writing: Standard Word Processors

- Features for access
  - Template
  - Auto Correct (Abbreviation Expansion)
  - Find/Replace
  - (Word count)

- Features for written production
  - Auto Correct
  - Spell and Grammar checks
  - Word Count/Writing Level
  - Dictionary and Thesaurus
  - Grammar Settings
Writing: Adaptive Word Processing

- Emergent Writing (e.g., Grid Word Processing)
- Talking or Symbol Processors
- Word Prediction
Emergent Writers: Grid Word Processing

- Clicker 5 (similar activities can be built on high tech AAC devices)
Sentence Building: AAC Device

I like to eat cookies.
I don't like to go shopping.
I don't like to listen to music.
I don't like to read books.
I saw the cookie.
You ate the ball.
Mary wanted the movie.
The dog took the ring.
Adaptive Word Processing: Talking Word Processors

- Write:OutLoud

This is Write:OutLoud. As I type, each word is spoken. There are several features to help struggling or reluctant writers.
Symbol Word Processing

- Symwriter

This is Symwriter! As I type, symbols appear above each word!
Adaptive Word Processing: Word Prediction

- Word Prediction
  - Originally developed to speed word processing for individuals with physical disabilities
  - Mixed findings in research
  - May significantly reduce keystrokes and fatigue
AT for Written Expression

- Graphic Organizers
  - Especially helpful because of difficulties with concept development
THANK YOU FOR ATTENDING!

If you have questions:

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Resources:
MBC’s site:  http://web.utk.edu/~mbc
PowerPoint:  http://web.utk.edu/~mbc/mbc_materials  and  http://web.utk.edu/~dphmd/DPHMD_Convention_Handouts

Georgia Bureau for Students with Physical and Health Impairments site:  http://education.gsu.edu/PhysicalDis