

## Improving Literacy Outcomes for Individuals who require AAC

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## Benefits of literacy skills

- Literacy skills are critically important
  - Allow fuller participation in education
  - Enhance employment opportunities
  - Support personal expression & social relationships (e.g., texting, blogs, Facebook)
  - Allow access to enjoyable leisure pursuits (e.g., reading, surfing the Internet)

## Benefits of literacy skills for individuals who require AAC

- Literacy skills are even more important for individuals who have limited speech & require AAC
  - Expand communication options significantly
  - Increase perceptions of competence
  - Increase self-esteem

## Literacy outcomes for individuals who require AAC

- Unfortunately, many individuals who require AAC
  - Do not attain basic literacy skills and/or
  - Are underachieving in literacy compared to their peers
- These poor outcomes result from
  - Low expectations for these students
  - Lack of appropriate evidence-based instruction adapted to meet the needs of individuals who have limited or no speech

## Goals of presentation

- Share evidence-based intervention designed to enhance the literacy skills of individuals who require AAC
  - Describe intervention
    - Target skills, instructional procedures, materials
  - Share case examples to illustrate intervention and outcomes
- Project is part of a large federally-funded research grant
  - Funded by the National Institute on Disability and Rehabilitation Research (NIDRR) as part of grant # H133E030018

## Components of effective evidence-based literacy intervention

1. Sufficient time allocated for instruction
2. Appropriate instructional content
3. Effective instructional procedures
4. Adaptations to allow active participation of individuals with limited or no speech
5. Positive rapport and motivating instruction

### 1. Allocate sufficient time for literacy instruction

- Allocate sufficient time for literacy instruction
  - Start literacy instruction at early age
  - Provide instruction on a daily basis
  - However, our research demonstrates that significant literacy gains can be achieved
    - Even if the amount of instruction is less than ideal
    - Even with older students

### 2. Target appropriate skills

- Reading to student & talking about texts
- Phonological awareness skills
- Letter-sound correspondences
- Decoding skills
- Shared reading
- Sight word recognition skills
- Reading and understanding books / other texts
- Early writing skills

### 3. Provide direct instruction in basic skills

- Model
  - Instructor demonstrates the skill
- Guided practice
  - Instructor provides scaffolding support to help student perform skill successfully
  - Gradually fades scaffolding support
- Independent practice
  - Student performs skill independently
  - Instructor provides feedback

### 3. Apply skills in meaningful literacy activities

- Provide frequent opportunities to apply skills in meaningful literacy activities
  - Increase motivation for learning to read & write
  - Enhance generalization to new materials / contexts
  - Provide additional opportunities to practice skills
    - Build fluency in basic skills
    - Practice integration of skills required to read and write

### 4. Provide adaptations for students who have limited or no speech

- Adapt procedures to accommodate needs of individuals who have limited or no speech
  - Eliminate the need for spoken responses
  - Compensate for lack of oral production /rehearsal
    - Model oral production
    - Encourage subvocal rehearsal
      - “Say it in your head”

### 5. Positive rapport & motivating instruction

- Build intrinsic motivation for learning
- Ensure rapport is positive & instruction is motivating
  - Build on student strengths
  - Capitalize on student interests
  - Develop positive relationship
    - Focus on instruction /Ignore extraneous behavior
    - Celebrate student success

## Case #1

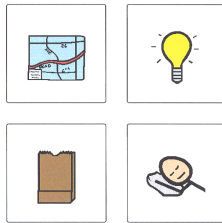
- 4 ½ years old
- Cerebral palsy
- Nonambulatory; limited function with hands
- Attends preschool
- Loves sports
- Communicates through
  - Vocalizations
  - Low tech communication boards
  - Waiting for funding for a speech generating device
- Preliterate

## First steps in literacy intervention

- At each stage of literacy intervention, the instructor targets 3-4 skills
- At first stage of literacy instruction, target
  - Reading to student & talking about texts
  - Phonological awareness skills
  - Letter-sound correspondences
  - Decoding skills
  - Sight word recognition skills
  - Shared reading
  - Reading and understanding books / other texts
  - Early writing skills

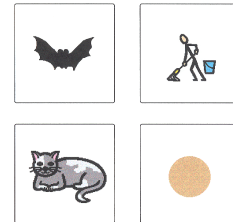
## Instruction in sound blending

- Goal
  - The student will blend phonemes presented orally in sequence & determine the target word
- Task
  - Present 4 or more AAC symbols & label orally
  - Say the target word orally with each phoneme extended 1-2 seconds
  - Student must blend the phonemes & point to the AAC symbol or say/sign the word



## Instruction in phoneme segmentation

- Goal
  - The student will match a target phoneme presented orally to the AAC symbol that starts with the phoneme
- Task
  - Present 4 or more AAC symbols & label orally
  - Say target phoneme e.g., /b/
  - Show letter (e.g., b) at the same time
  - Student must point to the AAC symbol of the word that starts with the target phoneme or say/sign the word



## Instruction in letter sound correspondences

- Goal
  - The student will match a target phoneme presented orally to the correct letter
- Task
  - Present 4 or more letters
  - Say the target phoneme e.g., /b/
  - Student must point to the letter that represents the target phoneme

m	t
a	b

## Progression of instruction in letter-sound correspondences

- Teach letter sounds, not letter names
- Teach 1 letter at a time
  - a, m, t, p, o, n, c, d, u, g, h, f, i, s, b, l, e, r, w, k, x, v, y, z, j, q
- Teach
  - Lower case letters first; later teach upper case
  - Letters that are used most frequently first
  - Letters that are dissimilar first

## Typical early instructional session 20-30 minutes

10 minutes	Phonological awareness skills • sound blending & phoneme segmentation
5-10 minutes	Letter sound correspondences
5-10 minutes	Reading books to the student & talking about the books

## Next steps in literacy instruction

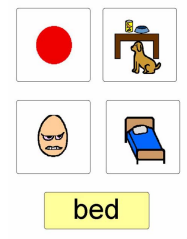
- Once student
  - Is competent with sound blending and
  - Knows approximately 6-7 letter-sound correspondences
- Teach single word decoding
- Teach sight word recognition skills
- Introduce shared reading activities
  - Provide opportunities to apply skills in meaningful contexts

## Next steps in literacy instruction

- Continue to
  - Teach new letter sound correspondences; review known ones
    - As student learns new letters / sounds, introduce new decoding words using these letter sounds
  - Practice phonological awareness skills; build fluency
  - Read to the student & talk about the text

## Instruction in single word decoding

- Goal
  - The student will decode a written word & match it to the correct AAC symbol or say/sign the word
- Task
  - Present 4 or more AAC symbols
  - Present the target written word
  - Student must read the word and point to the AAC symbol of the target word or say/sign the word

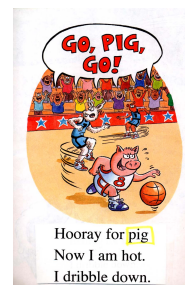


## Instruction in shared reading

- Apply decoding skills during shared reading
  - Highlight target words
  - Read sentence out loud and track words with finger
  - Pause at the target word
  - Student must decode word
    - Select the AAC symbol for the word from low tech display or SGD
    - Say or sign the word
- Gradually increase the number of target words until students are reading full sentences



## Applying decoding skills in shared reading activities



## Instruction in sight word recognition

- Teach sight word recognition
  - Highly motivating words that are too complex to decode
  - Irregular words that are frequently occurring
- Goal /task
  - Present 4 or more written words
  - Say the target sight word
  - Student must select the correct written word
  - Use this task if sight words are not easily imaged

Spiderman	football
basketball	school

## Typical instructional session 30-40 minutes

5 minutes	Letter sound correspondences • Teach new sounds & review known
10 minutes	Single word decoding
5-10 minutes	Sight word recognition skills
10 minutes	Shared reading activities • Apply decoding & sight word skills
5 minutes	Review sound blending & phoneme segmentation skills

## Results for Case #1

- 5 years old; after approx 40 hours of instruction
- Demonstrates phonological awareness skills
  - initial phoneme segmentation >90% accuracy
  - sound blending >90% accuracy
- Knows letter sound correspondences
  - all of the consonants
  - all of the short vowels; learning the long vowels
- Reads several hundred regular words
  - Regular consonant-vowel-consonant (cvc), vc, cv words
  - Decodes novel cvc words using known letters/sounds

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## Results for Case #1

- Participates actively in shared reading activities
  - Decodes cvc, vc, and cv words
  - Recognizes high interest sight words
- Beginning to read simple sentences independently
- Enters Kindergarten as a reader
  - Is fully included in a regular education classroom

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## Case #2

- 3 years 10 months old
- Autism
- Preschool
  - One on one aide (TSS)
- Loves Mickey Mouse, Sesame Street
- Communicates via
  - A few signs
  - PECS
  - Vocalizations /speech approx
- Frustrated
  - challenging behaviors
- Preliterate

## Early literacy instruction

- Initially focused on teaching
  - Phonological awareness skills
    - Sound blending
    - Phoneme segmentation
  - Letter sound correspondences
- Then focused on teaching
  - Single word decoding
  - Sight word recognition skills
  - Application of skills during shared reading

## Teaching sound blending with visual supports

- Present written word with illustration covered
- Point to letters in sequence
  - Say letter sounds in sequence with each sound extended 1-2 seconds
  - If student knows letter sounds, he/she can say them
- Student must blend the sounds and
  - select the AAC symbol / picture from choices provided or
  - say/sign the word



mad

## Next steps in literacy instruction

- Expand decoding skills
  - Introduce longer words
    - E.g., cvcc & ccvc words (e.g., wind, stop, flag)
  - Introduce simple decoding rules
    - silent e /long vowel
- Continue to expand sight word recognition skills
  - High interest words & irregular high frequency words
- Provide opportunities to apply decoding & sight word skills during shared reading
  - Gradually increase the number of target words until students are reading full sentences



Mickey and Minnie have fun.



Mickey hugs Minnie.

## Next step

### Building reading comprehension

- Reading comprehension is complex
  - track through sentence visually from left to right
  - decode or recognize by sight each word in sequence
  - access meaning of all words
  - process all words in sequence to derive meaning of sentence (or longer text)
  - relate meaning to prior knowledge /experience to comprehend text
- Build reading comprehension
  - First ensure basic comprehension
  - Then build more advanced comprehension skills

## Ensure basic comprehension skills

- Goal
  - Student will read each word in sentence and then process words together to derive meaning of sentence (or longer text)
- Task
  - Present 3 or more pictures /illustrations
  - Present the written text
  - Student must read the sentence and point to / select the correct picture to represent the text

## Answering reading comprehension questions

- Student reads the text
  - Initially student reads one page; answers question
    - Reduce working memory demands
  - Later reads several pages; then answers questions
- Instructor asks appropriate questions
  - Start with simple factual questions
  - Later introduce more complex inference questions
- Student may respond via
  - Speech
  - Signs
  - Pointing to pictures or written choices /multiple choice questions
  - Typing answers /using letter cards

### Skills targeted in literacy intervention

- Reading to student & talking about texts
- Phonological awareness skills
- Letter-sound correspondences
- Decoding skills
- Shared reading
- Sight word recognition skills
- Reading and understanding books
- **Early writing skills**

### Building writing skills

- Writing skills are critical in today's society
- Writing should be a key part of literacy instruction
  - Teach writing skills in parallel to reading skills
- Learning to write is more difficult than learning to read
  - Writing imposes additional working memory demands
    - Requires learner to dynamically encode (Ehri, 2000)

### Skilled writing

- Skilled writing requires integration of
  - Skills in narrative, expository, persuasive or other genres
  - Semantic, syntactic, & morphological skills
  - Phoneme segmentation
  - Letter sound correspondences
  - Sight word skills /spelling of irregular words
  - Keyboard knowledge (or handwriting skills)
  - Knowledge of conventions of writing
    - e.g., capitalization, punctuation

### Writing instruction

- Teach basic skills
  - Phoneme segmentation skills
  - Letter-sound correspondences
  - Keyboard knowledge
  - Encoding skills – single words
- Use adapted keyboard
  - Introduce keyboard as soon as student knows approximately 3-4 letter sounds
  - Adapt keyboard with lower case letters

### Adapted keyboard



### Writing instruction

- Provide opportunities to apply skills in meaningful writing activities
  - Telling stories
    - Use photos or pictures as visual supports
    - Start with familiar motivating experiences
  - Publishing books
    - Use the books for reading activities
    - Share books with others

### Results for Case #2

- 5 years 2 months old
  - Results after approximately 60 hours of instruction over 50 weeks
- Mastered basic literacy skills
  - Letter sound correspondences
  - Single word decoding / sight word recognition skills
    - Reads more than 170 words independently
    - Decodes novel regular words
    - Recognizes frequently occurring sight words

### Results for Case #2

- Reads simple books independently
  - Reads stories with 30-40 words
  - Responds to factual wh-questions with >80% accuracy
  - Learning to respond to inference questions
- Writing skills
  - spells more than 50 words
    - Attempts any word with sound spelling
  - writes simple stories
- Enters Kindergarten as a reader and writer
  - Literacy skills exceed those of most typically developing peers
  - Included in regular education class

### Results for Case #2

- Use of written language as visual support for speech & language development
  - Use of letters / written words to support speech production
    - Improved intelligibility
    - Increased length of utterances
  - Use of written words /sentences to support language development
    - Increased range of vocabulary
    - More complex sentence structures / word endings

### Adaptations for older students and for students with multiple disabilities

- Many individuals who require AAC do not receive literacy instruction when young
  - It is never too late to start literacy instruction
- Special challenges with students who are older and who have multiple disabilities
  - Limited language skills
  - Learned passivity or challenging behaviors
  - Low expectations
  - Reduced opportunities for learning

### Adaptations for older students with multiple disabilities

- Literacy intervention should include
  1. Sufficient time for instruction
  2. Appropriate instructional content / skills
  3. Effective instructional procedures
  4. Adaptations to allow active participation of individuals who have limited speech
  5. Positive rapport and motivating instruction
- Adaptations to accommodate unique challenges
  - Older students
  - Multiple disabilities

### Case #3

- 8 years old
- Weissenbacher-Zweymuller Syndrome
- Tracheotomy
- Visual impairment
- Bilateral sensorineural hearing loss
- Uses a power wheelchair
- Limited fine motor skills
- Attends life skills class
- Communicates telegraphically using
  - Few adapted signs
  - Speech generating device (SGD)



### Adapting instruction to meet complex needs

- Accommodate visual impairment
  - Ensure appropriate correction/ glasses
  - Provide large print – 80 point font
  - Provide color contrast
    - black text on yellow background
- Accommodate hearing impairment
  - Utilize FM system / bilateral hearing aids
  - Provide augmented input
    - speech + sign or writing

### Adapting instruction to meet complex needs

- Incorporate instruction in recognition of motivating sight words early on
  - Provide access to shared reading as soon as possible
  - Increase motivation
- Introduce shared reading activities early
  - Utilize highly motivating personalized books
    - Enhance motivation
    - Provide context to support understanding

### Adapting instruction to meet complex needs

- Adapt instruction in letter-sound correspondences
  - Modify sequence of letter-sounds to accommodate hearing loss
  - Start with sounds that look different
- Provide visual supports when teaching phonological awareness skills
  - Reduce demands on auditory processing
  - Introduce sound blending with written words

### Case #3 Next steps in literacy instruction

- Continue instruction in sight word recognition, letter sounds & decoding skills
- Apply sight word & decoding skills during shared reading
  - Introduce wide range of reading materials
    - Curriculum-related materials
  - Introduce reading buddy program
  - Gradually increase number of words per sentence

### Results for Case #3

- After 55 hours of instruction (16 months)
  - 9 years old
- Letter sound correspondences
  - Increased rate of acquisition over time
  - Knows 19 letter-sound correspondences
    - a, m, t, b, i, r, o, c, e, g, u, l, n, s, d, h, f, p, and j
  - >90% accuracy from keyboard

### Results for Case #3

- Reading
  - Reads 60+ words with >90% accuracy
  - Reads short sentences / simple stories independently with >90% accuracy
  - Reads successfully with adults and peers
- Early writing
  - Locates letters on keyboard
  - Types known cvc words accurately
  - Learning to type simple sentences
- Language skills
  - Use of written language to build language skills
    - Increases in vocabulary
    - Building syntax

## Summary of research results

- Participants
  - 3 years old to adolescents
  - Wide range of special needs
    - autism, cerebral palsy, developmental apraxia, Down syndrome, multiple disabilities
  - Using various means of communication
    - speech approximations, signs, PECS or other low tech systems, speech generating devices (SGDs)
- 100% of participants learned to read
  - Time to acquisition varied across participants
  - Schools & families reported high levels of satisfaction with instruction & outcomes

## The art and science of literacy intervention

- The science of literacy intervention
  - Implement effective evidence-based instruction
    - Provide sufficient time for instruction
    - Target appropriate instructional content / skills
    - Utilize effective instructional procedures
    - Provide adaptations to allow active participation of students who have limited speech
    - Ensure positive rapport and motivating instruction
  - Monitor effectiveness with each student
    - Adapt as required to ensure individual success

## The art and science of literacy intervention

- The science alone is not enough
- The “art” of literacy intervention is critical
  - the belief and the commitment to the right of all individuals to have the opportunity to learn & seek their full potential

## Additional resources

- Websites /webcasts
  - Light, J. & McNaughton, D. *Literacy instruction for learners with autism, cerebral palsy, Down syndrome and other disabilities*. <http://aacliteracy.psu.edu>
  - Light, J. & McNaughton, D. (2006). *Maximizing the literacy skills of individuals who require AAC*. Webcast at <http://aac.psu.edu/?p=533>
  - Light, J & McNaughton, D. (2011). *Improving literacy outcomes for individuals with autism spectrum disorders and limited speech*. Webcast at <http://aac.psu.edu/?p=157>
  - Research, education, and web resources in AAC at Penn State <http://aac.psu.edu>

## Additional resources

- Publications
  - Light, J. & McNaughton, D. (2009). *Accessible Literacy Learning (ALL) Curriculum: Evidence-based reading instruction for learners with autism, cerebral palsy, Down syndrome and other disabilities*. San Diego, CA: Mayer-Johnson
  - Light, J. & McNaughton, D. (2013). *Literacy intervention for individuals with complex communication needs*. In D. Beukelman & P. Mirenda. *Augmentative and Alternative Communication: Supporting children and adults with complex communication needs*. Baltimore, MD: Brookes Publishing Co.
  - Light, J. & McNaughton, D. (2009). *Meeting the demands of the curriculum for conventional and advanced readers and writers who require AAC*. In G. Soto & C. Zangari (Eds.), *Practically Speaking: Language, literacy, and academic development for students with AAC needs*. Baltimore, MD: Paul H. Brookes Publishing Co.
  - Light, J., McNaughton, D., Weyer, M., & Karg, L. (2008). *Evidence-based instruction for individuals who require augmentative and alternative communication: A case study of a student with multiple disabilities*. *Seminars in Speech and Language*, 29, 120-132.

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  - We are grateful for their support in helping us to make a difference in the lives of individuals who require AAC