Supporting Literacy in Individuals with Autism Spectrum Disorder through the use of Assistive Technologies

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Objectives
✓ Gain understanding of common reading barriers for students with ASD
✓ Gain understanding of features of technology that address reading barriers
✓ Gain an understanding of the process for feature matching student needs and technology features

Components of Reading

The reading problems of those with autism spectrum disorder may not be obvious initially and may become more apparent over time as reading demands increase.

Autism Spectrum Disorder Characteristics

<table>
<thead>
<tr>
<th>DSM-5</th>
<th>Federal Definition of Autism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Interests and Repetitive Behaviors</td>
<td>Engagement in repetitive activities and stereotyped movements; difficulty changing activities or focus; engagement in repetitive behaviors</td>
</tr>
</tbody>
</table>

- a) Stereotyped or repetitive speech, motor movements, or use of objects
- b) Excessive adherence to routines, ritualized patterns of verbal or nonverbal behavior, or excessive resistance to change
- c) Highly restricted, fixated interests that are abnormal in intensity or focus
- d) Hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of environment

<table>
<thead>
<tr>
<th>DSM-5</th>
<th>Federal Definition of Autism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualitative Impairments in social communication</td>
<td>Disability affecting social interactions</td>
</tr>
</tbody>
</table>

- a) Deficits in social-emotional reciprocity
- b) Deficits in nonverbal communicative behaviors used for social interaction
- c) Deficits in developing and maintaining relationships, appropriate to developmental level
Underlying Characteristics Checklists

<table>
<thead>
<tr>
<th>Area of Developmental Concern</th>
<th>Possible Effect on Literacy and Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language发展</td>
<td>Comprehension of word, sentence, and text</td>
</tr>
<tr>
<td>Oral language</td>
<td>Spoken language relates to written language</td>
</tr>
<tr>
<td>Recognizing and responding to non-verbal language</td>
<td>Misuses context cues and foreshadowing</td>
</tr>
<tr>
<td>Literal interpretation of language</td>
<td>Difficulty with idioms, connotation, multiple meanings, figurative language, hyperbole and personification</td>
</tr>
<tr>
<td>Understanding relationships between words and meaning</td>
<td>Difficulty organizing and categorizing words, impacting recall of information</td>
</tr>
<tr>
<td>Interpretative language abilities</td>
<td>Generating inferences, resolving ambiguity, cause and effect, monitoring comprehension</td>
</tr>
<tr>
<td>Difficulties with pronouns</td>
<td>Loss of meaning and confusion of characters</td>
</tr>
<tr>
<td>Difficulty generating questions while reading</td>
<td>Difficulty establishing meaning and relevance</td>
</tr>
<tr>
<td>Listening and understanding oral language</td>
<td>Misuses own content of oral literacy activities</td>
</tr>
</tbody>
</table>

Socialization and Literacy Impact

<table>
<thead>
<tr>
<th>Area of Developmental Concern</th>
<th>Possible Effect on Literacy and Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play skills</td>
<td>Cognitive development, learning and literacy</td>
</tr>
<tr>
<td>Shared enjoyment</td>
<td>Decreased time in shared activities including reading</td>
</tr>
<tr>
<td>Joint attention</td>
<td>Limited attending to shared activities with others</td>
</tr>
<tr>
<td>Imitative play</td>
<td>Practice of roles and actions in real-life may impact understanding of those roles and actions in storybooks</td>
</tr>
<tr>
<td>Imaginary play</td>
<td>Understanding of imaginary content in books</td>
</tr>
<tr>
<td>Conversations with adults</td>
<td>Decreased language development</td>
</tr>
<tr>
<td>Social experiences</td>
<td>Limited SE skills, limited understanding of vocabulary and storyline (plot, characters, etc.)</td>
</tr>
<tr>
<td>Social understanding</td>
<td>Difficulty relating to storylines and characters</td>
</tr>
<tr>
<td>Perspective-taking</td>
<td>Understanding of characters and interactions</td>
</tr>
</tbody>
</table>

Communication and Literacy Impact

<table>
<thead>
<tr>
<th>Area of Developmental Concern</th>
<th>Possible Effect on Literacy and Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limited general fund of knowledge</td>
<td>Understands less</td>
</tr>
<tr>
<td>Narrow focus of interest/knowledge</td>
<td>Generalization of info may be difficult</td>
</tr>
<tr>
<td>Exposure and then repeated exposure to a narrow range of topics</td>
<td>General reading material is less motivating and interesting, socialization impacted</td>
</tr>
<tr>
<td>Restricted or repetitive play, leisure, or academic activities</td>
<td>World, word and social understanding may result in decreased flexible thinking</td>
</tr>
<tr>
<td>Reading as a restricted and repetitive activity</td>
<td>Isolation results in decreased social understanding and application to materials</td>
</tr>
<tr>
<td>Literal, specific, and concrete understanding</td>
<td>Generalization and imagination may be limited and impact understanding</td>
</tr>
<tr>
<td>Restricted focus</td>
<td>Difficulty with multiple meanings</td>
</tr>
<tr>
<td>Over-selective attention</td>
<td>Shifting focus or attends to multiple details</td>
</tr>
<tr>
<td>Self-stimulatory behaviors</td>
<td>Limits engagement in reading activities</td>
</tr>
</tbody>
</table>

Restrictive and Repetitive Behavior and Literacy Impact

<table>
<thead>
<tr>
<th>Area of Developmental Concern</th>
<th>Possible Effect on Literacy and Comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text-to-Speech</td>
<td></td>
</tr>
<tr>
<td>Spacing</td>
<td></td>
</tr>
<tr>
<td>Alternate Access</td>
<td></td>
</tr>
<tr>
<td>Summarize</td>
<td></td>
</tr>
<tr>
<td>Highlight</td>
<td></td>
</tr>
<tr>
<td>Reading Level</td>
<td></td>
</tr>
</tbody>
</table>

Practice

Socialization and understanding of those roles and actions in real-life may impact understanding of those roles and actions in storybooks.

Limited SE skills, limited understanding of vocabulary and storyline (plot, characters, etc.)

What can you do with accessible text?

Text books published prior to 2006 may not be available.

http://www.nimac.us/
SETT Framework

- **Student**
- **Environment**
- **Task (what is the purpose?)**
  - Connected to the standards
  - Need identified in the IEP
  - ID of weak skills through formative assessment
- **Tool**

Kim

- Very happy and social preschooler (4 years old)
- Word reading ability at a 5th grade level (Hyperlexic)
- Vocabulary understanding is below age range
- Generally gross and fine motor manipulation skills appropriate, but some difficulty with coordination and imitation
- Communication skills are delayed with difficulties in using vocabulary appropriately and word ordering
- Recites content of many different TV commercials and shows
- Visual motor skills delayed for prewriting
- ESL but family speaks primarily English
- Special interest is Nascar racing

Environments

- Integrated preschool program in elementary building
- Twelve students (8 students neuro-typically developing, 4 students with special needs), one preschool teacher, one paraprofessional
- Center based activities involving hands-on/experiential learning, kinesthetic, music, sensory, etc.
- Receives speech and language therapy in classroom in small group (2 x's weekly)

Tasks

- Ask and answer questions and comments about characters and major events in familiar stories
- Retell or re-enact familiar stories
- Communicate with others about text, listen to others, take turns talking and staying on topic
- Recognize and read familiar words or environmental print
Matching Features to Student Needs

<table>
<thead>
<tr>
<th>Needs</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask and answer questions about characters and major events in familiar stories</td>
<td>Picture communication supports of relevant vocabulary text to aid in retelling and connecting words with the vocabulary meaning</td>
</tr>
<tr>
<td>Retell or re-enact familiar stories in appropriate order</td>
<td>Picture communication supports with sequencing features</td>
</tr>
<tr>
<td>Continue vocabulary development</td>
<td></td>
</tr>
<tr>
<td>Find alternate ways to show what he knows since drawing, writing, &amp; speaking skills are delayed</td>
<td>Manipulatives and/or technology choices</td>
</tr>
<tr>
<td>May need to capitalize on his special interest when possible to foster motivation and engagement</td>
<td>Use of Naska when needed</td>
</tr>
<tr>
<td>Communicate with others (e.g., listen to others, take turns talking and speaking about the topic or text being discussed)</td>
<td>Social narratives to support appropriate behavior</td>
</tr>
</tbody>
</table>

Tools for Trial

- Writing with Symbols Mayer Johnson (Win Only)
- Boardmaker Mayer Johnson
- Symbolstix by N2Y

Picture Supports –Creating

- Boardmaker Mayer Johnson
- Writing with Symbols Mayer Johnson (Win Only)

Baltimore City Public Schools

Communication Board
- Symbolstix by N2Y

Picture Supported Digital Books and Supplemental Activities

- Tar Heel Reader

- http://tarheelreader.org/

- http://www.setbc.org/setbc/accessiblebooks/

**Jonah**

- Third grader in general education setting
- Enjoys electronic media
- Uses iPad at school for recreation and leisure
- Excels in math computation
- Good word recognition and spelling but has difficulty understanding the true meaning of many vocabulary words
- Struggles with sequencing, listening capacity, cause-effect, interpreting, predicting, summarizing and making inferences
- Tends to keep to himself in social situations

**Environments**

- 3rd grade general education classroom
- 24 students in the class
- Students sit at tables (4 students per table)
- Jonah sits at table next to teacher's desk
- Attends small group social skills lesson once a week for 30 minutes with SLP/Guidance Counselor

**Tasks**

- Share own point of view and identify how it is different from that of the narrator or characters
- Describe the relationship between events, steps and ideas in a text, using time, sequence, and cause/effect language
- Follow conversational rules (i.e. listening to others, taking turns and speaking one at a time)
## Matching Features to Student Needs

<table>
<thead>
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<tbody>
<tr>
<td>Describe the relationship between events,</td>
<td>Embedded notes and prompts within a story or characters</td>
</tr>
<tr>
<td>Graphic organizers, steps and ideas in a</td>
<td>Highlighting of key points in books</td>
</tr>
<tr>
<td>text, using time, sequence, and cause/effect language</td>
<td></td>
</tr>
<tr>
<td>Can share own point of view and identify</td>
<td></td>
</tr>
<tr>
<td>how it is different from that of the</td>
<td></td>
</tr>
<tr>
<td>narrator story or characters</td>
<td></td>
</tr>
<tr>
<td>Understand meaning of vocabulary words</td>
<td></td>
</tr>
<tr>
<td>Picture/video dictionaries in text</td>
<td></td>
</tr>
<tr>
<td>Follow conversational rules (i.e. listening</td>
<td>Video Modeling</td>
</tr>
<tr>
<td>to others, taking turns and speaking one</td>
<td></td>
</tr>
<tr>
<td>at a time)</td>
<td></td>
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## Tools for Trial

- Graphic organizers
- Embedded notes and prompts within a story or characters
- Highlighting of key points in books
- Picture/video dictionaries in text
- Follow conversational rules (i.e. listening to others, taking turns and speaking one at a time)

## Reading/Writing Software

- **Read&Write GOLD**
  - [Link](http://www.freeminds.cc/RSG/products/wynn.asp)
  - [Link](http://www.kurzweil-edu.com/products/kurzweil-3000.html)

- **Kurzweil 3000**
  - [Link](http://www.freeminds.cc/RSG/products/wynn.asp)
  - [Link](http://www.kurzweil-edu.com/products/kurzweil-3000.html)

- **Embedded Notes**
  - **Bubble Notes**
  - **Kurzweil 3000**
    - [Video](http://www.youtube.com/watch?v=6TJIpZKIasQ)
  - **Highlighter Feature with Extraction**
    - [Video](http://www.youtube.com/watch?v=Hk_OWdFDc80&feature=share&list=PLD25103877CD1D8A6&index=6)
Jada

- Seventh grader
- Enjoys listening to music and dancing
- Likes animated movies
- Limited verbal language
- Fine motor limitations and no standard keyboard access
- Auditory sensitivity
- No word recognition
- Hits, screams, bangs head and throws objects when frustrated
Environments

- Resource room for language arts and math
- 12 students, one special education teacher, two paraprofessionals
- Attends social studies, science, all related arts classes in general education setting with shared paraprofessional
- Receives speech and language therapy once a week for 42 minutes in resource room
- Receives occupational therapy once a week for 42 minutes in resource room or related arts class when applicable

Tasks

- Determine the meaning of words and phrases in text
- Compare and contrast a text to other media versions of text content
- Read and comprehend science/technical texts independently and proficiently

Matching Features to Student Needs

<table>
<thead>
<tr>
<th>Needs</th>
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</thead>
<tbody>
<tr>
<td>Fine motor support to show what she knows</td>
<td>Alternate access (touch screen vs expanded keyboard)</td>
</tr>
<tr>
<td>Read and comprehend science/technical texts independently and proficiently</td>
<td>Alternate access software that includes the features of embedding video, presentation of content, picture supported text, text-to-speech highlighting, expanded keyboard access, custom layouts/content of supporting activities</td>
</tr>
<tr>
<td>Compare and contrast a text to other media versions of text content</td>
<td>See above features</td>
</tr>
<tr>
<td>Determine the meaning of words and phrases in text</td>
<td>Picture supports of words and content</td>
</tr>
<tr>
<td>Communication supports that are durable due to destructive behaviors, to show what she knows, to comment, request, etc.</td>
<td>AAC, cells, voice output vs. no voice output, d/t/ auditory sensitivities, picture supports of vocabulary</td>
</tr>
<tr>
<td>Reduce auditory input</td>
<td>Noise cancelling devices (headphones, ear-buds)</td>
</tr>
</tbody>
</table>

Tools for Trial

- Inteltools Classroom Suite and Intellkeys
  - Picture Supported Digital Books and Supplemental Activities
  - YouTube Video of Biomes
  - https://www.youtube.com/watch?v=ZouWWVySsK8
Video: Showing What You know with Symbols and Biome Activity

http://sda doe louisiana gov/ResourceFiles/Literacy/InformalAssessmentUsingSymbols wmv

Informal Assessment Using Symbols

Mid Tech: Leveled Communication System with Voice Output
Tech Speak
http://amdi.net

Low Tech Content Specific Communication Board
http://fdlsregion3curriculumvisualswikispacescom/Biomes

Auditory Sensory Support
Noise Cancelling Headphones
Earbuds and sound choices

Adam
- Junior in high school
- Attends career center
- Prefers working independently
- Interested in how technology works (repair/technician)
- Literal comprehension skills are fairly good
- Detail oriented
- Deficits in working memory, organization skills, sequencing and planning and accessing relevant background knowledge
- Pragmatic skills deficits
- Verbalization skills more advanced than comprehension of vocabulary

Environments
- Attends high school for required language arts and math courses
- Participates in Interactive Technology Program at career center (2 year program)
- “Case manager” connects with Adam weekly at career center

Tasks
- Determine meaning of symbols, words and phrases when used in scientific or technical context
- Organize self, materials and information for school and work
- Answer questions or solve problems using a variety of media or formats
- Respond appropriately to social situations in the work place
Matching Features to Student Needs

<table>
<thead>
<tr>
<th>Needs</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile solutions for school and work environment</td>
<td>Mobile technologies</td>
</tr>
<tr>
<td>Determine meaning of symbols, words and phrases when used in scientific or technical context</td>
<td>Dictionary support, homophones, confusable words in DJ or RWG</td>
</tr>
<tr>
<td>Organizational skills support</td>
<td>Graphic: Organizers</td>
</tr>
<tr>
<td>Answer questions or solve problems using a variety of media or formats</td>
<td>Adapted websearch tools, video chat tools, voice activated electronic personal assistant “tell me the definition of…..”</td>
</tr>
<tr>
<td>Pragmatic skills support</td>
<td>Video modeling</td>
</tr>
</tbody>
</table>

Full Featured Reading/Writing Software

- Solo
- Read&Write GOLD
- Kurzweil EDUCATIONAL SYSTEMS

Merriam-Webster Dictionary

Electronic File Management Systems

Popplet
Inspiration and Inspiration Maps

http://www.inspiration.com/

You Tube Tutorials

https://www.youtube.com/watch?v=G Ho D6aE CsM

Siri
Apple iOS

Prizmo

Virtual Mentoring-Synchronous

https://www.apple.com/ios/face-time/
http://www.skype.com
### Virtual Mentoring - Asynchronous/Video Modeling

[Image of virtual mentoring]

[http://voicethread.com/](http://voicethread.com/)

### Making Final Decisions

- Trials of tools
- Data collection on relevant variables related to the tasks, environments, and needs
- Ongoing progress monitoring

### Assessment Tool for Technology Based Reading Accommodations

[Image of assessment tool]


### ATIM

- WATI - Reading Part 1
- WATI – Reading Part 2

[ATIM logo]

[http://www.atim.net](http://www.atim.net)