

Finding, Understanding, and Using Research about Assistive Technology to inform your Practice, Part 2

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How might you Increase Reading Comprehension?

1. Use of audio text alone
2. Use of text to speech software
3. Use of audio text + print text + training in note taking

What would you choose?



LD and literacy

- About 90% of students with learning disabilities (LD) have significant difficulties in literacy
 - Vaugh, Linan-Thompson, & Hickman. (2003)
- These students are more likely than their peers to be disengaged from the learning process
 - Seo, Brownell, Bishop, & Dingle,(2005),

Traditional Reading Instruction

- Designed to support readers' ability to decode and make the connection between the sounds heard and letters read;
- Leaves behind a group of students who may never achieve a level of speed, fluency, and accuracy that supports their emotional, social, cognitive, and intellectual development.
- Leaves the struggling reader with little to no energy or capacity left to solve the word, make sense of it, and then do something with it (i.e., comprehend, respond) -(Hirsch, 2003).

AT for Reading

- Text-to-speech software is most common AT used for students struggling with reading.
 - Works very well for some, but not all.
 - Must be tried for multiple sessions to see if it will make a difference.
 - Programs have varying features, including:
 - reading rate,
 - voice type,
 - document tagging (which affects reading order), and
 - dynamic highlighting.

Text-to-Speech

TTS increases vocabulary, increases reading speed, provides exposure to correct pronunciation;

Needs to be used for at least 40 minutes per week for one semester;

Allows more room in active memory for constructing meaning; and

Leaves students less fatigued.

-Stodden, Roberts, Takahishi, Park, & Stodden(2012)

Text-to-Speech

- Allowing students choice and control builds student interest, motivation, and engagement, all of which are important for students who may otherwise become reluctant readers.
 - Reinking, (2005)
- TTS allows students to customize viewing, interacting, and pacing with text. These enhance student engagement and motivation.
 - Strangman & Dalton, (2006)
- Students may feel they finish reading tasks more quickly and read more fluently.
 - Meyer & Bouck, (2014)

Using text-to-speech technology does not mean that students don't have to be skilled readers. It means that the computer has become their decoding eyes. They must then:

- add expression,
- reread with fluency,
- create pictures in their mind,
- make connections, and
- make sense of it all.

-Parr, M. (2013)

Latest review of research

- Recent definitive meta-analysis.
- Excluded students without identified LD.
- Included single subject design studies.
- Found the use of text-to-speech tools has a significant impact on reading comprehension scores for students with learning disabilities.
 - Wood, Moxley, Tighe, & Wagner. (2017)

TTS best for students with

- slow or inaccurate decoding that does not correlate to their cognitive and intellectual potential (i.e., less than 90% accuracy);
- lower levels of fluency, typically 24 to 92 words per minute;
- high levels of listening comprehension that can be activated by TTS;
- low levels of confidence and/or internal motivation that lead to reader reluctance and withdrawal;
- pacing and attentional difficulties that can be regulated by TTS; and
- the need for multiple readings of assigned text.

Training needed in Comprehension

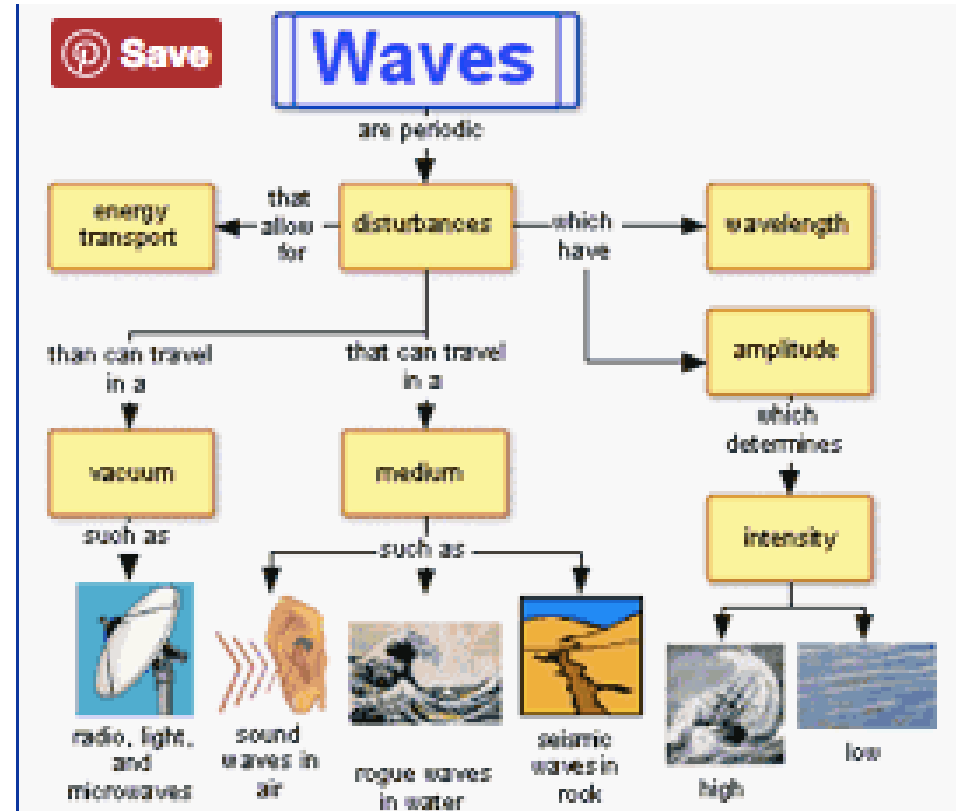
- modeling
- thinking aloud how to self-question and reflect during and after reading
- engaging students to become actively involved in monitoring their understanding and processing text meaning.
 - Edmonds, Vaughn, Wexler, Reutebuch, Cable, Tackett, & Schnakenberg (2009).

Summary: Research on TTS

- Research is limited and results are mixed.
- Research supports use of TTS.
- Pair with comprehension strategy training.
- Make sure to invest enough time to see results.
- Talk with each student about how it is working/not working for him or her.

Graphic Organizers for Reading

- Can help students:
 - Take notes;
 - Comprehend content;
 - Make connections within an
 - Participate in class.
- Hall and Strangman (2002); Gajria, Jitendra, Sood, & Sacks (2007)



Technology based graphic organizers

- Allows educators to:
 - Change the visual representation of the images and text,
 - Convert the information in a concept map to an outline,
 - Add audio and text.
- Allows students to:
 - Manipulate text,
 - Alternate between concept map and outlining,
 - Insert, re-use notes,

E-books

- Changes of font size on e-readers significantly increased legibility.
- Eye-tracking data collected on the participants also showed a significant decreased fixation on the text when compared to paper books,
- Represented an increase in legibility.
 - Siegenthaler, Wurtz, & Groner, (2011)

Tablet computers

- Use of iPad 2 with specific applications could result in academic gain in reading comprehension, reading fluency, and vocabulary in students with learning disabilities.
 - Retter, Anderson and Kieran (2013)

AT for Reading

- Much of the research regarding reading focused on sight word memorization or drills in decontextualized sub skills
 - Erickson, Hanser, Hatch, & Sanders (2009)
- Emergent literacy research: oral and written language skills of listening, speaking, reading, and writing develop concurrently and interrelatedly rather than sequentially.
 - Teale & Sulzby (2005)
- Research based: *MEville to WEville* from AbleNet
- Uses AT: Bookworm and QuickTalker

Picture Supported Text

- Nonconventional forms of literacy, such as picture-supported text, limit literacy learning in the long run and interfere with learning opportunities
 - Erickson, Hanser, Hatch, & Sanders, (2009); Erickson et al., (2010); Hatch, (2009).
- Several studies have concluded that pictures slow the rate of word learning
 - Pufpaff, Blischak, & Lloyd, (2000); Rose & Furr, (1984); Saunder & Solman, (1984)
- Picture supported text provides access to content, but actually impedes the learning of reading skills.

AT for Writing

- Very little research
- Alternate keyboards, switch access, and partner assisted scanning;
- Word prediction, speech to text;
- Paired with authentic writing instruction such as First Author.
 - Sturm, Cali, Nelson, & Staskowski, (2012)

Invented Spelling important

- Relationship between sophistication of invented spelling and later reading
- Alphabetic knowledge and phonological awareness are developed through practice
- Discourage use of picture supported writing

- Ouellette & Sénéchal (2017)

Writing

- 65% of students referred for learning disabilities have a writing disability. -Mayes, Calhoun, and Crowell, (2000).
- The National Assessment of Educational Progress (2009) found only 6% of students with disabilities scored at a proficient level on writing tests. 46% scored below basic level, and 48% performed at basic level. -Smith & Okolo,(2010).
- Students with LD are more likely to have errors in spelling, punctuation, capitalization, and word usage. Their writing is more likely to be shorter and illegible. – DeLaPaz (1999)

AT for Writing



- Personal computer spell checkers, digitized text, word prediction software, speech or voice recognition, and alternative writing are the most common computer features used in schools to facilitate writing
 - Cullen & Richards, 2008; Barbetta & Spears-Bunton, 2007).

Research on Word Prediction

- Word prediction alone and in combination with text-to-speech had a positive impact on the written output of students with identified Learning Disabilities.
 - Silió & Barbetta (2010); Cullen, Richards, & Lawless-Frank (2008); Tam, Archer, Mays, & Skidmore (2005).

Graphic Organizers for Writing

Studies show increases in:

- number of words written;
- Amount time spent on planning;
- Common story elements;
 - Blair et al., (2002); Sturm & Rankin-Erickson, (2002); Unzueta & Barbetta, (2012); Gonzalez-Ledo, Barbetta, Unzueta, (2015).
- Changes in overall organization found in some, but not all of these studies.

Voice Recognition

- Use of voice recognition produced passages with more words and fewer errors than handwritten passages.
 - Quinlan, (2004); MacArthur & Cavalier (2004); McCullum, Nation, & Gunn (2014).
- Requires ability to plan phrases and sentences and to dictate without stopping to correct every error.
 - Cullen, Richards, & Lawless-Frank, (2008)



Large impact for some

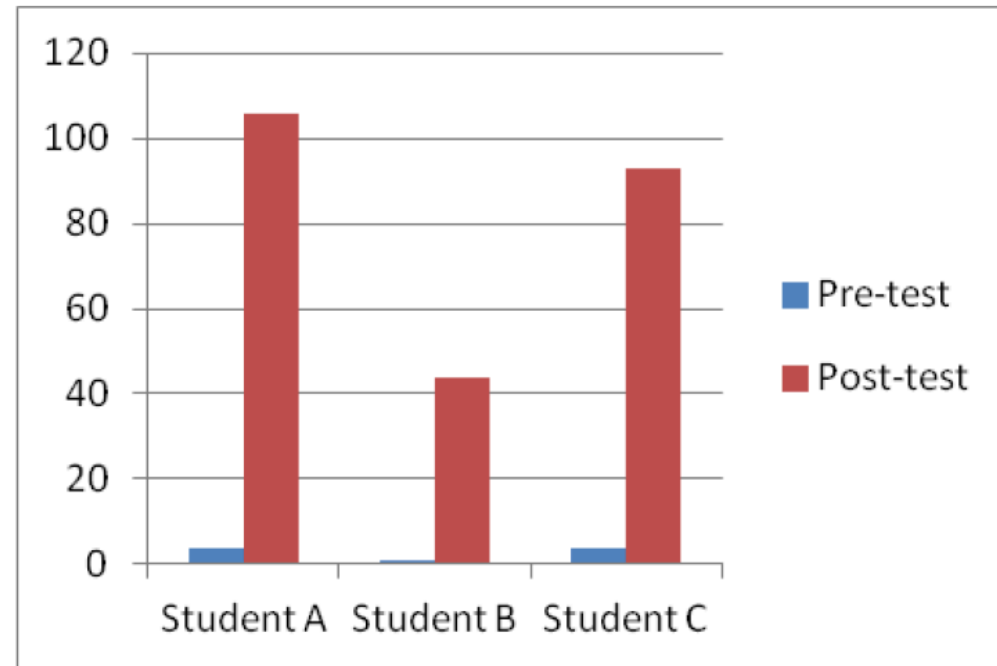


Figure 3. Correct writing sequences.

Punctuation, capitalization, spelling, and syntactical and semantic usage -McCullum, Nation, & Gunn (2014)

When to use VR

- Works for many, but not all students with Learning Disabilities.
- VR is particularly beneficial for those whose oral skills are stronger than their writing skills
 - (Li & Hamel, 2003)
- If you want to try it, a good guide is *Speech Recognition as AT for Writing*. It can be downloaded from bit.ly/srguide
 - Cochrane & Key, (2014).

Impact of Tech on Writing

- Studies are limited, but suggest positive influence on quality of written text, organization, transcription, and revising.
- Tech combined with instruction yields most positive results.
- Collaborating with peers when using tech appears beneficial for both composing and revising.
- Technology motivates children and enhances their opportunities to practice writing.
 - Batorowicz, Missiuna, & Pollock (2012)

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Increased Reading Comprehension

- Audio combined with the text was significant
 - Boyle, Rosenberg, Connelly, Washburn, Brinckerhoff & Banerjee (2003).
- Listening to text while following along with the printed word resulted in improved comprehension and vocabulary skills
 - Montali, J., & Lewandowski, L. (1996).
- Listening alone without visual text is not effective.
 - Maccini, P., Gagnon, J., & Hughes, C. (2002).

Overall: AT Works!!

- Progress on IEP goals;
- AT's contribution greater than any of nine other intervention strategies;
- Team approach is most effective.
 - Watson, Ito, Smith, & Anderson (2010)

Finding the Research

- Research articles in peer-reviewed professional journals
- Compare to find the “best evidence”
- Evaluate the applicability of research to your situation



Reading the Research

- Questions:
 - Did they use the right methods?
 - Were the subjects randomly assigned?
 - Were the groups equivalent?
 - Did they use the right measurement tools?
 - Edyburn, D. (2005). How to read a special education technology research article.
- **Bottom line: If it made it into a peer reviewed journal, those questions have been asked and answered!!**

Journals with AT Research

- Augmentative and Alternative Communication-
www.isaac-online.org/en/publications/aac.html
- Assistive Technology-www.resna.org
- Journal of Research on Technology in Education-
www.iste.org
- Journal of Special Education Technology-
www.tamcec.org or jset.sagepub.com
- Journal of Speech, Language, & Hearing Research
<http://jslhr.pubs.asha.org/journal.aspx>
- Journals of your professional organizations

Websites about AT Research

- <https://kpr.pythonanywhere.com/>

▼ Summary & Graph

There are 189 cases in this dataset, with a mean text entry rate of 9.10 wpm. The minimum was 0.29 wpm, the maximum was 48.00 wpm, and the standard deviation was 8.59 wpm. The histogram below shows the distribution of text entry rate across these 189 cases. The most common range was text entry rate between 0 and 2 wpm, representing 34 individuals.

