

## Supporting Reading Comprehension Through Accessible and Flexible Digital Educational Materials



### Big Ideas

- There is no such thing as an “average” student. Many students who struggle with reading have some of the same problems with cognitive processing as students with learning disabilities.
- Some features of accessible digital materials can be used to support reading instruction and scaffold reading comprehension for all students.
- Universal Design for Learning (UDL) principles can be used to guide the development of reading instruction and reading supports using accessible educational materials.

Instructional materials are more than textbooks. Educational materials include licenses or sets of materials that are available in bound, unbound, kit, or package form and may consist of hardbacked or softbacked textbooks, electronic content, consumables, learning laboratories, manipulatives, electronic media, and computer courseware or software that serve as the basis for instruction for each student in the core courses of mathematics, language arts, social studies, science, reading, and literature. FL 1006.29(2)

Students with disabilities may have difficulties accessing educational materials. The World Wide Web Consortium (W3C) has four principles of accessibility regarding digital and online content.

**Perceivable** - Information and user interface components must be presentable to users in ways they can perceive.

This means that users must be able to perceive the information being presented (it can't be invisible to all of their senses). *This can include visual limitations, hearing limitations, and cognitive processing problems with visual and auditory perception.*

**Operable** - User interface components and navigation must be operable.

This means that users must be able to operate the interface (the interface cannot require interaction that a user cannot perform). *This can include physical and cognitive processing problems that affect motor skills.*

**Understandable** - Information and the operation of user interface must be understandable.

This means that users must be able to understand the information as well as the operation of the user interface (the content or operation cannot be beyond their understanding).

**Robust** - Content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies.

This means that users must be able to access the content as technologies advance (as technologies and user agents evolve, the content should remain accessible)

<https://www.w3.org/TR/UNDERSTANDING-WCAG20/intro.html#introduction-fourprincs-head>

There are a wide variety of tools and technologies that can be used to support access to educational materials and to a digital based curriculum for students with disabilities. Access to a computer can include different types of keyboards and switch systems. A student may need large cursors. Students who struggle with text may need text-to-speech. Students with writing difficulties may need speech-to-text. The Assistive Technology Image Gallery - <http://assistivetechology.strikingly.com/> - provides pictures of many different types of assistive technologies. Assistive technologies can also be viewed at the AT & UDL Loan Library - <https://www.at-udl.net/> .

It is important to understand that some of these accessibility principles and assistive technologies can help students who don't have problems severe enough to be eligible for ESE services but who do struggle with reading and learning. There is no such thing as an "average" student. Students vary on a number of learning skills. Examples include:

- Visual perception
- Auditory perception
- Information organization
- Sequencing information
- Abstraction
- Memory
- Expressive skills
- Language
- Motor and writing skills
- Social and emotional skills

This variation of learning skills between students can make it difficult to provide reading instruction that matches each student's instructional zone; that range of instructional engagement that has just enough challenge to encourage skill growth but not so much challenge as to result in disengagement. Tools that are used to make digital text accessible for students with disabilities may also be used by struggling readers as instructional scaffolds to help them engage with reading content.

**Example:** Text-to-speech tools are often used by students with specific learning disabilities who have problems decoding text. But these tools can also be used to help students improve their reading skills. Staff at the University of Hawaii at Manoa did research with 104 high school students (grades 9-12) who had disabilities or who were struggling readers and were at-risk of referral for ESE services due to reading difficulties. The study showed that the use of text-to-speech tools resulted in students demonstrating significantly improved reading when not using the text-to-speech tools.

<http://www.sciencedirect.com/science/article/pii/S1877050912008034>

Additional information on this "myth of average" can be found at the links to videos below.

- Beyond Average - <http://bit.ly/29DzpSx>
- The Myth of Average - <http://bit.ly/1o2nws4>

There are many strategies and tools that can be used to scaffold cognitive processes and help students engage in reading instruction as well as process curriculum content and demonstrate what they have learned. Below are a few examples.

| Cognitive Processing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <p><b>Input</b> - Visual/Auditory</p> <ul style="list-style-type: none"> <li>• Recognizing size, shape, and placement of text</li> <li>• Recognizing line and paragraph typography</li> <li>• Distinguishing subtle differences in sounds</li> <li>• Distinguishing figure and background sounds</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Use trans-formative tools, such as text-to-speech, to scaffolding difficulty in decoding text.</li> <li>• Highlight, or visually mark up, text to support visual navigation of content.</li> <li>• Use visual reading guides (physical and digital) to support consistent visual movement through a text while reading.</li> <li>• Simplify digital and online text by removing distractions on the page.</li> <li>• Use text summarizers to reduce the amount of content in a text so students can learn the core ideas, then add the rest of the content.</li> <li>• Change the size and type of font used.</li> <li>• Adjust the spacing between letters, words, sentences, and paragraphs.</li> <li>• Reduce the width of the columns of text.</li> <li>• Use personal or classroom audio FM systems</li> </ul> |
| <p>Example Tools:</p> <ul style="list-style-type: none"> <li>• Natural Reader - <a href="http://www.naturalreaders.com/">http://www.naturalreaders.com/</a> . a free text-to-speech tool for Windows systems.</li> <li>• Macintosh built-in Text-to-Speech - <a href="http://www.wikihow.com/Activate-Text-to-Speech-in-Mac-OSx">http://www.wikihow.com/Activate-Text-to-Speech-in-Mac-OSx</a></li> <li>• Balabolka - <a href="http://www.cross-plus-a.com/balabolka.htm">http://www.cross-plus-a.com/balabolka.htm</a> . a free text-to-speech and text-to-audio tool for Windows systems.</li> <li>• ATbar - <a href="https://www.atbar.org/">https://www.atbar.org/</a> . a free Windows cross-browser toolbar that includes text-to-speech, control of font sizes, and other supports.</li> <li>• Readability - <a href="https://www.readability.com/">https://www.readability.com/</a> . a free online tool that cleans up web pages and removes distractions, allowing a student to focus on the main content.</li> <li>• Online Text Summarizer - <a href="http://www.tools4noobs.com/summarize/">http://www.tools4noobs.com/summarize/</a> . free online tool that summarizes text. You can paste text in or paste in a URL and decide how much to summarize.</li> <li>• Newsela - <a href="https://newsela.com/">https://newsela.com/</a> . provides news at five different Lexile levels.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p><b>Integration</b></p> <ul style="list-style-type: none"> <li>• Sequencing, ordering, and relating information</li> <li>• Abstraction, inferring meaning</li> <li>• Generalizing a text</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>• Use graphic organizers, concept maps, mind maps, timelines, outlines, etc. to organize information and visually integrate different bits of information or events with each other.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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| <p>Example Tools:</p> <ul style="list-style-type: none"> <li>• Infographics for Teachers - <a href="http://bit.ly/29XRb51">http://bit.ly/29XRb51</a> . infographics can be a great tool to provide students with the big picture and sequence of information.</li> <li>• TeachersFirst: Infographics - <a href="http://www.teachersfirst.com/iste/infographics/resources.cfm">http://www.teachersfirst.com/iste/infographics/resources.cfm</a></li> <li>• Student Infographics - <a href="http://www.teachersfirst.com/iste/infographics/examples.cfm">http://www.teachersfirst.com/iste/infographics/examples.cfm</a></li> <li>• Free Printable Graphic Organizers - <a href="https://www.teachervision.com/graphic-organizers/printable/6293.html?s2">https://www.teachervision.com/graphic-organizers/printable/6293.html?s2</a></li> <li>• Intel: Tools for Student-Centered Learning - <a href="http://www.intel.com/content/www/us/en/education/k12/teachers.html">http://www.intel.com/content/www/us/en/education/k12/teachers.html</a> . a collection of tools that students can use to organize ideas and develop the rationale for an argument.</li> <li>• Popplet - <a href="http://popplet.com/">http://popplet.com/</a> . online and iPad tool for organizing thoughts through mind maps, word walls, etc.</li> <li>• MindMup - <a href="http://www.mindmup.com/">http://www.mindmup.com/</a> . a free, quick and easy online mind mapping tool</li> <li>• Tiki-Toki - <a href="http://www.tiki-toki.com/">http://www.tiki-toki.com/</a> . create beautiful, interactive online timelines.</li> <li>• Timeline from readwritethink - <a href="http://www.readwritethink.org/files/resources/interactives/timeline_2/">http://www.readwritethink.org/files/resources/interactives/timeline_2/</a> . a free online tool that can be used to sequence events that are not calendar based</li> <li>• Timetoast - <a href="http://www.timetoast.com/">http://www.timetoast.com/</a> . an online time line tool that quickly switches from timeline to text views.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Memory</b> <ul style="list-style-type: none"> <li>• Short-term memory</li> <li>• Long-term memory</li> <li>• Long-term potentiation</li> <li>• Long-term depression</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Processing or reading through the content several times, each time with a different focus (e.g. making personal connections with the text, asking questions, analyzing the structure, reading for understanding, reviewing).</li> <li>• Creating visual graphic organizers or timelines to help organize the information.</li> </ul>                                                                               |

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| <p>Example Tools:</p> <ul style="list-style-type: none"> <li>• Compare &amp; Contrast Map from readwritethink - <a href="http://bit.ly/2ahsl0l">http://bit.ly/2ahsl0l</a> . a free online tool for doing compare and contrast activities.</li> <li>• Popplet - <a href="http://popplet.com/">http://popplet.com/</a> . online and iPad tool for organizing thoughts through mind maps, word walls, etc.</li> <li>• MindMup - <a href="http://www.mindmup.com/">http://www.mindmup.com/</a> . a free, quick and easy online mind mapping tool</li> <li>• Penzu - <a href="https://penzu.com/">https://penzu.com/</a> . an online, cloud based writing journal. Students can write and review their journals across computers and mobile devices.</li> <li>• Flashcard Machine - <a href="http://www.flashcardmachine.com/">http://www.flashcardmachine.com/</a> . a free online tool, available in pay versions for mobile devices.</li> <li>• Free Printable Flash Card Maker - <a href="http://www.kitzkikz.com/flashcards/">http://www.kitzkikz.com/flashcards/</a> . a free simple online tool for making and printing flash cards.</li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>Output</b></p> <ul style="list-style-type: none"> <li>• Spontaneous language: self-selecting, relating, and organizing thoughts</li> <li>• Demand language: self-selecting, relating, and organizing thoughts</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Provide extra time to process information.</li> <li>• Use discussion guides, graphic organizers, or outlines ahead of time that support the organization of main ideas to share, then use them as prompts when sharing with others.</li> <li>• Prepare fact cue cards prior to sharing.</li> <li>• Prepare vocabulary cue cards or lists prior to sharing.</li> <li>• Review text mark-ups and notes on facts, questions, and reactions to the text prior to sharing.</li> </ul> |
| <p>Example Tools:</p> <ul style="list-style-type: none"> <li>• Free Printable Graphic Organizers - <a href="https://www.teachervision.com/graphic-organizers/printable/6293.html?s2">https://www.teachervision.com/graphic-organizers/printable/6293.html?s2</a> . extensive collection of ready to print and use graphic organizers.</li> <li>• Free Printable Flash Card Maker - <a href="http://www.kitzkikz.com/flashcards/">http://www.kitzkikz.com/flashcards/</a> . a free simple online tool for making and printing flash cards that can be used as cue cards.</li> <li>• How to Teach Public Speaking to Elementary Students - <a href="http://everydaylife.globalpost.com/teach-public-speaking-elementary-students-11035.html">http://everydaylife.globalpost.com/teach-public-speaking-elementary-students-11035.html</a> . tips to help students prepare for speaking.</li> </ul>                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

- Preparing Speeches - [http://www.hawaii.edu/mauispeech/html/preparing\\_speeches.html](http://www.hawaii.edu/mauispeech/html/preparing_speeches.html) . tips and guidelines on developing and giving a speech
- Free Online Teleprompter - <http://www.cueprompter.com/> . free tools to use as an aid in presenting

Learning media assessments can be used to help identify which presentation format of curriculum content a student will be most successful engaging with. Uses can include:

- Identifying if students have a higher auditory fluency than a print fluency.
- Identifying the instructional reading level of a student.
- Identifying presentation and print format characteristics that may match a student's learning needs.

Here are some example tools and resources.

- AEM Navigator – <http://aem.cast.org/navigating/aem-navigator.html#.VcocofVhHw> . online tool to facilitate the process of decision-making around accessible instructional materials
- AIM Explorer – <http://aem.cast.org/navigating/aim-explorer.html#.VcocwvVhHw> . free computer based simulation to help identify what format features will meet a student's learning needs
- uPAR / PAR: Protocol for Accommodations in Reading – <http://donjohnston.com/upar/#.VkYnDrerSUK> – A comprehensive guide on using tools from Don Johnston (or other tools) in the consideration of accommodations for students with print disabilities
- [Reading & Study Digital Tools](#) – a pdf booklet with step-by-step tutorials on how to use features like text-to-speech, color adjustments, comprehension supports, magnification, and much more

One thing that teachers always need more of is time. **Universal Design for Learning (UDL)** provides a framework for designing instruction so that tools and instructional scaffolds are embedded and made available to all students. Students learn to choose which tools and strategies they need to help meet their academic goals. This release of responsibility by the teachers helps students become independent learners and allows teachers to focus on other classroom needs.

UDL is included in several federal and state laws, including the *Every Student Succeeds Act* (ESSA). You can find more information on UDL in ESSA at <http://aemita-florida.wikispaces.com/ESSA> .

Describing how teachers use UDL principles to match students to texts and provide ongoing access for all students is a part of the K-12 Reading Plan. Many of the tools, strategies, and learning media assessment tools and resources in this handout can be used by teachers and schools to support reading through the UDL principles. These principles can be viewed at <http://www.udlcenter.org/aboutudl/udlguidelines> .

In addition, schools and districts can use the Publishers UDL Rubric - <http://www.tlc-mtss.com/assets/udl-reviewer-rubric-district-example.pdf> - to review their educational materials and to review materials up for purchase consideration.

Ongoing support and information on assistive technologies and UDL can be found in the AT & UDL Newsletter, a free quarterly digital newsletter published by the Technology & Learning Connections Unit, a part of the PS/RtI Project at the University of South Florida. You can review an edition on UDL and Reading Comprehension at <http://conta.cc/1U4hNBC> . You can sign up to receive the newsletter at <http://bit.ly/1TLoHLQ> .

