

CHAPTER
4

Technology Interventions for Reading and Written Language

Cheryl Wissick
University of South Carolina

Brenda Heiman
Louisiana Tech University

John Castellani
Johns Hopkins University

Integrating technology instruction and applying productivity tools encompasses more than just the effects on students with disabilities. The effectiveness of these tools for all students when integrated into instruction makes them important universal interventions. Written and verbal computer-mediated communication is critical for success in a 21st century work environment (Fadel & Lemke, 2006; Graham & Perin, 2007; MacArthur 2009). Instructional technology applications are critical, as they provide resources for all students, not just those with disabilities. General and special education teachers can work together to integrate free technology tools to increase achievement and monitor the progress of all students. Teachers who use free or low-cost tools can then provide multiple options to all students in the classroom.

The research on the effectiveness of technology for written language provides several starting points for technology integration. Word processors, spreadsheets, presentation programs (e.g., PowerPoint, Keynote), graphic organizers (e.g., Inspiration), and collaborative web tools (e.g., wikis) can be embedded into core instruction in reading and writing. Writing or written language encompasses handwriting, spelling, grammar, syntax, organization,

and creative thought. Effective writing instruction includes strategic instruction in basic skills and revision; frequent writing on meaningful topics; and opportunities to share, collaborate, and get feedback from peers and teachers (Graham & Perin, 2007; MacArthur, 2009). Gersten and Baker (2001) emphasize that effective writing must include explicit teaching of the writing process and students must be provided feedback on their writing, thereby providing an opportunity to integrate technology.

In the area of reading, all students need instruction in phonemic awareness, alphabetical principle, accuracy and fluency, vocabulary, and comprehension. Programs that incorporate technology to pair visual with auditory information during presentation and feedback provide an advantage to learners and offer dynamic representations illustrating blending sounds and segmentation of words (Strangman & Dalton, 2005). For older students, reading instruction should focus on motivation, vocabulary, fluency, and comprehension, and it should combine elements of phonemic awareness and the alphabetical principle to word study (Roberts, Torgesen, Boardman, & Scammacca, 2008). Technology can support these basic reading skills by providing opportunities for repeated reading and multimedia support with visual and auditory cues for training and self-correction (Okolo, Cavalier, Ferretti, & MacArthur, 2000; Silver-Pacuilla,

Ruedel, & Mistrett, 2004). In addition, reading instruction should focus on motivation and self-directed learning, text-based collaborative learning, ongoing formative evaluation, diverse texts, and a technology component to provide support (Biancarosa & Snow, 2006). Clearly, a technology component can be integrated into all reading and writing instruction to provide universal interventions to all students.

Universal Design for Learning: Supporting Reading and Writing in the Classroom

Activities for reading and writing can be aligned to the principles put forth by the National UDL Center and the Center for Applied Special Technology. The UDL Center lists the three main principles of UDL and the guidelines for each principle with checkpoints for each guideline. Basically, UDL requires that students be provided with multiple means of engagement, representation, and expression. For example, the principle of multiple means of representation includes providing options for perception, language, symbols, and comprehension. Checkpoints for perception include offering options for customizing the display and then providing alternatives for both visual and auditory display. The UDL Center provides a checklist for teachers with examples of different tools that can be implemented in the classroom or used to

provide rationale and information on each checkpoint. Teachers can apply each principle and guideline to their classroom and to individual students. For a complete list of teaching tools and examples, visit the UDL Center [www.udlcenter.org].

This chapter will review strategies for reading and writing under the context of the Universal Design for Learning principles of multiple means of presenting materials and engaging and assessing students. The integration of UDL principles into reading and writing can facilitate the flexibility of how curriculum materials are presented to students with disabilities for literacy instruction and allow them to have multiple ways to use technology to demonstrate reading and writing skills. Table 1 is an advanced organizer for structuring concepts and technology-based strategies. This structure, as shown in Table 1, will be used throughout this chapter to organize technology tools and strategies for promoting literacy instruction. The table of the UDL checkpoints and related software was originally developed for a conference presentation prior to the publication of the UDL resources related to the checkpoints. Tables 2–5 list URLs for the free technology tools and websites cited in Table 1. Additional tools to support reading and writing are available; for links to free tools visit Wissick's WebToolboxes Wiki (webtoolboxes.wikispaces.com). Table 1 features free technology tools that can

Table 1. Tools for Use with CAST's UDL Guidelines

This chart is based on CAST's original chart outlining its guidelines. It names websites or programs that integrate the guidelines into the classroom experience.

ENGAGEMENT	REPRESENTATION	EXPRESSION
<p>Recruit Interest</p> <p><i>Locate Interests: Survey Tools</i></p> <ul style="list-style-type: none"> • phpSurvey • Zoomerang • Survey Monkey • Google Forms • Jackpot Survey: Intervention Central <p><i>Fun with Words</i></p> <ul style="list-style-type: none"> • Wordle • Cool Text • Spell with Flickr <p>Sustain Effort</p> <p><i>Collaborate with Wiki & Blogs</i></p> <ul style="list-style-type: none"> • PBWorks • Wikispaces • WetPaint • ZohoWiki • Blogger • Edublogs • TiGed: Taking It Global <p>Promote Self-regulation</p> <ul style="list-style-type: none"> • KidsTools • OKAPI for building fluency & graph results • Intervention Central 	<p>Options for Perception</p> <p><i>Alternatives for Visual Information</i></p> <ul style="list-style-type: none"> • Web Anywhere • MyStudyBar <p><i>Books Online</i></p> <ul style="list-style-type: none"> • Bibliomania • Readprint <p><i>Graphic Organizers</i></p> <ul style="list-style-type: none"> • FreeMind • Bubbl.us • MyWebspiration • ReadWriteThink • ThinkGraph <p>Options for Language</p> <ul style="list-style-type: none"> • WordWeb • Windows to the Universe • Wikipedia, Simple Text • Autosummarize in Word <p>Options for Comprehension</p> <ul style="list-style-type: none"> • UDL Editions by CAST • BookBuilder by CAST 	<p>Physically Respond & Interact</p> <p><i>Creative Writing</i></p> <ul style="list-style-type: none"> • VoiceThread • ToonDoo • Glogster • Storybird • KerPoof • DoInk • Prezi <p>Expressive Skills & Fluency</p> <p><i>Writing tools</i></p> <ul style="list-style-type: none"> • Ghotit • Let Me Type <p><i>Text to Speech</i></p> <ul style="list-style-type: none"> • ReadPlease • Natural Readers <p>Executive Functions</p> <ul style="list-style-type: none"> • Remember the Milk • CAST UDL Strategy Tutor • CAST Science Writer • Trackstar

Note: The source of this table is CAST (2008). *Universal design for learning guidelines version 1.0*. Wakefield, MA: Author. Retrievable at www.udlcenter.org/sites/udlcenter.org/files/UDL_Guidelines_v2%200-Organizer_0.pdf.

Adapted with Permission.

provide universal access for all students, and not just those with special software listed in their IEP.

This chapter provides examples within the context of whole class activities that are free and easy to implement. In addition, activities focus on the

areas of reading and writing with respect to students with mild cognitive or intellectual disabilities or students who are at risk.

Table 2. Centers and General Resources

Centers and Resources	Web Link	Comments
CAST	www.cast.org	Research and Development Center for UDL
UDL Center	www.udlcenter.org	National Center on UDL
UDL Guidelines	www.udlcenter.org/implementation/examples	Guidelines with examples and supports
Intervention Central	www.interventioncentral.org	Fluency Probes and Jackpot Generator
EasyCBM	www.easycbm.com	Fluency Probes
ReadWriteThink	redirects to www.readwritethink.org/classroom-resources/student-interactives/	Templates for writing activities
4Teachers	www.4teachers.org	Variety of tools to create tracks of websites, rubrics, quizzes and more
Web Toolboxes	Webtoolboxes.wikispaces.com	Links for free tools to support writing, reading, and content instruction

Multiple Means of Engagement

The UDL Center lists multiple means of representation as the first principle, but students often must be engaged before any learning can take place. Therefore, activities related to reading and writing in the area of engagement are discussed first.

RECRUIT INTEREST

For the principle of engagement, teachers are to provide options to recruit interest. However, as teachers we don't always know the interests or motivations of students, given their various backgrounds and diversity. One way to tap into student interests would be to create a survey about motivation, interests, or favorite

activities using free survey tools such as Survey Monkey, Poll Daddy, or Free. The Intervention Central Site [www.interventioncentral.org] also provides a survey—Jackpot Survey—related to student preferences for motivators.

These strategies help teachers focus on whether students are motivated more by tangible rewards, praise, working with other students, or independent choices. Teachers can pick and choose which items to use in their surveys. Google forms also provide teachers with a free and easy way to collect information from students about their interests, or from other teachers regarding behavior or topics. Teachers can create a survey and send

it out to teachers to complete. All the results are automatically compiled in a spreadsheet document for easy viewing and collation.

For written language or content instruction, teachers can foster engagement with text, words, and vocabulary using free tools such as Wordle, Cool Text, and Spell with Flickr. All these tools provide students with visual tools to create word clouds or pictures of their words. These tools can assist students in both their reading and vocabulary building. At the same time they provide students engaging ways to interact with text. Wordle also can be used to practice vocabulary by having students create word clouds of synonyms or groups

Table 3. Tools for Engagement

Resources	Link	Comments
Jackpot Survey	www.interventioncentral.com	Create interest and motivation surveys
Survey Monkey	www.surveymonkey.com	Easy survey maker for 10 questions
Poll Daddy	www.polldaddy.com	Online survey maker
Free Online Survey	www.freeonlinesurveys.com/	Web or email surveys
Wufoo	wufoo.com/	Collect online information
Wordle	www.wordle.net	Create word clouds for visual effects or vocabulary
Spell with Flickr	www.metaatem.net/words/	Create interesting banner of words
Cool Text	www.Cooltext.com	Create a text effect for a paper or web page
BeFunky	www.befunky.com	Edit photos with special effects
Shape Collage	www.shapecollage.com	Create collages using photos
DaFont	www.dafont.com/	Download different fonts
BigHugeLabs	www.Bighugelabs.com	Create motivational posters using images from Flickr
Glogster	www.glogster.com	Create a poster with words and images
Spezify	www.spezify.com	Search engine that provides links with pictures and text from various places (use with caution for potential inappropriate images)
Wikispaces	www.wikispaces.com	Wiki free to educators
PBWorks	www.pbworks.com	Wiki that allows sublevels
Wiggio	www.wiggio.com	Collaboration tool with discussion board, document sharing
Zoho	www.zoho.com	Wiki and document collaboration
Google	www.google.com	Create collaborative document and sites
Blogger	www.blogger.com	Create a class blog
Class Chatter	www.classchatter.com	Web logs for the classroom
KidTools KidSkills	kidtools.missouri.edu/	Download teacher tools as well as elementary or secondary versions

of related words. Figure 1 displays a Wordle for the vocabulary study of the word *cantankerous*.

Students can use Glogster to create

posters on topics of their choice. At the beginning of the year, students could create a poster to represent people and things of importance to them. Later in the year, the tool could

be used to present a topic in social studies to the class. Other tools such as Shape Collage, BigHugeLabs, or BeFunky engage the user by changing images or creating collages or

Table 4. Tools for Representation

Resource	Link	Comments
Web Anywhere	webanywhere.cs.washington.edu/wa.php	Provides auditory support for any web page
MyStudyBar	www.rsc-ne-scotland.ac.uk/eduapps/index.php	Set of tools to provide access to and creation of text materials; can be downloaded to a flash drive
Readability	www.lab.arc90.com/experiments/readability/	Download and install as part of web browser, reduces stimulus on page of text
Readprint	www.readprint.com	Search online books by author, topic, or title
Bibliomania	www.bibliomania.com	Search online books by author, topic, or title
Project Gutenberg	www.gutenberg.org/wiki/Main_Page	Search online books by author or title
Online Literature	www.online-literature.com/	Learn about authors and books with additional information on chapters
Online Books	onlinebooks.library.upenn.edu/new.html	Search new books in a variety of topics by author or title
Classic Bookshelf	www.classicbookshelf.com/	Books can be viewed in larger print with choice of colors and background for easy reading
International Digital Children's Library	en.childrenslibrary.org/	Actual digitized pages from a variety of books in many languages; cannot add audio but a text can be enlarged
ReadPlease	www.readplease.com	Download reader to copy and paste text
Natural Readers	www.naturalreaders.com	Download reader for text
NDVA Screenreader	www.nvda-project.org/	Screenreader that can be run from a flash drive
C-Map	cmap.ihmc.us/conceptmap.html	Download graphic organizer
Thinkgraph	www.thinkgraph.com	Download graphic organizer
MyWebSpiration	www.mywebspiration.com	Visual collaboration tool
Slatebox	www.slatebox.com	Online collaboration and concept mapping
Bubbl.us	Bubbl.us	Online concept mapping
WordWeb	wordweb.info/	Download vocabulary tool for off line access
VisuWords	www.visuwords.com/	Creates a visual map between words and definitions
Vocabhead	www.vocabahead.com/	Animated vocabulary with auditory definition
Shahi	blachan.com/shahi/	A visual dictionary using Flickr
Windows to the Universe	www.windows2universe.org/	Multilevel site with materials for science, mythology, and social studies
BookBuilder	Bookbuilder.cast.org	Create and read digital books
UDL Editions	udleditions.cast.org/	Leveled support for books; ages 10 and up
BookBuilder example	bookbuilder.cast.org/view.php?op=view&book=19906	Instruments of the Orchestra
BookBuilder Example	bookbuilder.cast.org/view.php?op=view&book=19763	Are we there yet? A story to integrate science and literature

motivational posters. Teachers could create their own classroom motivational posters using student images and quotes. All of these tools can be incorporated easily into reading, writing, and content instruction to increase student engagement.

Options to Sustain Effort and Persistence

The second guideline for multiple means of engagement involves providing students with opportunities to sustain their effort. One way to help students sustain effort is to provide

frequent reinforcement and opportunities to work and collaborate with their peers. Using free documents, blogs, or wiki tools such as Wiggio, PBWorks, Wikispaces, WetPaint, Zohowiki, GoogleDocs, Edublogs, or Blogger, students can work together

Table 5. Tools for Expression

Resource	Link	Comments
Ghotit	www.ghotit.com	Online spelling checker for students with dyslexic spelling
Let Me Type	www.clasohm.com/lmt/en/	Autocompletion tool that runs in the background can be used with other programs
Google Scribe	scribe.googlelabs.com/	Online autocompletion tool
ClickNType	www.lakefolks.org/cnt/	Download onscreen keyboard and word prediction
VoiceThread	voicethread.com	Collaborative storytelling with pictures, voice, and text
ToonDoo	www.toondoo.com	Cartoon creator
KerPoof	www.kerpoof.com/	Animation, images create stories
Prezi	prezi.com	Animated presentation tool
PowerPoint Activities	Webtoolboxes.wikispaces.com	Links to sites describing how to create interactive PowerPoint shows
Storybird	storybird.com/	Collaborative storytelling
DoInk	www.doink.com	Online collaborative art projects
Scribblar	www.scribblar.com/	Online whiteboard for collaboration
Twiddla	www.twiddla.com/	Web-based meeting playground
Dabbleboard	www.dabbleboard.com	Whiteboard to explore and visualize collaboratively
Remember the Milk	www.rememberthemilk.com/	Electronic to do list
TaDa List	www.tadalist.com/	Electronic to do list
HottNotes	hottnotes.com/	Keep your to do list on a flash drive
Quizlet	Quizlet.com	Make flashcards and quizzes and share with others
QuizStar	quizstar.4teachers.org/	Tool to create online quizzes
Strategy Tutor	cst.cast.org/	CAST tool to guide students in conducting research
Science Writer	sciencewriter.cast.org/	CAST tool to guide students through science research project writing
TrackStar	Trackstar.4teachers.org	Tool to create guided and prompted learning through websites
Rubistar	Rubistar.4teachers.org	Tool to create rubrics
WebQuest	WebQuest.org/	WebQuest consortium and links to many WebQuests

Figure 1. Wordle



quirky
contrary
ill-natured
cantankerous
cantankerous
grumpy
ornery

to complete a project, paper, or presentation. As a collaborative team, students can assist one another to expand their ideas.

These tools can help in both writing and reading activities. For example, a teacher can post a short reading excerpt on a blog and have students post comments about their interpretations. For writing, teachers can post a paragraph with mistakes in grammar or spelling. Then they can challenge students to post the corrected version. Seeing written work published for friends and family to view can add a motivating factor to the completion of final products. The collaboration tool, Wiggi, allows for group discussion with a summary of the discussion sent to the teacher. The teacher could then provide immediate feedback to the group on their process and collaboration.

Options to Promote Self-regulation

The third aspect of engagement deals with building students' ability to self-regulate and maintain their behavior. Schoolwide positive behavior support promotes both students' ability to sustain effort and promote self-regulation. Specifically related to writing and reading, the free programs KidTools and KidSkills promote ways that students can develop their own management plans and contracts. Teachers can download and install both programs; they have options for elementary or secondary students. Each program contains several modules for self-management of behavior or academic work. Students can learn techniques to monitor their own behavior or their learning.

Another way that teachers can promote self-regulation is to provide frequent probes for specific reading or writing behavior and then to graph

results. Weekly or biweekly, students can read individually for one minute and teachers can use a spreadsheet to plot the number of words read correctly. For writing, students can be given a prompt and then write for three minutes. Teachers can count the number of correct word sequences. Counting and graphing can be done quickly in a spreadsheet, but preparing biweekly reading or writing prompts can be time consuming.

Intervention Central features several tools to assist teachers in creating prompts. Using the reading fluency or the maze generator, teachers can copy and paste text from free online sources or type in a block of text from a reading book. The reading fluency generator will count the number of words and provide both a teacher sample with the word count and a student copy for reading. The teacher sample also includes the reading level. Using this tool, teachers can quickly create multiple reading prompts to use for various levels in their classroom. The maze generator will analyze the text and create a maze passage with the correct number of distractors that can be used as presented or it can be edited manually. There also are word list, writing, and math worksheet generators. Additional tools for monitoring and assisting students to develop self-regulation can be found at www.easycbm.com.

Multiple Means of Representation

UDL also states that students be presented with multiple means of representation. This means that they are provided with a variety of options for perceiving information with different visual and auditory representations.

Options for Perception

The first tenant for multiple means of representation is to provide students with alternatives for visual and auditory information. There are many free tools that provide different options for viewing or obtaining textual material. For students with auditory disabilities, resources are available for sites with signed interpretation, and media can be obtained that is captioned. Teachers can experiment with creating their own captioned videos using free captioning software.

Many students have difficulty reading and obtaining content information from text. They might be able to read fiction books at or just below their grade level, but struggle with expository text in science and social studies. For web-based pages, students who need to hear information read to them can use the Web Anywhere tool to view and listen to any web page. Web Anywhere works well, as it does not have to be installed and students can use it on any computer as long as they can navigate to the main address for Web Anywhere.

MyStudyBar is a set of free tools that provide several reading and writing programs that float in one toolbar. StudyBar provides tools for planning, reading, writing, vision, and voice. Options for screen masking and marking are available to help students focus. The advantage of MyStudyBar is that students can carry all the tools on a jump drive and use them with any computer.

Some students might be distracted by web pages that contain ads and links to additional information. For these students, the tool known as Readability can be downloaded and installed in the web toolbar. Once set up, the tool makes reading easier by removing clutter around the main text. For example, students can be distracted by the ads, the photos, or the various buttons that surround a new article. Readability filters the web page to show just the main text. Figure 2 displays a web page with and without Readability.

Students who have problems reading information can view books online at sites such as Bibliomania, ReadPrint, and Project Gutenberg. Once a book is located, then using free text-to-speech tools such as ReadPlease, Natural Readers, or one of the tools in MyStudyBar, students can listen to the book. MyStudyBar incorporates the NonVisual Desktop Access (NVDA) screen reader, which can be used as one of the tools or as stand-alone software. Free versions of

these programs read the text from the web, but low-cost versions of some of the programs will convert the text to MP3 player format so that students can listen to the book off line. Research indicates that students do need to see the words highlighted as they read in order to support reading instruction; however, for general or pleasure reading, highlighting also can increase the student's motivation to read, because it can help to make reading fun (Boyle, Rosenberg, Connelly, Washburn, Brinckerhoff, & Bannerjee, 2003). Some free programs, such as ReadPlease, will highlight words as they are read, while others just read all the text.

Another option for multiple representation is to provide both textual and graphic information using free graphic organizers. FreeMind and CMap must be downloaded to the computer, but other tools such as Bubbl.us, MyWebspiration, and Slatebox can be used individually or collaboratively on the web. Also, the comprehensive site, ReadWriteThink, offers many activities in graphic format or alternatives for thinking about information or producing information.

Options for Language and Symbols

One aspect of multiple means of representation is that teachers provide students with multiple exemplars for language. Many free tools exist to

Figure 2. Readability

MSNBC page without Readability



Page with Readability activated

Boy, 10, is impaled by stingray barb but survives - TODAY People - People: Tales of survival

>> but let us begin with that 10-year-old boy who got the shock of his life when he was impaled by the barb of a stingray . in a moment we'll talk to him and his parents exclusively. but first, his story. 10-year-old quentin tokar was fishing with his family earlier this month off a pier on the outer banks of north carolina . nearby another group of fishermen were pulling a stingray out of the water. in the blink of an eye the barb of the stingray came off, fighting at least eight feet in the air, hitting quentin in the stomach.

>> i don't think i have words for what it felt like. i just pretty much started screaming, get it out of me.

provide visual or auditory representations of words and concepts. As mentioned previously, free graphic organizers can assist students and teachers in providing a more pictorial or visual representation of concepts or text.

Other free tools provide differing aspects of vocabulary assistance. WordWeb is a free download that can be used on- or offline. The program will read the word, then provide the definition and use it contextually in a sentence.

Visuwords provides a graphic map of the word and relationships to that word. This tool might be used by older

students, as it highlights the types of relationships and parts of speech. As the user scrolls over parts of the visual, a more detailed definition pops up. A simple Visuwords for the study of the word *cantankerous* is shown in Figure 3, with the pop-up for the definition of *ill-natured*. Another tool that presents a visual representation of words is Shahi, which combines Wiktionary content with images from Flickr to demonstrate a word.

Other ways to provide support for language and symbols include using specifically designed web pages developed with multiple versions of the same content so that a user can access a beginner, intermediate, or advanced

version of the context. Windows to the Universe offers this feature as well as providing a quick switch between English and Spanish web pages.

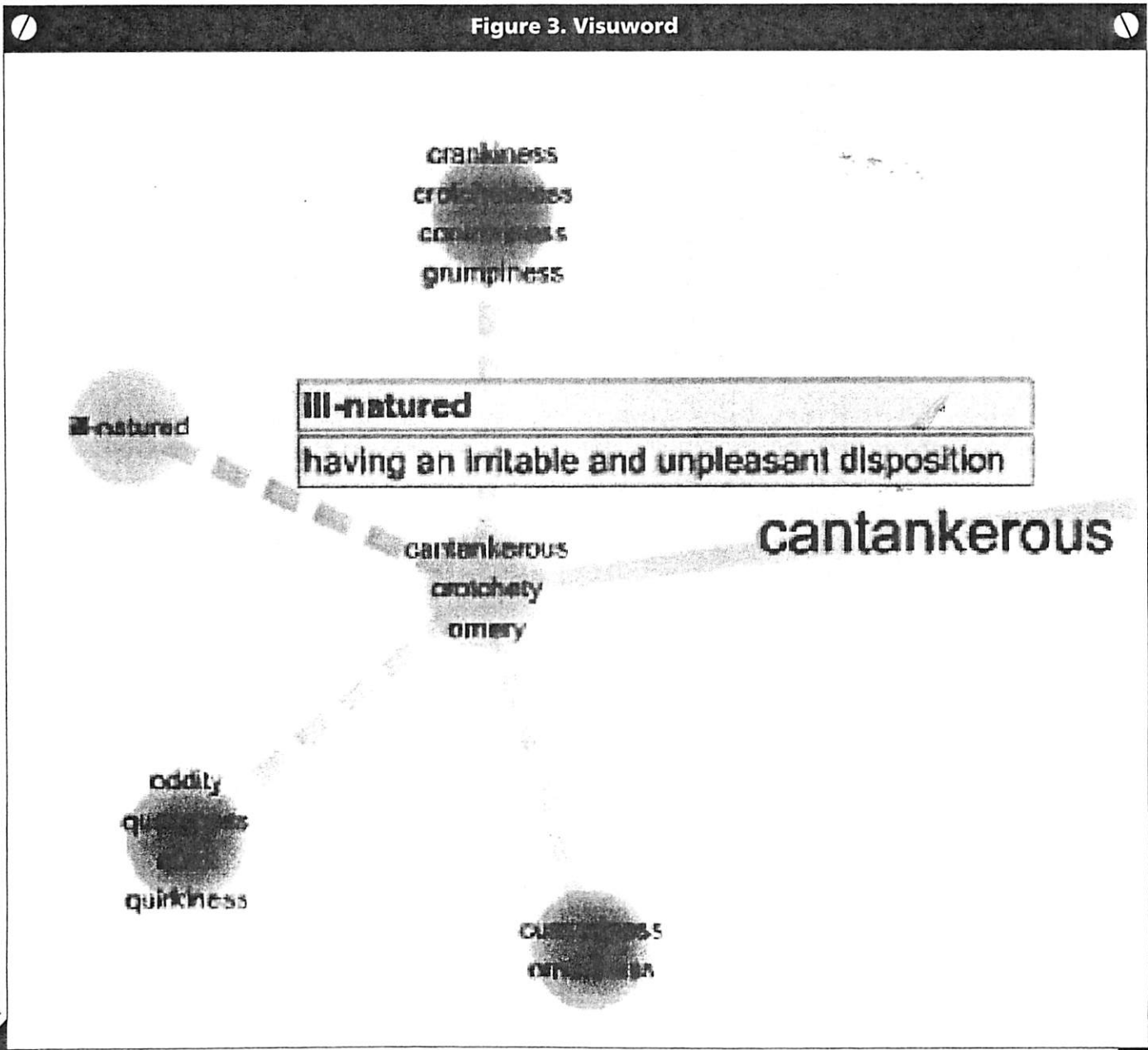
Not all web sites containing scientific or historical information provide this type of conversion; for other topics teachers can use Wikipedia Simple Text to change the format of a content site. First, locate a topic in Wikipedia and then scroll down the list of languages to Simple Text, then convert the topic to simple text. This one conversion might provide easier access for many students.

If some students need additional formatting, then teachers can use the

Autosummarize feature in Microsoft Word. If you can't find this feature in your version of Word, do a search for help and follow the directions to add it to the Word Ribbon. Autosummarize allows a user to take any text and create a short summary of that text. Another option allows

the user to highlight just important parts of the text. Again, this feature might not work for all students, but it is a tool that can be implemented to adjust text and reading for some students. The Autosummarize tool also can be used in written language, having students check their own work

with autosummarize to see if the tool highlights their important points. A teacher also can challenge students to discuss the options highlighted and provide opinions on the appropriateness of the important points. Figure 4 displays a Wikipedia entry for *guitar*, then in simple English,



and finally with 50% highlighted by autosummarize.

Options for Comprehension

The third guideline in multiple means of representation requires support for comprehension in the areas of memory, information processing, activation of background knowledge, and critical features. In the area of reading, students might need multiple representations of text in order to comprehend and understand the essential points.

CAST has created two tools that provide supported text: UDL Editions, and BookBuilder. UDL Editions provides a toolbar for all web pages. The toolbar (Figure 5) allows the option of hearing the text, looking up words, linking to a web search, changing the word to Spanish, or masking parts of the text in different colors. Just the use of this toolbar might be sufficient to provide some learners with additional tools to supplement their reading comprehension. UDL Editions currently has seven novels with strategy support that includes stop and think prompts, highlighting of literacy devices, links to a dictionary, and additional resources. The stop and think prompts are provided by animated coaches that encourage students to interpret the text by providing models and corrective feedback.

BookBuilder is for younger students

Figure 4. Simple English and Autosummarize

Guitar from Wikipedia

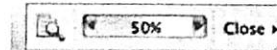
The guitar is a plucked string instrument, usually played with fingers or a pick. The guitar consists of a body with a rigid neck to which the strings, generally six in number but sometimes more, are attached. Guitars are traditionally constructed of various woods and strung with animal gut or, more recently, with either nylon or steel strings. Some modern guitars are made of polycarbonate materials. Guitars are made and repaired by luthiers. There are two primary families of guitars: acoustic and electric.

Guitar in Simple English

The guitar is a string instrument which is played by plucking the strings. The main parts of a guitar are the body, the fretboard, the headstock and the strings. Guitars are usually made from wood or plastic. Their strings are made of steel or nylon. The guitar strings are plucked with the fingers of the right hand (or left hand, for left handed players), or a small pick made of thin plastic. This type of pick is called a "plectrum" or guitar pick. The left hand holds the neck of the guitar while the fingers press the strings to the fretboard. Different finger positions on the fretboard make different notes.

Simple English Version Highlighted with Autosummarize

The guitar is a string instrument which is played by plucking the strings. The main parts of a guitar are the body, the fretboard, the headstock and the strings. Guitars are usually made from wood or plastic. Their strings are made of steel or nylon. The guitar strings are plucked with the fingers of the right hand (or left hand, for left handed players), or a small pick made of thin plastic. This type of pick is called a "plectrum" or guitar pick. The left hand holds the neck of the guitar while the fingers press the strings to the fretboard. Different finger positions on the fretboard make different notes.

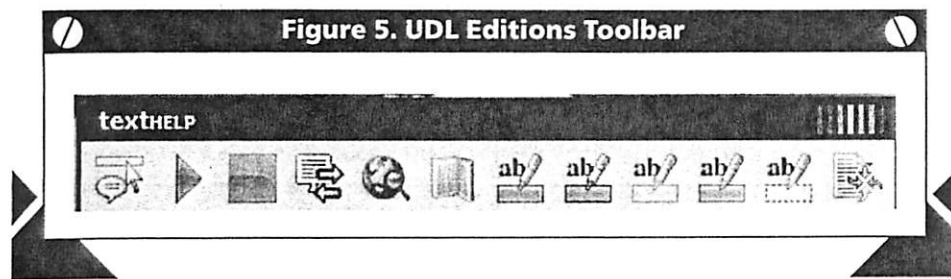


or for teachers who want to create their own books. BookBuilder includes the same reading toolbar as UDL Editions, but allows teachers to create customized books. For each page in the book, the teacher can include a picture or drawing, text, and up to three coaches to provide prompts or clues related to the text as appropriate. All prompts by the coaches are read to the students. Teachers can record their own voice to provide additional auditory support. A variety of books created by teachers is available on the BookBuilder site in the shared public library. As discussed in the following

section, many of the tools to support representation in the area of reading and writing also can be applied to the area of expression.

Multiple Means of Expression

The final principle of UDL focuses on providing multiple means of expression, although in the K-12 setting there are many methods and ways of expressing knowledge and expertise. Students can act, perform a task, or complete a sequence of steps. For the focus on reading and writing, this



technology always requires mediation and constant progress monitoring by the teacher to match the technology to the needs of each learner.

Options for Expressive Skills and Fluency

The second guideline for multiple means of expression focuses on providing options for expressive skills and fluency. Scaffolding the writing process and directly teaching skills can assist students with developing their creative expressive skills and building fluency in writing. Young children can practice skills for writing by using the word processor to scaffold the process for both writing and reading. Students can unscramble words to create sentences, or unscramble simple sentences to create a story. Older students can be contracted to create short stories with 5-10 sentences, and then mix up the sentences to have younger students put them in order. This activity can be individualized by assigning the length of stories as appropriate to the student level. This skill will help integrate reading with writing. Using the word processor, students practice the skills of cut and paste or moving text to the correct location. These skills will help them later with revisions to their own work.

Teachers also can create paragraphs with certain key words underlined and have students practice vocabulary by using the word processor to

section on multiple means of expression will primarily feature alternatives to handwriting or creative writing. Most important, no technology can take the place of good direct instruction in the process and steps of writing, including preplanning, composing, and revising. The word processor alone or with some add-on features can be used throughout all stages of writing. In addition, the principle of multiple means of expression challenges teachers to provide students with alternative ways to express what they know. Using the word processor might be one alternative for some students, but other free tools and activities can provide students with different ways to express and engage.

Options to Physically Respond and Interact

Tools are available to assist students with physical access to the computer. Students can use alternative keyboards, onscreen keyboards, and even access technology using a camera mouse or augmentative device. The UDL Center presents this guideline with respect to physical access to the technology and alternative means

of navigation and accessing assistive technology tools.

Most students in the general education classroom will be able to use the computer with a keyboard if they are provided with strategic instruction. Teachers do not have to be keyboarding teachers to provide students with practice in keyboarding to support transcription. Young children can learn to keyboard by practicing letters of the alphabet. King (1986) developed an alphabetic method to teach keyboarding skills. In this way all teachers can have students practice keyboarding while reinforcing other language skills and alphabetical order. This method can be used with any student who has not already had keyboarding instruction. Once students learn keyboarding, research indicates that word processing can increase both quality and quantity of written language as well as engagement and motivation (Goldberg, Russell, & Cook, 2003). Unfortunately, students will not always produce more written language or produce it faster using technology (Berninger, Abbott, Augsburger, & Garcia, 2009; MacArthur, Graham, Schwartz, & Schafer, 1995). Therefore using

change the underlined words to a synonym or antonym. Students practice reading and writing revision skills and build vocabulary. The number of underlined words as well as the length of the paragraph can be altered according to student needs.

Many students also have difficulty writing longer, more complex sentences. Again, students can practice the skill of creating complex sentences using conjunctions. Using a word processor, students can be presented with two short sentences such as:

- The cat was white.
- The cat was soft.

Using the word processor allows students to practice creating new sentences without retyping all the words. For this example, students could learn to delete the second "The cat was," and add the word *and* to create one sentence. Another way to rewrite this would be to move the word *white* in front of the word *cat*: The white cat was soft. Students could then count the different ways that the new sentence was rewritten.

Older students could be provided sentences that relate to their content areas in science or social studies. For example, students in sixth grade learn about ancient cultures. So, given the following set of sentences they could practice rewriting into one or two sentences:

- Poor Romans lived in apartment buildings.
- Apartment buildings were dirty.
- Apartment buildings were crowded.
- The poorest Romans had to climb a lot of stairs.

These activities also can be used on a teacher's writing blog, where activities can be posted and students can respond with their answers. Using the blog approach, teachers provide students with practice viewing the work of others and learning appropriate skills for critiquing each other.

Additional tools can be used for students who need additional support in locating words, spelling, and sentence structure. First, students need to be taught how to use the spell checker feature effectively; for the spelling feature in a word processor to be effective, students must begin the misspelled word with the correct letter and include most of the word's phonetic intent (MacArthur, 2009; MacArthur, Graham, Haynes, & De La Paz, 1996; Montgomery, Karlan, & Coutinho, 2001). Students whose misspelling is not consistent and who have problems with the word processor's spelling checker can use tools such as Ghotit. The online tool is free and schools can download and use the stand alone tool for all students. This spelling checker was designed to interpret unusual spellings for words based on sounds, not letter combinations.

Some students might need more

assistance from a word prediction or an autocompletion program. LetMeType will run in the background and can be used with any program. It collects words that are frequently used and adds them to the bank for autocompletion. Word prediction does not change what a student wants to write, as the student can always override the list of words presented. Scribe, an online autocompletion tool by Google, allows users to type and paste text into other applications. Another free program with word prediction that also offers an onscreen keyboard is ClickNType. A fee-based word prediction program that offers more sophisticated dictionaries and customization could be purchased for one or two computers in order for students with more severe spelling and composition difficulties to use them. More advanced word prediction programs provide options to hear the words read to the students and customizable dictionaries. Students who do use word prediction can increase their spelling and overall quality of writing, but quite possibly their speed and quantity will decrease (MacArthur, 1999). In time, students can learn to use the tools and compose at a rate comparable to others.

As mentioned previously, tools that provide text-to-speech, such as ReadPlease and Natural Readers, also can assist students in their writing. Some students might benefit from hearing words read as they are typed, and this feature might help

as much as or more than complete word prediction (Cullen & Richards, 2008). Other students who listen to their writing once they have finished can use the auditory feedback to edit and pick out mistakes in endings, grammar, and missing words.

Another way that teachers can offer multiple means of expression would be to use a variety of web-based tools that combine both text and visuals to present a topic. For example VoiceThread can integrate photos, text, and the student's visual interpretation of the photo. Then, others can offer comments regarding that work. ToonDoo can be used to create cartoons to discuss or explain a topic. Glogster is a combination of a bulletin board and a poster, so students can create a collage of a topic. For a more engaging twist on a presentation, students can use Prezi. Students can present their topics using PowerPoint or work collaboratively with others

on presentations using Zoho or Google Docs. Many teachers feel that PowerPoint does not provide an interactive forum for learning, but using nonlinear page linking, activities can be created for self-checking and concept building. Figure 6 displays two slides from a PowerPoint presentation where students read, make a choice to create, and choose the ending of the story. Figure 7 displays two slides where students read and receive corrective feedback. Teachers can create their own stories or contract with older students to take photos and create stories for their class.

Many programs can be used for collaboration and for other students to view the projects and comment. A whole set of whiteboard or collaborative drawing tools such as DoInk, Scribblar, or Dabbleboard can allow students to collaborate across space and time on projects and art. The graphic organizers or concept maps

listed in the area of representation also can help students brainstorm their ideas for written expression. Many of the web-based graphic organizers allow for collaboration so that students can brainstorm together, even at a distance. Some of these programs will convert the graphic map into an outline, providing students with a scaffold to the next step in the writing process. Working collaboratively can help students learn to set goals and monitor their own work.

Options for Executive Functions and Goal Setting

The last guideline for expression suggests that teachers provide options for students to work on goal setting, organization, and developing their executive functions. Many students with disabilities or who are at risk have problems developing strategies for learning, reading, and writing. First, students can access a range of

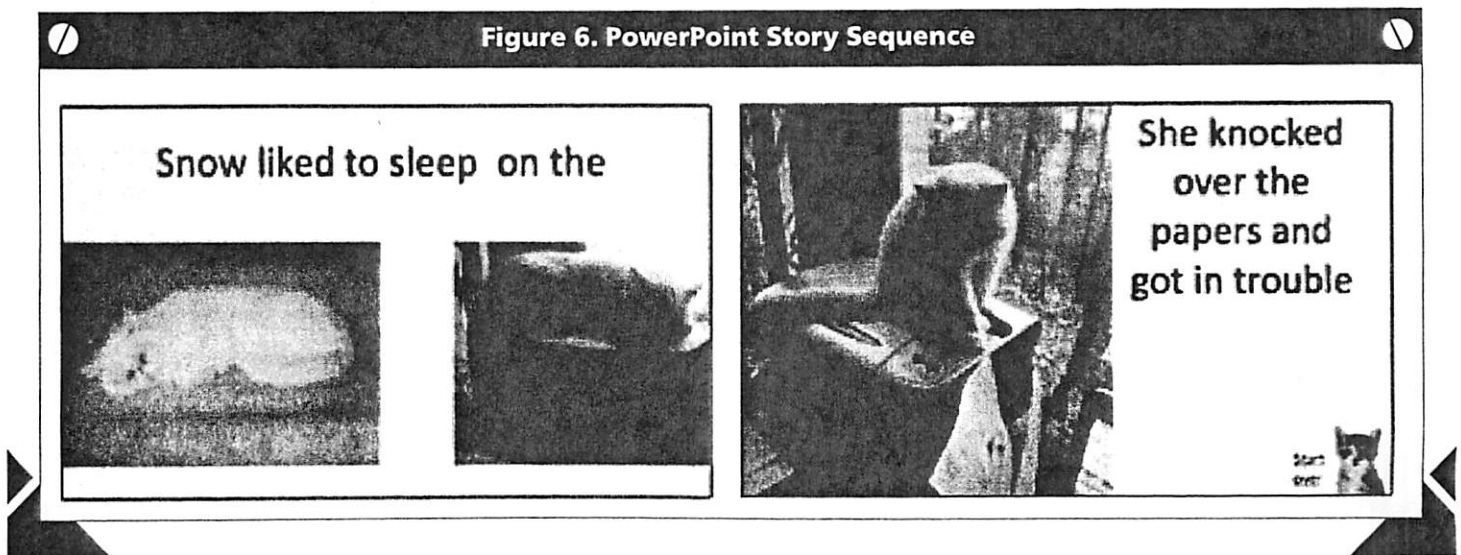
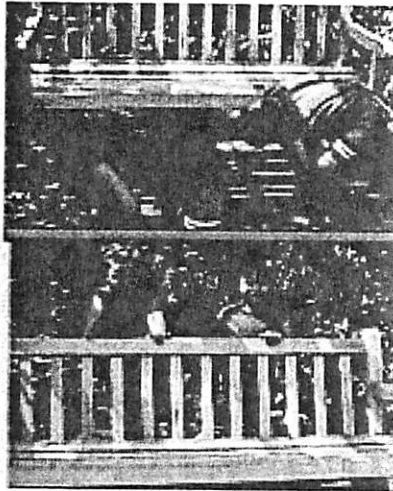


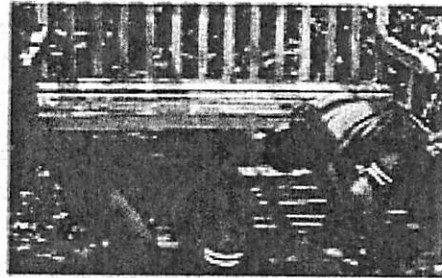
Figure 7. PowerPoint Corrective Feedback

Then Phillip
dropped his gum.
The boys had to
look under the
bench to find it.

Under



Yes, the boys had to look under the bench.



Do you think they found the gum?

tools to assist them in organization and memory. Remember the Milk, Hott Notes, and TaDa List are all free electronic list makers and reminders. HottNotes can be saved on a jump drive and carried from computer to computer. Free programs also are available to create flash cards and quizzes that support students in their vocabulary and strategic learning.

Another option to assist students in keeping organized would be to have them create their own list of web links using tools such as Delicious or Dingo. By using Delicious, a student could bookmark important tools to support access to a web site and also key sites for content. Then, those sites could be accessed from any computer. For example if a student needed to use Web Anywhere at the public library, then by accessing his Delicious account, he could access

this as the first link in the list. From there on, any of his other pages would be read to him.

CAST also developed two tools that can help students develop strategies in writing and researching: Strategy Tutor, and Science Writer. Strategy Tutor supports students as they choose a research topic and develop their report. Science Writer provides a support structure for writing a report as well as text-to-speech tools and coaches to prompt critical thinking. Both tools use coaches to assist students in their executive planning

Teachers also can support higher order thinking by creating WebQuests or using a tool such as Trackstar. WebQuests are inquiry-oriented lessons with web links to support them. Some students might find it difficult to focus on the topic or problem; by

using Trackstar, teachers can create a list of links with annotated prompts for students to read and follow. For example, in writing students might be given five web links with a different writing prompt for each website. Trackstar allows teachers to organize the websites and write out the prompts. For many students, having the web page with the prompt on the screen can help in organization and keep them focused on the task at hand. Teachers still can use the tool for inquiry-based learning, but also can scaffold the process for students who need more structure. Rubistar is another tool teachers can use to create a rubric for writing or reading tasks. Using rubrics provides students with a structured way to evaluate their work and can help in developing goal setting.

Summary

The technology presented represents only a few of the tools and strategies that can be used to implement each UDL guideline. As mentioned, many of the tools can be used for a variety of reasons and aligned with different guidelines for individuals or groups of students. Readers would be wise to visit and bookmark the UDL Center for more detailed information on the checkpoints under each guideline and suggestions for activities to integrate them. The focus in this chapter is on tools to integrate into reading and writing using UDL principles and guidelines as the organizer. Regardless of the technology used, teachers must teach students the basic skills in the area of reading and writing directly and train them how to use the technology effectively to support their learning. Moreover, the effective use of technology with students must be integrated into the curriculum in a manner that corresponds to individualized education plans, state and national standards, and methods that are anchored in evidence-based practice (Gardner, Wissick, & Edyburn, 2008).

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