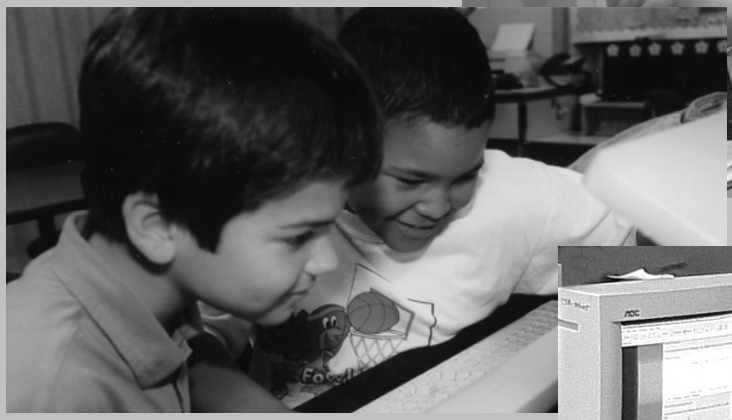
Assistive Technology as Universal Design for Learning



eMINTS
NATIONAL CENTER

Assistive Technology as Universal Design for Learning

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Purpose of the Module

In this session, participants will familiarize themselves with text to speech (TtS) and voice recognition (VR) software, important tools to assist all students in their quest to play a meaningful role in the classroom. These software programs have many features that can enhance an inquiry-based learning environment. Knowing how to use text to speech software, which works with many other applications, helps teachers become more effective in the classroom.

Module Objectives

- Learners will become familiar with the functions and features of basic text to speech and voice recognition software programs.
- Learners will understand how the software will benefit all students in their classroom.
- Learners will understand ways the software can allow special needs students to function independently.
- Learners will learn tips for evaluating and implementing assistive technology hardware and software.

National Education Standards

Federal IEP information
http://www.ed.gov/parents/needs/speced/iepguide
These guides assist educators, parents and state and local educational agencies in implementing the requirements of Part B of the Individuals with Disabilities Education Act (IDEA) into Individualized Education Programs (IEPs) for children with disabilities, including preschool-aged children.

Section 508 – Federal access to government information
http://www.section508.gov
Section 508 was enacted to eliminate barriers in information technology, to make available new opportunities for people with disabilities and to encourage development of technologies that will help achieve these goals.

MO DESE IEP information
http://dese.mo.gov/divspeced/Compliance/IEP/Index.html
Last revised September 2007 to the model IEP form.

MO DESE Special Education, Effective Practices
http://dese.mo.gov/divspeced/EffectivePractices
Coordinates programs designed to meet the special needs of children, youth and adults with disabilities in the areas of professional development, state school outreach coordination, state improvement grant management, technical assistance and parent training.

How Can Technology Assist?

Most students develop reading skills in a fairly similar sequence and time frame during the first four years of their school career. Students who are even slightly off the traditional journey pose challenges for educators.

Reading is one of the most complex skills we ever ask of children. Even a simplified outline shows how it involves multiple areas in the brain. A word first must be recorded in the visual cortex, then decoded in the left side of the brain in the angular gyrus, which separates it into basic sounds. This process activates the Broca's area which allows the word to be identified. Identification of the word is only the beginning for it must then be tied to a meaning and then related back to the context in which it appears.

Some children struggle with accomplishing the reading process because of specific differences in the way they process written material. These students are said to have a specific learning disability. The United States' special education law, the Individuals with Disabilities Education Act, defines a specific learning disability as

> a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, that may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia.

To be diagnosed with a learning disability, a child must have *at least* average intelligence and yet be unable to achieve at a level anticipated by his/her intelligence. Many children with learning disabilities have above average intelligence but cannot perform well in the classroom because of a processing issue. In fact, a growing number of children qualify as both gifted and learning disabled. To qualify as learning disabled a child's challenges must not be caused by a physical limitation such as eyesight, deafness, motor disorders or mental health issues.

Students who have difficulties in reading and writing are said to have print disabilities, meaning their interaction with print materials is impaired. Whether a student's reading and writing challenges are because of a specific learning disability or simply a slower developmental sequence, technology offers tools that allow students to achieve at their greatest potential.

Programs that read text aloud to students and those that recognize a student's spoken language and translate it to text have brought success to many students who struggled to get through the regular curriculum. These programs also offer significant benefits for all students and can aid teachers recover instructional time by performing individualized rehearsals that students can access on their own.

Software Tools

Regardless of the specific software used, text to speech (TtS) and voice recognition (VR) software give students a way to interact with printed materials despite their

disabilities and challenges. Each software choice offers different components and choices for different uses.

Reading Tools

Changing text to speech is one of the most meaningful options available. Students using this tool have audible access to printed material used in the classroom. Many programs have scanning abilities that allow learners to see and hear textbooks and other instructional materials. The ability to hear text that may be above students' reading level gives them an equal chance to process materials. When students can hear the questions and content proposed on a test with text to speech technology, teachers can better evaluate their knowledge of an academic subject rather than their ability to read a test question or directions.

Considerations for making the software available to students:

- Having the software installed on all computers in the classroom allows students to benefit from the tools while in various groups and settings.
- Allowing students to wear headphones with a built-in microphone as they work allows them to select tools they need at the moment they become necessary.

Teachers may want to consider scanning and developing a library of materials in a shared folder space:

- Worksheets used for practice
- Spelling and vocabulary words
- Textbooks
- Homework assignments
- Outlines of teachers' notes
- SMART Notebook pages used in lessons

Text to speech programs often provide other tools that assist the student in seamless functioning in the daily classroom activities. These tools may include a dictionary that reads aloud definitions and pronunciations. Speech maker applications allow students to record verbal output from a text reader as MP3 or AIFF files which means they can replay them on a computer or any MP3 player.

Many programs offer the ability to read webpages so students can access web-based primary sources and scientific studies. Most students can process information at a much higher level than they are able to read independently.

The option to highlight text as it is being read aloud offers the reader a chance to learn the words as they are spoken and improve their visual tracking skills. Many programs allow the reader to select whether a single word is highlighted or the entire sentence or paragraph.

Experts with experience using many of the popular software packages on the market say there is very little difference in their accuracy for voice recognition. Marshal Raskind, Ph. D. (Director of Research and Special Projects at Schwab Learning Center) says that having a good headset, with a powered noise canceling microphone that plugs into the USB port, is the most important consideration. He also emphasizes that making sure the microphone, usually a moveable boom microphone, is in the same position each and every time is critical. He suggests marking the headset with the

position of the microphone so that it will be at the same position each time a student uses it. Raskind cautions that young students may have to re-teach the software every six months, or even more frequently, because of their voice naturally changing.

All voice recognition software becomes more accurate with use, a fact that should be kept in mind while students are learning how to use the software. Teachers in an eMINTS pilot study noted that deleting the student voice recognition files after a few weeks helped in some cases. In elementary grades, some students will never become proficient with the voice component. The best classroom strategy is to concentrate on communication arts skills using the software program for reading and writing while working individually in short sessions with children for voice recognition.

Writing Tools

Text to speech programs have a significant impact on students' ability to communicate in writing. While any word processor frees students from the fine motor requirements of paper and pencil tasks, it does not free the student who is challenged by other essential skills. Text to speech programs offer tools such as phonetic spell checkers, word prediction, homophone helpers and even study skills tools to make written assignments a less demanding and stressful process.

Phonetic spell checkers not only highlight a word that needs the writer's attention but they analyze the phonetic possibilities thus increasing the chances that the suggested spellings are accurate. For instance, if a student types "fotograf," words with both "f" and "ph" are suggested. Combining spell check with the text to speech components means each possible spelling suggestion will be read aloud for the students to consider which word they were attempting to spell. Many students use simple words they can easily spell rather than attempting words they may use in verbal communication but be unable to spell. This type of tool will allow their writing to move up to the level that they can verbally communicate.

Word prediction tools learn from the writer's style and, in a separate box on the screen, predict the word from what is being typed. Word prediction, combined with a text to speech tool, allows these words to be read aloud so readers who know the beginning sounds in the word can have the predictor help them select words that best reflect their meaning.

Homophone helpers offer assistance in the confusing world of homophones. Some tools highlight the homophones in the text a student has produced so that by clicking on the typed word, students can hear the word aloud in a sentence. Hearing the word in context improves the chance of accurate word selection.

Applications of text to speech and voice recognition are as numerous as the number of times students interact with text.

Assistive Technology Software

A number of software products can be used in classrooms to help struggling and emergent readers, English language learners and students with special needs. Software as universal design for learning (UDL) has the potential to benefit all

students. What software is appropriate for the classroom, especially if all students will be engaged with it? Several considerations before purchasing software follow:

Checklist for Hardware

1. Is the software compatible with the computers in the classroom?
2. Is the software compatible with the operating system in use by computers in the classroom?
3. Can the software be run from a school server when purchased with a site license?
4. Are headsets required?
5. Will students share headsets or will each student have his/her own?
6. Are wireless headsets supported?
7. Can a fully functional demo copy be obtained?
8. Is the software on a thumb drive for easy use with laptops?
9. Are student files stored on individual computers or on a server?

Buying Tips

1. Consider how many computers need the software. Look for site licenses and/or server editions.
2. Check for cost savings with server editions: $4,000 for a server edition to reach all 250 student computers in a building costs significantly less than $275 per copy for 250 student computers ($68,750).
3. USB headsets work best with noise cancelling microphone and volume controls. They should be section 508 certified.
4. What training is available, for students and for teachers?
    - Is an online tutorial available that students can work through?
    - At what grade level is the tutorial presented?
    - Are support files for the tutorial available?
    - Is a “cheat sheet” or quick reference guide of functions provided?
    - How do users obtain updates - automatically via the web, additional purchase cost, etc.?
    - Does the vendor offer (free) webinars on advanced features?
    - Is a tutorial packaged with the software? If so, where can users obtain support or help if questions are not answered by the tutorial?
    - Evaluate help resources available - software help utilities, online/web help, e-mail, telephone support.

Features Tour

These items for consideration were suggested by program functions described in R&WG® and Dragon NaturallySpeaking® websites.

- Can any portion of a webpage be read, including embedded text?
- Can scans be read?
- Can scans taken with a digital camera be read?
- Are simple and advanced calculators available?
- Is an integrated toolbar that works inside MS Office applications included?
- Can users record MP3, WMA or WAV files to replay in PowerPoint and other applications?
- Are there study skills resources – summary of articles, personal folders for students, graphic organizer, calculator, research tools, etc.
- Can users transport voice training to a home computer via thumb drive?

- Are different colors for highlighting provided?
- Does software allow text to be selected to be read?
- Does the spell checker have phonetic settings?
- Is help for selecting the correct homophone included?
- Are teacher-level controls provided for what students can use/access?
- Are translations available (English, Spanish, other)?
- Can scans be made from the software?
- Word prediction available?
- Talking dictionary available?
- Integrated web search tool that facilitates using a standard search engine?
- Speech recognition?
- Text-to-speech?
- Phonemic breakdown of words into syllables?
- Is the DAISY standard for accessible documents and books functional in the software?
- Clipboard for cutting and pasting?
- Support for Adobe Acrobat?
- What is required to train the software for speech-to-text?

Classroom Challenges and Successes

During a 2006-2007 pilot program teachers met in focus groups, kept online journals and met with their facilitator to share challenges and successes. Teachers in the pilot program reviewed the leading software programs and selected Read and Write Gold. Though R&WG is not the only assistive software available, since the pilot used R&WG, the successes and challenges below reflect teachers' experiences with that product.

The challenges were few but significant. The engines that provide speech-to-text voice recognition (VR) are not well suited for young users. The same limitation was found to be true for several VR products, not only for R&WG. There were some success stories but more often than not the students who needed VR the most could not get success rates high enough to warrant continued use. (This finding represents a contradiction because correcting the software over time normally yields a higher success rate.) A small number of students, especially those with above average reading skills, did not want to use headphones after the "new" wore off though they did use the headphones for editing and proofreading work. As eMINTS knowledge and experience with VR grows, including conversations with leading educators like Dr. Raskind, we will continue to share information with classroom educators.

Successes were widespread. Some easily distracted students were reported to be more on-task when they put on headsets. After a few days students started developing an awareness of who needed the headset for what activity. Some students always used the headset and others only for a specific task like word pronunciation.

Teachers reported writing assignments for third through sixth grade were most affected. Teachers asked students to use text-to-speech (TtS) for initial edits. Teachers reported many students "heads-up" experience: "This program won't read my sentence right! It left out a word!" When the teacher helped review the sentence, they found, in fact, a word left out. Teachers also reported that students wrote more to have the software read more back to them. ELL students were in complete control of what they wrote, and also wrote more. Students came to realize that though they

initially thought their writing was perfect, TtS demonstrated the need to pay attention to additional edits. TtS is not an expert system; it is an expert reader as it reads exactly what is written, punctuation included.

Some strategies for student writing included the following:

- First edit with TtS; second edit with share-pair; then sign up for teacher conference.
- Every student listens to first edit alone, completes second draft, partner listens and checks for corrections, corrections completed, final reading.
- Explore word prediction feature ("the blue ball") with students.
- Explore the homophone function as a way to allow interaction time after time. Software does not care how many times a student asks the same question.
- Explore spell check with students. Other spell checks are available but this one is integrated with the software.
- Any format that places responsibility on the learner and software, that educators think is appropriate, is worth trying! Experiment! Teachers reported a recovery of significant teaching time, students working independently and increased awareness of how important editing is in the writing process.

Teachers reported WebQuest activities were positively affected. Students were able to use headphones to have webpages read to them, get help for specific words and work more independently. One teacher remarked that she had not realized how much WebQuest time she spent helping students find the right place on a webpage, help read the passage and then help students understand the material. Teachers reported that frequently a webpage had information that some students could manage but others could not. The software allowed students to manage their own learning by first reading the passage when requested and giving definitions for specific words.

Some strategies for WebQuests included the following:

- Pre-teach how to use the software for a WebQuest – highlighting a passage with the software for reading.
- Pre-teach how to use the dictionary.
- Pre-teach how to use the fact folders.
- Remind students that the dictionary can pronounce words. This feature is all many students will need: pop on the headset, listen to pronunciation, off with the headphones!

General Classroom Tips

- Use the microphone and software as digital recorders. This strategy puts a digital recorder on every desk in the classroom. Students can record and save recordings as .MP3 or .WAV files for use in multimedia projects.
- Explore the math calculator. Equations can be copied to MS Word.
- Designate student helpers to assist others.
- Use a graphic organizer similar to Inspiration.
- Make sure students know which activities for TtS are mandatory, if any, and which are up to the student to decide when to use.
- If students in upper grades have used the software, invite one to come be the "expert" for a few introductory sessions.
- Other teacher users are excellent resources for how to implement the software.

- Go through the tutorial with the class. Assign groups to explore tools. Have groups report to the class using SMART Board or PowerPoint. Since most TtS programs allow recordings of voices to .MP3 or .wav files, ask each student group to create a few PPT slides illustrating specific tools and features, then combine them into a class PPT.
- Students will have more time to explore the program than teachers. Set aside a weekly time to learn about new feature(s) and/or uses. When students find new tools they think are important, schedule them to help others learn the new function. Teachers may need to review how the feature works with the student before presenting to the class.
- Contact building or district technical support staff before installing the software. A mature and robust software package is vital, but with firewalls, virus protection and detection and filter interaction local technical intervention may be required to get classroom software up and running successfully.

Text-to-speech and voice recognition software offer innovative ways for students to learn at their potential while staying in charge of their own learning. They provide another way that engaged, self-directed students can see they are in charge of how they learn. They appear to support the increase in student efficacy reported by teachers in the pilot program. Writing skills are where the most student improvement has been seen, but other areas remain to be explored.

Resources

Missouri Assistive Technology – equipment loans

http://www.at.mo.gov

The mission of Missouri Assistive Technology is to increase access to assistive technology for Missourians with all types of disabilities, of all ages. The Council is charged to serve as an advocate for policies, regulations and programs to establish a consumer-responsive, comprehensive assistive technology service delivery system.

Missouri Special Education – reimbursement program

http://www.at.mo.gov/speced.shtm

The Assistive Technology Reimbursement Program is designed to assist school districts cover the costs of assuring students have the assistive technology they need to receive a free and appropriate education under IDEA. Only school districts can apply for this program. A request must be tied to a specific student for whom assistive technology is specified in the student's IEP. The cost of the devices must be between $1,000 and $5,000.

Nuance, Dragon NaturallySpeaking

http://www.digitalriver.com/v2.0-img/operations/scansoft/site/367062/367062_dns-talk.html

Text-to-speech and voice recognition software.

TextHELP, Read and Write Gold

http://www.readwritegold.com

Text-to-speech and voice recognition software.