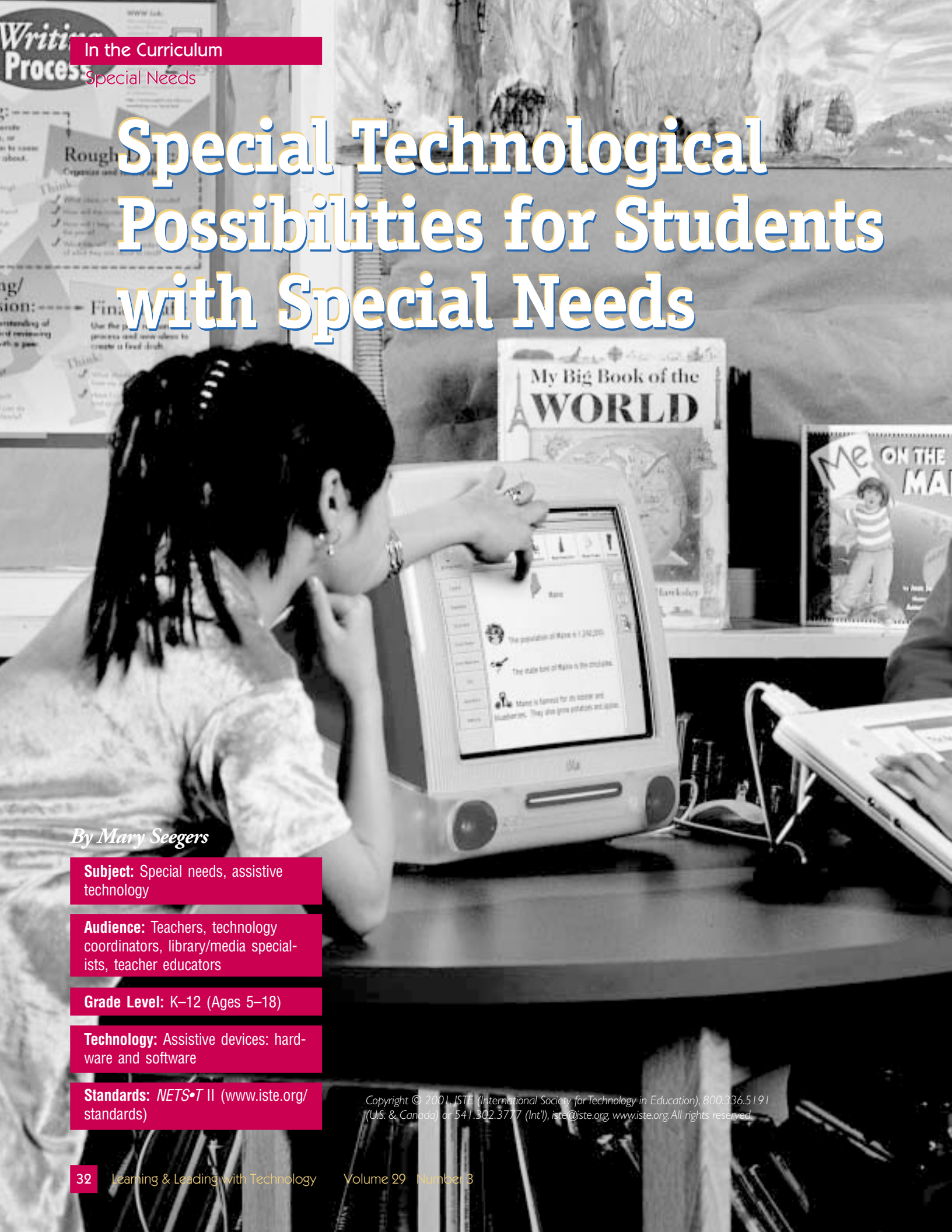




Special Technological Possibilities for Students with Special Needs

By Mary Seegers

Subject: Special needs, assistive technology

Audience: Teachers, technology coordinators, library/media specialists, teacher educators

Grade Level: K–12 (Ages 5–18)

Technology: Assistive devices: hardware and software

Standards: *NETS•T II* (www.iste.org/standards)

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**“If your students face a challenge, chances are technology innovations can help provide a solution”
(Milone, 1997, p. 2).**

By definition, students with special needs face many challenges, so investigating technological possibilities that can provide them with opportunities to learn, share information, and gain independence is especially important.

U.S. federal legislation increasingly supports such efforts. Particularly within the past decade, the U.S. government has “accelerated the effort to adapt technology so that all students will have equal access to educational opportunities” (Milone, 1997, p. 1). Section 504 of the Vocational Rehabilitation Act of 1973; Public Law 94-142; and the Education for All Handicapped Children Act of 1975 were followed by The Americans with Disabilities Act; the 1998 Technology-Related Assistance for Individuals with Disabilities Act (also known as the Tech Act in its 1994 amended form); and Parts B and H of the Individuals with Disabilities Education Act (IDEA, 1990), which requires that schools “must determine whether an assistive technology device and/or service is needed in order for the student with special needs to receive a free and appropriate public education” (Massachusetts Department of Education, 1995, p. 4).

As a regular education teacher, I may conceivably have students with any number of disabilities mainstreamed into my classroom at any given time. That fact, coupled with my firm belief in technology’s value in education, spurred me on to investigate technological tools designed specifically to assist students with special needs.

Software

I learned that assistive technology devices take many forms. Speech output, word-prediction, and speech recognition software offer unique ways of assisting students with various language and vision-related problems.

IntelliTalk II by Intellitools.

Computerized speech synthesis, an aid for students with visual and speech impairments as well as auditory learners has been available for some time (Messerer, 1997). In its "Computer Accessibility Technology Packet," the U.S. Department of Education (1997) makes an important distinction between "talking software" applications and "screen readers," however:

An example of the first is an instructional software package [that] provides verbal directions for an on-screen activity or uses verbal reinforcement for correct responses, "good job," "you are correct," etc. In contrast, a screen reader can read all system icons, menu bars, system information, etc. and text generated through applications. While the first is important for instructional purposes, a screen reader is essential to full computer access. (p. 39)

Armstrong, Brand, Glass, & Regan (1995) recommend the speech output provided by IntelliTalk (Intellitools), a "talking word processor" (p. 3), as a tool for students with learning, cognitive, or vision problems. (Find the URLs for products mentioned in this article in Table 1.) eReader (formerly Ultimate Reader) and Write: OutLoud are other screen readers that provide auditory feedback for each letter, word, sentence, or paragraph, along with a talking spelling checker. The programs' talking toolbar feature provides auditory access to program commands as well.

Sandy Brennan (online interview, May 24, 2001), a special education teacher at Webster Intermediate School in Auburn, Maine, has used CAST's Ultimate Reader for both reading and writing with her fifth- and sixth-grade students with learning and emotional disabilities:

My students used information they found on the Internet to

Table 1. Products, Company Names, and URLs by Category*

Speech Output, Word Prediction, and Speech Recognition Software		
Co:Writer 4000	Don Johnston	http://donjohnston.com **
Discover: Kenx	Don Johnston	http://donjohnston.com **
Dragon Dictate	Dragon Systems	www.dragonsys.com/products/dragondictate
IntelliTalk II	Intellitools	www.intellitools.com
Kurzweil 1000, 3000	Lemout & Hauspie	www.lhsl.com/store/edu.cfm
OutSPOKEN Solo 3.0	ALVA	www.alva-bv.nl/alvacorp/corp_enu.html , www.alva-bv.nl/alvacorp/osw04.html
textHELP! (includes Wordsmith, Read & Write, Type & Talk, and ScreenReader)	textHELP! Systems Ltd.	www.texthelp.com
Write: OutLoud	Don Johnston	http://donjohnston.com **
Communication Devices		
Minspeak language system	Prentke Romich Co.	www.prentrom.com/index.html
Zygo Lightwriter	Zygo Industries Inc.	www.zygo-usa.com/lighwrts.htm
Zygo Macaw 3	Zygo Industries Inc.	www.zygo-usa.com/macaw3.htm
Input Devices		
<i>Alternative Keyboards</i>		
BAT Personal Keyboard	Infogrip	www.infogrip.com
Mini Keyboard (Passive)	TASH	www.tashinc.com/catalog/ca_winmini.html
<i>Expanded Keyboards</i>		
IntelliKeys	Intellitools	http://www.intellitools.com
Key Largo	Don Johnston	http://donjohnston.com **
Display and Readability Tools		
CloseView (Mac utility)	Apple	www.apple.com/education/k12/disability/easyaccess.html
Compu-Lenz	Florida New Concepts Marketing	www.gulfside.com/compulenz
HeadMaster Plus	Prentke Romich Co.	www.prentrom.com/index.html
HeadMouse	Origin Instruments	www.orin.com (also available at http://store.yahoo.com/fos/headmousedesk.html)
InLarge	ALVA Access Group, Inc.	www.aagi.com/aagi/aagi_home.html (also available at www.keyalt.com/ksoftware.htm#inlarge)
TouchWindow	Edmark	www.edmark.com/prod/tw
ZoomText Xtra version 7.05	Ai Squared	www.aisquared.com (also available at www.adaptivetech.net/screenmag.htm)
Other Tools		
Alphasmart 3000	Alphasmart, Inc.	www.alphasmart.com
ChatterVox	Asyst	www.communimate.com/products/chatter1.html , www.abattery.com/chattervox.htm
Coin-u-later	ParentBanc	www.parentbanc.com
Four Frame Talker	Attainment Company	www.AttainmentCompany.com
Franklin speller products	Franklin Electronic Publishers	www.franklin.com/education
Reading Pen	Seiko Instruments	www.readingpen.com , www.rit.edu/~easi/ak12/k12/rpquick.html , www.eaiusa.com/mo_seiko_reading_pen.htm
*Products, company names, and URLs were accurate as of press time, but are subject to change.		
** When looking for products on the Don Johnston Web site, select Search our site, then search for the exact product name.		



IntelliKeys by Intellitools.

create books, which [eReader] could then highlight and read aloud. They also used it to make autobiographies. They scanned in pictures and wrote a story to go along with them. ... [The speech synthesis software also] reads their stories aloud for students who are too shy ... to present in front of a group. It is also conducive for displaying with the LCD projector and external speakers. Teachers can use it to teach mini-lessons on a topic. ... Then students can read the lesson and hear it at the same time, [for] self-directed learning. ... I also downloaded ebooks for students to read and listen to as well. eReader allows you to type in a URL, and it will automatically go to the site and read the Web page aloud. I like it because low-level readers can access important information for research as well as read and listen to classics and other literature that they could not otherwise read.

Kathy Durrenberger (personal interview, May 29, 2001), a special education Resource Teacher and Inclusion Facilitator at Harrison Street School in Geneva, Illinois, has used

Write: OutLoud with a fourth grader who is legally blind. She noted the computer's ability to "read sentences back to him is essential because he can't see the menus or words very well. Another nice thing is that it will repeat words, sentences, or paragraphs, ... so he can look at (and hear) his writing as an organized whole."

For a student with learning disabilities who has used Write: OutLoud, Mrs. Durrenberger reported, "He has a hard time thinking of what to write. It helps that the program reads his writing back to him. The challenge is lack of keyboarding skills. He likes it, though, because he has a hard time forming letters, so it is nice for him because what he writes looks good when he sees it on the screen or prints it out."

Although both programs have effective text-to-speech capabilities with synchronized text highlighting, when I compared them, I found that each has several unique features. eReader has a button for direct connection to the Internet, and it can read Web pages aloud, although it does not allow for bookmarking Web sites. Second, it has a "mark place" feature, a convenient way to locate where a reader left off in a long document. Next, it allows for a word processing document to be open

adjacent to the Web page, convenient for taking notes or copying and pasting information. Finally, it can open rich text format (RTF) as well as text files. It kept the formatting intact when I copied and pasted this article into it for proofreading purposes. What is special about Write: OutLoud are its speaking dictionary and homophone checker and the audio cues it provides for misspelled words. It can also pronounce words as you type.

A group of tools from textHELP Systems Ltd. (WordSmith, Read & Write, Type & Talk, and ScreenReader) are also designed to help struggling readers and writers. Features include a talking toolbar, on-screen text reading, a phonetic spelling checker, word prediction capabilities, and a thesaurus.

Milone (1997) reports that the outSPOKEN software aids students with visual impairments by describing the "icons, graphics, and other elements on the screen in addition to reading text" (p. 3).

JAWS (Job Access With Speech from Henter-Joyce), another speech synthesis program, is available for Windows only. It is the only program I know of that verbally leads the user through the installation and setup process as well as reading text files aloud.

Word-prediction software, such as Co:Writer and textHELP!, are designed to help students with language deficits. As a user types, the program predicts words he or she might use in that context and provides a list of words from which the user can choose with a single keystroke or by pressing a switch (Messerer, 1997). Armstrong and colleagues (1995) endorsed Co:Writer as "word prediction software at its best" (p. 1). Mrs. Durrenberger tried using Co:Writer with a second grader who has ataxia, a form of cerebral palsy. His occupational therapist recommended it to help with the student's fatigue factor, thinking that fewer keystrokes would be required by selecting words from a list rather than typing each letter.

However, Mrs. Durrenberger thinks that the program "slows him down:"

[because] he concentrates on the choices and forgets what he intended to write. Each keystroke results in a new list of words to choose from. The time required to look at each new set of choices seems to interfere with the creative element of writing. Also, I think it's more work in regard to this particular student's fatigue factor because his hands must leave the home row keys to select an arrow key or use the mouse. ... Co:Writer works in conjunction with a word processing application. The user can toggle back and forth between the Co:Writer portion of the screen and the word processing document. Simply by hitting the space bar, the user can automatically transfer the text from Co:Writer to the word processing file. Using Co:Writer requires word recognition, spelling, and keyboarding skills. It does not allow for correcting spelling errors and does not include a spell checker, so if someone types misspelled

words, the computer reads the mistake, which can sometimes sound like gobbledygook.

On the other hand, Amy Gailunas (personal interview, June 26, 2001), a special education teacher at Pat O'Hearn Elementary School in Dorchester, Massachusetts, said, "I almost get misty thinking about it," when referring to one of her first grader's experiences with Co:Writer. The seven-year-old student with cerebral palsy could read at grade level, but his fine and gross motor skills were such that he could not finish writing a complete sentence. When given a prompt such as "My friends are....," he tried to read back his own printing but ended up saying, "I didn't know what I wanted to say" out of frustration.

The student's occupational therapist recommended using a slanted writing surface, a thick pencil, a ball-shaped crayon, visual cues (e.g., highlighter tape) on his paper, and tactile cues (e.g., Wikki Stix). The results of these interventions were a limited quantity of writing and increased legibility, but the letters were scattered on the page, and he had a startle reflex when using the crayon. Ms. Gailunas then had him try an AlphaSmart keyboard. It was a breakthrough. His hunt-and-peck keyboarding methods proved effective. "He was able to write three simple but complete sentences. They made sense. He could read them back, but the quality and content were still limited. He would stop typing at the end of the AlphaSmart window. I thought he could do more, so we tried Co:Writer. This is so exciting. He filled a page. He read it back. He was thrilled!"

But Ms. Gailunas did not stop there. She could see that after about three months of using Co:Writer, "The word prediction got in the way of his own voice. It slowed him down, so I moved him to word processing. He now uses clip art and PowerPoint. I almost get

misty when I think about how far he has come." With Sticky Keys and Toggle Keys on, without using the mouse ("He was 'a clicker,' so I had him use the arrow keys instead."), and with the transition to word processing software, "his writing quality and quantity improved. He has a better awareness of punctuation and spelling. Now he is developing style and voice in his compositions." She concluded, "I think the most important thing about any assistive technology is evaluating to see if it's necessary."

As a middle school language arts teacher, I am particularly interested in "talking word processor" programs. I like the idea of having questions read aloud by the computer to some of my students with learning disabilities and Attention Deficit Hyperactive Disorder (ADHD), instead of having an aide do it. That way, each student can hear the text repeated as many times as necessary, and it frees up the aide to assist in other ways. With such programs, students can also "hear" their own writing, which can be a definite boon to the revision process.

Two speech synthesis programs that have built-in optical character recognition capabilities for scanning text are Open Book Ruby Edition and Kurzweil 3000. Open Book (Windows only) comes with a conventional manual, plus Braille and cassette versions. It provides oral instructions, such as "Press the Scan key to scan." Kurzweil 3000 has a unique note-taking feature.

The Kurzweil Web site describes Kurzweil 1000 as an "advanced reading tool for people who are blind or visually impaired," while the Kurzweil 3000 "is ideal as a compensatory reading program for students with learning disabilities. ... Words are highlighted in context as they are read aloud. Language tools such as a dictionary, thesaurus, syllabication, and phonetic spelling provide additional support."



Alphasmart 3000 by Alphasmart, Inc.

Words can be pronounced, defined, and spelled aloud.

This is definitely a step beyond books on tape. A special education teacher in my school said her high-school-aged son has a learning disability and uses the Kurzweil system. He uses an auditory recording device that records what the speaker says onto a disk. The data on the disk then interface with the Kurzweil computer software, which transposes the information into text. The text can then be manipulated in various ways to assist in learning the material (e.g., read aloud, highlighted, condensed into notes, etc.). During this process, then, the information moves from auditory to text and back to auditory. In contrast to books on tape, however, where the words are read fluidly and with natural voices and expression, Kurzweil text is read word by word within each phrase, line, or paragraph of words highlighted, and the speech sounds like automated, robot-like voices (M. Lancaster, personal interview, October 27, 2000).

Another parent reported her family's experiences with using technology to help their son who has a learning disability.

A year and a half ago, I started (my son) with a talking Franklin Speller [now the Webster's Spelling Corrector], which would pronounce words and give definitions. But it was not something he would use enough to make it automatic. That's when we started looking for text-to-speech to keep up with the increased reading demand. ... He uses the Kurzweil program to edit his written work as much as he does for reading his assignments. He will type his report in Microsoft Word, copy it to Kurzweil, print it out, and circle his mistakes as he hears it read to him. ... We also use various CD-ROMs to tie in with his curriculum [such as the] Dorling Kindersley Eyewitness series for History, Science, etc. They break down complex material into interesting chunks of information. [More than] 75% of the text is read out loud. Most of the graphics are photographs of real things and situations. They are truly outstanding for "reality-based learning," which I believe has been a big part of the progress

we have seen in the past year.

(J. Graziano, e-mail, June 8, 1999)

Of course the font, size, and color of the scanned text can be adjusted to address the needs of students with visual impairments, and it can also be translated into Braille with special software and then printed using a Braille printer. Additionally, questions on the computer can be accessed by students with alternative keyboards or switch-activated input devices. The computer can even type the student's verbal answers, if necessary, by means of speech recognition software. For example, Dragon Dictate allows users to input text verbally and instantly see what was spoken on the monitor. They can also move the cursor around within the document, edit and format text, move the mouse, and activate pull-down menus and dialog boxes, all by voice. Messerer (1997) points out that computers with speech-recognition capabilities can significantly help students with physical, visual, or other disabilities. His assessment is that speech-recognition systems "offer vastly improved capabilities beyond those available just a few years ago" (Messerer, p. 52).



Zygo Macaw 3 by Zygo Industries Inc.



Zygo Lightwriter by Zygo Industries Inc.

Communication Devices

Minspeak interfaces with the Zygo Macaw, a communication device designed to help people with a speech loss or severe speech impairment, giving “a voice to the voiceless” by means of touch-sensitive, speech-synthesized symbols (icons) that aid in both communicating and learning language. The Zygo Lightwriter requires spelling and writing ability and adequate manual dexterity to use its keyboard. The text typed into this small, portable device (similar to an AlphaSmart) can be viewed on dual LCDs (one facing the listener), and it can be heard simultaneously through speech synthesis as well.

Input Devices

For students who have dexterity problems when using their arms or hands, Messerer (1997) suggests the use of a switch. With this device, “a cursor moves through a series of alternatives. Students activate the switch when the option they want is highlighted” (Messerer, p. 51). For people who cannot use their hands, pointing devices enable them to input information into a computer by using a “pointing stick” held in their mouth or attached to a headband. They can make contact with a touch-sensitive surface (e.g., TouchWindow) with the “pointing stick” or transmit information using an infrared beam (e.g., HeadMouse and HeadMaster).

Condensed (mini) or expanded alternative keyboards can help students who have fine motor dexterity skills but developmental disabilities. The condensed models (e.g., Mini keyboard and the BAT Personal Keyboard) are designed for individuals with a limited range of motion. Expanded alternative keyboards (e.g., Key Largo and Intellikeys) have large, touch-sensitive keyboards that can be programmed to work with various commercial or teacher-created overlays (Messerer, 1997). To interface such external input devices with the computer, several experts recommend Discover:Kenx. Armstrong and colleagues (1995) are impressed with the software’s ability to create a flexible environment, enabling users to “create individualized tools for computer access from multiple input options including single switches, alternate keyboards, and augmentative communication devices” (p. 2).

Display Readability

Making text larger or more readable for people with visual impairments can be accomplished in a number of ways. First, a document’s font, size, color, and style can be adjusted within many applications. Second, the Windows 98 High Contrast display settings can be selected in the Accessibility Options control panel. Third, software applications designed specifically to enlarge information on the computer screen in-

clude CloseView and inLarge for the Macintosh and ZoomText for Windows machines. CloseView can enlarge information up to 16 times its normal size. A fourth option is to purchase a screen magnifier such as Compu-Lenz, which attaches to the front of the computer monitor (Messerer, 1997).

Other Products

Although not all directly computer-related, several other products are also designed to assist students with language and writing development. The Speaking Spelling & Handwriting Ace, more commonly known as the Franklin Speller, is available along with five other Franklin products designed to support reading, writing, speaking, and listening. They are the Speaking Homework Wiz, the Speaking Merriam-Webster Dictionary & Thesaurus, the Speaking Language Master, the Speaking Spanish Master Spanish/English Dictionary, and the Speak English! Language Tutor.

Another device, called a Reading Pen II, looks similar to a laserdisc bar code reader. Users roll the pen’s optical scanner over a word, which the pen then pronounces, spells aloud, and defines.

Other products qualify as assistive devices as well. The Four Frame Talker is a handheld tool that holds graphic overlays and records up to four 5-second messages. It is useful for helping students with language deficits

improve their vocabulary, word retrieval, and pronunciation skills.

The ChatterVox enables people with voice impairments to be understood by amplifying minute sound signals. This device works with a hands-free microphone and an amplifier unit that attaches to the user's waist.

To help students learning life skills, the Coin-u-lator functions like a calculator, but its buttons have the appearance and values of a penny, nickel, dime, quarter, and dollar bill. Students can use it to count, add, and subtract money, and to play money-counting games.

Questions for Further Research

It seems obvious that the appropriate use of the assistive devices described here can have a significant, life-changing impact on the students with special needs they are designed to serve. I wonder several things, however, and pose them as questions for further research. I wonder if such devices are, in fact, available to the people who need them. I wonder what expectations the student, parents, and teachers have when they consider incorporating an assistive technology device into a student's life. Do they anticipate minor or major changes, not only for the student but for their family members as well? Do people pin their hopes on a device, trusting it to become the "magic wand" that will make it possible to overcome insurmountable obstacles, or do they recognize its limitations and approach it realistically or with cautious apprehension? Does an assistive device always free a student from disability-related communication imprisonment? Can an assistive device ever become too much of a crutch, holding a person back from greater independence? I wonder how students react and feel with and without their assistive device(s).

With a broader awareness of many of the assistive technologies currently

available on the market, the next question is how can we make those devices available to the people who need them, train people in their uses, and assess their effectiveness?

And so, the quest continues—to provide assistance for people with special needs and to find new and better ways of doing so.

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Mary Seegers (mseegers@avenue.com) currently teaches Grade 7 language arts at Geneva Middle School in Geneva, Illinois. During her 30-year teaching career, she has served as the school's language arts instructional coordinator and technology coordinator and in 1997 received the Kane County Middle School Educator of the Year. She holds a BA in English from Illinois State University, an MA in secondary reading from the University of Northern Colorado, and an online MEd in technology in education from Lesley University, Cambridge, Massachusetts.



Joan Thormann (thormann@mail.lesley.edu) is L&L's special needs editor and professor in and co-director of Lesley University's innovative technology in education program. She taught students with special needs in public and private schools. She wrote Literacy in a Science Context (ASCD, 1996), a technology-based curriculum for inclusive classrooms.



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