eSCHOOL NEWS online™
Where K-12 Education and Technology Meet

eSN Special Feature: Assistive Technologies
New technologies can help all students excel, regardless of physical challenges

From eSchool News staff and wire service reports
March 1, 2003

As educators nationwide set about the tough task of making sure all students—including those with disabilities—achieve at high levels of proficiency as required by the No Child Left Behind Act (NCLB), many are looking to technology to help accomplish this task.

The good news is that new developments in assistive technologies are producing tools that are better able to help all students achieve, regardless of their disabilities. The bad news is that federal funding for these technologies under the Individuals with Disabilities Education Act (IDEA) hasn't kept pace with the need.

Education lobbyists are hoping that changes when Congress reauthorizes IDEA, which is expected to happen later this year. They'd also like to see the new law address training for teachers in the use of assistive technologies, as well as the integration of projects that promote the development and use of "universal design" technologies in mainstream classrooms.

If schools are seriously expected to bolster the academic performance of students with disabilities, Congress must do its part to provide adequate funding for these improvements, lobbyists say.

Currently, IDEA calls for the federal government to contribute 40 percent of the average daily expenditures schools dedicate to teaching students with disabilities. But according to Kim Anderson, a lobbyist for the National Education Association (NEA), since IDEA first became law in 1975 the actual commitment by the feds never has exceeded more than 18 percent of these costs.

The perennial shortfall has forced many states to cut into other programs to pay for such items as technology upgrades, building access, and special-education teachers. "The federal government is not pulling its weight," Anderson said. "We need to have full funding."

Mary Kusler, a legislative analyst for the American Association of School Administrators, agrees. With state governments embroiled in their worst fiscal crisis since World War II, "the federal government really needs to help pick up some of the slack," she said.

Although the legislation is slated for reauthorization this year, Anderson said there's no telling how long it will take to set this process in motion. "We don't know how quickly IDEA will move," she said. "Given the budget deficit, we have a tough road ahead of us. But governing is about prioritizing, and we certainly think educating America's youth is a major priority."

'Universal design' technologies

NEA is one of 24 organizations that also are lobbying for Congress to integrate the principles of "universal design" into IDEA. Universal design calls for the development of products that can be used by people with the widest possible range of capabilities, either directly or through the use of assistive technologies.

For example, a universally designed web browser would enable students with a wide range of disabilities to access information online—either directly through the browser itself, or by being compatible with assistive technologies such as screen-reading devices.

Education and disability-rights groups want the reauthorized version of IDEA to:

- Incorporate projects that promote the development of universal design concepts in technologies and educational materials, and authorize corresponding increases in the levels of funding for research, development, and personnel training;
- Require entities that receive federal assistance to ensure the accessibility of their project deliverables, including print materials, electronic media materials, web sites, videos, software, CD-ROMs, and DVDs;
- Require educational programs supported through federal assistance to ensure the accessibility of their learning materials; and
- Establish a priority for projects that emphasize educational personnel training and preparation, particularly with respect to universally designed technologies and assistive technology devices, and authorize corresponding increases in funding for these projects.

To make learning accessible to a diverse group of learners, the Center for Applied Special Technology (CAST)—a nonprofit educational research organization—has taken this concept of universal design and applied it to the way curriculum is delivered to students.

CAST's approach is called Universal Design for Learning (UDL). It draws on current brain research and new media technologies to respond to the differences in learning among students.

"It's just a given that in today's classroom there is diversity," said Grace Meo, CAST's director of programs and services.

The idea behind UDL is to create a flexible curriculum that give students a choice about how they will access the content and achieve learning goals. "We need to place the burden of change on the teaching practices, the methods, the curricula," Meo said.

For example, for a first-grade science lesson about seeds, the teacher would give students multiple versions of the same content. There might be three or four books for students, each written at different reading levels, and some students could use the computer to read with software such as eReader. Created by CAST, eReader reads text aloud and provides synchronized highlighting so students can follow along.

Kirsten Howard, a first-grade teacher at Young Achievers Science and Mathematics Pilot School in Jamaica Plain, Mass., is one teacher who has adopted UDL.

"I look around my room and realize that my students have choice about their curriculum. They can partner read, they can read independently, they can use a tape recorder or the computer. I am not holding them back," Howard said.

UDL encompasses three principles. First, to support recognition-based learning, you need to provide multiple methods of presentation. Second, to support strategic learning, you need to provide multiple, flexible methods of expression and apprenticeship. Third, to support affective learning, you need to provide multiple, flexible methods of engagement.

Textbooks, for example, create access barriers for some students. But if that content is available in a digital form, the text easily can be enlarged or can be read aloud by text-to-speech software.

"You can embed supports when [a textbook is] in a digital form, so it becomes much more flexible," Meo said. "If someone needs large print, you can easily make large print."

To ease the preparation burden on teachers, Meo said CAST is working with several leading textbook publishers to help them rethink how the curricula they sell is written and designed, so teachers could buy UDL curricula right out of the box.

The center is also spearheading an initiative to create a standard digital file format that could become the voluntary national standard for states and schools to use to make their textbooks accessible. However, critics question whether a standard file format will be adopted nationally, because more than half of the states already have laws that govern what file format is to be used.

When will UDL become more prevalent in classrooms? "We hope in the not-too-distant future," Meo said. "It's a big step forward with this national digital file format. But no one wants to be the first."

Speech-recognition software: A sound investment?

Educators who struggle to accommodate special-needs children are finding that new developments in "continuous" speech-recognition technology may provide a solution.

Unlike older voice-recognition (VR) software, the latest versions of programs such as Dragon NaturallySpeaking by **ScanSoft Inc**. and ViaVoice from **IBM** allow kids to talk at normal speed, without having to put pauses between each

word.

Once they say the words aloud, the program "hears" them and types their message for them on the computer.

Originally written for quadriplegics and people with physical handicaps that made typing impossible, the programs also can help students who are visually impaired or have certain language-based learning disabilities, such as dyslexia, educators who are familiar with them say.

VR software has been available commercially for nearly a decade, but until recently it was not ideally suited to the classroom environment, said Susan Barton, a consultant on dyslexia and developer of the Barton Reading and Spelling System.

Older technologies that required students to speak in a slow and stilted manner and precisely enunciate each word were extremely difficult for learning-disabled kids to use.

"Many kids who are dyslexic also have attention-deficit disorder, so it can be really hard to teach them to slow down and say one word at a time," said Barton.

The primary reason for using VR software as a tool for dyslexic students has to do with the nature of the learning disability itself.

"People with dyslexia usually have excellent verbal skills, but they have extreme difficulty getting their thoughts onto paper in a legible form," said Barton. "Not only do they have terrible spelling, but they almost always have 'dysgraphia'—extreme difficulty with the act of handwriting."

Typing can be difficult for dyslexics, too.

"People with dyslexia face a significant challenge when it comes to memorizing, and they will always be confused about left versus right," said Barton."That's why learning to touch-type is difficult. To be a good typist, you have to memorize which keys are pressed with the left hand and which with the right hand."

According to advocates of VR software for dyslexics, the newer software provides a way to bypass those weak areas.

"You can easily get your thoughts onto paper without handwriting, typing, or worrying about correct spelling," Barton said.

Experts agree that typing, writing, and spelling are all basic skills that students should master, whether they have dyslexia or not. Preferably, Barton said, learning-disabled students should receive corrective training while using assistive technology, like VR.

"There are two ways to approach a child with disabilities—accommodation and remediation," she said. "Ideally, a child will have both going on at the same

time."

Because it can take two or three years to get a dyslexic child's reading, writing, and spelling up to grade level, VR is a way to ensure that kids aren't losing that time.

Research has even shown that using VR technology might be more than an assistive technology—it might actually improve certain reading skills in dyslexics.

Dr. Marshall Raskind and Dr. Eleanor Higgens are learning-disability researchers at the Frostig Center in Pasadena, Calif. In a series of studies of children ages 9 to 18 with diagnosed learning disabilities, they found that children who use VR software to write for a total of 10.5 hours improved significantly in word recognition, word decoding, comprehension, and spelling.

"What appears to be responsible for those gains were improvements in phonological awareness," said Raskind. "Users say a word and then the word appears on the screen. That's basically a linking of the way the word sounds with the way the word looks."

But Raskind is quick to add that speech-recognition technology is not a panacea.

"It does not work for everyone," he said. "We need to continue research, and there need to be mechanisms for disseminating that research outside of professional journals."

Most VR software packages currently on the market require a relatively high-end Windows-based PC with a standard soundboard and microphone.

The cost of such programs, once in the thousands of dollars, no longer is prohibitive for schools. According to Barton, one $100 copy of NaturallySpeaking serves 25 students.

Continuous voice-recognition software does not require that teachers take a lot of training, but it does take a small amount of training for students to use it.

One point of difficulty for dyslexic students: The software has to 'learn' to recognize each user's voice before the software will operate properly. Software programs normally require first-time users to read a passage from a book aloud, so the program can analyze the user's inflection and pronunciation.

"The problem is that many dyslexic students can't read very well, so they need to be prompted by a parent or teacher," said Barton. Normally setting the program up would only take 45 minutes, but with dyslexic students it could take up to four hours.

"But boy, is it worth it," said Barton. "[The software] allows these kids to be independent, and that is so important."

Text-to-speech software

Incorporating blind, dyslexic, and learning-disabled students into mainstream classroom activities is also getting easier thanks to a new generation of affordable, high-tech tools that convert electronic text to audio. The software allows students to hear the contents of electronic documents spoken aloud instead of having to read them from a computer screen.

Screen-reading software is nothing new. Products such as **Freedom Scientific's** JAWS and GW Micro's Window-Eyes have been around for some time. The problem for educators has been that neither of these options was designed with the needs of students—or the budgets of schools—in mind.

Annette Parslow, outreach vision consultant at the Utah Schools of the Deaf and the Blind and a teacher for 16 years, said that while the technology has continued to develop, many of its advancements have led to programs that are too complex and leave younger learners behind.

"Some of these products have too many bells and whistles," she said.

Now, two companies in particular—Nextup.com and **Premier Programming Solutions Inc.**—have introduced solutions they say favor simplicity and affordability over technical complexity and higher prices, making their products ideal for schools teaching younger students on tight budgets.

Nextup.com's TextAloud product allows students to hear text spoken through a variety of voices by copying any amount of text from a document and pasting it into the open TextAloud program window. Students can hear eMail messages read to them, listen to eBooks, and even download audio files to portable MP3 players or burn files onto compact discs for use at home.

Premier Assistive Technology's Text-to-Audio program is only one of an entire suite of applications that it markets specifically for use in assistive learning. Other products from Premier—such as Scan and Read Pro, Talking Word Processor, Universal Reader, Complete Reading System, and Talking Internet Browser— all have speech capabilities that are targeted to various types of applications for individuals.

Rick Ellis, president and chief marketing officer of Nextup.com, said the company originally developed its software for the consumer market but received an instant response from educators interested in implementing TextAloud in the classroom.

"Our product is very well-suited for learning," he said.

Gayle Underwood, assistive technology coordinator for the Allegan County Intermediate School District in Michigan, said her district has used the TextAloud product to great effect with blind and learning-challenged students.

Underwood said Allegan County is considering a teamwork system that would pair blind students with learning-disabled (LD) students and encourage them to use the software together, effectively teaching each other as they go.

"The LD child could click and drag the mouse for the blind child, and a blind

child with good comprehension skills could then help the LD child with certain skills," she said.

According to Parslow, who has yet to use the TextAloud or Text-to-Audio products, many of the screen reader programs she has encountered, while effective, have proven very difficult to learn.

"Teachers can't believe how long certain things take to learn. You end up asking yourself: How do I find enough time in the day?" Parslow said.

Conversely, Underwood said she has experienced little, if any, difficulty with learning or adjusting the TextAloud product.

"Students can highlight the text, hit a key, and it will read [the highlighted text] for them," she said. "It's very simple; anyone would be able to use it."

According to Underwood, the program's operational simplicity is part of what has made it so effective. TextAloud lets students keep the program window open while they switch back to their clipboard or browser programs and copy the text to be read. The software also allows for dialogue creation, so different voices can be used while students are listening to plays or performances.

Penny Reeder, editor of Braille Forum, said another key to a successful screen reader is that it must be able to use the most realistic voices possible.

Parslow agreed: "The kids want a better quality of speech."

Nextup.com's TextAloud and Premier's Text-to-Audio are both available with AT&T Natural Voices. The lifelike voices are able to change tone and accent words to a better extent than preinstalled computer voices, but typically cost more and are not required with either product.

Premier's Text-to-Audio product offers functionality similar to TextAloud but is even more flexible, according to the company.

Steve Timmer, Premier's president and founder, said his company's product is more versatile than others because it can read files in several types of file formats, including Microsoft Word, plain-text and rich-text format, HTML, and PDF files.

Premier's product also has the ability to compress an hour's worth of text in four minutes, saving time on downloading. This ability is most pronounced when functioning with Natural Voices, he said, because they are slower to download and take up more space than standard ones.

Educators looking to purchase Nextup.com's TextAloud for their schools can do so by contacting the company directly. The product is offered at $24.95 for standard voices and $49.95 for the AT&T Natural Voices. Educational discounts on site licenses also are available.

All of Premier's products are under $200, Timmer said. The company also offers a grant program for schools that provides free use of all 10 products in its Accessibility Suite for an entire school year. "If it's not affordable, it's not

accessible," he said.

Makers of more expensive solutions contend that important functions are lost with solutions that operate solely as screen readers.

Kurzweil Educational Solutions' Kurzweil 3000, which can be purchased for $379 or $539 per seat depending on whether a school chooses color or black-and-white, is one product that offers screen reading and several other features in a single program, including an audio spell check, scanning capabilities with automatic format correction, and note-taking or highlighting options for reference.

Kurzweil also offers the product with a floating license, so a set number of users can operate the software from anywhere within the school.

"It offers the kinds of tools that are helping students to learn, as opposed to those that you just read with," said Cindy Johnson, vice president of marketing at Kurzweil. "We're looking at a start-to-finish solution."

Johnson said the Kurzweil product could help a student write a book report or complete a research project, as opposed to just allowing them to read and transport text.

"There's a value and purpose for the cheaper models, if reading is all you want them for," said Ken Elkind, product manager for the Kurzweil 3000. "It's a different product for different folks. We have integrated all kinds of tools into our product, whereas some of the cheaper models have only solved one problem."

New aid for hearing-impaired students

School administrators charged with ensuring that handicapped students receive an education equal to their peers might welcome a powerful new technology that addresses the special needs of deaf or hearing-impaired students.

Created by Interactive Solutions Inc. of Sarasota, Fla., a subsidiary of Teltronics, the iCommunicator system makes interactive verbal communication possible between the hearing world and a person who is profoundly deaf, hard of hearing, or one who has special communication needs.

"Most children who are hard of hearing leave our school systems after 12 years with a fourth-grade reading level," said Michael Dorety, executive vice president of Interactive Solutions. "We want to teach them to comprehend the spoken word and to read the written word effectively."

iCommunicator is a communication access technology that runs on a high-end laptop or desktop computer. The kit consists of a high-powered laptop with the iCommunicator software, Dragon NaturallySpeaking software, a special cable for connecting to the student's hearing assistance device (if the student has one), and a small wireless microphone worn by the teacher. The microphone transmits directly to the student's laptop.

The product is the first technology of its kind and was awarded a patent last

year. "To our knowledge, there is no product like it," said Dorety.

iCommunicator was conceived in 1999, when the company was approached by Virginia Greene and her then-16-year-old son, Morgan. Morgan is profoundly deaf and uses a hearing device called a cochlear implant.

Cochlear implants are surgically implanted devices that create an electronic artificial sense of sound by sending electrical impulses into the auditory nerve. iCommunicator can be connected via the computer to work effectively with this device, or other peripheral assistive hearing devices, using appropriate device-specific connector cords.

"We were asked to invent a product that allowed Morgan to communicate with the hearing world and not solely rely on a sign language interpreter," said Dorety. The problem with interpreters is that they are rare and can lead to dependency when deaf students rely on them to communicate.

"The iCommunicator is not intended to replace sign language interpreters; it's intended to support the child when the interpreter is not there," said Dorety.

To use iCommunicator, the teacher speaks into a small wireless microphone that transmits directly to the student's laptop computer. The iCommunicator program converts speech to text and/or video sign language in real time. The program has a lexicon of more than 9,200 signs. If a sign is not available for a spoken word, the program will fingerspell the word.

"The computer must be high-end—800 MHz or better—because as you speak, your voice is converted to text and simultaneously converted to sign language," said Dorety.

When a teacher speaks a word, the student sees that word appear on the screen and simultaneously sees a video of an interpreter sign language model signing the same word. If a hearing-impaired child has a cochlear implant, uses an FM system, or wears a hearing aid, he or she also can hear the word pronounced.

"We take the teacher's voice and convert it to a computer-generated voice," said Dorety. "That computer-generated voice comes from the laptop and transmits directly into the student's hearing aid, FM system, or cochlear implant, eliminating all ambient noises."

Not being able to determine whether sounds picked up by cochlear implants, FM systems, or hearing aids are actually words—rather than background noise—is one limitation of those devices, he said. With iCommunicator, when students hear a word, they know the sound they are hearing is, in fact, a word.

"The question here is how to make [hearing aids and cochlear implants] more usable," said Dorety. "One of the [added benefits] of this technology is that the multisensory [elements] can allow for real comprehension."

If a student wants to communicate back, he or she can type a response and the computer pronounces the words. That speech then loops back to the child so he or she can hear how the computer pronounces the words and can break

them down into syllables, learning how to pronounce multisyllable or other unfamiliar words.

According to company officials, iCommunicator is based on an open-architecture platform and is effective for most children who have a basic understanding of reading and sign language, even as young as age five.

The cost of the system has declined remarkably since the technology initially was introduced in 2000. Once $8,100, the price for the iCommunciator kit now is $3,999 and includes a warranty, service, and software integration. An optional teacher training package is available for $100.

A few years ago, Sue Potteiger taught third grade to student Hilary Sedgeman at Bell Shoals Baptist Academy (preK-8, enr. 500) near Tampa, Fla. Hilary is almost entirely deaf and uses two high-powered hearing aids. Her classmates can hear normally.

"From the time Hilary was two she loved to use my computer—she really connected with it," said Martha Cook, Hilary's mother. "But there was nothing out there that would work for school." Then Cook read about iCommunicator and purchased one of the systems for Hilary to use in second grade.

"She learned to use it and we took it to her private school and said, 'Here, we need you to use this,'" said Cook.

During class, Potteiger had to pronounce her words precisely, like a television broadcaster, Cook said. "The trainers came and trained my voice into the technology so that it can recognize my speech patterns," said Potteiger. "We also had a training session with the kids, where they could ask questions and understand that it is not a toy, but something that helps Hilary learn."

She estimates that the professional development involved took no more than six to eight hours in total.

"In class you have to enunciate your words and slow down your normal conversational speech," said Potteiger. "Beyond that, getting it plugged in and turned on every morning is really the biggest challenge. It is very user-friendly."

The system provides an "instantaneous, close-captioned classroom," added Cook. "Hilary lip-reads, but with iCommunicator the teacher can turn around and [Hilary] can still know what's going on."

Dorety cautioned that the iCommunicator is not a "silver bullet" and might not be appropriate for every child. "If there is a message I'd like to deliver, it is that educators need to assess both the product and the child for a match prior to purchasing this," he said. "There needs to be a positive match between the end user's communication access needs and the features and capabilities of the technology."

See these related links:

Center for Applied Special Technology

http://www.cast.org

Bright Solutions for Dyslexia
http://www.BrightSolutions.US

ScanSoft Inc.
http://www.dragonsys.com

IBM Voice Systems
http://www-4.ibm.com/software/speech

The Frostig Center
http://www.frostig.org

Nextup.com
http://www.nextup.com

Premier Programming Inc.
http://www.premier-programming.com

AT&T Labs Natural Voices
http://www.naturalvoices.att.com

Kurzweil Educational Systems Inc.
http://www.kurzweiledu.com/index.html

Interactive Solutions' iCommunicator
http://www.myicommunicator.com

If you liked this **Research** story, try these other **Research** resources.

Stories
- Study probes technology's effect on math and science achievement
- Study: High-stakes testing might lower achievement

Publications
- eSchool News, the nation's single best source for school technology news and information.
- School Technology Alert, All the management intelligence you need in one efficient package!

www.eschoolnews.com
info@eschoolnews.com
7920 Norfolk Ave., Suite 900
Bethesda, MD 20814
(800) 394-0115 - Fax (301) 913-0119

Privacy Policy