Last month I was asked to testify before the Senate Appropriations Committee on the future of educational technology. Since my testimony was almost exclusively about special education technology, and very related to the issues of this column, I thought I would print my remarks in this journal. What follows is the actual written version; the oral remarks were slightly different in delivery (I flubbed up in a few places due to stage-fright) but not in substance.

Testimony before the Senate Appropriations Committee

My name is David Rose and I am the co-executive director of CAST, the Center for Applied Special Technology. I welcome the opportunity to speak with you today. The fact that I have been asked to testify on the educational technology needs of disabled students demonstrates that the Congress understands how essential new educational technology is for ALL students.

Members of this committee were central in the passage of numerous pieces of landmark legislation over the past 30 years. Section 504 of the Rehabilitation Act of 1973, the Individuals with Disabilities Education Act 1975, Section 508 of the Rehabilitation Act of 1988 and 1998 and the Americans with Disabilities Act in 1990 are all landmark pieces of legislation. Because of these laws, many things formerly thought to be impossible for individuals with disabilities are now not only possible, they are commonplace.

Among those commonplace results is the fact that individuals with disabilities now have a right to a free appropriate public school education, and can expect to find educational buildings that are physically accessible to them. It remains a tragedy however, that the curricula — the materials and methods for learning inside those buildings — are too frequently NOT available or accessible to students with disabilities.

At this moment in history, when innovative new educational technologies are being designed and distributed to classrooms, there is a unique and urgent opportunity to right this injustice. If this opportunity is seized, the future will see disabled people making contributions to our society that were envisioned with the passage of these landmark pieces of legislation. Moreover, the strategic appropriation of funds at this time will result in more effective use of educational dollars and a subsequent reduction of people having to go onto SSI and SSDI programs because they are not qualified to work in the jobs of the future. The overall benefits will be shared not only by children with disabilities, but by ALL children.

Assistive Technologies and the Present

Most of the existing successes of technology for individuals with disabilities are examples of “adaptive” or “assistive” technologies. Assistive technologies are applications (either hardware or software) that are developed specifically to assist disabled individuals in overcoming barriers. We are all familiar with spectacular examples of these technologies.

Matthew, a physically disabled 3rd grader who cannot use his arms or legs, uses electronic switches to drive a wheelchair and operate his computer to write and communicate.

Katherine, a 6th grader who is blind, uses screen reader technologies to navigate the Internet and do her social studies homework.

Nina, who has a brain injury that causes her to be aphasic, uses an electronic augmentative communication device to speak to her friends and collaborate on schoolwork.

And there are even more spectacular assistive technologies under development, including ones that are more centrally placed in the nervous system – implanted technologies for hearing, for vision, for control of paralyzed muscles. These are essential uses of technology for individuals with disabilities and their continued development will require sustained federal support – there is simply not enough profit in these “low incidence” students to attract the strengths of the private sector.

Therefore I recommend that the congress should continue to fund Part D research and technology development to ensure that new assistive and augmentative technologies are developed, particularly those that interface with new learning technologies (see below) and those that support cognitive as well as sensory and physical access. In addition, congress should support, through technical assistance grants or contracts, the training of assistive technology specialists so that every school district has access to trained individuals who can teach children to use these powerful technologies in a timely fashion, can assist their parents in understanding and advocating for their use, and can assist teachers and administrators in being effective consumers and implementers of these technologies.

That recommendation notwithstanding, there is a danger in seeing that assistive technology is the sole focus of technology for students with disabilities. Such an orientation places the emphasis of intervention on the individual rather than the environment. While developing powerful technologies for overcoming barriers is a good thing, it must
be balanced by designing environments that have fewer barriers. The lesson of the ADA is that small affordances built in everywhere, like curb cuts and ramps, are as essential as powerfully motorized wheelchairs.

The same is true for educational materials and methods. We need to use the new technologies not only to overcome existing barriers to learning, but to design environments for learning that have fewer barriers right from the start.

Moving toward the center: the power of digital content for students with disabilities.

In the Concord, New Hampshire public schools, teachers and parents have recently completed the painstaking task of copying all of their printed curricular materials into the computer. They now have their own “digital versions” of virtually every textbook and printed text used in their schools. Why did they go to all that bother?

They did it because the digital versions of the books are much better for students with disabilities. The difference is not in the content — the digital versions have exactly the same content — the difference is in the way that content is displayed.

In print versions the content is dried into the paper, and its display is fixed, immutable, “one size fits all.” In digital versions, on the other hand, content is presented dynamically on a computer screen. As a result, the power of the computer can be used to display the content in ways that are highly variable, malleable, and individualizable.

Imagine, for example, a digital version of “To Kill a Mockingbird” for a 10th grade classroom.

Sarah, a student with low vision, can display the text in a very large font so she can see it;
Bill, a student who is blind can have the computer display the text as spoken words or have the computer produce it as refreshable Braille;
Jennifer, a student with severe physical disabilities can change the display [e.g. turn the pages] with a single blink of her eye;
Michael, a student with dyslexia, can click on a difficult word to have the computer read it aloud.

In these simple ways, digital versions of traditional curricular materials can effectively reduce barriers to learning and reduce the costs associated with more expensive adaptations and pull-out programs. But it is possible to do more than merely reduce barriers. In a recently completed research study (with technology developed under support from OSEP), colleagues at CAST digitized books from local schools and, using the flexibility of digital text, embedded research-based strategies for improving reading comprehension. Nearly all of the students (109) in the study had learning disabilities and were performing at least two grade levels below their peers. Because of the digital texts, the level of access and support for reading comprehension could be adjusted closely to each child — providing the foundation for highly efficient learning.

The results were stunning – the students who used the digital texts not only found them more accessible [and enjoyable and empowering] than students who used traditional books, they learned reading comprehension strategies vastly better than their peers, and they showed highly significant improvements [achieving a half year’s progress after reading only three novels] on later standardized tests of reading comprehension. Their peers without such digital books did not show any progress at all.

Where can schools get these kinds of digital books? Local solutions are far too inefficient. When many schools across the country, like Concord, have begun to digitize their own books, the duplication of effort is staggering. And it will get worse: most schools are not yet aware of this capability. The problem is further exacerbated, particularly for national publishers, by a bewildering and contradictory array of local requirements and formats.

A new piece of legislation, the Instructional Materials Accessibility Act of 2001, is critical. This bill provides for the establishment of a single national electronic file format to be used by publishers corresponding to texts they publish. This will greatly facilitate the timely and efficient conversion of textbooks into versions that are accessible to students with disabilities: e.g. Braille, large print, digital audio and other specialized formats like those that I have been describing. The bill further calls for a national electronic file repository – a central and efficient solution to replace a hodge-podge of local ones.

Having digital, accessible, learning materials in the schools is essential. Two other things are essential to ensure success. Most teachers are now unaware of, and unprepared for, the power of digital resources like these. The congress must ensure that there is support for the national training and dissemination of teachers, administrators, and parents in using these more efficient ways of making the curriculum accessible.

And it is also important to understand that we have only begun to exploit the power of digital resources: congress should support ongoing research and development designed to develop and implement digital curricula that are infused with the best of research-based accommodations and enhancements for individuals with disabilities and their peers.

Projects funded under OSEP from part D funding of the IDEA [e.g. the National Center on Accessing the General Curriculum housed at CAST] are already making progress on each of these points but I recommend that congress intensify these efforts lest we miss the opportunity before us. These efforts will ultimately save resources, and they will save children.
Building a better Future: Universal Design of Learning Technologies

Making traditional books and printed materials accessible via new technology is a necessary, but not sufficient, step: in effect it is using new technologies to do old things.

The more powerful new learning technologies, those that my colleagues on this panel have been describing, use the new technologies to do NEW things – to engage ALL students in active experimentation at a level impossible in "traditional" classrooms, to communicate about learning with other students all over the world, to evaluate their own learning, to construct problem solutions in social groups, to create and edit new kinds of media well beyond the limits of writing text. These technologies prepare students for their future.

Unfortunately, most of these learning technologies are not being designed with students who have disabilities in mind. As a result, these new technologies are likely to create new barriers for students with disabilities, leaving disabled children farther behind.

This is what I meant earlier by the urgency the opportunity in front of us. We are at the infancy of these new learning technologies; they are not yet crystallized. Once they have been "hardened" and disseminated, it will be very expensive and wasteful to retrofit accessibility into them or to build new assistive technologies to overcome the barriers they impose.

An analogy well known to members of this panel is important. Several decades ago television, a new technology, was completely inaccessible to individuals who were deaf. Over time, decoder boxes were developed that individuals could buy to put on their televisions and see captions. These retrofitted technologies were expensive, purchased at hundreds of dollars apiece. Later, important legislation was passed to require that the design of televisions include a decoder chip, a small piece of accessibility that is now built into every television at only pennies a television. The result is higher quality, cheaper, accessibility for individuals who are deaf. But there is an additional benefit. The heaviest use of captions is not by deaf people at all – but hearing individuals in noisy bars and airports, individuals who are English language learners, exercisers in gyms and so forth.

The concept of building accessibility into the technology from the start is an example of what is called Universal Design. It is generally better and cheaper to practice universal design than to retrofit solutions later. So, at this moment, when we are building new technologies for learning, we need to ensure that they are universally designed.

It is important to reflect on the recent history of chapter 508. Most government websites were originally created with no awareness of disability access. When the law was passed making it essential to design carefully, there has been enormous expense to retrofit sites.

What can congress do to ensure that the new technologies are universally designed right from the start?

First, congress can take the same kind of leadership as it did in legislating 508 for the workplace – in this case in the "learning place". Congress should require that any educational technology developed, maintained, procured, or used by the Federal government should be universally designed. Secondly, congress should require that all educational programs that are administered or supported by the federal government use universally designed educational technology. These actions by themselves would send a clear message that, like 508, would extend throughout the larger education community.

Second, to ensure rapid dissemination of better educational technologies, congress should support the development of research-based guidelines for school districts, publishers, parents, and administrators on how to evaluate and select universally designed educational technologies.

Third, provide funding for continued research and development in designing, implementing, and integrating better universally designed educational technologies.

Summary

I commend the Congress for its leadership and its commitment to students with disabilities. Fundamental to this commitment, and to all of the things I have recommended, is the leadership implicit in IDEA. I strongly support the commitment to fully fund this foundational legislation for our future.

In the innovative area of educational technology it is essential not only to provide the kinds of support provided under Part B of IDEA, it is essential to fund discretionary programs that enable technology research, training, and dissemination – those under Part D. Without that support we will miss the opportunity, just at this propitious moment, to turn the power of educational technology in a direction that will indeed leave none of our children behind.

In specific, I have made recommendations in three areas:

1) Assistive technologies. These individual technologies are essential to overcome the barriers that students with disabilities face in normal classrooms. Congress should support their continued development into areas where barriers remain, and should fund technical assistance to school districts so that they can be effective consumers of these powerful technologies.

2) Digital Curricula. Most existing classroom technologies are still print based – making it very difficult to use assistive technologies, and even more difficult to individualize the curriculum in ways that are necessary for students with disabilities. I
recommend that the congress provide support and legislation so that every piece of curriculum is made available in digital format so that it can be easily customized and made accessible for all students.

3) Universal Design of Learning Technologies. As new technologies are developed for schools, they should be made accessible to all of the students in the school, right from the start. Congress should support efforts to make guidelines for universal design of such technologies and provide leadership in purchasing, maintaining, and disseminating such technologies in all of its programs.

The over-arching recommendation that I make to you is that we extend the same kinds of protections now afforded to physical spaces and to information in the workplace to a new area, the most important space for our future – the learning space. Our future as a culture depends on us to make the learning spaces, those most precious spaces in the lives of our children, accessible and supportive of every single child. I believe that if we make the leaning spaces of our schools accessible to all of our children, we will save both the short-term costs of miss-educating our children in the present and the long-term costs of NOT educating them for their future.