Technology and Education: What Will the Future Bring?

by Patricia L. Hutinger

Although a lens to view the future is clouded, and must be filtered through the past and present, the ability to stand back and think about the impact of technologies on student learning will undergird research in technology for the education of children, youth, and adults with disabilities in the 21st century. We must view the coming changes, and they will be massive, from the perspective that technology provides access to learning but does not control it; that technologies are not the content of education rather, they provide a cornucopia of tools for learning.

The technologies we know now will change and merge, at an increasingly rapid pace. In 1965 Gordon Moore, founder of Intel, predicted the exponential growth of technology. Moore's law postulates that the processing power and speed of any electronic calculating device will double every 18 months. At the same time, the price for that technology will decline approximately 35% a year relative to the power. If this continues to be true, researchers will have an abundance of exciting new tools to use as they study the curriculum and children of the future. Those tools will not only be more powerful than we have now, they will cost less, making them affordable for research, for schools, and for families.

Educational research will undergo massive paradigm shifts we can only imagine. Because we live in a revolutionary time of astonishing advances in technologies, a world of constant and unrelenting change, new paradigms appear before the implications of their predecessors are digested. We know that schools must make changes to accommodate the technology revolution. Many are already making changes in curriculum, teaching, and learning.

Living in a world of constant change is not easy, and predicting the nature of the coming changes brought about by the accelerating pace of technology advances, the accompanying information explosion, and the future's research agenda in special education is a little like going backpacking in a primitive wilderness area. If we register with the rangers, take a trail map, compass, water, tent, sleeping bags, first-aid kit, and well-stocked backpacks, we will be prepared for most, but not all, events. We do know we will encounter unknown excitement, pleasures, and dangers. We will not know what lies ahead on the trail. Neither can we predict with accuracy what our research agenda will be. Those who have been exploring technology applications with children and youth with disabilities attempt to keep abreast of the rapid advances and potential uses in education and anticipate increasingly interesting possibilities. Still, we are often amazed at the exciting new products of technology and can hardly wait to explore them and their effects on the education of children and youth, including those with disabilities.

The critical gear we carry on the research trail into the future is our mindset, one of exploration, of investigation, of accepting new ways of doing new things. Those who become entrenched in the past, those who say, "This is the way we've always done it," will find that their gear is too heavy.

The literature on change describes levels of initiation and acceptance of innovations. As I see it, educators are divided into at least four groups, quite similar to what one experiences on the trail:
the forerunners, the trailblazers, who innovate; those who come along and build on what others do; the middle ground who try what the first two groups find out; and those who lag behind, saying, "This will never work; it's just a passing fad." As we negotiate the wilderness trails ahead, accepting and adjusting to paradigm shifts in teaching and learning will become the survival tools for education's future.

The focus of the future's research agenda must remain on children and youth, the learners and the teachers, and how to find strategies to harness the power of the technologies in this endeavor. Education must come to grips with the technology revolution quickly, design and use new learning experiences, and teach more process skills than ever before. A mindset that encompasses creativity and subsequent innovation will be required if we are to explore and harness the potential offered by technologies. Futurists and educational reformers argue that new schools are needed for a new age, that the social power of technology will force us to redefine education, a task that will require a different mindset than educators have had in the past.

The debate between those who espouse standards-based testing, founded on the knowledge of the past, and those whose position is firmly in the process-based curriculum for the future will figure prominently in the redefinition of education. In addition to reading, writing, and arithmetic, children and youth must develop process skills in problem solving and critical thinking, communication, technical reading and writing, applied technical reasoning, information literacy, using technology as a tool, new personal skills, new mindset skills, and new curricula (Jukes & McCain, 2000). What strategies will we use to ensure that children and youth with disabilities acquire these process skills? Which strategies will be most effective? With which children? Are changes in learning long term or short term? What content will we use to teach process skills? Who will develop and supply that content? How will the elements of a process and content curriculum be integrated? How will we evaluate it? What will the new process-oriented curriculum look like? How does it compare to current curriculum? What does that mean to those who, today, are "general curriculum?" How effective is the new curriculum? For which children? How does standards based testing fit into the mix? What are children capable of doing? Are adaptations necessary? If so, what adaptations will continue to be needed? Which ones can we drop? What will the new technologies be able to do? These research questions and others will encompass a vast, ongoing field of inquiry.

Crucial questions revolve around new strategies related to making changes, to applying what we already know about change, and to bringing research findings to practice quickly. How will we instill a mindset in educators so they will incorporate the potential of present and new technologies into the curriculum quickly? What are the most effective ways of bringing about changes that reflect the new curriculum?

While there is no need to reinvent the wheel (a timeworn, but accurate cliché), that is what sometimes happens in educational technology practice. I hear "tech gurus" at special education technology conferences advocating software that is nothing more than the old glorified workbookâ€”pedestrian in content, going electronic with the drill and practice activities of the past, with the bells and whistles made possible by powerful computers, yet providing little intellectual content, requiring few (if any) processing skills, supremely underestimating the capabilities of children, and making use of only a small amount of the powerful potential present day computers
provide. Text book publishers quickly figured out how to move their wares from the printed page to the computer screen. As they did so, some failed to appreciate the tremendous capability of computers, the operations the equipment is able to perform, and the processing skills of children. I am greatly disappointed at some of the technology applications I see touted to computer-naive people as being "really good for children with disabilities." Yet the activities are dull, dull, dull. The applications are not only outdated and could have been accomplished on an old Apple IIe, but they are also based on faulty application of developmental theory.

The situation reflects a Paradigm Paralysis (Jukes & McCain, 2000), with educational practice continuing to operate in the same old paradigm, remaining in the amazingly stable environment it has enjoyed for years, only adding technology to the curriculum, another bead on the necklace of knowledge. But technology is not another bead, another subject, another class. It represents a pervasive set of changing tools for learning and teaching. Given the power and potential of new technologies, if we continue to do the "same old thing," and use the "same old" paradigms, then outcomes for individuals with disabilities, no matter their age, will be less than favorable, much less than possible, and much less than we dream.

Technology is a tidal wave flooding the whole world, not a passing fad (even though some in education and elsewhere wish computers and their accompaniments would go away). It will not disappear in the next few years. Authors such as Healy (1998) may say the children are failing to connect, and she may be right in instances where one-dimensional software, based on drill and practice and worksheets is being used. However, she is mistaken in situations where children use interactive software that requires a range of cognitive, communication, and social processes for use.

Teachers often comment, "My children don't need computers. They need the basics." In reality, computers and their accompanying applications, as well as other technologies, are the basics for children whether they are disabled or not. Schools are not just "getting children ready" for technology use at some later date. Children, even preschoolers with disabilities, can and are using technology now and they are connecting. As David Thornburg reminds us, we are preparing children for their future, not our own past (1996).

Old ideas die hard; however, we must not forget the lessons history teaches, or we--and each generation following us--will be relegated to repeating the work and mistakes of the distant or recent past. Researchers and educators alike must move away from entrenched positions. We must not only do things differently, we must do new things and do them quickly, or public schools are likely to succumb to businesses who see education as a profitable enterprise. One of the most critical needs at present is that of finding new ways to connect learners and teachers with the results, implications, and procedures of educational research.

References