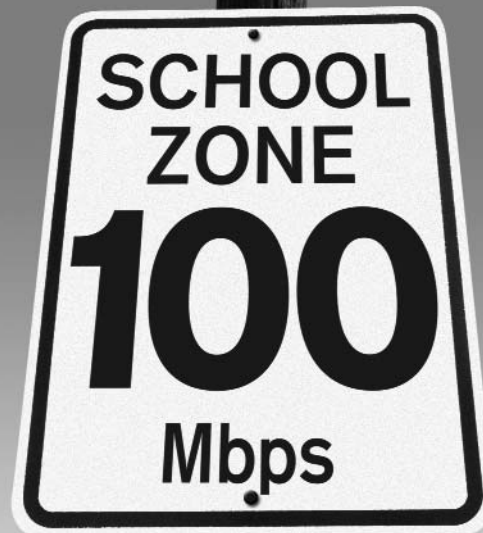


High-Speed Learning

How broadband is changing the educational landscape

By Katherine Fulton



It is an institution that underpins global politics, health and trade. Communication, banking, business and public safety would be impossible without it. Nations flourish when it is available to all of its citizens but wither when only the privileged can obtain it. It is taken for granted by many, but had you not received it, it would be impossible to read the words on this page. Education is vital to every major establishment in the modern world, so it's no wonder that many citizens list it as one of their top concerns.

Providing citizens with the best educational opportunities is a goal for many municipal officials, but it is one that many have trouble realizing. School districts are facing a demand for increased student performance, while at the same time watching funding from local, state and federal sources shrink. These budget cuts often lead to staff cuts, which in turn lead to cuts in classes and instruction.

While there are some who advocate a "back to basics" approach to education and curriculum, it is becoming increasingly obvious that the United States must prepare its students for the rigors of global politics, economics and communications by providing them with the knowledge and perspectives needed to thrive in a complex world. And as districts, educators and governments seek ways to make all of this possible, one word stays at the forefront of the discussion: Broadband.

The World in a Wire

Broadband's role in education is ever-changing. With the proper equipment, advances in distance learning, research, classroom interaction and a myriad of other possibilities could become commonplace from kindergarten to college in schools across the nation. While many districts have broadband technologies in place to varying degrees, there are still some that have doubts about the necessity of a faster network.

"I think many people look at broadband and wonder why they need it," says Pankaj Shah, director of OARnet, the networking division of the Ohio Supercomputer Center and the Third Frontier Network. "They think, '

Why do I need broadband? I can do my e-mail – so what if it's slow?' The point is, that's not where it ends; that's where it begins."

The example posed by Shah underscores one of the most urgent needs of the broadband for education movement: Changing public perception and demonstrating that the technology is not a frivolous perk, but instead an essential component for today's students.

"We must first convince the general population of the value of broadband, and then we can narrow it down to convincing leaders in the educational community," says Shah. "The way students are grasping their education today is completely different than what I did when I was in high school or college. Students today have become multitaskers to a great extent, and they are used to doing chat and e-mail and voice mail and video and that's how they do their homework today.

"Whether this is good or bad, it has become a way of life, and we won't ever return to the old ways of teaching and learning. The point is we have unknowingly accepted broadband as a major medium of communication for all of us today."

The immediate benefits of such a system are readily apparent, but what makes this prospect even more tantalizing is the potential for a ripple effect that could spread beyond education and influence entire communities. "Economic development and education research are tied to each other in the long run," says Shah.

Parents, and later students themselves, are more likely to live and learn in areas with strong schools. Should a municipality choose to extend a high-speed network to the community at large, additional benefits can be reaped as well.

"Currently, if you look at many states, they have developed technology parks," Shah says. "Just as we give tax breaks for economic development, we need to provide incentives to develop our technology infrastructure to help lure the best companies and brightest employees."

This ripple effect is not just limited to interstate communications. High-speed connections give students at all

levels the opportunity to interact with others on a global scale, introducing them to new languages, cultures, ideas and knowledge. By introducing such concepts at an early age, children will more readily grow into adults who are ready to be active participants in an increasingly international landscape.

Students for Life

As anyone who has attempted to program the clock on a DVD player knows, children seem to be more tech savvy than adults. What some adults may not realize is that children at younger and younger ages are starting to expect more from the machines and connections they use to learn. And like adults, children get impatient when the information they wish to access is hampered by slow transfer speeds.

"K-12 students get frustrated with low bandwidth, so broadband is especially important to them," says Frank Mayadas, program director for the Sloan Foundation, a philanthropic nonprofit institution that is involved with education research.

As educational video content and interactive programs become larger and more intricate, both primary and secondary schools need faster connections and networks to bring this information to their students. In a bid to facilitate a better understanding of technology and offer easier access to online educational resources, the Milwaukee Public School district has established a high-speed network that not only connects classrooms and schools to the Internet, but also to each other.

"Each of the 4,407 classrooms in Milwaukee's public schools are wired with fiber," says James Davis, CIO of Milwaukee Public Schools. "Each classroom has a 10/100 MB Cisco switch. This infrastructure supports H323 video (IP) to every classroom. The district's wireless broadband project is a new project involving the use of the district's TV frequency."

Funding for the project came from the federal government's E-Rate program, a portion of the Universal Service Fund that is dedicated to schools and libraries.

Milwaukee's powerful network allows for a level of interaction and immersion that would have been impossible prior to its implementation. Classes from across the city can interact instantly, and children of different age levels can communicate without leaving their buildings. In addition, special programs allow students to take virtual field trips. One such program, Courtrooms and Classrooms, lets middle school students discuss the court system with judges.

Programs such as these are just the start. As students move through the educational system, broadband becomes even more integrated in the learning process. "U.S. colleges and universities have recognized the potential for broadband Internet as a critical learning tool for many years, and several years before the mainstream

recognized the potential for high-bandwidth applications," says Damon Manetta, manager of public affairs for the National Association of College and University Business Officers (NACUBO). "Broadband is extraordinarily widespread in the U.S. higher education system and continues to grow by the use of such ultra-high-speed networks as Internet2."

Internet2, also known as the University Corporation for Advanced Internet Development (UCAID), is a consortium made up of universities and various companies aimed at building high-speed networks for research, new services and innovative broadband applications.

Distance Learning

In addition to allowing university faculty and students to communicate with others in academia, high-speed broadband networks have also allowed institutions to reach out to K-12 students and integrate distance learning programs.

"Schools can collaborate with higher education and national networks like Internet2; they have forums for art, languages and music," says Shah. "There are classes being offered by organizations like the New York Philharmonic, the Cleveland Institute of Music and the

New World Symphony in Miami that schools can take part in through broadband connections."

Like primary and secondary education, universities can use distance learning capabilities to great advantage by offering a wider curriculum. High school students taking advanced placement courses can utilize similar programs to take college-level courses without leaving their school campus.

"We are just seeing the tip of the iceberg as far as distance learning

goes," says Shah.

One example of a distance learning network is OARnet, Ohio's statewide Internet for education and research. "OARnet has many videoconferencing resources that have been available to Ohio's higher education institutions and research centers for a number of years that are just now starting to become available to the K-12 communities," explains Shah. "We expect to see some new programs come out of this K-12 rollover that can invest more money in this infrastructure to make broadband programs more available."

However, he says that there are a number of issues that need to be addressed before distance learning can become truly commonplace. "There are problems with intellectual property, profit sharing and copyright that come into play, and these are some issues that will need to be worked out as we move forward with this technology."

Another concern is the effectiveness of distance learning when faced with constraints such as class size and environment.

"Investing in broadband technology provides a more efficient and effective use of funding because it provides

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predictability of cost and content,” says Shah. “But you also have to balance the physical constraints of inter-activeness as you increase the number of students who participate in distributed learning environments. You need to have the student feel the same way participating as though he or she was in the same room as the person providing the instruction. Students still need to have an immediate interaction in many cases, so there is an upward limit on the number of participants, depending on the physical parameters of the rooms, technical considerations like acoustics, and subject matter.

“If you have a thousand students participating in one distributed learning session, you can’t expect there will be enough time to respond to all the questions that would be likely from that size of classroom. In some instances you might have a class being taught in one school to 10 students, but you could easily expand to 30 or 40 students without affecting the learning outcome.”

Continuing Education

But distance learning is not just for traditional students. In fact, more and more adults are turning to distance learning as a viable option for job training and even degrees.

One such program is the National Coalition for Telecommunications Education and Learning (NACTEL) in which Pace University offers a telecommunications curriculum jointly created by the industry and the university in an initiative managed by the Council for Adult and Experiential Learning (CAEL).

“NACTEL’s mission is to offer online education, including single courses, certificates and two- and four-year degrees that support and prepare the technical side of the telecommunications industry,” says Susan Kannel, executive director of NACTEL and senior director of online programs at CAEL. “All NACTEL programs are instructor led, offered over the Internet, available from anywhere in the world, offered asynchronously and provide hands-on learning and practice.”

The NACTEL curriculum is geared toward those in the telecommunications industry. Classes and subjects are continually updated to ensure that students are kept up to date on the latest advances in broadband. “This broadband curriculum supports each of the partners as the industry moves aggressively into products that include fiber, fiber-to-the-premises, fiber-to-the-home and video,” says Kannel. “At any given time, there are approximately 350 students active in NACTEL technical programs. As of this year, approximately 300 students have received an associate’s or bachelor’s degrees through NACTEL. However, many students enter the NACTEL program with a goal to complete several specific courses or a certificate to support them in their careers, and never intend to complete a degree.”

In this capacity, the NACTEL program can serve as a convenient continuing education program, allowing participants to stay up to date while learning on their own time.

The process, known as asynchronous online learning, lets students log in to courses (including audio and video lectures, lab assignments, reading materials, practice quizzes and chat rooms) on their own time as opposed to attending classes held in traditional classrooms.

“Online asynchronous learning has proved to be extremely effective and popular,” says Kannel. “Greater access to high-speed broadband connections makes online education a much richer and more robust experience than was true in the pre-broadband era.” Broadband connections and their ability to transfer larger files at faster speeds lets educators provide richer, more interactive content such as videos, animations, audio files and other data that turn lessons into experiences.

It’s an arrangement that not only benefits students, but their employers and unions as well. “This is an industry-sanctioned education that is directly related to the students’ current jobs, which is aligned with the future of the telecom industry,” says Kannel. “It is largely supported by employer tuition assistance. Because NACTEL programs are delivered online, students who cannot participate in face-to-face classroom education can access NACTEL programs from anywhere in the world, 24/7.”

Employers and unions, in turn, can be assured that their employees/members are getting current education in the fields that matter most.

“The program offers a quality and consistent curriculum with significant industry control that is aligned to current and future technical requirements,” says Kannel. “In addition, each major telecommunications company has employees throughout the country and all over

the world. Online learning thought NACTEL offers all employees equal access to the same high-quality education. Unions want to support their members, to maintain continued employment in high-paying technical jobs, and NACTEL provides the format to achieve this.”

The Economics of Education

There is both value and promise in the use of broadband for education, but nothing comes for free. Cost will always be a factor in setting up broadband networks, and some districts and companies might be intimidated by the funds that are needed to initiate such a program. In the long run, however, it may prove more cost-effective than traditional methods of classroom learning. “Investing in broadband technology provides a more efficient and effective use of funding because it provides predictability of cost and content,” says Shah. “These things are a one-time investment in training and leveraging, rather than yearly investments. It’s a win-win situation for school districts. You’re sharing the resources and sharing the costs by distributing it across two or more districts, and reducing the overall costs to everyone.”

While this may sound easier said than done, there are options for districts that cannot meet financial obligations on their own.

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“Budgets have been flat or slashed for years, and a lot of our schools have difficulty getting the needed infrastructure,” says Shah. “Many schools will need to pursue federal, state and local grants to help pay for their last mile circuits and other bandwidth costs. They will need to have a plan and to leverage those plans to explain the benefits to potential funders. The first stage of this is to collect that information and have it ready to provide the potential funders to explain why you need that broadband connection and what you intend to do with it, as well as how it will benefit your students and your community.”

As with the Milwaukee Public School system, schools that meet the necessary government requirements can apply for the government’s E-Rate program. “E-Rate has been a huge success,” says Dan Phythyon, public policy director of the Alliance for Public Technology. “The E-Rate provides more than \$2 billion in discounts annually for advanced, affordable telecommunications services, Internet access and internal connections to public and private schools and public libraries.”

Programs such as E-Rate have helped classroom connectivity go from 3 percent in 1994 to 93 percent at the end of 2003. But despite these great strides, there is still room for improvement.

“There are still instructional rooms and libraries that need to be connected,” says Phythyon. “For those that are connected, most will continue to rely on E-Rate discounts to maintain connectivity, and much more needs to be done to improve the quality and speed of those connections.”

The greatest and most profound effect of broadband on the learning process, however, could come from equal and affordable access not just to schools, but homes as well.

“Our next challenge for the use of broadband for educational purposes is to ensure that students at all levels have true high-speed connections in their homes and workplaces, so that they can take advantage of educational opportunities outside of educational institutions, regardless of where they live,” says Phythyon. “Universal access to broadband networks will be fundamental to effective communication, the quality of life in the 21st century and democratic participation. Universal, high-speed, advanced communications networks not only will expand educational opportunities for lifelong learning, but also bring better and more affordable health care to all citizens; enable independent living for senior citizens and people with disabilities; create opportunities for jobs and economic advancement, as well as the ability to control one’s own finances; make government more responsive to all citizens; simplify access to communications technology; and, reduce the inequities of geographic isolation in rural communities.”

As with the education it can help to support, broadband can open the door to a new world of possibilities for communities across the nation. It’s a lesson we cannot afford to miss.

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