Technology in Schools: The Ongoing Challenge of Access, Adequacy and Equity

If our children are to excel in a fast-changing, global society, we must harness the technology resources they need to function in a digital age. We must remember our commitment to their future as we set priorities and establish policies on their behalf.

—NEA President Dennis Van Roekel

Great strides have been made in infusing technology into schools and into the instructional process. School districts have invested heavily in the infrastructures required to accommodate computers and the Internet. They have commandeered resources to purchase software and technical support for students and staff, and they have mandated professional development for educators and administrators. Some have even established curriculum standards for technology to ensure that students achieve a certain level of competency before they graduate.

Yet, despite the overall progress, many schools are not making full use of technology as a component of comprehensive school reform. The pace of implementation may be slow partly because of competing priorities, and partly because of the lack of reliable information, resources, and expertise on which to make decisions and guide implementation. This policy brief is offered as a resource to help policymakers, researchers, and educators gain further insight into the issues of access, adequacy, and equity in education technology, and to offer recommendations on how to ensure greater balance in the integration of technology in schools.

Where are the computers?

Although schools have made progress in bringing computers and the Internet to students and staff, greater access is still needed in order for technology to become a reliable tool for teaching and learning. Studies continue to document that the availability and quality of technology is woefully inadequate in most classrooms, and most educators report their classroom is not the main location in the school where their students use computers.[1] Educators and policymakers who advocate the learning of skills relevant to the 21st century strongly argue that literacy in information and communications technology (ICT)—which relies on skills such as thinking and problem solving, communicating effectively, self-direction and productivity—requires fully integrating technology with classroom learning.[2]

A national count of computers in public schools shows a ratio of 3.8-to-1 for the number of students sharing an "instructional computer" with Internet access[3]—but the data makes no distinctions between computers in the classrooms and those in school technology labs. All computers in the school are counted as being used for "instructional purposes" whether or not they are available for students' use. Beyond that definition, the ratio does not reflect how computers are distributed across districts, schools, and classrooms of varying demographics. The state of Maryland, for example, reports that, on average, only 10 percent of classrooms in the state have five or more computers.[4]

To supplement classroom computers, districts are beginning to rely more upon portable and wireless computers that can be moved between classrooms and can be used outside of school by staff and students. Districts across the country are beginning to seek public and private funds to buy more laptops, and they are looking to install wireless infrastructures that would permit more flexibility in the use of their school technology. [5,6]

Internet, software, and technical support are concerns

Providing access to the Internet, as well as obtaining appropriate software, are also issues for many educators, particularly those working with young students and those working in urban schools. Educators working in the early grades need increased access to the Internet, as well as more age-appropriate software for their students. This is

especially important to districts that are paying particular attention to technology in the early years, using an integrative approach to technology whereby students build on their skills each year they progress through the grades. [7]

Computer maintenance and upgrades are also a challenge in many schools. Educators working in urban schools who have relied on the federal e-rate fund—a program which provides discounts to assist public schools and libraries to obtain affordable telecommunications and Internet access—still must seek other resources to help upgrade software and to provide maintenance and support for their computers. Educators in senior high schools, particularly in urban areas, need greater technical support to help set up and use technology in their classrooms.[8] Experts agree that maintenance capabilities and technical personnel make up a large part of the school technology budget, but most often is not given the proper attention during the planning phase of bringing technology in.[9]

Who's using technology—and for what?

Although educators do get technology training, most do not feel prepared to use technology for instructional purposes, especially for individualized instruction. Educators in urban and rural schools are much less likely than suburban educators to feel adequately trained. [10]

Some technology advocates believe technology training should be emphasized much earlier, during teacher education programs, but only 19 states have technology requirements as part of the licensing requirements.[11] Experts further believe that teachers should know how to use technology to deliver alternative kinds of pedagogy, such as inquiry learning, models, and simulations to help students develop higher-order thinking skills. Here, students utilize technology to become more involved in the construction of their knowledge rather than having all information flow from their teachers. However, such uses still are not common, and the technology standards that are in place for students or teachers are not being applied. Of the 48 states with technology standards for students, only four test students on their knowledge of technology. [12] Clearly, the full integration of technology into teaching and learning is a multistep process that goes well beyond buying equipment and offering basic technology training.

The link between technology and achievement

Even with funding and policy limitations, several states and districts are engaging their students with a multitude of technology-enriched curricula and instruction and are demonstrating positive links to student achievement in a variety of subjects. [13,14] Researchers are finding a clear link between technology, achievement, and motivation. Most experts engaged in the technology debate agree that students and teachers tend to be more engaged and interested when technology is an integral part of teaching and learning. For example, seventh- and eighth-grade students in Maine who received laptops are reported to be more engaged and able to produce higher quality work,[15] while distance learning projects in several states (Florida, Virginia, New York, New Jersey, and Texas) have been found to foster collaborative learning and student interest in science. [16] Most educators agree that technology improves student learning, but the vast majority also believe their students enjoy learning more with technology. Urban educators are particularly strong in their belief that technology has a positive impact on their students.[17]

Enthusiasm for technology has led many school districts to successfully alter not only the curriculum but also the way the curriculum is delivered. By recent counts, at least 23 states are now operating virtual schools where students can receive instruction online.[18] In Florida, almost 45,000 students in grades 6–12 take courses online from the Virtual School, and Michigan became the first state to pass a law mandating that high school students have at least one "online learning experience" to graduate. Rural and small town schools are now able to use videoconferencing and the Web to provide courses in subjects where a local teacher is not available, and some districts now offer services at home to some students with disabilities.[19] In fact, the growth in online learning prompted NEA and other organizations to work together to develop guidelines for course development.[20] The guidelines are intended to help students, parents, teachers, and school administrators create, use, and even assess online courses.

Technology also has a significant effect on the quality of the work experience for classroom teachers. While teachers are generally positive about technology, newer teachers are even more enthusiastic. More of them are satisfied with their general knowledge of technology and see it as having an impact on their job effectiveness. Studies show that when educators use technology they feel they are able to do their job more effectively.[21] Also, while most educators agree that technology is essential to teaching and learning, educators in urban and rural/small town schools are more likely to agree strongly about the value of technology for them and their students.[22] Perhaps the value of technology in urban and rural schools rests mostly with its usefulness

as an engaging, assistive-learning tool, particularly since students in lower income urban and rural areas have less access to technology outside of school.

NEA's policy recommendations

1. Improve access to technology

Educators have been remarkably creative with limited computer access, but if technology is to be integrated into instruction, more computers must be made available for students' use, whether that is through stand-alone computers or portable and wireless technologies. States and school districts should pay more attention to building wireless infrastructures that can support increased access to technology.

2. Increase Internet access, address software issues, and expand technical support

Programs designed to close the achievement gaps must begin addressing equity issues related to Internet access, software, and technical support. Educators across the board should have greater access to computer software for planning and instruction. Educators in urban schools, in particular, need better instructional software, and more instructional staff should be involved in making decisions about software purchases for their schools. Educators in elementary schools should have more age-appropriate software for students, but, just as importantly, they need more high-speed Internet services.

Maintenance support for computers must be adequate to insure that computers function properly and reliably. Quality technical support for computers and other technologies should be available in every school. Particular attention should be given to senior high schools, as well as to schools located in urban areas, where maintenance and technical support are less likely to be provided. One option is for districts or schools to make use of their students' technical expertise by formally arranging for qualified students to provide technical assistance where needed. Another important point is separating the instructional support role of paraprofessionals from that of providing maintenance and technical support.

3. Expand professional development in technology

Technology training, most commonly offered for administration, communications, and research, should focus more on applications for instruction. And those entering the profession, as well as experienced educators, should have access to high-quality professional development in technology. Particular attention should be paid to training opportunities provided for educators working in schools located in urban and rural areas, where educators believe the technology training in their schools has not been adequate.

Computers and other technologies should be used in classrooms as assistive learning tools that help educators design and present individualized lessons for students and help students develop cognitive skills through the manipulation and feedback generally provided in quality instruction. Moreover, in order to expand the limits of information access, the curriculum standards in K–12 education should include technology as an instructional tool to facilitate learning through interactive, real-time, and other multimedia. The curriculum should require students to use technology as an integral part of their class work and in a manner that enhances their creativity and learning of higher-order skills.

4. Capitalize on teachers' and students' enthusiasm about technology

Schools should seek more ways to use technology for the greatest gain in student achievement, particularly in urban and rural/small-town schools. State and district leaders should encourage schools to use technology in more creative ways by permitting more flexibility in instruction and by providing incentives that support technology-enriched programs. More ways should be found to motivate the most experienced educators to use technology through better training and more curriculum-related opportunities.

5. Involve educators as advocates

Teacher organizations, such as NEA and its state affiliates, can be a valuable ally in the goal of fully integrating technology into education. State and local Associations can also help educate parents and the business community about the benefits of better integrating technology into teaching and learning. They can actively support district and state efforts to secure more funding for school technology by lobbying state legislatures, establishing partnerships with commercial and private enterprises, and seeking federal and private grants.

References

[1] National Education Association – American Federation of Teachers (NEA-AFT). 2008. *Access, Adequacy and Equity in Education Technology: Results of a Survey of America's Teachers and Support Professionals on Technology in Public Schools and Classrooms*. Washington, DC: Author, www.nea.org/research/images/08gainsandgapsedtech.pdf.

[2] Partnership for 21st Century Skills. 2002. *Learning for the 21st Century: A Report and Mile Guide for 21st Century Skills*. Washington, DC: Author, www.21stcenturyskills.org/resources/mile_guide.asp.

[3] Wells, J., and L. Lewis. 2006. *Internet Access in U.S. Public Schools and Classrooms: 1994–2005*. Washington, DC: U.S. Department of Education, National Center for Education Statistics, http://nces.ed.gov/pubs2007/2007020.pdf.

[4] Maryland State Department of Education. 2007. *Where Do We Stand in 2007: Technology Inventory Results*. Baltimore, MD: Maryland Business Roundtable for Education Committee on Technology in Education, http://md.ontargetus.com.

[5] Apple Education. 2007. *Profiles in Success: Henrico County Public Schools Continuous Learning*. Richmond, VA: Author, www.apple.com/education/profiles/henrico1.

[6] Delisio, Ellen R. 2005. "Learning with Laptops: An Urban School Shows Gains." *Education World, Lessons from our Nation's Schools Series,* www.education-world.com/a_issues/schools/schools020.shtml

[7] Mehlinger, H. D. 1997. "The Next Step: Now That Schools Have Technology, It's Time to Let the Technology Transform Schooling." *Electronic School* (June). Washington, DC: National School Boards Association, www.electronic-school.com/0697f2.html.

[8] NEA-AFT technology survey, see note 1.

[9] Bausell, C. V., and E. Klemick. 2007. "Tracking U.S. Trends." *Education Week* 26(30): 42–44, www.edweek.org/ew/toc/2007/03/29/index.html.

[10] NEA-AFT technology survey, see note 1.

[11] Ibid.

[12] Ibid.

[13] Murphy, R. F., W.R. Penuel, B. Means, C. Korbak, A. Whaley, and J.E. Allen. 2002. *E-DESK: A Review of Recent Evidence on the Effectiveness of Discrete Educational Software.* Menlo Park, CA: SRI International, http://ctl.sri.com/publications/downloads/Task3_FinalReport3.pdf.

[14] O'Dwyer, L. M., M. Russell, D. Bebell, and K. R. Tucker-Seeley. 2005. "Examining the Relationship between Home and School Computer Use and Students' English/Language Arts Test Scores." *The Journal of Technology, Learning and Assessment* 3(3). http://escholarship.bc.edu/jtla/vol3/3/.

[15] Silvernail, D. L., and D. M. Lane. 2007. *The Impact of Maine's One-to-One Laptop Program on Middle School Teachers and Students*. Portland, ME: Maine Education Policy Research Institute, University of Southern Maine Office, www.usm.maine.edu/cepare/Impact_on_Student_Writing_Brief.pdf.

[16] Harouna, B., and D. Keisch. 2004. *Bridging the Gap between Formal and Informal Learning: Evaluating the Sea Trek Distance Learning Project.* New York: Center for Children and Technology, http://cct.edc.org/admin/publications/report/SeaTrekfinal04.pdf.

[17] NEA-AFT technology survey, see note 1.

[18] Robelen, E. W. 2007. "E-Learning Curve." *Education Week* 26(30): 34–36.

[19] Trotter, A. 2007. "Getting Up To Speed." *Education Week* 26(30): 10–12.

[20] National Education Association. Online guide to high school courses. Washington, DC, Author, www.nea.org/technology/onlinecourseguide.html.

[21] National Center for Education Statistics. 2000. *Teachers' Tools for the 21st Century: A Report on Teachers' Use of Technology.* Washington, DC: U.S. Department of Education. http://nces.ed.gov/pubs2000/2000102.pdf.

[22] NEA-AFT technology survey, see note 1.

Resources

The Consortium for School Networking (CoSN) provides products and services to support leadership development, advocacy, coalition building, and awareness of emerging technologies for K-12 education. www.cosn.org.

The International Society for Technology in Education (ISTE) provides leadership and service to improve teaching, learning, and school leadership by advancing the use of technology in PreK–12 and teacher education. www.iste.org.