

Myths and Realities About Technology in K-12 Schools: Five Years Later

Glenn M. Kleiman
Director, Center for Online Professional Education
Education Development Center, Inc. (EDC)

I wrote the "Myths and Realities About Technology in K-12 Schools" article ([Kleiman, 2000](#)) in 1999. Looking back at it 5 years later as it appears as a "seminal article" in *Contemporary Issues in Technology and Teacher Education*, I find myself reflecting about what has changed and what has remained the same with regard to technology in K-12 schools and the challenges faced by teachers in realizing the full potential of technology in K-12 classrooms.

Meeting the Potential of New Technologies

One statement that caught my eye in reviewing the article is the following:

The investment in technology for schools resembles the investments being made in many "dot-com" Internet companies. In both cases, the investments are based on the potential of new technologies, in the hope that this potential will be fulfilled in the coming years. And in both cases, the investments involve significant risks and may be a long way from yielding adequate returns. (p. 7)

We now know the fate of those dot-com companies: A very small number, such as ebay.com and Amazon.com, have prospered; some others have survived; and a great many have vanished into bankruptcy as it became apparent that their claimed potential would never be fulfilled. Looking back at the article provides an opportunity to ask, "How have we fared with the investment made in educational technology for K-12 schools?"

I would argue that educators have done far better, overall, than the private sector dot-coms, although the story is also mixed on the education side. We have certainly seen significant advances in the availability of Internet-enabled, multimedia technology in schools across the country, as a result of the e-rate program and many other forms of financial support for technology. In the five years since I wrote the original article, the Internet and World Wide Web has evolved from a new innovation primarily used by techies to a standard tool in schools, libraries, community centers, and homes—one that many people of all ages use for information, communications, shopping, learning, and playing.

We have also seen some advances in integrating technology into curriculum standards and materials, the availability of curriculum-relevant digital resources, the number of teachers who have participated in technology-related professional development, and the use of assistive technologies for students with special needs. National education technology standards have been developed for students, teachers, and administrators (see, e.g., the standards established by the International Society for Technology in Education at <http://www.iste.org/standards/>).

In some places, exciting educational technology innovations have taken hold. These innovations include virtual courses for students (e.g., [Virtual High School](#) and [Florida Virtual School](#)); ubiquitous technology programs in which every student and teacher receives a laptop and every school has wireless access (e.g., in every public grade 7 and 8 classroom in Maine); technology used to support inquiry-based learning (e.g., the Missouri-based [eMINTS](#) program), and online courses and workshops for preservice and in-service teachers (e.g., the [EDC EdTech Leaders Online](#) program). So in some ways—access to computers, digital resources, and the Internet nationwide and the advent of innovative technology-enabled programs in districts and states—we've made impressive national progress. (**Editor's Note:** See [Resources](#) section at the end of this paper to find URLs for these projects and others online resources.)

However, in many places, the myths persist, and progress has been limited. A great deal of technology lies unused in schools. The computers and wires may be there, but the plans to put them to good educational use, the preparation necessary for the teachers to use them well, and the support needed to ensure that they will work when needed are lacking.

We continue to see computers used in ways that are peripheral, rather than central, to the curriculum and important learning goals. And we continue to see technology plans and programs developed separate from school improvement, curriculum reform, professional development, and special education plans. Although progress has been made in equity of access to technology in schools, serious inequities remain in terms of ways those computers are used in classrooms and the level preparation for teachers to use them effectively. Unfortunately, in much of the country little progress has been made toward fulfilling the educational potential of information and communications technologies.

Moving Forward

Another statement from the original article addressed necessary steps to move forward:

The key determinant of our success will not be the number of computers purchased or cables installed, but rather how we define educational visions, prepare and support teachers, design curriculum, address issues of equity, and respond to the rapidly changing world (p.14)

This statement certainly remains true. Each item—educational vision, teacher preparation, curriculum, equity, and change—presents challenges to teachers and, therefore, also to teacher educators in preparing teachers to address them. Some comments follow about each in turn.

Visions

The first item on the list of factors that will determine success is education visions. As I described in the original article under Myth 2, there are a number of different visions of

the major goals for incorporating technology into K-12 schools, ranging from improving standardized test scores to providing more project-based learning to updating education with new approaches to teaching and learning. My own work, and that of my colleagues in the research, policy, and practitioner communities, has focused on technology to expand opportunities for students, broaden the information they have available, better connect them with real-world issues and activities, provide them with opportunities for creativity, extend how they communicate and collaborate, and in general, better prepare them for the lives they will lead in the technology-rich 21st century.

Unfortunately, the No Child Left Behind legislation and the economic situation of the past few years have been slowing, and in some places reversing, progress in these types of uses of educational technology. The focus on standardized testing as the sole measure of success by students, teachers, and schools has caused many educators to focus on how technology can be used to increase test scores, rather than how they can best prepare children for their lives in the 21st century.

I certainly believe that these two objectives often diverge. Twenty-first century skills, such as information literacy, communication skills, global awareness, creativity, and collaboration (see, e.g., [North Central Regional Educational Laboratory and the Metiri Group, 2003](#), and [The Partnership for 21st Skills](#) website), can all be fostered by educational uses of technology that are significantly different from those for test preparation. However, as more of the time in schools is focused on preparing for and taking standardized tests, these more powerful uses of technology are in some places being neglected.

In addition, this testing wave has occurred during a difficult economic period that has resulted in a significant drop in the funding available for technology resources and innovations. The Market Data Retrieval technology survey reports that from the 2001-2002 to the 2002-2003 school year, technology spending for schools dropped almost 25% ([Technology counts, 2004](#)). The combination of the emphasis on standardized tests and the funding limitations have resulted in a decrease in innovative uses of technology in many schools. One resulting challenge for teacher education is to prepare teachers to bring powerful uses of technology into the classroom—uses that will engage students; expand their thinking, communicating, and learning; connect to their lives outside of school; and prepare them for the future.

Teacher Preparation and Support

The second item on the list of factors that will determine success is preparing and supporting teachers. We have seen some advances incorporated into many professional development programs, including online courses and online professional development workshops, as well as the addition of online discussions and resources to extend college courses and onsite workshops.

Online courses and workshops can have many advantages, such as providing scheduling flexibility, minimizing travel, broadening the courses available to teachers (especially important in rural communities), and extending the resources and expertise available to participants. Online learning also provides opportunities for preservice and in-service teachers to experience using digital resources and engaging in online interactions—that is, to experience using the technology first as learners as they prepare to use it well with students.

Online courses are becoming common in many schools of education and one, [Western Governors University Teachers College](#), was designed to offer flexible, online, competency-based teacher education programs. Current research shows that online courses can be as successful as in-class courses, but that teaching and learning online has some significant differences from teaching and learning face-to-face (see Kleiman, 2004, for more specifics). The challenge for teacher education faculty is effectively integrating online courses—and online enhancements of face-to-face courses—into their own programs.

In addition, online courses are now extending the opportunities available to high school students and, in some cases, middle school students, with good success (e.g., [Virtual High School](#) and [Florida Virtual School](#)). These opportunities present another challenge for teacher educators: preparing teachers to make effective use of the online medium in their own instructional practice. Teachers must learn to develop good online curriculum, gain expertise in online communications, and understand when and how to best employ online learning with their students.

Curriculum Design

The third item on the list of factors that will determine success is curriculum design. In most places, we have seen a sprinkling of technology into the curriculum—a program that provides drill and practice within a game here, use of a spreadsheet there, a webquest as a special event, and so on. They represent a first step toward integrating technology into the curriculum, but only a first step.

When technology leads to rethinking the curriculum to fully incorporate new tools, the impact can be profound. For example, technology does not merely replace pencil-and-paper and typewriters in a writing program, but can extend the program to communicating with multimedia tools in addition to static text—that is, producing the types of communications now common in many occupations. Effectively incorporating technology into the writing curriculum can also teach students new levels of editing, revising, and collaborating, as well as provide opportunities to share their products with real audiences via the Web.

Similar examples can be found across the content areas: The availability of abundant primary resources can change the nature of history class. The use of real-time data collection and analysis tools can change the nature of science labs. The use of interactive, visual programs designed to enable explorations of mathematics concepts can provide new ways of teaching and learning mathematics. Speech analysis, understanding, and synthesis software can have a major impact on language learning. The use of instruments linked to computers with musical instrument digital interfaces (MIDI) can provide new ways for students to learn to play and to compose music—and so on through each content area.

In each case, preparing teachers to develop and teach curricula that fully integrate these types of technology tools requires major revisions in methods courses and the uses of technology in teacher education. So far, only a few teacher education institutions have demonstrated that they are ready to meet this challenge.

Another set of challenges for teachers and teacher educators centers around issues of equity. Technology can play a major role in addressing the needs of different students. For students with physical and sensory disabilities, assistive technologies can provide life-changing aids. For example, text-to-speech devices make all books available to visually

impaired students; speech-to-text devices enable students who cannot physically use a pen and keyboard to express themselves in writing. Specialized software can provide “scaffolds” to help students with learning, language, or attention disabilities to succeed in learning tasks that would be impossible for them without these supports.

Students who cannot attend school for health or other reasons can connect via online courses and communications. English language learners can use automated translation programs to support their transition to English. The field of Universal Design for Learning (<http://www.cast.org>) provides important principles about the design of curriculum, instruction, and assessment to provide learning opportunities for all students, and technology plays a critical role in the implementation of these principles in classrooms. All of which, of course, presents another challenge to teacher educators: preparing new and practicing teachers to use technology to differentiate instruction, to support students with special needs, and, in general, implement the principles of Universal Design for Learning in their classrooms.

Responding to the Rapidly Changing World

The last item on the list of factors that will determine success is respond to the rapidly changing world. Over the last 5 years, several studies have documented a key area of change that is critical for educators—the students themselves. The generation of students born toward the end of the 20th century have been labeled the Millennial Generation (<http://www.millennialsrising.com/>).

Having grown up in a technology-rich world in which the Internet, email, instant messaging, cell phones, DVDs, and digital music are part of their experience from childhood, these students view information, communication, and community very differently from prior generations. In their experience, information on any topic is easily available and free, communication via instant messaging, email, and cell phone is embedded throughout their days, and community does not depend upon physical proximity—they find it natural to participate in online communities formed by people with common interests who they have never met in person. They are interested the world around them, view the world as far smaller than prior generations did, and are optimistic about their futures.

Unfortunately, over the past 20 years, there has been a significant decline in the percentage of high school students who find school to be meaningful and interesting and in the percentage who view school learning as important to their future lives. Many find that schools do not provide the real-world connections and uses of technology to learn, communicate, and create that they have at home.

In addition, we know that the demographics of the students in many schools have changed and continue to change, with in many places a wider range of language and cultures being represented in the school community. To complicate matters, all of these changes are taking place in conjunction with the globalization of communications and economies, changes in employment opportunities and the skills needed to succeed in the workplace, and advances in technology that raise new societal, legal, and ethical issues. (For more information, see the Pew Internet Project reports, including [Lenhart, Rainie, & Lewis, 2001](#), and [Levin & Arafeh, 2002](#), as well as a presentation by Susan Patrick, Director of Educational Technology for the U.S. Department of Education, at http://www.nclbtechsummits.org/summit2/presentations/p_Patrick.pdf).

The experiences of our students—their ways of learning, communicating, and engaging in the communities and world in which they live—are dramatically different from those of prior generations. The resulting challenges are easy to state but hard to meet: How can we prepare teachers to teach these Millennial Generation students and the Post-Millennial Generation students born in the 21st century who will soon enter our schools? How do we prepare teachers to go beyond the current educational standards, assessments, and practices to consider how education needs to be updated to prepare students for the lives they will lead in the 21st century?

Those were significant issues when I wrote the original article in 1999, and the changes since then have made it even more urgent that educators at all levels begin seriously to address these critical challenges.

References

- Kleiman, G. M. (2000). Myths and realities about technology in K-12 schools. In the Harvard Education Letter report, *The digital classroom: How technology is changing the way we teach and learn*. Retrieved July 30, 2004 from <http://www.edletter.org/dc/kleiman.htm>
- Kleiman, G. M. (2004). *Meeting the need for high quality teachers: e-Learning solutions* [White paper written for the U.S. Department of Education Secretary's No Child Left Behind Leadership Summit.] Retrieved July 30, 2004, from <http://www.nclbtechsummits.org/summit2/presentations/Kleiman-MeetingtheNeed.pdf>
- Lenhart, A., Rainie, L., & Lewis, O. (2001). *Teenage life online: The rise of the instant-message generation and the Internet's impact on friendships and family relationships*. Retrieved July 30, 2004, from http://www.pewinternet.org/pdfs/PIP_Teens_Report.pdf
- Levin, D., & Arafah, S. (2002.). *The Digital Disconnect: The widening gap between Internet-savvy students and their schools*. Retrieved July 30, 2004, from http://www.pewinternet.org/pdfs/PIP_Schools_Internet_Report.pdf
- North Central Regional Educational Laboratory and the Metiri Group. (2003). *enGauge 21st century skills: Literacy in the Digital Age*. Retrieved July 29, 2004, from <http://www.ncrel.org/engauge/skills/skills.htm/>
- Technology counts 2004. (2004). *Education Week on the Web*, 25(35), 3. Retrieved July 30, 2004, from <http://www.edweek.org/sreports/tc04>

Resources

EDC EdTech Leaders Online - <http://www.edtechleaders.org>

eMINTS - <http://www.emints.org>

Florida Virtual School - <http://www.flvs.net>

Maine's laptops in middle schools initiative - <http://www.mainelearns.org/> and <http://www.usm.maine.edu/cepare/mlti.htm>

The Partnership for 21st Skills - <http://www.21stcenturyskills.org/>

Western Governors University Teachers College - <http://www.wgu.edu/>

Virtual High School - <http://www.govhs.org>

Contemporary Issues in Technology and Teacher Education is an online journal. All text, tables, and figures in the print version of this article are exact representations of the original. However, the original article may also include video and audio files, which can be accessed on the World Wide Web at <http://www.citejournal.org>