



THE 21ST CENTURY CLASSROOM

Perspectives on leveraging
educational technology

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Less than 30 years ago, a few shared computers in a school lab represented the cutting edge of technology in education. Comparing the state of technology at that time to the present-day use of such sophisticated in-class devices as tablets and interactive whiteboards—not to mention the growth of online learning and “virtual schools”—gives one a snapshot of the extent of technological change an educator may need to adapt to in the course of a single career.

The further technology penetrates into the education system, the more dramatic are the transformations it brings to the learning environment and to teaching practice, the more agile and creative educators must be to adapt intelligently to emerging technology, and the more urgent are the concerns raised by stakeholders, including parents, teachers, administrators, and policymakers, over the nature of these transformations. The potential applications of the “connected teaching” model and of hybrid learning (both of which make ample use of computer technology and the Internet), the relative merits of “synchronous” (i.e., real-time) versus “asynchronous” teaching (as well as the “blended learning” model that incorporates some of both), and other issues related to online learning—all are among the questions currently being debated by educators and policymakers.



FEDERAL GOVERNMENT BETS ON TECHNOLOGY

The Obama administration's educational technology plan, "Transforming American Education: Learning Powered by Technology," takes for granted the saturation-level presence of technology in the lives of today's students. "Just as technology is at the core of virtually every aspect of our daily lives and work," the administration's report states, "we must leverage it to provide engaging and powerful learning experiences, content, and resources and assessments that measure student achievement in more complete, authentic, and meaningful ways."¹ The plan sets out two main goals to be achieved by 2020. The first goal is raising the national college graduation rate to 60 percent from approximately 41 percent, as calculated by the federal government nearly three years ago; although a more recent analysis by the American Council on Education found the rate at four-year public institutions to be closer to 54 percent at public institutions and 63 percent at not-for-profit schools.² The second goal is erasing achievement gaps based on race, ethnicity, geography, and income.

Technology is an essential component of the administration's strategy for meeting these goals, aiming to improve student achievement by harnessing technology's power to engage young minds. As the report itself puts the case: "Many students' lives today are filled with technology that gives them mobile

access to information and resources 24/7, enables them to create multimedia content and share it with the world, and allows them to participate in online social networks where people from all over the world share ideas, collaborate, and learn new things. . . . The challenge for our education system is to leverage the learning sciences and modern technology to create energizing, relevant, and personalized learning experiences for all learners that mirror students' daily lives and the reality of their futures."

Both the administration's competitive grant program, Race to the Top, and the more decentralized Common Core State Standards have impacted policymakers' choices when it comes to technology. Race to the Top is providing \$350 million in grants to states and districts to "develop and implement common, high quality assessments aligned with common college and career-ready K-12 standards," according to the U.S. Department of Education,³ and technology can play a role in reaching all of the program's goals, such as creation of a personalized learning environment for each student that is differentiated both in substance and style. Common Core State Standards in math and English language arts have been adopted by 45 states and the District of Columbia through an effort coordinated by the Council of Chief State School Officers (CCSSO) and the National Governors Association.⁴

Among the four areas in which DOE has asked states to advance education reform through Race to the Top is “building data systems that measure student growth and success, and inform teachers and principals about how they can improve instruction.”⁵ Indeed, a DOE presentation in 2011 called for states and districts to “use technology to its maximum extent to develop, administer and score assessments and report assessment results.”⁶ But some are skeptical about the “toolbox” being made available on an open data platform to schools and teachers. “This is a big investment in a very nascent field,” said Benjamin Riley, policy director at the nonprofit NewSchools Venture Fund.⁷

The Common Core State Standards assume the potential for technology to help students learn math and English language arts, from basic skills like

keyboarding to the integration of technology in helping them learn. For math, they should know which tools help them carry out different tasks, including tech tools like geometry software, and in English language arts, they should know how to use the Internet to produce and publish writing, as well as interact and collaborate with others. The standards are based on the idea that technology is not a stand-alone subject but rather something that’s integrated throughout the day. Chris Minnich, director of standards and assessments at the CCSSO, points out that these skills will help students succeed in college and careers.⁸

SOME ADVISE CAUTION, DELIBERATION IN ADAPTING TO TECHNOLOGY

The skepticism about technology’s use in Race to the Top is reflected in other commentary on the effects of technology in education. One prominent critic is

BEGINNING OF THE END OF TRADITIONAL TEXTBOOKS?

Educators are always hungry for ways to engage students more deeply in their studies. Technology’s potential for boosting student engagement is driving educators across the nation. Texas led the way when in 2010–2011 the state’s school budget allowed districts to use textbook money to purchase supplemental web-based educational materials. The districts were also empowered to determine what percentages of textbooks will be electronic.

The U.S. Department of Education is urging other states and districts to follow suit. In October, Education Secretary Arne Duncan stated flatly that “over the next few years, textbooks should be obsolete,” giving way instead to interactive digital textbooks and other resources such as videos, simulations, and assessments embedded in the text. Schools could also buy curriculum “a la carte” and take the best from multiple sources. Challenges include budget cuts that could stand in the way of schools upgrading to sufficient download speeds and the possibility that publishers could suffer from download piracy similar to that which the music industry underwent.⁹

The State Educational Technology Directors Association released a report in September 2012 that suggested schools should make the switch to digital textbooks by 2017, in conjunction with the spread of the Common Core State Standards and the continuous shrinking of school budgets. Citing Utah and Virginia as other states on the move, with 22 in all having launched an initiative of some kind to promote digital content, SETDA urges districts to invest what money they have in boosting Internet speeds and urged states to fund a la carte digital content, even if it doesn’t necessarily fit the traditional definition of textbook. Digital textbooks and other content provide for both interactivity and the ability to update information with new scientific discoveries, for example.¹⁰

But for now, digital content remains the exception rather than the norm. For one thing, e-reader technology will need to become navigationally slicker before this transition fully takes off, according to a reviewer at Lorenz Educational Press.¹¹ Indeed, even in Texas, the *Austin American-Statesman* reported that elimination of heavy, printed textbooks is a ways off, since “a lack of ubiquitous Internet and computer access for students, weak e-textbook content and costs to schools and publishers are major obstacles.”¹²

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Tina T. Garrison

Todd Oppenheimer, author of *The Flickering Mind: The False Promise of Technology in the Classroom and How Learning Can Be Saved*. Oppenheimer contends that the continuing encroachment of technology into education entails the neglect of the essentials of learning and the importance of teacher-directed learning. Too many teachers, he asserts, don't recognize the additional responsibilities they take on just by “opening the Internet's door to youngsters.”

“Teachers who sit back and delight . . . in the way the computer lets the students ‘take over’ their own learning are merely fooling themselves,” Oppenheimer writes. “Worse, they're fooling their students. . . . Downloading a captivating live software applet from a NASA site, which some Web designer had loaded with a few earnest questions to satisfy somebody's grant requirements, does not a satisfactory lesson make. Nor is simply writing a paper about this material, based on some extra Internet ‘research.’”¹³

One of Oppenheimer's critics, the University of Georgia's Thomas C. Reeves, actually agrees with Oppenheimer that student achievement improves when teaching improves—“but (Oppenheimer) fails to recognize that such pedagogical enhancements would be impossible without the capabilities of new technology.”¹⁴ But whether Oppenheimer is illuminating real dangers or merely “romanticizing the lecture,” as Reeves characterizes some of those who resist technology in education, all sides concede the place that technology has won for itself in education and realize there's no going back. Indeed, what the past tells us more surely than anything is that the rate of technological change only accelerates, often moving ahead by sudden, dramatic leaps rather than easily manageable increments. “The challenge for schools, therefore, is to be smarter about how they separate its wheat from its chaff,” Oppenheimer notes.

A POWERFUL TOOL, NOT AN END IN ITSELF

Technology—whether it's content or delivery—can be a powerful tool for teaching and learning. The first thing to remember, however dazzling the technology, is that it is only a tool and it must meet the needs of teachers and students, says Tina T. Garrison, executive editor for product development of Herff Jones' education division. “Technology, in and of itself, cannot replace good teaching,” she says. “However, some instruction or information provided through technology can be far more effective at conveying skills or concepts than almost any teacher. An example that comes to mind is an Earth-Sun simulation to demonstrate what causes seasons on our planet, a complex relationship that is at the root of often-cited misunderstanding. It's the combination of carefully thought-out objectives and appropriate strategies that makes the difference. Good teachers use multiple means to help their students grasp the objectives of their courses.”

Aside from technology's power to engage students, Garrison notes that it can help educators tailor instruction for different students, targeting individual students' needs and accommodating their learning styles as much as possible. She goes on to say that a view of teaching as a combination of lecture and individual reading followed by answering end-of chapter questions or completing workbook pages has “never been advocated as the most effective means of helping students learn.” The key, Garrison says, is student engagement. “Sometimes the best way to engage is reading; other times it's discussion, or watching a video, perhaps making illustrations, attentively listening or exploring the real world.” Every method that engages students has a place, including technology, Garrison says.

CONNECTED TEACHING PUTS THE STUDENT AT THE CENTER

The Obama administration sees technology as key to improving student outcomes, and promotes a “connected teaching” model that blends in-person instruction with online learning components. In connected teaching, classrooms are no longer headed by “solo practitioners.” Instead, teams of connected educators are linked to classrooms equipped to provide 24/7 access to data, resources, and tools. Teaching becomes a collaborative activity that enables a single teacher to build “learning communities” connecting students not only to the teacher but to peers, other educators inside and outside the school, professional experts in a variety of disciplines from all over the world, members of community organizations, and parents.

The idea is to place the student at the center of the learning experience by leveraging the flexibility, power, and speed of technology. Learning is anchored in core standards to which students and teachers are

accountable, “but beyond that students and educators should have options for engaging in learning: large groups, small groups, and work tailored to individual goals, needs, interests and prior experience of each learner.”

HYBRID LEARNING ACCENTUATES FLEXIBILITY

Blended, or hybrid, learning also makes a large place for technology in delivering instruction to students. At Notus Jr. Sr. High School in Notus, Idaho, technology is employed along with more traditional instructional methods to give students access to learning opportunities they would not otherwise have. This illustrates another benefit of technology in education—its ability to deliver educational content and experiences to rural school districts that couldn’t get them any other way.

Hybrid learning got off the ground at Notus, a 200-student school serving a rural southwestern Idaho town of about 600 residents, when its principal,

INTERACTIVE WHITEBOARDS FLASHY, CAN BE EFFECTIVE

Large, computerized screens that allow Internet access, video and audio presentations, digital assessments using remote clickers, and the ability to record lessons and play them later—interactive whiteboards are becoming increasingly ubiquitous in classrooms around the nation. When they’re used as a glorified overhead projector, they probably don’t justify their costs, but when used to their full potential—particularly when connected to the Internet—they can inject a new dimension into classroom learning.

Proponents see them as necessary to allow education to keep pace with the realities of the digital age. Those less enamored of the devices cite their high cost and argue that they don’t represent the revolutionary advancement over the plain chalkboard that their supporters claim. And, of course, a great deal depends on the teacher’s proficiency in using the device. If teachers don’t use the interactive features because they don’t know how to, then the whiteboard isn’t much more than a glorified chalkboard.

Despite these differences, research has shown that the devices are having a positive impact. Research conducted by Robert Marzano of the Englewood, Colorado-based Marzano Research Laboratory, studied students’ achievement in 200 classes and compared the results of those that employed interactive whiteboards with those that did not. Marzano correlated significantly higher student achievement in classes that used the devices, apparently due to their ability to increase student motivation and participation.¹⁵

To use interactive whiteboards effectively, New York City middle school technology “integrationist” Ben Stern advises thinking of them as a portal rather than a destination. “By using a variety of software, web apps, websites, and online media, you can utilize the [interactive whiteboard] to supplement your textbook and lectures with content and tools that would be inaccessible otherwise,” Stern writes.¹⁶



Benjamin M. Merrill, created “Pirate Academy,” a catalogue of for-credit online courses provided by the Idaho Digital Learning Academy. Students are allowed to take online courses during regular school days that also include traditional classroom instruction. As Merrill told Education Week recently, “My kids are so limited in terms of where they live, I thought it was unfair that their courses should be limited. Now they get to have the same quality of education because of online learning.”¹⁷

Online learning may also be employed to help students resolve scheduling conflicts and to recover credits for courses they have failed. It can even serve as a means of reaching out to high-school dropouts, as in one dropout-plagued school district in Detroit, Michigan, that is now showing success in using technology to reengage students who have quit school.

Another example of blended learning is the “flipped classroom.” Students do their initial work outside the classroom, almost always using technology—to listen to a lecture, to watch a simulation—and then they spend the next class time discussing, demonstrating, and illustrating what they learned. The teacher in this case is not at the center of instruction but instead works alongside students as a guide. Many educators are finding that flipping the instructional model is effectively engaging students in the learning process.

Education Week also talked to Richard E. Fertig, a Kent State University research professor and advocate of hybrid learning, who expects this approach to become much more common in the coming years. It is crucial to recognize, however, that blended learning is most successful when an in-school mentor is present—someone who can answer questions and help students through any initial adjustments they need to make to online learning. “We’ve shown time and time again,” Fertig says, “that the extent to which the face-to-face school provides online mentors is directly correlated to how successful the students are.”

DROPOUTS GET BACK ON TRACK THROUGH A VIRTUAL SCHOOL

The Detroit area struggles with one of the highest dropout rates in the United States. The Westwood Community School District near Detroit created Westwood Cyber High School to help combat this crisis. A virtual school established originally to help struggling students continue to make progress towards their diplomas through online courses, the school quickly demonstrated an ability to reengage dropouts as well. That got the attention of state officials who are anxiously watching the program to see if it makes any headway against the dropout problem.¹⁸

Westwood Cyber High School blends online classes with project-based learning and optional in-person time with a teacher. The school provides each student with a 20-inch Apple iMac desktop computer and pays for home broadband connections. The school launched in February 2009 with an enrollment of 180. It now numbers 540 students, many from surrounding school districts.

What school leaders are seeing, even in the relatively short time since the school opened, tends to reinforce the idea that success or failure in high school often turns on finding the right mode of instruction for the

individual student's learning style. Westwood Cyber High director Glen Taylor finds that many of the virtual school's students are clearly bright enough for academic success at the high school level—it's just that traditional teaching models had failed to engage them. "This program addresses the dropout crisis and is a total change of a model of instruction," Bruce Umpstead, director of Michigan's office of educational technology, told Education Week. "It hits the sweet spot."

And yet, precisely because of the utility and growing popularity of virtual schools, defenders of traditional brick-and-mortar institutions have come to see them

TABLETS, SMART PHONES BECOMING PART OF THE CLASSROOM

With the continuing advance of technology into education, it should be no surprise that educators have begun to explore how to integrate tablet and smart phone devices into learning.

Wired magazine spotlighted one attempt to do just that: a pilot program at Abilene Christian University in Texas in which 1,000 freshmen students were offered their choice of an iPhone® or an iPod Touch® for free.¹⁹ The devices enabled students to get the information they needed when and where they wanted it, and the program has reportedly proved successful. One of the faculty members who helped build the program characterized it as "kind of like TiVoing education."

One professor incorporates the iPhones into classroom sessions, instructing students to search the web for information pertinent to the lesson, and then helping them evaluate which information sources are reliable and which aren't. The Abilene students' iPhones also include polling software that enables them to answer classroom questions anonymously and that can rapidly generate quizzes to test the student's understanding of the lesson. Abilene educators and students find the anonymous polling a highly attractive component of the program. "Polling opens up new realms for people for discussion," one ACU student told *Wired*. "It's a lot more interactive for those who aren't as willing to jump up and throw out their answer in class. Instead, you just push a button on the iPhone."

Tablets have begun to compete with laptops, especially in schools and districts that are attempting to achieve "one-to-one" status in which every student has a device. During the second quarter of 2012 alone, Apple says it sold 500,000 MacBook laptops—but also 1 million iPads, double the number from a year earlier. "Education tends to be a conservative institution, but we're not seeing that at all on the iPad," Apple CEO Tim Cook said during a quarterly earnings call on July 24. One early adopter is Michael Singleton, head of the social studies department at Orlando Science Schools, who puts the iPad in the same category as book bags, rulers, and pencils in terms of how commonplace they will become. His schools' students all have been issued iPads this fall, although they must maintain a certain GPA to keep them.²⁰

Some educators doubt whether tablets are "ready for prime time" in replacing laptops in such "one-to-one" environments. "Tablets cannot offer the storage capacity or collaborative and robust multimedia tools students need to create as well as consume content," Leslie Wilson, CEO of the One to One Institute, told *District Administration* magazine. And Jaime Casap, senior education evangelist for Google, says that to research and write, students need a keyboard and the ability to keep open multiple windows—which tablets currently do not provide. "It's about finding the right tool for the right job," he says.²¹

as a threat, with the result that states like Wisconsin and Oregon have imposed caps on virtual-school enrollment. Such a position is at odds with the Obama administration's education plan—which, as we have seen, banks heavily on the efficacy of technology. The U.S. Department of Education has called for the removal of all enrollment caps, so it remains to be seen whether the caps now in place will last.²²

SYNCHRONOUS, ASYNCHRONOUS, OR BLENDED LEARNING?

Online learning, unlike traditional teacher-centered classroom instruction, has the ability to function asynchronously—that is, to enable students to access course materials and lessons from anywhere at any time, no longer restricting them to a set time and place for receiving instruction. The degree of flexibility afforded here undoubtedly suits the learning styles—and overall lifestyles—of many of today's perpetually plugged-in students. But both synchronous and asynchronous modes of instruction have their place, and opportunities should be sought to combine the two wherever possible, according to Liz Pape, president and chief executive officer of the Maynard, Massachusetts-based Virtual High School Global Consortium. Pape, quoted in *Education Week's* special e-learning issue, says asynchronous instruction is strengthened when synchronous elements are incorporated into it.²³

Some learning contexts are better suited to synchronous instruction. Students engaged in problem-solving, for example, often benefit from immediate feedback from an instructor. Neither can the asynchronous approach approximate the flow and dynamics of a real-time discussion, nor reliably safeguard the integrity of standardized testing. But asynchronous learning can be just what the doctor ordered for some students—and very likely useful to any student some of the time.

Asynchronous instruction, precisely because it can be accessed any time, allows students to spend more time on subjects that come less easily to them. “In reality, you've extended the class day for the kids,” Pape says. “It's no longer dependent upon the school bell.” The asynchronous approach may also be more effective than the synchronous in helping students develop critical thinking and writing skills. Christa Ehmann

Powers, vice president of education at the Washington-based online-tutoring service Smarthinking, was also quoted in *Education Week's* e-learning supplement. She says the personal aspect of writing sometimes makes synchronous environments uncomfortable settings for it. “If you're aligned with some of the late thinking on how to teach composition and rhetoric and writing as a process, then that all falls in line,” Powers says.

To capture the best of both worlds, schools and districts have turned to blended learning, which involves a combination of traditional classroom and independent, “hands-on” instruction that's most often delivered online. The concept can encompass myriad experiences, which vary based on what the school, home, and library have to offer. Some teachers and administrators believe blended learning should incorporate multiple types of printed and other materials; for example, textbooks can be used as a strategic, targeted resource rather than as a backbone of curricula, supplemented with primary source documents that provide a deeper understanding of the subject.

OPTING OUT OF TECHNOLOGY NOT AN OPTION FOR EDUCATORS

Whatever one's views about the proper role and reach of technology in education, the question for all concerned is how best to incorporate it into learning, not whether to do so. The dramatic transformations wrought by technology in all our lives, and in every institution, discipline, and profession in our society, is surely only a harbinger of the potentially even more dramatic metamorphoses to come. The Obama administration has committed more federal funding to educational technology than has any administration before it, so educators' involvement with technology is only going to increase.

As Tina Garrison sums up the situation: “If teachers take advantage of professional development when new technology is acquired, or when they join the faculty of a new school, they will very likely see examples that effectively demonstrate the power of the particular technology. . . . Teachers are well aware of the range of abilities and variety of learning styles among a group of students, and they can become adept at addressing them in any number of ways. Technology can be one of them, but it takes time, training and patience.”

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