

Transforming Education with Technology

A Conversation with Karen Cator

Marge Scherer

The U.S. Department of Education recently released Transforming American Education: Learning Powered by Technology. Here, Karen Cator, director of the Office of Educational Technology, talks with Educational Leadership about the highlights of that plan and the national vision for schools.

You've said that one of your goals as director of the Office of Educational Technology is to share exemplary technology use. Can you tell me about a school you have visited that exemplifies good use of technology?

A school district that immediately comes to mind is Mooresville Graded School District in Mooresville, North Carolina. It's about 20 miles outside of Charlotte. It has spirited teachers, exemplary leadership, and a commitment to figuring out how to teach each student. When I visited that school district (see "Focus on Mooresville," p. 19), they invited me to go up and down the hall, and into any classroom. As I did so, I watched for engagement. All the students from 4th grade through high school had their own laptops, and they were using them to do their work. If they were practicing math, they had bookmarked practice sets and tutorials. If they were preparing a report, they were researching and creating the media to accompany the text. It struck me as very straightforward.

In several classrooms, I couldn't tell where the front of the classroom was. On one side of the room was an interactive whiteboard; on another side, a regular whiteboard; and the teacher's desk was on a third side. The whole space was a learning environment, and the technology was just part of the infrastructure.

In a high school class, students had chosen books and were presenting to classmates their digital visual representation of the theme of the book. As they watched one another's presentations, they were entertained, yet the meaning of "theme" was completely clear, and they were being exposed to a variety of literature. Although the subject wasn't related to technology, technology facilitated communication, engagement, interaction, and understanding. And the teacher did not have to know how to create what the students created; she was looking for students' understanding of theme and ability to communicate.

Is engagement in learning the most important characteristic you look for in a technology-rich school, then?

I do like to picture an engagement meter in the classroom. When you look across the room, every person is leaning forward, interacting with the teacher, with other students, or with the content. Engagement isn't a focus on entertainment; it's about brain activity. Is each student's brain fully engaged?

Another thing I look at is the nature of the assignment. Is it compelling, does it have some semblance of relevance, and does it allow for a variety of depths? Does it consider whether answers can be searched, calculated, or copied; and does it ask students to do something with the basic information and calculations?

The third quality is the level of personalization. With technology, it's easier to allow for student choice, for meeting interests, for ensuring that assignments are at an appropriate level, and for allowing prior experience and language to support learning. We talked a lot about personalized learning in the National Education Technology Plan.

Do you think that learning that occurs online is different from learning that happens in traditional classrooms?

I think today it is. In the past, online learning has tended to be isolating and less participatory and has been distinct from using technology in the classroom. But going forward, interactions will be key. Just as people engage in online interactions—around virtual sports teams, cooking, or whatever—students will be able to engage in participatory learning experiences online in and out of the classroom.

Right now classrooms are predominantly print-based environments with textbooks, teachers' guides, assessment materials, and supplemental materials. And today, the available technology is often a shared resource. As we transition to a digital learning environment and each learner has his or her own device, we will be able to facilitate personalization, participation, interaction, and collaboration—with people who might be right there in the classroom or people who might be across the world.

In this digital learning environment, we'll incorporate cognitive tutors and integrate simulations, visualizations of complex math and science concepts, videos, and animated demonstrations. And we need to make sure the environments are fully accessible to all students.

Concerning the question of access, does the Department of Education know how many schools have broadband at this time? Does the technology plan recognize that many schools, especially in rural areas, may not have access?

Access is hugely important, and the chapter on infrastructure in the technology plan as well as the Federal Communication Commission's National Broadband Plan recognizes that. The broadband plan focuses on access but also discusses national purposes of broadband technology, one of which is education.

Access is a basic necessity for learners of all ages, everywhere. We have been working with the Departments of Commerce and Agriculture because they had a significant amount of American Reinvestment and Recovery Act money to aggressively tackle the broadband provisioning across the country. There is another project underway to create a visual map of the country showing broadband access. People will be able to look at where they live and compare what's available in their own neighborhood with what's available in other areas like theirs. They will be able to have higher expectations about what they can ask for, what they can hope for, and what they can replicate.

How can schools address the inequities in terms of student access?

Now is the time to begin to make sure that every student has a digital device 24/7. I say that for three reasons. First, digital and mobile devices are proliferating and are available at lower costs; second, the amount and quality of digital content for learning is exploding; and third, interactive environments online are becoming easier to use and more useful. Students must have a digital device with them in class, just as they have had their binder, their textbook, and their pencil box.

They can use this digital device to maintain their portfolio, access news and information when they need it, get their grades, and manage their learning life. Many schools and districts are now trying to figure out how they can leverage, rather than disallow, student-owned devices. Forsythe County, Georgia, for example, is developing a new policy that allows student-owned devices. This particular strategy does require careful policy development and planning.

That is an interesting concept, but devices are so unequal. A really good iPad and a cell phone, for example, have different capabilities.

Because devices come and go, you can't get too attached to them. We need to talk about the features, what you can accomplish with them. We might say, for example, that all students need a device that will allow them to access the Internet and create documents. And different devices might provide different capabilities. The small mobile device can be used for information access, calculations, and communication. Other devices, maybe shared, will need more processing power so students can create more complex videos or animations.

And would you make it the families' responsibility to furnish the devices?

That totally depends on the community and its culture—the local context. In most places it would have to be a shared responsibility.

Obviously, we cannot have policies that exacerbate the digital divide. We want to improve access for *all* students.

The school will likely continue to purchase devices and have them available for some or all students. Colleges used to have many more computer labs and public access spaces, but those have decreased as students have begun coming to school with their own devices. Some communities have access in centers. Libraries are incredibly important. It is an evolving strategy.

In some classrooms, kids are using online learning to learn higher-order skills, and in others, kids are taught basic skills. How do we address that inequity?

In addition to addressing the digital divide, we need to address the pedagogical divide. We can use technology and the opportunity for learning online to provide more balanced learning opportunities for students. This digital learning environment can augment the capacity of the teacher. And we can improve the opportunity for teachers to learn from one another. In rural and underserved areas, we can provide full courses that would otherwise not be available.

How does the typical veteran teacher become more facile with technology? Are you seeing any good professional development out there?

To improve the abilities of teachers, I would focus first on their personal use. Now, most teachers are quite facile with technology in their personal lives—for shopping, finding old college and high school friends, videoconferencing with children or grandchildren, or playing interactive games online. (A key demographic for these games, like teaching, is actually middle-aged women.)

So I think we need to get beyond calling teachers digital immigrants, as if technology holds a certain code only young people can decipher. We can let that go. Now we can focus on using technology to support learning goals. And the technologies we focus on need to improve teachers' opportunity to be successful. If a product requires a chunk of time for professional development just to know how to use it, then it may not be well-designed.

What kinds of collaborations are needed among classroom teachers, online teachers, and media specialists?

In the technology plan, we talk about the highly connected teacher. Teachers can connect with data, resources, content, and the people who can help with their students' learning—to people providing after-school programs, to students' parents, to content and domain experts. Getting better at developing meaningful connections is really important. We are working on a new project on the design of online connected communities of practice where people can grapple with a problem together, share what they have learned, develop a solution together, and connect with experts who can provide research, information, and strategies. Communities of practice are not new, and there is evidence that they are incredibly helpful, so we are focusing on the best ways to leverage online environments and technologies to connect professional educators.

Because our theme is called "Teaching Screenagers," I want to talk more about students. When we interviewed some of our college-age interns who worked for us this past summer (see p. 44), they told us that their high schools often had blocked sites, which in a sense blocked their learning. What is your take on that practice?

I certainly understand their frustration. It is really important that we do everything we can to make sure children are safe online. This requires strong policies and rules; better information and education for teachers, leaders, and students; and much improved technologies to sort the appropriate from the inappropriate. Many filtering programs today use what I call brute force. They are not intelligent enough to distinguish one YouTube video from another. We should be able to get our smartest computer scientists to create seriously intelligent filtering systems and search technologies to empower learning, not just blocking.

ELauthor Mark Bauerlein (p. 28) argues in this issue that technology can affect learning negatively—that it's taking away from students the ability to read deeply. He also says that it encourages kids to respond to complex content before they understand it. Do you see ways schools can counteract that potential downside of technology use?

When you add any new technology—whether it's a printing press, a pencil, or a computer—something is amplified, and something is reduced. Part of being literate in the 21st century (or probably any century) is being able to make careful decisions about technologies and their uses.

Students really need the wisdom of adults, as they always have, to figure out what they need to learn and how they should go about it. The challenge for teachers is to understand the opportunities new technology provides (something that is hard because of rapid changes in what is possible) and then make decisions about how to manage the learning environment. Teachers have a tremendous opportunity to create compelling assignments that require their students to read a lot and to think deeply. If we value the abilities that Mark suggests we are losing, then we need curriculum to support their development.

We have had a tremendous shift in culture with the rise in mobile devices that provide fast and easy answers to the kinds of questions we have always spent a lot of time teaching and testing. To me, this provides an opportunity to ask new questions of students that will deepen understanding, get them to grapple with complex problems, and publish to a wide audience. But I understand what Mark is talking about and value his perspective.

How would you define digital literacy for today's students and for 21st century citizens?

I think that digital literacy has three parts. The first is the ability to use information well—to find it, consume it, analyze it, and leverage it to solve a problem. The second part of digital literacy is the ability to use media and digital technologies to communicate and collaborate effectively. What are the best practices in publishing online? How do you tell a story or communicate your message using different media? How do you organize and collaborate effectively with your personal network? Third, and arguably the least understood, is the development of digital citizenship. Just as we have always worked with students to play well on the playground, we need to make sure they learn to behave well in an online environment. For example, it's really important that students understand that their voice is amplified and persistent when it's online.

The ability of people to live in a globally networked society depends on developing a sense of personal responsibility and applying it online, just like offline.

Tell me more about the recommendations of the national technology plan.

There are five major chapters to the plan. The learning chapter articulates the opportunity to create much more personalized, engaging, interesting learning environments.

The assessment chapter talks about measuring what matters and using data for continuous improvement across the ecosystem, as well as increasing feedback loops and building better assessments that use the power of technology.

The teaching chapter emphasizes that teachers must be highly connected to be successful.

The infrastructure chapter recommends that broadband be available universally, that all students have electronic devices at school, and that we develop the policies and infrastructure that will support everyone.

The productivity chapter discusses cost efficiencies and processes and practices that increase the efficiency of learning. For example, it questions whether we can move from a seat-time-based model to a competency-based model.

What research needs to take place to make this plan a reality?

A lot. We articulate four grand challenges in the plan, and there is much more that can be done to increase understanding of the learning technologies that are most effective. We are thinking a lot about technology transfer from other sectors, even from the consumer space. Just as advertisers are becoming more targeted with their ads, we can learn from that science and more effectively customize learning. In an online environment, you have so much more data. In education, we haven't even begun to scratch the surface of how to use that to better develop learning tools.

In addition to technology transfer, we are looking at how to sustain and scale up the most effective technologies. The whole research and development ecosystem needs to evolve in education, and we need to invest in the intensive development of learning technologies.

Is the purpose of the national technology plan simply to broadcast the vision for the future of technology in schools, or is funding attached to it? And with technology changing so quickly, is long-range planning really possible?

We were careful to laser-focus on learning, assessment, and teaching so that long-range planning will be both possible and necessary. If we started naming specific products, any plan probably would seem ridiculous even in a couple of years. But this plan presents the long-range vision, the goals, the recommendations, and the next steps. It is a high-level vision, but it is both research-based and practitioner-based. It does not specify one funding source but opens the door to multiple pockets of funding to support the overall opportunity to totally power up learning.

The plan is a call for collaboration. As in the children's story, it's like stone soup. We have a recipe, but everybody needs to add something toward making learning rich and flavorful. Over time, we will make this amazing stone soup.

Focus on Mooresville

"Technology with every child, every day" is one of the mantras of Mooresville Graded School District in Mooresville, North Carolina. A district of eight schools and 5,400 students, Mooresville has issued every student in grades 4–12 a MacBook to use at school and at home. All classrooms are also equipped with interactive whiteboards, data projectors, and a variety of other resources. Textbooks have been for the most part phased out except in advanced placement classes, and student homework, grades, assignments, and calendars are all online. Teachers also receive personal laptops, and they participate in summer institutes and training days and receive assistance from technology facilitators and media specialists. When the new technology plan was introduced, more than 800 parents attended a technology symposium. The school holds technology nights throughout the year to assist families in helping their children use technology wisely and well.

Superintendent Mark Edwards reports that the district's academic performance continues to improve at every school, with a 13 percent gain on state test scores in the last three years. Ranked 101 of North Carolina's 115 districts in per pupil funding, the district's graduation rate is 7th in the state. The school has been singled out as a replicable model whose program has had an impact on achievement.

See the [Mooresville Digital Conversion Executive Summary](#).

National Technology Goals

Use technology to help raise the percentage of young people with two- or four-year college degrees from 39 percent to 60 percent by 2020.

Provide "broadband everywhere" to serve learners inside and outside schools.

Put a computing device in the hands of every student.

Make connectedness the hallmark of effective teaching.

Create an online learning registry of content developed by federal government agencies.

Fund the research and development of open-source educational resources.

Fund research about how online communities of practice can improve teaching and learning.

Create a national initiative that defines productivity in education and establishes metrics for measuring it.

Source: Office of Educational Technology, U.S. Department of Education. (2010). *Transforming American Education: Powered by Technology*. Retrieved from www.ed.gov/sites/default/files/NETP-2010-final-report.pdf

