The Change Agents

Cheryl Lemke and Ed Coughlin

Technology is empowering 21st century students in four key ways.

The timing is right. Just as the funding for education in the American Recovery and Reinvestment Act has opened a window of opportunity for the K–12 community to reinvent itself, Web 2.0 tools are offering strikingly different, more participatory and interactive ways for people to learn.

To date, U.S. elementary and secondary schools have marginalized technology. Many school districts still restrict their students' use of such Web 2.0 tools as social networking sites, chat rooms, blogs, wikis, visual media, instant messaging and texting, virtual worlds, and interactive games (Lemke, Coughlin, Garcia, Reifsneider, & Baas, 2009).

Instead of requiring our students to check their Web 2.0 technologies at the schoolhouse door, we should teach them how to use these tools for learning. Our students need such guidance. Although we often picture them as technology experts—engaging in multiple texting or instant messaging conversations while listening to music on iTunes and browsing the web—most children and youth don't know how to use technology as informed consumers, intelligent learners, creative producers, and effective communicators (Kaiser Family Foundation, 2006).

As educators, we should be using technology as a critical design factor, in combination with research on how people best learn, to establish new and different environments for student-centered learning. Here are four key ways that technology is changing the nature of learning in the 21st century.

Change Agent 1: Democratization of Knowledge

The Internet has become a treasure trove for content related to the academic curriculum, providing learners with free access to thousands of valuable courses, information sources, and experts. Elementary and secondary students are accessing these resources every day. Many a teacher has explained something in class only to have a student who recently Googled the topic speak up and add more current or detailed information to the discussion. For some teachers, being challenged in this way is problematic; but for others it is a teachable moment, an opportunity to expand the conversation in response to students' interests and explorations.

Tapping into a student's prior knowledge is a highly effective teaching
strategy. But the easy access to online information means that the kinds of prior knowledge students bring to the classroom vary now more than ever before. A high school teacher introducing Newton's laws of motion may have some students who know nothing about this topic, others who have explored the physics of skateboarding online, and even one or two who have taken an introductory online physics course from MIT. As students increasingly access such resources, educators need to assess students' prior knowledge and design instruction that provides more individualized learning paths and builds students' self-directed learning skills.

The democratization of knowledge requires that schools include digital content, filtered appropriately, within the school curriculum. The excellent online resources that now make information accessible to anyone (for just a small sample, see Resources for Learning Online, p. 57) mean that integrating this content into the curriculum is limited only by the teacher's imagination. For example,

- Biology students can access the animated video of how a cell works on the Biovisions website (http://multimedia.mcb.harvard.edu) and then run interactive, online simulations at the University of Colorado's Interactive Simulations website (http://phet.colorado.edu/simulations/index.php?cat=Biology). After developing a series of questions sparked by these activities, the students might hold an online conversation with a professional scientist at the Ask an Expert site maintained by the Center for Innovation in Engineering and Science Education (www.ciese.org/askanexpert.html).

- An elementary teacher could use the Learn Bird Songs! site (www.learnbirdsongs.com) to assess her students' knowledge of birds and then collaborate with a local nature center to take students on a bird walk. Such nature walks can be augmented through the National Geographic's Handheld Birds, a bird guide that can be used on an iPhone, iTouch, and other handheld devices. The guide enables the student teams to quickly search for bird types on the basis of characteristics they observe in the field, to access sounds and characteristics of specific birds, and even to record sights and sounds from the field to add to their database (see www.handheldbirds.com).

Afterward, the students could create their own multimedia site to share their knowledge of birds that they see and hear in the schoolyard, their neighborhoods, and the local community. These activities could lead to online investigations of birds that are on the endangered species list.

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Change Agent 2: Participatory Learning

The advent of low-cost global communications has led to mass collaboration in the social, economic, and political sectors. Young people are no exception; they expect to interact and have a voice in everything they do—and that includes learning.

More than 30 years of research on collaboration indicates that it contributes significantly to academic learning and is more powerful than competitive learning or learning individually (Darling-Hammond et al., 2008; Johnson & Johnson, 1989; Williams, Lemke, & Slipac, in press). One key indicator of collaboration is sustained, on-task discussion among students. Unfortunately, according to Kamil and colleagues (2008), this kind of discussion currently accounts for an average of only 1.7 minutes per 60 minutes of classroom instruction. The Internet makes it possible to extend such discussions beyond the walls of the classroom. By creating collaborative blogs and wikis, students can interact with their peers in other communities and even other countries.

For example, a geography class could read and compare interpretations of current events in newspapers in Beijing, London, New York, and New Delhi to gain insights into cultural, political, and social perspectives on such events. Then, by creating a wiki together with sister schools in one or more of these cities, U.S. students can participate in ongoing, in-depth discussions of how culture and geography influence the reporting of these events.

Blogs and wikis offer many opportunities to engage students in such discussions. For an example, see the blog maintained by an advanced placement U.S. government class in Colorado during the 2008 presidential elections (http://meyerapgovt.blogspot.com). The teacher asked crucial questions, and his students responded in sustained, online discussions. Sample questions included the following:

Here is your chance to define the label you place on yourself. Why are you a conservative? A liberal? A moderate? A Democrat? A Republican? An Independent? What do you believe in politically, philosophically, and ideologically? Enjoy . . . and remain civil.

Change Agent 3: Authentic Learning

Today’s society is fraught with economic, environmental, social, and political challenges. Students are eager to learn in the context of these realworld issues. And research suggests that such authentic learning increases their engagement and the depth of their learning (Newmann, Bryk, & Nagaoka, 2001).
The work of Newmann and colleagues suggests that three factors are crucial to the achievement of increased learning. First, the student work must have meaning or value that transcends the student-teacher relationship. Such value is created when the student shares his or her work in a meaningful way with an audience outside the classroom, when the student is personally interested in the topic and product, or when the student perceives a clear connection between the academic task and the kind of work done in the real world. Second, the work must embody serious, in-depth learning in the subject area. The student must begin to build a schema of expertise and understanding on the topic and to express that understanding through complex communications. Third, the student must use what he or she learns to produce something. This product might be simply a new idea or an understanding that synthesizes the concepts learned, or it might be an actual product for real-world use.

As we have worked with schools and teachers around the United States to develop rich, authentic learning units and activities for 21st century learning, we have had success with a backwards design process similar to that developed by Wiggins and McTighe (2006). We encourage educators to do the following:

1. Start with the academic standards. Know specifically what students should know and be able to do and what sort of performance might demonstrate that knowledge or skill.
2. Ask the question, Who cares about this content? Try to identify some professional who, in the course of his or her daily work, might apply this knowledge or skill. Think creatively. For example, a medical researcher might use math standards related to probability to analyze the results of testing on the effectiveness of a new drug.
3. Once you select a professional role, identify a task for which this professional might use the targeted skill or knowledge. Try to select a task that would be appropriate and motivating for students.
4. Identify content from other disciplines that might be integrated to make the learning more efficient.
5. Identify 21st century skills—information literacy, visual communications, and so on—that might be developed and assessed in the context of the learning.
6. Think about the tools and technologies of the 21st century that might contribute to the final product.

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For example, one school in California looked at the state's six social studies standards on ancient Greece through the lens of travel professionals. Students developed a website that featured themed tours based on those standards. The students incorporated their knowledge of ancient Greek culture. They used persuasive-writing skills to make the information engaging for potential users and incorporated math knowledge to calculate currency conversions. The students honed their information literacy skills as they gathered and evaluated information from other travel locations, and they practiced their visual-communications skills in designing an attractive and useable website.

Change Agent 4: Multimodal Learning

Communication in today’s world is complex, fast-paced, and conveyed through sophisticated media. People are bombarded with multimedia messages that they need to be able to interpret to gain a deeper understanding of the information. For instance, the New York Times online often includes interactive graphics to help its readers understand events. Recent graphics have illustrated such phenomena as changes in carbon emissions across the United States, the retreat of sea ice in the Arctic from 2003 to 2006, the differences in the language of presidential inaugural addresses from Washington through Obama, the spread of the swine flu, and the depth of past recessions compared with today’s economic picture.

Neuroscience research supports the power of learning through a combination of text and visuals. The dual-channel modality of the human brain suggests that the limited working memory (where people do their thinking) treats text/sound and visuals differently. Emergent research suggests that certain combinations of the two can significantly increase levels of learning (Mayer, 2003; Moreno & Mayer, 2007).

Students need to be prepared not only to interpret and analyze such media, but also to compose and produce communication using such media. Teachers should provide opportunities for students to produce graphics and charts to convey their ideas.

One of the most powerful ways in which schools are beginning to use multimodal learning is in digital storytelling, a type of composition in which the student tells a first-person narrative in his or her own voice using sound, oral language, music, and visuals. When engaging students in digital storytelling, teachers need to ensure that students not only are motivated and interested by the use of media, but also meet literacy standards.

The Center for Digital Storytelling (www.storycenter.org) has links to many resources and articles about this medium. You can find examples of digital stories posted by students and teachers in Niles Township High School District 219 in Skoki, Illinois, at www.digitalstories.org.
Two Choices

Walter Lewin is a physics professor at MIT whose online lectures have made him something of a web rock star. Although Lewin's classes are interesting and even entertaining, a story that appeared recently in the New York Times (Rimer, 2009) may serve as a guidepost for thinking about the 21st century classroom.

Despite the entertaining lectures of such professors as Lewin, MIT was struggling with relatively high failure rates and low attendance in its lecture-style introduction to physics courses. Ten to 15 percent of MIT students, arguably one of the most select student populations in the world, were failing physics courses, and in many classes, attendance had fallen to around 50 percent. MIT decided to move from lectures to smaller high-tech classrooms in which students work in teams on real-world problems, collaborating with teachers and students alike. Students are involved in inquiry rather than note taking: They are now conducting experiments and collaborating on knowledge products—authentic learning in action. As a result of these changes, attendance soared, and the failure rate dropped to below 5 percent.

This story suggests the changes schools need to make to leverage the opportunities offered by Web 2.0 technologies. Educators must

- Become familiar with new technologies and knowledge resources, even those that at first blush do not seem at all related to their teaching.
- Incorporate new knowledge resources into the learning program of each student. Leverage these rich online tools to differentiate learning and engage reticent learners.
- Promote self-directed learning for all students.
- Seek out real-world applications of content and integrate those applications in student learning.
- Give students opportunities to communicate their understanding through a variety of media—print, video, Web 2.0, and more.
- Promote active collaboration over individualized competition.

At this juncture in history, we have two choices: We can either leverage the democratization of knowledge and the power of participatory, authentic, and multimodal learning in the service of our students, or we can continue with current practice and careen down a path to irrelevancy.

References


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