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TECHNOLOGY: SOMETHING'S COMING—SOMETHING GOOD

Eva L. Baker

It's spring, and we can perceive the faint, sweet scent of progress. Technology is going to school, and this time the dust won't settle — at least over unused displays and discarded keyboards. Without a doubt, school use of technology is increasing rapidly as new and intriguing products - both software and hardware—arrive on the market. But just as we have learned with every other innovation in education, impact doesn't come simply because one has or hasn't purchased the new approach or tool. Rather, it matters how we use the innovation, how it connects to serious, internalized goals of the organization and the people in it, and how other parts of the system learn to support its effectiveness.

Researchers and practitioners have been thinking hard about how educational technology should be used since the time of educational film and lantern slides. When trying to synthesize their perspectives, it is immediately obvious that different scholars begin with varied entry points and many times pursue their own views of technology exclusively. Some will describe technology as it can be applied to helping children gain exposure to new information. Others are interested in the exploratory environments children may encounter. Still others look at technology as a tool box that can help students solve problems.

Occasionally, researchers think about teachers' uses, including the sharing of knowledge, communication with peers, feedback to students, and so on. We think it is most helpful to be able to shift perspective, from the various uses proposed for technology, and ask some fairly simple questions:

- What do we know about technology to date?
- What urgent needs can technology meet and how should technology help us improve education?
- What unanswered questions should we be thinking about for the future?

Eva L. Baker is co-director of the National Center for Research on Evaluation, Standards, and Student Testing and a professor of education at the University of California, Los Angeles.

WHAT WE KNOW

1. Technology Works

If we review studies on the effectiveness of technology, the overwhelming answer is that technology is a good investment, even though it is true that the quality of software needs to be improved and equipment ever needs maintenance and upgrading. Why? Because technology engages students' attention, gives them power over knowledge and skills, and provides an engaging environment for peer learning (Herl et al., 1996; Herl, O'Neil, Schacter, & Chung, 1998a).

2. The Access Gap in Technology Is Shrinking

Especially when one looks at access including VCRs, game platforms, WebTV, and computer support at home and at school, the ability to plug in will shortly be universal. For example, in a recent study contrasting high- and low-access schools, the differences between groups were erased when we considered student reports of home technology access (Herl & Baker, in preparation).

3. Plugging-In Itself May Soon Be an Anachronous Idea

Wireless sensors and networks are a mature technology about to be transferred both to schools and consumer products. These advances can multiply the use of technology and give us far better information about what is being used by whom and under which of a vast number of flexible conditions (Asada et al., 1998; Beadle, Harper, Maguire, & Judge, 1997).

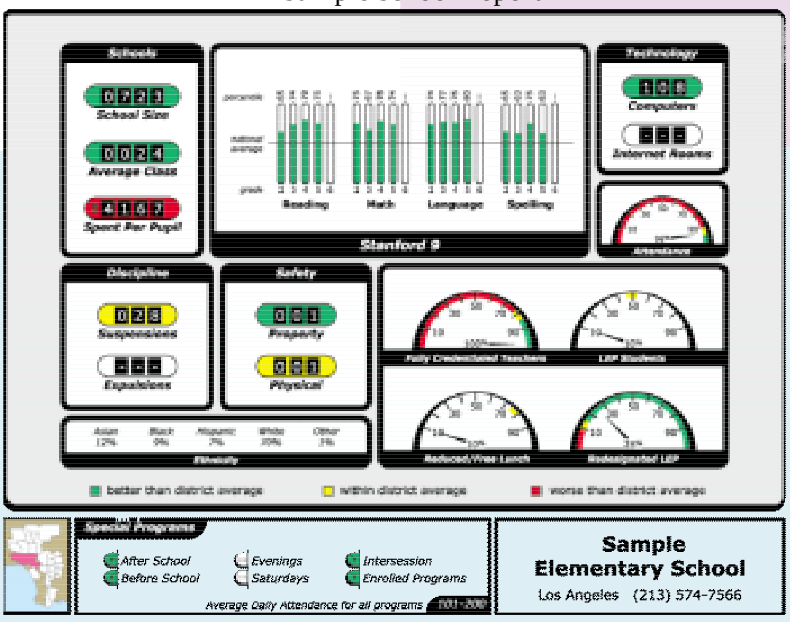
4. Technology Goes Beyond Classroom Instructional Uses

Most of us get stuck when we think about technology. We first think about its use as an instructional treatment to impact directly on children's learning. But until we have our priorities clear—about standards and expectations—we will not be in a position to specify needs for high quality courseware for students. Instead, we should start with other purposes that technology is ready to serve, like testing, accountability, teacher preparation, and parent communication. These may all be smarter functions for early investments.

5. Technology May Be Most Powerful in the Short Run for Quality Monitoring

Rapid progress is being made in using technology to meet important requirements for quality monitoring, including computer-based testing for classroom or large-scale purposes, automated scoring, and database queries to check on the progress of individuals and groups; graphical approaches to reporting complex information to the public; and automated report generation (Herl, O'Neil, & Chung, in press; Herl et al., 1998b; O'Neil, Chung, & Brown, 1997; O'Neil, Wang, Chung, & Herl, in press; Osmundson, Chung, Herl, & Klein, 1999; Schacter, O'Neil, Herl, & Chung, in press). For example, The Sample School Report (Figure 1 below), is a representation of student data that uses graphics as a way to communicate (Brown, 1999).

Figure 1
Sample School Report



The Quality School Portfolio, developed at CRESST, is one of a number of applications designed to help teachers understand results of their efforts by querying databases (Baker & Linn, 1999). For these options to work well, we must assure the quality of the indicators that they use for data. To this end, a sustained research program with quality assurance components is critical (Blank, 1993).

SUGGESTIONS

Demand the Future: Real Needs That Technology Can Fill

1. Underprepared Teachers

Especially with class size reduction plans and anticipated baby boomer retirements, the need for qualified teachers greatly exceeds the supply. How can technology help?

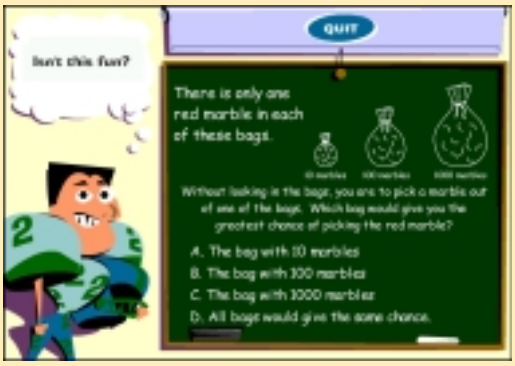
Curricula developed to help students to meet standards, even if imperfect, will be far better than putting children with teachers who don't have the minimal skills in subject matter - good math, science, or literature competence. Using Internet courses for students is an option.

Technology as a medium can also help teachers to gain the competency that they need in subject matters to teach. In a private way, technology can move teachers far beyond reading up on the next day's lesson the night before. Through networks, they can be put in contact with subject matter specialists, see examples of annotated lessons they might try, or make judgments of student work generated in a similar course. In fact, any curricula developed for students should have a teacher / parent version that follows the same standards, but provides deeper analyses and explanations.

2. Public Engagement

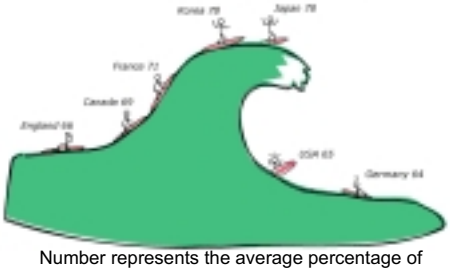
Accountability formulae are fine for the newspapers, but some parents, teachers, and students could benefit from knowing what the numbers stand for. Taking sample tests on the Web is one way for the public to get inside of what students are expected to do. CRESST has developed a prototype of Web testing whose main purpose is giving students and their parents a chance to show how well students can do in a particular area. At http://timssonline.cse.ucla.edu/, you can see what types of questions were asked on the eigth-grade math portion of the Third International Mathematics and Science Study (Schmidt, 1998; see Figure 2). You can also compare how well you do with students in other countries (see Figure 3). This Web site was created to be interesting and fun for students, and may be worth revisiting. But a major goal was to display in an accessible way the content of the TIMSS examination.

Figure 2
Sample TIMSS Challenge Question



At the onset of the challenge, users are asked to select one of eight personas to help guide them through the process. These personas are animated characters created by the artists at Imagistic Media Studios. After answering each question in the TIMSS Challenge Quizzes, users are provided with immediate feedback on the response they selected. Upon completion of a challenge, users can receive a printable certificate showing their score on the challenge, pieces of art and movie clips featuring their favorite character, and games that they can download and play at home that will help them practice some of the concepts in the TIMSS eight-grade math assessment.

Figure 3
Data Representation



Number represents the average percentage of correct responses for 8th-grade students in the corresponding country.

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Next Steps

Even though we have many ideas for how technology can improve education, some difficult questions remain. For example,

1. Can applications be crafted that will serve multiple constituencies: teachers, students, and parents?

2. Can technological applications be designed to serve multiple assessment purposes, such as improvement and certification?

3. When technology access is equalized, will benefits be equal as well?

4. How should we adjust our investment to make technology most effective and in what time period?

5. How do we evaluate technology use in the classroom and its relation to learning?

These important questions deserve our attention now. Instead of reacting to the latest technology hardware and software advancements, the education community needs to be deeply involved in specifying the needs technology should serve to improve learning. If we don't clarify our priorities, others will do it for us. Children will use technology in any event. They need advocates for the best use possible.

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