Revolutionizing Education:

What We're Learning from Technology-Transformed Schools

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Project RED

Introduction

Project RED is a national research and advocacy effort based on the premise that technology holds the promise of allowing us to re-engineer our educational system. Through the efforts of Project RED and our partners – including Intel, Apple, the Pearson Foundation, Qwest, eChalk, NSBA, AASA, CoSN, ISTE, ASBO, AESA, NAMTC, SETDA and iNACOL – we hope to arrive at a better understanding of what it will take for technology to transform learning and schools, just as it has transformed homes and offices in almost every other segment of our society. In order to do this, however, our nation needs to rethink the way we look at – and budget for – technology in schools.

There is a tremendous gulf between schools that are committed to preparing students for success in the 21st century with help from digital technology and those who are still taking a "wait and see" attitude about the role of technology in the classroom. In response, Project RED has conducted a survey of technology-transformed schools across the country to find out what's working for them and to show how technology can save money when properly implemented.

In this eBook we share some preliminary results from the survey and take a look at what past research and current observation tells us about some of the keys to successful technology implementations in areas including: curriculum, leadership, funding and legislation.

To learn more, visit us online at www.projectred.org.

— The Project RED Team

Transforming the Curriculum: Challenges and Opportunities


If the rate of change inside an institution is less than the rate of change outside, the end is in sight.

Jack Welsh, CEO, General Electric

by Dr. Mike Gielniak and Tom Greaves

For as long as one can remember there have been calls in this country for school reform. In recent years, technology – with its potential to engage and motivate, support differentiated learning, and provide practice in information-age skills – has been viewed by many as a catalyst for innovation. And yet, another truth about education is that school reforms are frequently transitory, with goals not fully realized before the pendulum swings again. What makes the difference between changes that "stick" and ones that do not? Into which category does technology-supported school reform fit? The answers depend on the degree to which we understand the challenges that make reform so difficult. They include:

• **Education is complex.** Individual students are complex. Multiply these complexities by many students in a school community, factor in the political and funding issues and the challenges can be daunting.

• **Change takes time and requires patience.** School reform is political and subject to changing moods and opinions. It is far too easy to give up and try something new before the promise of a particular innovation has been realized.

• **Entrenched regulations, policies, practices and beliefs can get in the way.** As an old Chinese proverb states: "In times of rapid change, experience is your worst enemy."

• **Proof can be hard to come by.** When human behavior is the subject, scientific research is difficult. The search for objective accountability measures has fueled an obsession with test scores, and yet it is tremendously hard to build a causal link between anything schools do and higher test scores.

• **Lack of access continues to be a barrier in many settings.** The challenge of measuring progress is compounded by the fact that ubiquitous access to computers was practically unheard of until recent years and remains rare in many schools today.

• **Successful school reform requires buy-in.** Too often, technology initiatives are seen as imposed from the top down or added with little regard for impact. School reform requires careful planning, professional development, and consensus-building so that all stakeholders are on board.

• **There is little consensus on technology uses.** While some tout technology as a "wonder drug" for educational innovation, the medicine is of little use without the prescription. Unfortunately, there is no consensus about the best uses of technology in education – and even when best practices are known, they are frequently ignored.

In trying to understand what works, it is important to avoid a pitfall raised by Stanford professor Larry Cuban in a 2006 *Education Week* article: "Again and again," he writes, "officials mistake the medium of instruction (laptops) for how teachers teach."

We at Project RED have seen much evidence that ubiquitous technology can be a powerful aid to school reform, but to realize the potential it is imperative to shift the conversation from what technologies are worth buying to questions about how students learn, what methodology is most appropriate, and how technology can enhance the process. Let's start by examining some beliefs that shape teaching and learning in this country.

Direct Instruction

Direct instruction is the traditional means of transmitting information from the teacher to the student. It typically follows a cycle that includes specified content to be learned, guided practice in that content, and testing of a student's knowledge. Learners are often passive recipients of information, as they listen to lectures and work through questions with defined answers.

Direct instruction is not inherently good or bad. When specific procedures must be learned or quick memorization is valued, direct instruction may be the preferred methodology. And there is little doubt that digital technology can help – allowing the computer to deliver the direct instruction and assess student progress in an individualized way that no one teacher can possibly replicate.

However, there is a paradox between the outcomes education leaders say are desired and the methods used to drive these outcomes. We aim for students who are critical thinkers, prepared for the workplace of tomorrow, yet continue to rely heavily on direct instruction, which research shows is not an effective way of developing complex, higher-order thinking. Some researchers (like Spiro & Jengh, 1990) say that direct instruction can result in rigid understanding of the content that hinders subsequent learning.

Student-Centered Learning Involves:

- Active rather than passive learning;
- Emphasis on deep learning and understanding;
- Increased student responsibility and accountability;
- Increased sense of autonomy in the learner;
- Interdependence between teacher and learner;
- Mutual respect within the learner teacher relationship.

Student-Centered Learning

In the student-centered model there is a shift in power from teacher to student, with the student taking on increased autonomy and responsibility. Student-centered philosophies are nothing new. F. H. Hayward has been credited with coining the term as early as 1905, with high profile advocates such as Dewey and Piaget emerging in the mid-20th century. The advent of computer technology in the 1980s fueled a new interest in student-centered learning – the idea of students working independently or collaboratively on technology-based projects as the teacher moved from the role of "sage on the stage" to "guide on the side."

This transition is not always easy, however. As a sixth grader in a Michigan middle school academy based on technology-supported, student-centered learning put it, "The hardest thing is that they (the teachers) don't give us any answers." Changing to a student-centered environment in which the instructor no longer provides all the questions and answers can be quite a culture shock for students and teachers alike. Another challenge is the need to incorporate knowledge acquisition into the model since, without sufficient content knowledge, it is difficult for students to be self-directed.

Technology provides a natural medium for students to drive their own learning and work at their own pace, as was demonstrated in Michigan's Freedom to Learn one-to-one program. When it was implemented, some were reluctant to allow special education students in the program. And yet, the schools that did were astounded by the results. The individualization of the instruction and the engaging, motivational nature of the device helped the students achieve beyond what many teachers thought was possible.

Evidence continues to mount about the benefits of student-centered learning. A six-year study in Helsinki (Lonka & Ahola, 1995) that compared direct instruction to student-centered learning found that the student-centered group developed a better understanding of the content. In 1997 Hall and Saunders showed that learners in a student-centered program demonstrated increased participation, motivation and higher grades. In another study (O'Neill & McMahon, 2005), 94 percent of students said that they would recommend the student-centered approach over direct instruction.

Knowledge Creation

Knowledge creation takes some basic principles of student-centered learning, but transforms the learning environment in a fundamental way. Instead of a focus on the individual student, knowledge creation involves students coming to see themselves and their work as part of a real-world effort to advance the knowledge of a field. Web 2.0 tools are doing a lot to spur interest in knowledge creation. With them, students can: create collaborative presentations with peers they've never met; participate in scientific experiments involving data from all over the world; interview world-renowned experts; and post videos

6 Themes of a Knowledge Building Community

1. Knowledge advances as a community rather than through individual achievement;
2. Knowledge advances as idea improvement rather than as progress toward given truth;
3. Knowledge of in contrast to knowledge about;
4. Discourse as collaborative problem solving rather than as argumentation;
5. Constructive use of authoritative information;
6. Understanding as an emergent phenomenon

and stories for hundreds of people to comment on and enhance. Scardamalia and Berieter, creators of Knowledge Forum describe knowledge building as "initiating the young into a culture devoted to advancing the frontiers of knowledge … and helping them to find a constructive and personally satisfying role in that culture."

Research into the value of knowledge creation is not yet plentiful but those who've experienced it are enthusiastic. One large-scale example is GLOBE, a worldwide project that has students and teachers in more than 20,000 schools worldwide collaborating on inquiry-based investigations of the environment and the Earth system in partnership with NASA and NSF. As a fourth grade student in Canton, Ohio, stated, "GLOBE is important because we are helping real scientists do their job."

Dozens of research reports have been published based on the GLOBE program, one of which showed that data collected by students in the project was at least as accurate as that collected by professionals.

Looked at in a broader context, many share with the Institute of International Education the belief that, “Peace and prosperity in the 21st Century depend on increasing the capacity of people to think and work on a global and intercultural basis. As technology opens borders, educational and professional exchange opens minds.”

If we are to truly transform education with help from technology, it is essential for us to have a national dialog, supported by ongoing research, about how people learn. Until we do so, we will continue on a treadmill of new wonder programs with few results to prove their worth.

Choosing the Right Approach

Clearly there are benefits and drawbacks to each approach outlined here. The bottom line, however, is that until we spend the time to deal with the underlying belief systems of teachers and administrators, we will not see the fundamental changes in the education system that we so strongly desire.

Dynamic Leadership: The Key to Success

Technology has changed our world and has the potential -- still unrealized in a number of settings – to transform our schools. The global economy and information age create an educational tempest from which the digital shift can emerge.

by Leslie Wilson

Leadership for technology-rich 21st century schools demands a holistic, dynamic approach. According to the authors of Leaders and Laggards: A State by State Report Card on Education Innovation, "Educational innovation means discarding policies and practices that no longer serve students while creating opportunities for smart, entrepreneurial problem-solvers to help children learn."

Carol Bartz, CEO of Yahoo, wrote in the November 2009 issue of *The Economist* that to be successful amidst the barrage of information technologies today, leaders need to know how to navigate turbulent waters and provide "unequivocal" direction. She noted that hidebound management is the antithesis of leadership for today's world. Contrast her perspective of the dynamic leadership needed with that of the traditional education bureaucracy. For today's education system to produce success, leadership must reform to match expected outcomes.

Where leaders of yesterday were predominantly managers, this century's must be quick sailors on the rapid seas of information, able to adjust, adapt and lead in a changing environment. Klimek, Ritzenhein and Sullivan, in *Generative*

Leadership (2008), complement Bartz's observations with their recommendations that leading must be “organic,” consistently reinventing itself based in a changing world. If we had been careful watchers of technology trends a decade ago, there would be fewer schools with computer labs and more with the bandwidth and infrastructure to accommodate full-scale one-to-one programs.

Learning From Three State Projects

Research from three states that have invested heavily in one-to-one technology initiatives demonstrates what sort of leadership is needed for innovative programs to succeed. Maine's Learning Technology Initiative (MLTI) – at seven years, the nation’s longest-running statewide one-to-one program – created a leadership team for every school that included a principal, teacher leader and a technology lead person. Jeff Mao, MLTI policy director, explains that the members of this team are selected based on classroom experience and leadership skills, *not* on technology expertise.

In summarizing several years of research on the impact of MLTI, Dr. David Silvernail, director of research for the Maine International Center for Digital Learning at the University of Southern Maine shares findings about effective leadership:

1. There must be a clear strategic vision and plan.

2. Teachers must receive strong, meaningful and sustained professional developments and support.

3. Technology use must be appropriate to the task and focused.

4. The technology must be used as a learning tool.

5. Assessments must match learning with technology.

6. There needs to be clear evaluation and research plans developed early in the initiative.

7. It is important to articulate and manage expectations.

In Texas, the Technology Immersion Pilot (TIP) was a three-year pilot project involving middle school students at several high-need schools. Research conducted by the Texas Center for Educational Research reached the following conclusions about the role of effective leadership at the one-to-one program sites:

- Full implementation of the technology immersion model – which was associated with higher student achievement and engagement – only was reached by approximately one quarter of the schools by year three of the pilot.

- Full implementation was found to require: Leadership, Teacher Support (buy-in), Parent and Community Support, Technical Support, and Professional Development.

- Teachers felt best supported by administrative leaders who welcomed innovation, helped engage parents and community members, and ensured plentiful technical support and professional development.

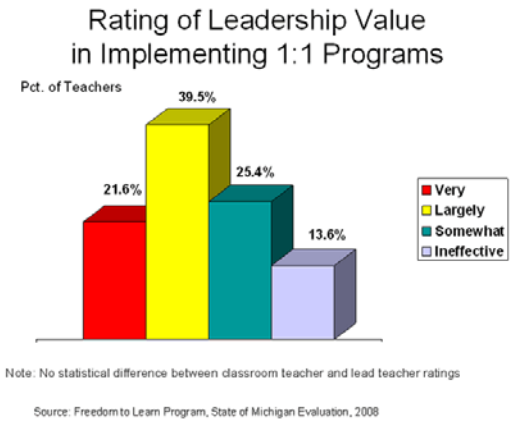
Michigan's Freedom to Learn (FTL) 1:1 program was a leader in addressing the necessity of administrators' professional learning as they embarked on dramatic change. The University of Memphis's Center for Research and Education Policy

studied the effects of leadership on the program's success and found:

• Over 60 percent of FTL respondents believed that the program was “largely” to “very well” implemented.

• Implementation success was largely attributed to the size of the leader’s role and the quality of the program’s leadership.

• Principals and assistant principals were perceived to be somewhat more effective in bringing about FTL goals than were other administrators.



Leadership in Today's Technology-Rich Schools

Professional research as well as anecdotal evidence from technology-rich sites point to a variety of other attributes and practices of effective leaders. These include:

• Clear, consistent articulation of a compelling vision, allowing constituents to feel they have an important role to play in the mission;

• Solid planning from concept to implementation to sustainability, with action plans aligned to the vision and based on research, best practice and trends;

• A shared leadership model that draws on the collective and individual strengths of each stakeholder;

• Facilitating ongoing, high-quality professional learning for teachers, administrators and technology leaders;

• Proactively addressing infrastructure and bandwidth;

• Consistent and honest communication with stakeholders regarding successes, challenges and lessons learned;

• A game plan for troubleshooting emerging issues;

• A systems approach to integrating ubiquitous technology across the organization;

• Skills for leading the change from traditional to the transformed environment;

• Evaluation, monitoring and adjusting plans.

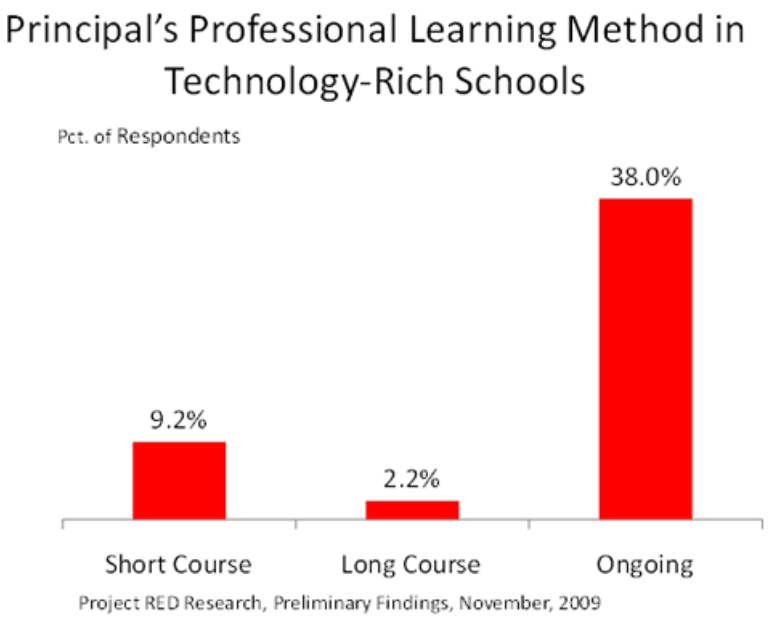
Dr. Bill Hamilton, who as superintendent of Michigan’s Walled Lake Consolidated Schools has led a large-scale 1:1 program for nearly a decade, advises, "Begin your project with those who are believers. … Frequently connect with your pioneers. Be sure they know you are there, always, to lend support." Embedded in those processes is the management of expectations. What can the school, district and community

"expect" when students have uninterrupted access to the Internet? Will high-stakes test scores soar? What does the research say? Keep expectations realistic and grounded in what is known from experts and the knowledge base.

Professional Learning for Administrators

Michael Fullan, a University of Toronto researcher who studies the change process in schools, says that professional development is the cornerstone strategy for improving and transforming schools. A variety of other researchers agree that professional learning is the key leverage point for ensuring opportunities for ongoing school improvement practices by educators to increase student achievement.

While common sense and experience both tell us that professional growth experiences for administrators – as well as for teachers – are key to implementing change, it is rare for districts to commit to ongoing, technology-related professional development for school leaders. In fact, across the 4,000 plus pages of research about technology implementations, precious few point to sustained professional learning for administrators. Early results from the Project RED survey of technology-rich schools were heartening, however. Of the principals who responded, 38 percent are engaged in ongoing professional development, with 11 percent involved in online courses. Compared to the norm, this demonstrates a strong commitment to ongoing training opportunities for administrators.

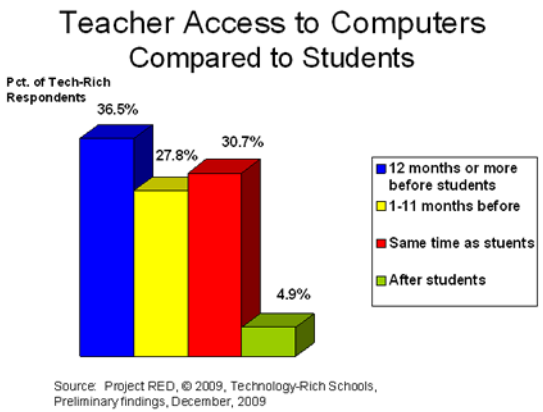


Planning and Sustainability

Transformation for today's schools is a 360 degree affair. It must be systemic. We've all heard of initiatives that failed because of lack of vision, goals, effective planning or benchmarks for measuring success. Planning must be based on reality - the education system's current status - aligned with strategic, detailed action plans with timelines and benchmarking aimed at accomplishment of the vision.

The chart above takes a look at one commonly-accepted aspect of planning for one-to-one computing: the benefits of placing the technology in the hands of teachers well in advance of the students for training and acclimation purposes. Complementary to this is the finding that teachers and administrators in technology-rich schools have a high rate of belief in sustainability of their programs – with a significant majority believing their initiative is sustainable for five years or more.

In a school that is committed to technology-supported reform, “dancing with change” becomes the norm not the exception. At the heart of such a school's leadership you will find: a collective vision, which calls on the spirit; *learning*, which invigorates the brain; and action, which produces vigor. From these perspectives, leadership development shifts from individualized to collective; from static curriculum and instruction to dynamic content production. The robust technology-rich classroom continually evolves around students' personalized learning experiences. Teachers empower learners and leaders empower teachers as we move into the future together.



Source: Project RED, © 2009, Technology-Rich Schools, Preliminary findings, December, 2009

Finances for Digital Age Schools: Cutting Costs While Improving Outcomes

By Jeanne Hayes

One of the sobering realities about envisioning educational innovation of any sort is money. How will districts fund new programs and maintain existing ones when education is already being criticized for costs that have risen dramatically in recent years?

According to the National Center for Education Statistics, education expenditure increases for K-12 education have exceeded the rate of inflation since the end of World War II, with costs accelerating in the past two decades. Viewed in this context, it is understandable that education leaders should be concerned about the cost of technology implementations and how to fund everything from new hardware to maintenance of existing equipment, from sustained professional development to ever-more-essential broadband connectivity.

In the long run, the financial impact of technology investments should be strongly positive, resulting in: more competitive schools in a global economy; higher property taxes and income taxes from better-educated citizens; and reduced social welfare costs as drop-out rates decline. However, school systems reeling from the recent drop in sales and property taxes can’t focus on long-term goals now. Responsible administrators need to concentrate on the short term, looking for ways to improve outcomes while slowing the growth of expenditure increases.

How is it possible to cut back on technology when there is so much evidence that it is helping schools prepare students for their futures – and when there is such momentum driving the transition to online learning and one-to-one computing? According to the Sloan Consortium's *K-12 Online Learning, 2008* report, the overall number of K-12 students engaged in online courses in 2007-2008 was estimated at over one million, representing a 47 percent increase from the 2005-2006 school year. *America's Digital Schools 2008* found that the number of K-12 students engaged in one-to-one computing has also surpassed 1 million students. If it were not for the current financial crisis, one would expect these trends to continue. But can we afford them today?

Fortunately, in addition to the costs, there are savings to be had from technology. As other industries have decreased their costs through process improvement and technology-supported innovations, so education has an historic chance to do so now. As one of the last major industries in the U.S. to achieve transformative change from technology, education has the opportunity to look at both improving outcomes and avoiding costs through what author Clayton Christianson would call the disruptive nature of technology and personalized learning.

Cost reductions, improved student engagement, and better learning outcomes are all possible through the implementation of appropriate technologies. In fact, Project RED research has calculated an overall 8 percent cost reduction – even when hardware and maintenance costs are factored in – by using online courses, digital content, online assessment and professional development.

Use of Digital Content

The use of digital content in place of textbooks provides many potential benefits, such as greater access, currency, and portability, which can lead to more effective learning. One district that has led the nation in the use of digital content is Arizona's Vail School District. Convinced that its objective of preparing students for the 21st century would not be met using current materials and procedures, the district created teams of teachers charged with building a database of digital content tied to state standards. The materials – many of them in the form of interactive multimedia – are a combination of teacher-made lessons and content drawn from premium subscription services and free online resources. A peer review process is used to ensure standards alignment and content quality.

Cost savings per student: Digital Content vs. Textbooks
Empire High School, Vail, Arizona

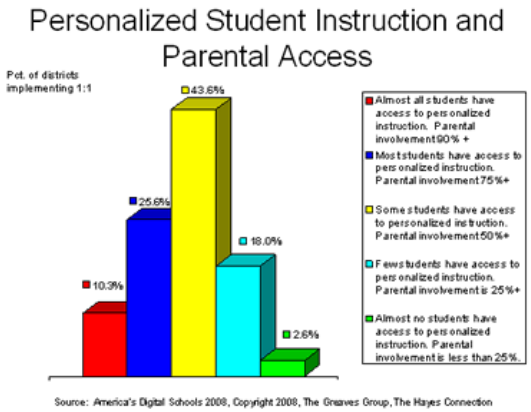
Textbook vs. digital content costs	Total
Annual textbook cost per student	$125
Digital content cost per student	$84
Digital content cost savings per student	**$41** (33% savings)

Source: Interview with Matt Federoff, CIO, Vail School District. Vail, Arizona

The eye-opening fact about this creatively disruptive effort is that costs are lower than for purchase of analog content (see chart). The cost of teacher time to develop and adapt digital content, while not insignificant, is similar to that of their previous work of aligning analog content with state and district standard but offers greater benefits. This work is viewed as so successful that eleven other districts in Arizona are following Vail's lead.

Not only does the use of digital content save money, it also offers clear benefits that should not be overlooked in analyzing the value of the program. In *America's Digital Schools 2008*, researchers asked school district technology directors whether

their students had personalized instruction and parental access – an approach at the heart of 21st century teaching and learning. As can be seen from the chart above, only 10% of respondents reported that most of their students had access to personalized instruction. And yet, according to Vail's CIO, Matt Federoff, placing teachers in the role of producers of knowledge and content has allowed them to personalize teaching and learning in profound ways. Vail's outcomes and those of other districts offering personalized instruction are important for us to measure – both in educational results and in financial impact.



Online Learning as Part of the Solution

As a recent meta-analysis by the U.S. Dept. of Education and SRI Center for Technology in Learning reported, students who took all or part of their classes online performed better, on average, than those taking the same course through traditional face-to-face instruction. With good outcomes, particularly for a blend of online and traditional face-to-face instruction, this approach offers cost savings in the following areas:

- **Instructional materials:** Digital content is less costly than text-based content and is easily indexed and searched via the district's network or web.

- **Facilities:** Students and teachers can access online coursework from anywhere with an Internet connection and a computer, allowing for flexibility of scheduling and cost savings in custodial care, electricity, administration, and other overhead expenses.

- **Transportation:** Students can access the course from any location if they have a computer and Internet access. They do not need to be transported to a school site.

- **Infrastructure:** Schools can contract with a virtual school that is responsible for student access to courses, technology devices, infrastructure, and teachers.

- **Increased student attendance and engagement** because of personalized learning

- **Accelerated learning/completion of coursework** for more students

Walled Lake School District in Michigan has been hard hit financially by the recession; in searching for ways to save money and improve instruction at the same time, Superintendent Dr. William Hamilton determined the savings possible from an online course for 300 students resulted in a 13 percent reduction. (See chart.) The online courses have also allowed students to access classes not offered by the district, facilitated student scheduling flexibility, and allowed high school students to reduce on-campus attendance by two periods per semester.

Cost savings per student: Traditional vs. Online Course Delivery
Walled Lake Consolidated Schools, Walled Lake, Michigan

Traditional Course vs. Online Course Costs (Walled Lake)	Total
Incremental cost per student per instructional year-two face-to-face courses per semester	$950
Online per student per instructional year cost including teacher support	$823
Online per student per instructional year cost savings-two online courses per semester	**$127** (13% savings)

Source: Interview with Dr. William Hamilton, Superintendent, Walled Lake Consolidated Schools, Walled Lake, Michigan

Recommendations for Policy Makers and Education Leaders

What follow are additional suggestions for school leaders and other decision-makers interested in keeping education technology affordable:

• Information about cost of implementation of new technologies is abundant, but projections of cost savings or benefits from new implementations are surprisingly absent. Focus on both sides of the equation as you consider new initiatives.

• Standard metrics should be developed to ensure a cost/benefit analysis as part of school reform. One such metric might be to require that school leaders know the cost to teach any individual standard.

• A structural change is needed in education system budgeting so that educators are required to provide evidence of savings in a cost/benefit tradeoff analysis.

• Seek help from your regional education service agency or form a group from the districts in your region.

• Seek help from your professional associations, such as national offices or your state affiliates for AASA, ASBO and CoSN. Many of these groups are addressing cost-savings solutions as part of the national dialog.

Legislation and Policy: What Lies Ahead?

by Tom Greaves

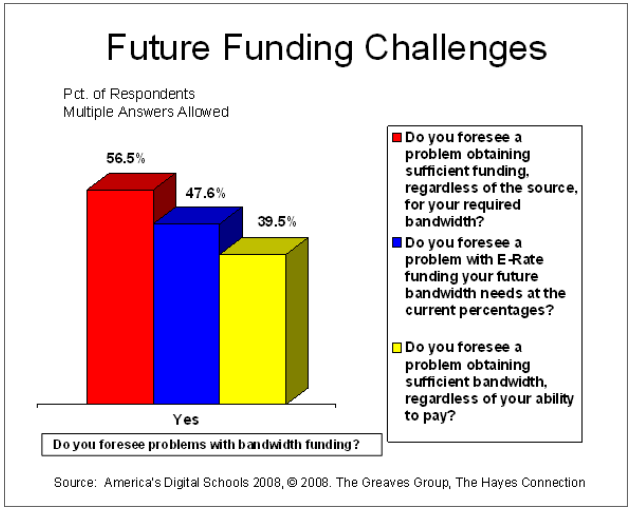
For innovation to become the norm, it is crucial to develop a vision for schools of the future and to back that vision up with enabling legislation and funding. Some examples to watch for:

Leadership and change management training: The largest single barrier to innovation is organizational inertia – as in 'that's the way we've always done it." An example of previous legislative efforts focused on organizational change is the requirement, by a number of states, that recipients of state-administered, technology grants must use at least 25 percent of their award to provide high-quality professional development.

Digital Materials adoption: True personalization – one of the best ways to improve student performance – is not practical in a print-based environment and yet today's system remains biased towards print. Texas recently enacted HB 4294, which takes a big step towards parity between print and digital content by allowing a school district to use a portion of its instructional materials budget for electronic resources and technology equipment. Several other states are focusing on similar legislation aimed at freeing schools to invest in digital content.

Performance-Based Contracts: Accountability is an important aspect of education today, although rarely does it apply, in this country, to technology-based or academic procurements. In the United Kingdom, it is common for vendors and schools to agree to a set of Key Performance Indicators (KPIs) – for example, a target time for a user to log on to an email system, with penalties for the vendor if the targets are not met. Along these lines, look for legislation to require that all technology initiatives commit to academic improvements, with financial incentives for success.

Bandwidth and connectivity: As schools move from print to digital, it is essential that connectivity and bandwidth be sufficient to support the transition. As shown in the graph, a majority of schools surveyed in 2008 foresaw problems obtaining sufficient funding for their growing bandwidth needs, which are doubling each year, according to some sources. Unfortunately, funding levels for the E-Rate have not changed since this important legislation was enacted in 1996. The net result is that, over time, the E-Rate is paying a smaller percentage of costs in covered schools. Given the critical nature of connectivity, it is in the national interest to ensure sufficient bandwidth – whether through an expanded E-Rate or other means.



Carnegie Units: Seat time requirements (also known as Carnegie Units) have served schools well in years past. However, when personalization becomes the norm, it makes sense to adopt a different system. Look for legislators to adjust seat time requirements to allow for personalized student progress and allow online learning flexibility. One can hope that this modification is accompanied by rigorous standards rather than serving as a way of "dumbing down" the curriculum.
Expect that lawmakers will establish achievement assessment as a substitute for Carnegie Units, starting with the creation of waivers for digital schools. Some states, including Alabama and Michigan, have already made moves in this direction.

Online Assessment: In 1934 Thomas Watson of IBM received a Congressional commendation for building the machine that "pierced the human intellect." That machine scored multiple-choice tests. Most would agree that, at some point, print-based multiple-choice tests are going to be replaced with more effective and sophisticated online assessment tools. We can expect statewide assessments to go all-electronic in the coming years, using a phased-in, proof-of-concept process.

Online Course Requirements: In the long run, a requirement that each student take some online courses prior to graduation will be viewed as rather archaic. For now, however, this is a helpful stepingstone that will provide students with much-needed preparation for higher education. States such as Michigan already have this requirement. Others will surely follow.

Revamping Content Standards: Expect changes to content standards in at least two areas. First, since technology enables higher performance levels, it would make sense to have more complex standards. Second, standards should be adjusted to reflect real-life, 21st century skills and take advantage of technology available to students. For example, a California standard that now reads "Students know how computer models are used to predict the effects of the increase in greenhouse gases" could be modified to have students demonstrate their understanding by building and interacting with computer models. In addition, look for legislation incorporating primary source material – more powerful than after-the-fact accounts – into state standards.

Re-designing school budgets: Taking a close look at the total educational budget picture helps avoid suboptimal budget behavior. For example, if new computers are only purchased from capital equipment dollars, with maintenance of the computers covered by maintenance dollars earmarked for all capital equipment, then schools will buy the computer with the lowest initial cost rather than the one with the lowest total cost of ownership. Look for legislation that requires a TCO sticker on computers and peripherals, similar to the ones found on appliances. Look also for reforms to the budget process emphasizing cost-avoidance and resource redeployment and for budgets to be annually reassessed to identify cost reductions to pay for education technology programs.

Revolutionizing education is a worthy but challenging task. It is clear that legislation will play a key role in the process. While the above priorities are a great starting point, they are likely to be just the tip of the iceberg. Project RED (www.projectred.org) welcomes comments on these priorities, or suggestions regarding additional priorities that should be considered.

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