



The Digital Promise: Transforming Learning with Innovative Uses of Technology

A white paper on literacy and learning in a new media age

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The American Recovery and Reinvestment Act (AARA) of 2009 initially dedicated more than \$100 billion to our nation's preschools through universities to achieve the following:

- Make progress toward rigorous standards and assessments, especially for English language learners and students with disabilities
- Establish reliable data systems to track progress and foster ongoing improvement
- Improve teacher effectiveness
- Support the lowest performing schools

New funding recently released, including the \$4 billion Race to the Top grant program and the \$650 million Innovation Fund, gives educational leaders additional opportunities to achieve these outcomes.

This paper describes how investment in technology tools, network access, professional development, and new personalized curricula can help schools address each of ARRA's four reform goals and simultaneously modernize to meet the needs of 21st century learners. Innovative examples of how technology can be used to promote literacy and to engage struggling learners are offered and a variety of related resources are shared.

Schools in a New Media Age: A Cultural Phenomenon Awaits Rigorous Evidence

Scholarly research on the effectiveness of new and emerging technologies in learning is in its infancy, with little consensus among researchers about how to measure the effects of technology in education and how studies should be designed. In a recent review paper, "The Power of Pow! Wham!: Children, Digital Media & Our Nation's Future," Dr. Rima Shore (2008), a Bank Street child development and school reform expert, reports that although millions of American children are "hanging out in cyberspace," the adults in their lives remain remarkably uninformed about the effects of these experiences.

While research efforts are underway to clarify how and what children learn from their experiences with networked technology and media, Shore says studies are "scattered and fragmented." She writes, "Rarely has a phenomenon affecting children been so pervasive and so powerful yet so poorly understood. We may be the Jetsons... but when it comes to understanding the impact of digital media and harnessing their potential so they can benefit all children, we are often more like the Flintstones."

This lack of hard evidence leads some educators to question the efficacy of incorporating these new technology-based learning experiences, such as those involving digital media and online social networking, and the urgency of investment in what they consider unproven strategies. Conversely, proponents of technology investment reason that digital media are already a prevalent fixture in the lives of contemporary students, so waiting for research to confirm the promise of digital innovation before committing to expanded experimentation is unwise. To proponents, the question is not whether technology should be used in classrooms, but *how* it should be used.

There are numerous benefits of educational technology when it is integrated deliberately and comprehensively into teaching and learning. These benefits are supported by research from various sources and include:

Technology supports student achievement. When integrated into instruction appropriately, technology has significant positive effects on student achievement in reading, literacy, mathematics, and science (International Society for Technology in Education, 2008).

Technology builds 21st century skills. Integrating technology into instruction can help students learn 21st century skills in addition to core academic subjects, which are essential but no longer sufficient for success in life and work (International Society for Technology in Education, 2008).

Technology engages students in learning and content creation. Integrating technology into formal learning and engaging students to create and publish their own work for a worldwide audience make school more relevant, resulting in higher levels of student achievement (America's Digital Schools, 2006).

Technology increases access to education, virtual communities, and expertise. Schools often provide students in disadvantaged communities their only access to computing devices and the Internet (International Society for Technology in Education, 2008).

Technology fosters inclusion. Technology is instrumental in providing solutions that help K-12 and postsecondary schools create inclusive learning environments that engage all students regardless of ability, disability, background, or learning style (Apple Inc., 2009).

Technology helps prevent dropouts. The National Dropout Prevention Center cites educational technology as one of 15 strategies that have the most positive impact on the high school graduation rate (Smink & Reimer, 2005).

Technology facilitates differentiated instruction. Technology can help teachers provide personalized, just-in-time instruction and intervention for all students, which are especially important when supporting underperforming students, English language learners, and students with disabilities (Apple Inc., 2009).

Technology empowers learning and research in critical STEM fields. Technology, including scientific simulations, computer labs, and visualization tools, is an essential tool for inquiry-based learning, advanced research, and collaboration in the science, technology, engineering, and mathematics (STEM) fields for both K-12 and higher education (CEO Forum, 2001).

Technology strengthens career and technical education. Technology gives teachers the opportunity to prepare students with new kinds of knowledge and skills that are in demand in high-growth emerging industries (Apple Inc., 2009).

Technology extends the learning day. Access to a computer or mobile device and an Internet connection can support learning beyond traditional school hours and classrooms (Apple Inc., 2009).

Technology supports teacher quality. Research shows that ongoing, job-embedded professional development makes the most difference in improving teacher quality; technology enables online learning as well as access to web resources and virtual communities of practice (Apple Inc., 2009).

Technology enables diagnostic, timely, and innovative assessments. Technology-based assessments can make state tests easier to administer and score, answer the need for more frequent classroom-based assessments, enable teachers to expand feedback through better communications with students, and provide real-time feedback and guidance (Apple Inc., 2009).

Additional details are available in a white paper titled, *American Recovery and Reinvestment Act—Stimulus Opportunities for Integrating Technology with Educational Goals*.

(Apple Education 2009)

In their article, "Toward a Theory of New Literacies Emerging from the Internet and Other Communications Technologies," Donald Leu, Co-Director of the New Literacies Research Lab at the University of Connecticut, and colleagues, Charles Kinzer, Julie Coiro, and Dana Cammack (2004) say that technology is not a passing phenomenon: "The demand from businesses, parents, and society at large is such that technology will continue to appear in schools even before research outcomes are known."

This view leads to a more pragmatic approach to technology in learning: technology and new media literacy are required to ensure that students will be prepared for the workforce of the 21st century while gaining the store of essential knowledge, skills, and perspectives to assure effective future citizenship roles. Schools need to prepare students to function in a 21st century work environment where employees are expected to collaborate on projects, incorporate feedback from a work group and a supervisor, and make connections between new and existing knowledge.

Unfortunately, many schools have been stuck in a time warp and now need to respond urgently to catch up to the technology revolution that has influenced nearly every other sector of society.

First Steps Toward Rigorous Standards and Assessments

Children have embraced the digital world in creative ways on their own time, but an increasing number now report being bored or disengaged in school. Many complain that they must "power down" the moment they enter a school campus. Don Tapscott, author of *Grown up Digital: How the Net Generation is Changing Your World*, says that for children of the "Net Generation," technology is like air. This supports the views of proponents who argue that wise deployment of stimulus dollars should aim to reduce the digital disconnect that exists between home and school and entice children with engaging digital learning experiences.

A Kaiser Family Foundation study, "Generation M: Media in the Lives of 8-18 Year Olds," confirms the immersion of American children in contemporary media. The average child spends over six and a half hours per day engaged with various types of media,

television, movies, music, electronic games, and computers. Over one week this equates to a full-time job with a few hours of overtime (Rideout, Roberts, and Foehr, 2005).

Today's children use digital technologies simultaneously. They naturally interact with devices and interfaces that did not exist a decade ago. Most of their encounters with digital media occur out of school, where adults are often unavailable to guide them. These facts offer educators clear direction as they reinvent failing schools and revamp educational practice: technology must be a key catalyst.

Researchers at media labs in prestigious universities such as Harvard, Stanford, MIT, NYU, USC, and Carnegie Mellon University, pioneering philanthropies such as the MacArthur and Hewlett Foundations, and industry leaders such as the Partnership for 21st Century Skills, have concluded that the key to engaging the 21st century digital generation involves harnessing its passion for media and technology and incorporating it into rigorous, more participatory learning experiences. Students today must, of course, master foundational skills like reading and numeracy, but they must also learn to communicate, create, analyze, and solve complex problems in a networked, global environment.

Education researchers, employers, and policymakers are defining a new set of 21st century skills that may be encouraged through an early immersion in challenging curriculum content but that require a new emphasis on technology integration and innovation in the entire culture of learning (Jenkins, 2006, Partnership for 21st Century Skills, 2008).

Global awareness and collaboration skills can also be uniquely enhanced with the use of technology. Andrew Zucker of the Concord Consortium says that the Internet allows students to learn with and from a global community of scientists, historians, authors, and learners. In his article, "Transforming Schools with Technology," Zucker (2008) reminds educators that networked technologies allow students to regularly and strategically reach out from their schools to communicate and learn from the real world. For many disadvantaged students, school-based experiences with networked technologies may be the only sources of such critical contact.

The Partnership for 21st Century Skills developed a framework that describes the skills, knowledge, and expertise that students must acquire to succeed in the new global economy of the 21st century. The partnership says, "Only when a school or district combines the Framework with 21st century professional development, assessments, and standards, can the American public be sure that high school graduates are prepared to thrive in today's global economy." The framework is explained in the following document: http://www.21stcenturyskills.org/documents/framework_flyer_updated_april_2009.pdf

(Partnership for 21st Century Skills, April 22, 2009)

ARRA funding, and specifically the Race for the Top and Innovation grants, demands that educators raise the bar and adopt rigorous assessments linked to research-based, internationally benchmarked standards in English, language arts, and mathematics for all students. Many states are increasing the rigor in their standards by pushing learners to apply, analyze, synthesize, and evaluate ideas. In an effort to help educators identify and develop content to support new literacy skills, increase rigor, and engage

contemporary learners, the National Council of Teachers of English (NCTE) adopted a new definition of literacy in 2008 that defines what 21st century students need to be able to do:

- Develop proficiency with the tools of technology
- Build relationships with others to pose and solve problems collaboratively and cross-culturally
- Manage, analyze, and synthesize multiple streams of simultaneous information
- Create, critique, analyze, and evaluate multimedia texts
- Attend to the ethical responsibilities required by these complex environments

Districts and schools should make new investments to train and encourage teachers to deploy technology to increase rigor and strengthen outcomes by:

- Redesigning existing lessons that are grounded in text and practiced on worksheets into problem-based learning experiences where students collaborate to develop solutions to real world problems using interactive concept maps, visualization and simulation software, and digital presentations. Required preparation for state assessments can be enhanced with adaptive software that addresses individual needs with games and interactive activities, further engaging learners and differentiating instruction.
- Analyzing student performance in a new community of peers. Student work, formerly passed to the front for the teacher's eyes only, can be shared with colleagues throughout the school and around the globe with a single click. Professional social networks supported by Moodle, Ning, Google, and the Apple Learning Interchange allow teachers to communicate and replicate successful practices.
- Creating relevant and responsive learning environments where students construct meaning by connecting their existing knowledge with new knowledge.

How Mobile Learning Can Advance Rigor and Relevance in U.S. Classrooms

In a recent report on innovative projects that are encouraging the use of mobile learning in the United States and around the globe entitled, "Pockets of Potential," Carly Shuler (2009) explains how rigor and relevance can be enhanced with mobile learning technologies. Research in the learning sciences suggests that situated learning is especially effective when information is available "just in time (when learners are able to apply it) and on demand (when learners know they need it and want it)." Shuler says, "Because mobile devices don't wed a child to the classroom or desk, they complement 'just-in-time' and 'on demand learning.'"

A field trip to the park becomes a more valuable learning experience if students can access information about an unusually patterned butterfly on their handheld devices, compare it with other familiar butterflies, track the location of other butterfly types through software programs such as Google Earth, decide if they have discovered something new, and share their discoveries with other networked users. If contemporary children must wait a day or even an hour for information, they will likely lose interest and fail to incorporate new information into existing cognitive structures. The immediacy of networked technologies allows teachers to respond to the needs of learners when they are ready to learn (Shuler, 2009).

www.joanganzcooneycenter.org/pdf/pockets_of_potential.pdf

Data Systems to Track Learning and Improvement

Research and practice demonstrate that when used skillfully, data systems can help educators move students toward meeting higher standards. Databases and analytic software can help school leadership teams pinpoint the needs of learners, select or craft interventions, and monitor progress. Open Source management tools like Moodle can be mounted on district servers and used as an evolving reference desk for educators who seek research tested interventions for struggling students. Responses to interventions can be tracked and evaluated with databases, discussed in forums, graphed with software, and shared in collaborative online documents. Data systems and the technology that supports them, allow teachers, administrators, and perhaps most importantly, students to “see” the evidence of their learning.

Guiding Data-Driven Decision-Making: What Districts Can Do

The U.S. Department of Education suggests an array of necessary and permissible investments in technology-enabled information and data systems that every school district and state should consider. The federal Institute of Education Sciences recently gave \$150 million to 27 states in April 2009 under the Statewide Longitudinal Data System Grant Program (see <http://nces.ed.gov/programs/slds> for details). Here are a few strategic investments to consider with ARRA stimulus funding and other types of federal and state support:

- Develop or enhance existing data systems to provide teachers access to student data in high impact areas such as attendance, grades, English-language-learner status, and data that show academic performance and growth. Focus particularly on how students are performing in relation to statewide and international standards and whether they are on track toward graduation.
- Train principals, teachers, guidance counselors, and other staff to use technology tools and data to identify the specific help struggling learners need to succeed.
- Launch an easy-to-use, online Individualized Education Program (IEP) system for students with learning disabilities that is aligned with state academic standards and can be used by educators to create content-rich IEPs that meet the requirements of the general education curriculum.

A key partner in learning to use assistive technologies are the families and other caregivers, who are often overlooked when new designs for learning are developed. The box on the next page outlines several ways to bring new assessment and data collection techniques into the 21st century for teachers and other caring adults.

Using Technology for New Assessments and Family Engagement in Learning

- Many special education students receive help taking tests. Often, the students are pulled from their classrooms to have tests read to them or entire classes are required to work at a slower pace while teachers read questions aloud. With video and an MP3 player, the teacher can record test questions for playback on the device, allowing the district's special education students to remain in the classroom while continuing to work at their own pace. Parents and other caregivers can model this practice at home. An example of this practice can be viewed at:
<http://homepage.mac.com/lmelem/websites/iMovieTheater21.html>
- Parents and teachers need to document the progress students make as they learn to read. Traditionally this might be done using a "Running Record." As a supplement or possible alternative to this process, educators can use a camera and microphone connected to a notebook computer to record the student reading text from the screen (or a book). These data become part of the student record/portfolio and can drive progress.
- To prepare for standardized testing, teachers and parents can create audio flash cards using applications such as QuickTime, Pages, Photo Booth, and GarageBand. Students can create their own review/practice sessions by creating a question or prompt and then an appropriate answer. These audio files can then be placed into a Pages document. Students receive help from their support teacher in the creation process and practice when they are at home often with the help of their parents. They activate the question and then listen to the prepared answer. This procedure gives families engaging ways to learn together.

Improving Teacher Effectiveness

Linda Darling-Hammond of Stanford University's pioneering research and the National Commission on Teaching and America's Future has concluded that student achievement is heavily influenced by teacher effectiveness (Darling-Hammond, 1997). Unfortunately, not every student is fortunate enough to have an effective teacher. ARRA seeks to remove the arbitrary advantage given to children who are assigned the strongest teachers by increasing the number of effective teachers. Although attracting and retaining effective teachers is a complex, long-term problem, the effectiveness of the current corps can be improved with well-designed, carefully deployed technology tools.

Networked technology tools such as school-based forum discussions, online professional networks, web-based collaborative documents, and video libraries of best practices can enhance professional development programs by giving teachers ongoing opportunities to explore successful practices. Instead of sending teachers to an out-of-context, two-day seminar during the summer break, technology-enhanced professional development programs can be embedded in practice throughout the school year. This allows teachers to learn new skills, test them in their classrooms, and reflect on the results with peers.

Moreover, students who attend innovative, technology-rich schools do not have to wait for their teachers to improve their skills; they can access outside experts through online tutoring and support services. State-sponsored virtual schools, such as Florida Virtual School, offer free courses to K-12 students around the world at any time, place, and pace. Online schools can provide districts, schools, and students with a wide variety of custom solutions to meet student needs (Florida Virtual School, 2009). Students can spend time in their school's media center during each school day taking courses in Mandarin Chinese, advanced mathematics, and art history on school computers. Technology can empower students to bypass the limitations of their schools and work ahead, catch up, or enjoy an alternative, technology-enhanced presentation of grade level coursework.

Technology tools can also help busy teachers to better organize data, create portfolios, and meet deadlines. Reminders can be set, notes or directions attached, then viewed from a computer or synced to a mobile handheld device for easy portability. Color-coded files and folders can assist in organizing and finding created content. Desktop organizational tools like Apple Spaces and Google Desktop compartmentalize applications and tasks. Together these tools allow educators to spend more time with students, focused on the challenges of teaching and learning. Students can also benefit from these digital tools, especially those who struggle with organizational skills.

Steps to Take to Encourage Teacher Innovation

To encourage innovative teaching, stimulus and other technology funds can be used to:

- Fund a "Digital Teacher Corps," a meticulously prepared team of at least two master technology teachers in every school, who can help teachers integrate the latest tools such as interactive whiteboards, computers, mobile devices, scientific probes and microscopes, personal responders, and curriculum-based games into classroom and extended day curricula. This group of teachers should go beyond the technology troubleshooters who fix jammed printers and troubleshoot computer problems, but are trained curriculum designers who teach teachers how to integrate technology tools into lessons to gain leverage on topics that are traditionally difficult to teach and learn. They should be networked with a national alliance of technology master teachers, such as those arrayed on the Apple Learning Interchange and through popular websites such as Ning, Facebook, WGBH's Teachers' Domain, and the Verizon Foundation's Thinkfinity.
- Provide the physical infrastructure and train the entire district to use new technologies with great potential to enhance instruction for "struggling" learners. Districts should consider the use of devices that allow teachers to track "real-time" performance and differentiate instruction. They should also consider the educational uses of powerful "next generation" devices such as iPod touch that allows students to access web resources and applications and to collect compelling information and acquire knowledge outside of the classroom.

Support for Low Performing Schools

Technology can help equalize access to knowledge and experiences. A low-income family may not be able to take a child to the local aquarium, but with a few clicks on a networked notebook computer and the support of an informed teacher, that child can take a virtual field trip to the Great Barrier Reef. A first grader with language disabilities may never know the isolation of self-contained special education classes because adaptive digital technologies allow him to be permanently mainstreamed with his non-disabled peers. An economically disadvantaged child, who may otherwise experience a “summer learning slump” because of a lack of educational enrichment opportunities, may learn a foreign language and computer programming through a virtual summer school instead.

Title I schools and others with significant percentages of disadvantaged students struggle with a wide spectrum of educational issues related to poverty. Teachers are especially challenged to scaffold and engage students, manage difficult behaviors, and move struggling students toward standards that often seem unattainable. While No Child Left Behind has historically required Title I schools to address goals similar to those of ARRA, new stimulus funds challenge struggling schools to adopt new approaches to old problems. Technology can make new breakthroughs possible. Some school districts are experimenting with new conceptions of learning and engagement for children at risk of dropping out, using the power of digital games as a motivating incentive to learn.

Video Games in Education

Three-quarters of American children, including a significant portion of children from economically challenged families, play computer and video games. Despite their reputation as mind numbing toys, digital games have been shown to help children gain content and vital 21st century skills from literacy to complex problem solving. Educational digital games offer a promising and untapped opportunity to leverage children's enthusiasm and help transform teaching and learning in America. These games allow teachers to tap into their students' existing enthusiasm for digital games to engage, expand, and empower them as learners (Thai, Lowenstein, Ching & Rejeski, 2009).

Opening its doors to sixth graders this fall, Quest to Learn (Q2L) is a new public school for digital kids in New York City, sponsored by the Institute of Play and several key partners including the John D. and Catherine T. MacArthur Foundation. The school uses the underlying design principles of video games to create a variety of engaging learning experiences for middle and high school students, with the goal of teaching traditional and 21st century skills and literacies. More information is available at the school's website: <http://www.q2l.org>.

A recent study by the Education Development Center on the integration of public media assets like *Sesame Street* and *Between the Lions* found that preschool children who participated in a media-rich curriculum incorporating public television video and games into classroom instruction developed the early literacy skills critical for success in school. Additionally, children who participated in the literacy curriculum outscored children in the science curriculum on all five measures of early literacy used in the study. http://cct.edc.org/ready_to_learn.asp

In addition to the engagement that technology provides to all students, new assistive technologies have significant potential to meet the needs of students with disabilities and English language learners, many of whom are concentrated in Title I schools. The same pedagogies that support technology-based lessons for general education students, engaging lessons that are rich with higher-order thinking and just-in-time learning, also apply to lessons for special needs students. Networked computers, open education resources, software, and mobile handheld devices offer special educators a variety of options to better serve students who struggle with language and learning. The following boxes outline innovative uses of new technologies in meeting the unique needs of learners with special needs and those who require new supports to catch up.

New Pedagogies to Transform Literacy Learning: Individualizing Supports with Breakthrough Technologies Developed by Apple Inc.

- Visually impaired students can use the built-in Universal Access features in every Mac desktop and notebook computer to enlarge text through Zoom, navigate the interface using Speakable Items, or depending on their degree of need, turn on the full screen reading interface found in VoiceOver. This flexibility allows visually impaired students access to the same text as their non-disabled peers, thus allowing them to remain in the least restrictive educational environment for a larger part of their day.
- Utilizing Apple's Text to Speech technology, students can support their understanding of web page content, PDFs, or electronic textbooks often above their reading level, leading to increased fluency and comprehension. Students can build their vocabularies and have access to content independent of reading level. Teachers can easily differentiate instruction and meet the needs of language learners at many levels.
- Teachers can create Keynote and PowerPoint presentations using realistic images and downloaded videos from the Internet to introduce new content and support vocabulary development as well as build background for reading. Often English language learners and special needs students have limited experience or vocabulary to be able to participate in introductory discussions without having that kind of visual support. Presentations can be filed on student computer desktops so they can access them to review challenging material and reinforce learning. Students can customize these presentations, connecting their personal experiences and knowledge to reinforce their understanding.
- Online dictionaries can support vocabulary development. If students listen to parts of web pages or have other digital content read to them through Text to Speech, they can access the pronunciation and meaning of new words immediately through online dictionaries. These just-in-time learning experiences can support the development of richer and deeper vocabularies.
- Research links oral reading fluency to reading comprehension. All students, but especially struggling ones, need to hear themselves practicing to promote fluency. Students can record themselves reading and use a podcast editing program such as GarageBand to edit out the "ums" and "ahs" and trial pronunciations. They can then read along with their own voice.

What Schools and Districts Should Do for Title I Students

- Teachers and supervisors need to deploy new tools for individualizing data assessment for struggling learners. Investments in new handheld devices to support data management and personalized instruction and the online reporting of student performance to parents should have high priority.
- Districts should experiment with new tools such as oral literacy voice recognition software and other inventive technologies (such as language translation tools) that help meet the needs of ELL students and children with learning disabilities.
- Extended learning and after-school settings should be outfitted with both highly trained teachers and/or youth development staff who understand how to use the needed hardware and software (educational games, software, and mobile devices) and the importance of scaffolding low-income youth as they learn with technology.
- At-risk students should take part in a technology-rich extended year summer school program so they can avoid the “summertime slump” that tends to victimize low-income children and contribute to the achievement gap. The National Center for Summer Learning at Johns Hopkins University says that although two-thirds of the ninth grade achievement gap can be attributed solely to unequal summer learning opportunities, most states and districts have not made summer learning a priority. A superb resource for summer school program information, including ways to integrate learning technologies, is available at <http://www.summerlearning.org/index>.
- A key untapped resource for school leaders is the use of educational media programs that teach early reading and math skills. Research-tested and publicly financed programs such as *Sesame Street*, *Between the Lions*, *Super Why!*, *The Electric Company*, and *Cyberchase* provide an effective way to motivate children to learn their letters, sounds, and numbers, while enjoying curriculum-based games, video sites, and educational materials that are available for free to teachers, parents, and students. These materials can be delivered on computers, mobile devices, and interactive whiteboards if vital infrastructure exists and if professional development in using the new infrastructure is undertaken. Under the auspices of the U.S. Department of Education's Ready-to-Learn educational media program, districts can access and incorporate these curriculum assets into early learning programs that will delight and help children advance their academic performance.
<http://pbskids.org/> <http://www.sesamestreet.org/home>

Conclusion: Eyes on the Prize—Staying Focused on New Investments in Technology

Spending stimulus and other federal dollars wisely to support a new vision of learning will require that district leaders consider priorities with a careful focus on results. In considering the recommendations and innovations outlined in this paper and others appropriate to each community and state, the following seven essential questions can help state and district planners initiate the transformation process:

1. Does the proposed expenditure support 21st century literacies or does it primarily support content acquisition that may be less critical in the information age?
2. Will the technology being implemented have the technical and human resource support necessary to be effective? Will teachers need professional development for effective implementation? Will the existing infrastructure support the technology?
3. Will the technology engage students and encourage intellectual curiosity? Will the expenditure produce high student achievement by addressing rigorous standards, providing schools with relevant data, enhancing teacher effectiveness, engaging struggling students, or improving struggling schools?
4. Is the new technology intervention superior to alternatives or existing interventions? Will it do new things in new ways, or merely serve as an electronic replication of what's already being done?
5. Is the expenditure a collaborative decision resulting from meaningful discussion by a reasonable and informed group of stakeholders? Is there evidence that it will improve the teaching and learning environment?
6. Will the district or school commit to sustained, ongoing resource investments in infrastructure and professional development necessary to support the technology after all stimulus funds are spent?
7. Is the expenditure in line with the goals of the stimulus package and state and community goals for improving student achievement?

The pace of technology innovation in other sectors of our society is proceeding rapidly: it is time for our nation's schools to embrace the digital promise that can propel children's learning. An appended set of resources, including websites and recent reports, is included with this paper to help technology integration planning teams accelerate progress over the next several years.

Appendix: Resources

Apple Education provides free online resources for teachers and professors.

Apple's education website includes lesson plans, quick start activities, professional learning and support, research, and many practical tools to help educators integrate technology into curriculum.

<http://www.apple.com/education/teachers-professors/resources>

The Asia Society provides a deep, authoritative source for promoting global knowledge and skills in classrooms, ranging from lesson plans on Asia to resources to help start a Mandarin Chinese program in a school district. Its website also includes funding resources, such as the Goldman Sachs Prizes for Excellence in International Education, which award annual grants for school-wide, policy, and technology solutions to bring "the world into your classroom."

<http://www.asiasociety.org/education-learning>

CAST is a nonprofit research and development organization that works to expand learning opportunities for all learners, especially those with disabilities. CAST uses the Universal Design for Learning (UDL) framework to design curricula that supports learners and reduces barriers to achievement. Publications, research, professional development opportunities, and other resources are available at its website.

<http://www.cast.org/index.html>

Classroom 2.0 is a social network for educators and others interested in technology-enriched education. Discussion boards, resources, live events, and workshops are shared and evaluated by over 28,000 members. Awarded the Best Website for Teaching & Learning in 2009 by the American Association of School Librarians.

<http://www.classroom20.com>

Concord Consortium is a nonprofit research and development organization dedicated to realizing the promise of educational technology. The group believes that new, emerging technologies can "ignite explosive strides in learning capacity and curriculum development." The Concord Consortium is committed to leading the drive to harness technological resources to provide education resources to all people. Publications and resources are available at its website.

<http://www.concord.org>

The Consortium for School Networking, a professional association for district technology leaders, recently coupled its Data driven Decision Making initiative with another related initiative, Using Technology to Raise the Achievement of ALL students (<http://www.accessibletech4all.org>), to pool resources to create tools for educators on the use of data for differentiated instruction, highlight the ways in which accessible technologies can be used to enhance learning for all students, and focus on personalizing the learning process for all students.

<http://www.3d2know.org>

Edutopia–The George Lucas Foundation is a web resource that shares success stories about what works in public education. Technology integration is presented as one of six core goals. Articles, case studies, and video examples of the innovative use of 21st century technologies in public school classrooms are featured.

<http://www.edutopia.org/tech-integration>

International Society for Technology in Education, dedicated to the effective use of technology in K-12 and teacher education, provides a list of resources to guide stimulus fund expenditures. ISTE also provides professional development and organizational development services to improve teaching and learning in K-12 education.

http://www.iste.org/Content/NavigationMenu/Advocacy/Dons_letter_on_Funding.htm

iTunes U is a part of the Apple iTunes Store that features free lectures, language lessons, audiobooks, and other resources that can be enjoyed on an iPod, iPhone, Mac, or PC. The iTunes U collection includes over 200,000 educational audio and video files from top universities, museums, and public media organizations from around the world.

Joan Ganz Cooney Center at The Sesame Workshop offers cutting edge research reports and program exemplars for schools and other educational professionals who wish to accelerate young children's literacy learning through the creative deployment of technologies such as mobile devices and games. It also provides links to nonprofit educational media company resources such as Sesame Workshop's The Electric Company.

<http://www.joanganzcooneycenter.org/publications/index.html>

Moodle is a free course management system (CMS), also known as a learning management System (LMS) or a virtual learning environment (VLE) that educators can use to create effective online learning sites. Moodle.org is an online community site where Moodle is made and discussed.

<http://moodle.org>

National Center for Summer Learning, based at the Johns Hopkins University School of Education, engages in research, develops policy, and delivers professional development to help ensure that all children and youth in high-poverty communities have access to quality summer learning programs. Its site includes a catalog of free research and publications, professional development opportunities, and examples of effective summer programs.

<http://www.summerlearning.org>

National Council of Teachers of English provides the latest information on upcoming events for educators, resources, and professional development programs for language arts teachers at all levels.

<http://www.ncte.org>

Ning is a free online platform for people to create their own social networks. Educators interested in sharing ideas for technology integration can quickly and easily create networks for collaboration.

<http://www.ning.com>

PBS Kids: Ready to Learn is part of a national PBS initiative to give children the skills they need to start school successfully. The program combines award-winning children's programming with workshops, activities, and learning materials for parents and caregivers.

<http://pbskids.org/read>

Teacher's Domain provides an extensive library of free digital media resources produced by public television, designed for classroom use and professional development.

<http://www.teachersdomain.org>

The Partnership for 21st Century Skills, a leading advocacy organization dedicated to infusing 21st century skills into schools, presents a framework for 21st century learning and resources for educators who wish to update and transform their schools to meet the demands of the 21st century workplace.

<http://www.21stcenturyskills.org>

Thinkfinity, sponsored by the Verizon Foundation's literacy, education, and technology initiatives, seeks to improve student achievement in traditional classroom settings and beyond by providing high-quality content and extensive professional development training. The website shares a free, comprehensive digital learning platform built upon the merger of two programs, Verizon MarcoPolo and the Thinkfinity Literacy Network.

<http://www.thinkfinity.org/home.aspx>

Wireless Generation is an education company that partners with researchers, academics, and educators to provide tools and resources for educators that are built on a foundation of data from research. The company provides a free product called FreeReading, an open source website where teachers can access a free, sequential, research-based reading intervention program for grades K-1 and contribute their own lessons and insights into what works best in the classroom.

<http://www.wirelessgeneration.com/freereading/reading.html>

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About the Joan Ganz Cooney Center

The mission of the Joan Ganz Cooney Center at Sesame Workshop is to foster innovation in children's learning through digital media. The Center supports action research, encourages partnerships to connect child development experts and educators with interactive media and technology leaders, and mobilizes public and private investment in promising and proven new media technologies for children.

For more information, visit <http://www.joanganzcooneycenter.org>.

The Joan Ganz Cooney Center is committed to disseminating useful and timely research. Working closely with our Cooney Fellows, national advisers, media scholars, and practitioners, the Center publishes industry, policy, and research briefs examining key issues in the field of digital media and learning.