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interactive educator

The Digital Face of 21st-Century Curriculum

Savvy Tech Shopping

Tools to succeed in
technology purchasing

Information Overload

Deciding what to use
(and what not) is important

Is It Worth It?

Is technology worth the
time, effort and money?

PLUS ———



David Weinberger

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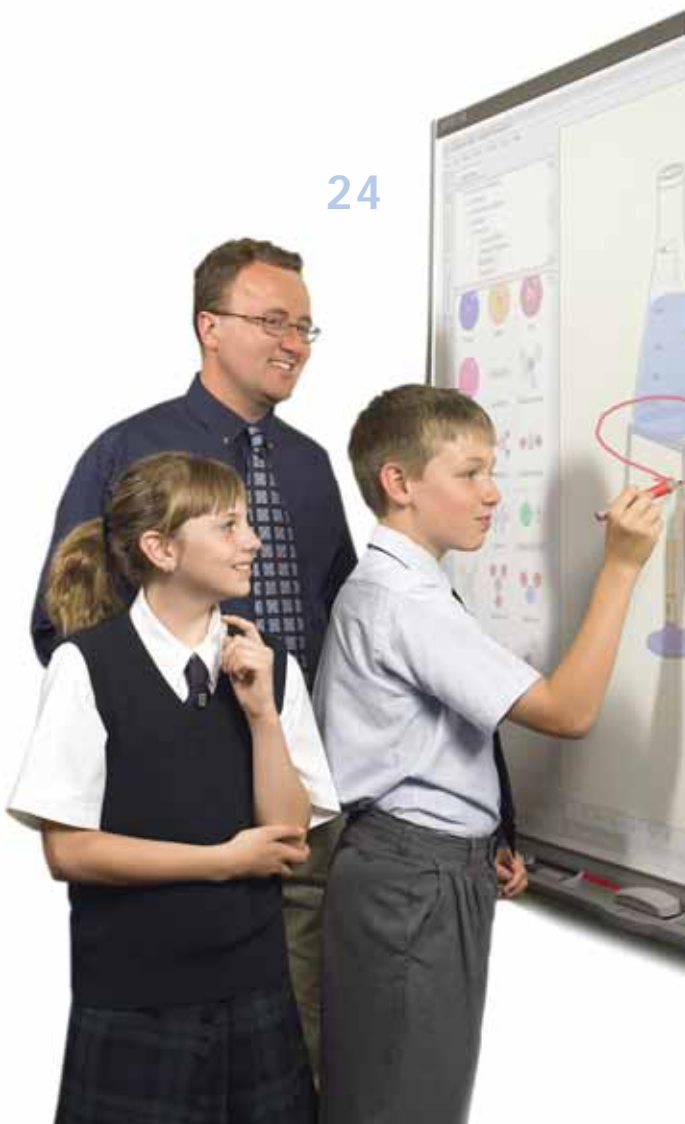
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interactive educator

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education.smarttech.com



So much is going on right now with regard to integrating technology, pedagogy and digital content that it's difficult to pinpoint any one trend or idea that truly represents a beachhead. The areas of inquiry span a range so broad that in a matter of moments you can jump from examining the shifting nature of knowledge to filling out a grant application on why you want iPods for every student.

At SMART – even with a tight focus on the integration of interactive whiteboards – we have our sights on multiple horizons. Everywhere we turn we see the profound impact such areas of inquiry are having. Classrooms are becoming collaborative, technology-based learning hubs, with products like interactive whiteboards boosting student engagement and promoting inquiry-driven learning.

The issues concerning the integration of technology, pedagogy and digital content are complex for many reasons. One part of the debate concerns the media and hardware. The Internet, handheld computers, laptops and even MP3 players are being used in unique and creative ways to support teaching and learning. The other side concerns

content. Blogging, podcasting, educational MUVES and MMOGs, digital learning objects – all relative newcomers to education, but all insinuating themselves into the discussion at a rate difficult to keep up with sometimes. Bring the two sides into the same discussion and ... well ... to quote an old friend of mine, "It's just really complicated."

In this issue of *i.e.*, we examine the interplay of technology, pedagogy and digital content. We discuss practical issues like how to integrate handheld computers into classrooms (All the Rage for a Reason, p. 38) and how to measure whether technology is worth it (Is It Worth It?, p. 35). We also delve into larger questions like how the nature of literacy is changing in the 21st century (Information Overload, p. 30) and how digital content is affecting pedagogy (The Digital Face of 21st-Century Curriculum, p. 24). Guest columnist David Weinberger also weighs in on how technology is changing the very nature of knowledge (Knowledge in Transition, p. 20).

We may raise many questions, but that is, after all, the nature of inquiry-based learning, and it seemed apt that we should examine them in the same manner that students face their own learning.

Thank you for the overwhelmingly positive response to the last issue of *i.e.*, which was our inaugural issue. We hope you find the information in this issue useful and insightful, too. Please send us your feedback, stories, experiences and suggestions so we can continue our discussion.

Sincerely,

Carolyn Dearden
Editor-in-Chief

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David Weinberger, an NECC 2005 keynote speaker, is a Fellow at Harvard's Berkman Center, and author of the international bestseller *The Cluetrain Manifesto*, and, most recently, *Small Pieces Loosely Joined*. He has written for numerous publications, including *Harvard Business Review*, *NY Times*, *Smithsonian*, *InfoWeek* and *Wired*.



David Warlick has been an innovator and leader in educational technology. He created and maintains the second oldest continuing online project, Global Grocery List, and writes for *Technology & Learning*, ALA's *Knowledge Quest*, *Education World* and *CUE Online*. He has also written three books: *Raw Materials for the Mind*, *Redefining Literacy for the 21st Century* and *Classroom Blogging: A Teacher's Guide to the Blogosphere*.



Wesley Fryer is an educator, author, digital storyteller, technology integration pioneer, husband and father. He is an international and national presenter and speaker, addressing a range of topics related to education, technology integration, distance learning and 21st-century literacy.



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■ New “intelligent” tools lead to smarter web searches

– Thanks to an emerging concept known as “intelligent searching,” teachers and students soon might have at their disposal a variety of online tools designed to help them more effectively navigate the vast amount of information on the internet.

From “federated” search technologies, which enable users to search through multiple online databases at once, to customizable user interfaces that enable individuals to define their own search criteria more effectively, technology architects are finding ways to give users more control over how they find, receive and process data mined on the web.

These innovations likely will translate into good news for educators, many of whom have struggled to help their students make sense of the vast amount of information they find online.

For example, Internet search leader Google Inc. has unveiled Google Suggest, which offers ideas culled from an index of online search terms to help users better define their searches. The company also is working on a Wild-Card Search tool, which would allow users to search for answers to a particular question by inserting an asterisk in the search phrase where the missing information should be.

A student doing a report on Abraham Lincoln might type in the phrase, “Abraham Lincoln was the * president of the United States.” Google, in turn, would replace the asterisk with a suggested answer, in this case, “Abraham Lincoln was the sixteenth president of the United States.”

Other new search tools worth a look include Blinkx and Dashboard.

Free to download, Blinkx provides the ability to search websites, Word

files, e-mail messages and other documents stored on a user’s hard drive or somewhere else on the broader Internet with a single query.

Dashboard takes the idea of intelligent searching to the genius level by attempting to provide users with information before they even ask for it.

According to the Dashboard website, the dashboard software proactively seeks out objects relevant to your current activity as you read e-mail, browse the Web, write a document or instant message (IM). Related documents are then displayed as links in a special section of your Web browser.

Google Inc.
www.google.com

Blinkx
www.blinkx.com

Dashboard
www.nat.org/dashboard

■ SMART receives largest whiteboard order for Mexico project

– SMART Technologies Inc. will be providing 41,116 SMART Board interactive whiteboards for the second tender in Mexico’s Enciclomedia project, making SMART the largest provider of interactive whiteboards to the project. Of 120,761 interactive whiteboards purchased by the Mexican government over two tenders, 43,028 are SMART’s. VideoNet, SMART’s distributor in Mexico, will provide the necessary support and training required for this widespread installation.

Enciclomedia is a project administered by the Mexican government’s Secretariat of Public Education. The aim of the program is to enhance student engagement, participation and learning outcomes through the use of technology products and digital content. Enciclomedia will

equip more than 145,000 fifth and sixth grade Mexican classrooms with technology products. Interactive whiteboards will be used to deliver digital curriculum materials also being developed as part of this initiative. Other products in the classroom technology suite include projectors, computers, computer speakers, uninterrupted power supply (UPS), computer desks and printers. More than 70,000 classrooms will be equipped with these products by the end of 2005. All will be fully equipped by May 2006.

This interactive whiteboard purchase makes Enciclomedia the largest education technology and digital content project anywhere in the world. Other countries where interactive whiteboards are widely used in education include the U.S. and the UK. SMART says most of the top 500 U.S. school districts use SMART products and almost 60 percent of interactive whiteboards installed in UK schools are from SMART.

SMART Technologies Inc.
www.smarttech.com/smartboard

■ New online resource helps build information literacy

– Teachers and library media specialists searching for new and innovative ways to educate their students about effective research practices now have an online tool at their disposal: S.O.S. (Situations, Outcomes, Strategies) for Information Literacy.

Launched Oct. 7 at the American Association of School Librarians (AASL) conference in Pittsburgh, this Syracuse University program – made public now for the first time – is a free multimedia resource for K–8 teachers and media specialists who want their students to learn how to evaluate sources or understand search engines.

The project includes an online resource page where educators can view lessons plans, video clips, and other teaching materials submitted by teachers and library media specialists. Curriculum-integrated lesson plans and teaching ideas are linked to real-world examples of solid teaching, most notably focusing on collaborative efforts between classroom teachers and library media specialists. So far, about 150 educators have contributed at least one lesson plan.

The video clips feature educators “in action” or “reflecting” on successful teaching episodes, and these clips are continuously assembled and reviewed by members of the target audience.

In addition, a Virtual Training page provides educators with hints and ideas to help them develop motivational information-literacy lesson plans of their own, and it shows educators how to use the S.O.S. online submission software to share their lesson plans with others.

S.O.S. for Information Literacy
www.informationliteracy.org/training/Home.htm

American Association
of School Librarians
www.ala.org/ala/aasl/aaslinindex.htm

Syracuse University's
Center for Digital Literacy
digital-literacy.syr.edu

■ **Study: States are slowly embracing eTexts** – Nearly all states with textbook adoption policies now include software, digital content and other technology-based media in their definitions of “instructional materials,” according to a recent survey by the Software and Information Industry Association (SIIA). But only a third have updated their submission or review processes

to account for unique technology issues not otherwise faced with printed textbooks.

“There’s a significant learning curve for states to even understand the issues involved in eText adoption,” said Mark Schneiderman, SIIA’s director of education policy.

According to the SIIA, which is the principal trade association for the software and digital content industry, 21 states require approval for textbooks, usually on a six-year cycle: Alabama, Arkansas, California, Florida, Georgia, Idaho, Indiana, Kentucky, Louisiana, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Utah, Virginia and West Virginia.

Officials from 18 of these 21 states completed the group’s survey. Of these 18 respondents, only one – Oregon – said it doesn’t define “textbooks” to include electronic learning resources.

But the survey found that state contracts and budgeting often remain barriers to final approval of a subscription-based model for core curricular materials, as is typical with most online resources. It also found that only one-third of states that have a depository requirement provide exceptions for web-based materials, and at least eight states reported challenges with the distribution of electronic resources for reviewing.

SIIA is encouraging state textbook administrators to review its survey questions and results as “an analytical tool for further internal reform.”

“Our bottom-line goal is that, if school districts . . . want to adopt electronic materials, states have put in place a means for making them available,” Schneiderman said.

Software & Information
Industry Association
www.siiia.net

■ Survey ranks schools’ wireless access

– Ball State University in Muncie, Indiana, has the best wireless Internet access of any college campus in the nation, according to a survey by Intel Corp. The survey also shows an explosion of wireless Internet access on college campuses nationwide over the past year alone.

“Last year, it was almost a novelty,” said Bert Sperling, principal author of the survey. “This year, it’s almost expected.”

Thirty-four of the top 50 schools in the survey have 100 percent wireless coverage, up from seven of the top 50 schools last year. According to the survey, the top 50 most “unwired” campuses are, on average, 98 percent covered by a wireless network, up from an average coverage of 64 percent in last year’s survey.

In fact, Sperling said, last year there were frequent instances of campuses with no wireless network deployment, while this year he reports that nearly every school examined had some degree of wireless infrastructure.

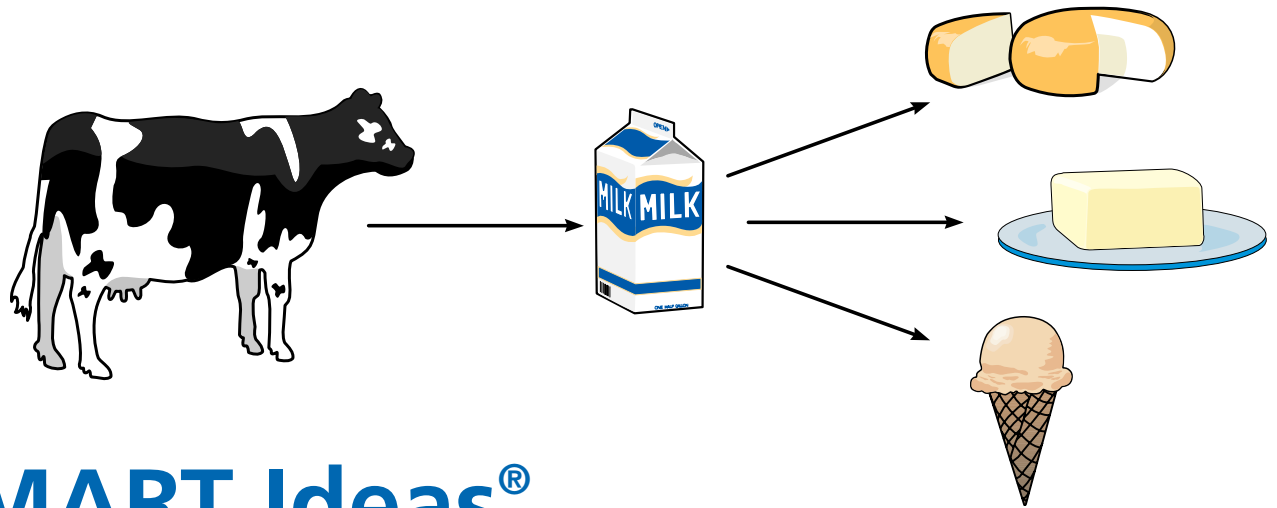
Sperling looked at nearly 1,000 colleges across the United States. The top 50 were ranked based on the amount of Wi-Fi coverage their campuses have, how the technology is used, the number of undergraduate students enrolled and the computer-to-student ratio on campus.

Rounding out the top five were Western Michigan University in Kalamazoo; the University of Akron in Ohio; Dartmouth College in Hanover, New Hampshire; and Carnegie Mellon University in Pittsburgh, Pennsylvania.

Intel Corp.
www.intel.com

2005 “Most Unwired Campus” survey
www.intel.com/go/unwiredcampuses

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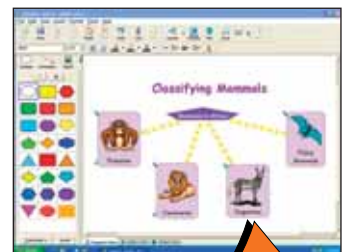
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by Sharon Oosthoek

Involving the Learner

Attentive students learn more and technology can help



Research into interactive whiteboards suggests the technology can help students pay attention and learn, and teachers reduce preparation time.

Recent research into technology and education suggests savvy teachers can significantly improve their students' learning environment. The key is giving teachers the proper training to feel comfortable with these new tools and to fully integrate technology into the classroom, say researchers at Kent State University's Research Center for Educational Technology.

"There have been a lot of critics of technology integration that indicated that we really haven't had the benefit that everyone's been promising in teaching and technology," says the center's director, Dale Cook.

But with the shift from sending students to designated computer labs to fully integrating computers into general classrooms, that's beginning to change, he says.

Getting students organized with handhelds

Cook is most enthusiastic about the impact of handheld computers on learning.

"These devices will have a profound impact, and we'll see the kind of impact we've been hoping for," he says. "They're Palm Pilot-like devices. A lot of people think of them as personal organizers, but they're quite powerful in education. . . . There are 40 different probes you can attach, and a lot of those probes are about science. You can take temperature readings, test water quality in streams and use weather station probes."

Indeed, studies carried out at the center suggest handheld devices can improve student motivation and organization. In 2001, researchers

distributed 280 handhelds in K–12 classrooms where teachers taught a variety of subjects, including computer science, math, language arts, integrated curriculum and special education. Of the students who received the devices, 84 percent had never used one. At the end of the school year, researchers asked students to fill out a questionnaire, yielding some interesting results.

"Students agreed that handheld computers were fun and easy to use, and motivated them to learn. The majority thought Palms helped them to learn (93 percent) and be more organized (87 percent), and about two-thirds of all students stated handhelds made them better students," the researchers wrote.

Karen Swan, a professor with the center, believes that helping a student become more organized has significant benefits.

"Teachers tell us that with a handheld, students turn their papers in on time. They're carrying their handhelds with them all the time. [Their work] is not in clumps in their backpacks," says Swan. "A lot of the research says kids need to have them [handheld devices] 24/7. It becomes a personal device for them, and they can learn wherever and whenever."

As this study hints, technology can be an important motivator for learning.

"I've never seen anyone who works in the field who says technology doesn't motivate students. It just happens to be hard to quantify," says Talbot Bielefeldt, director of research and education at the Washington DC-based International Society for Technology in Education, a nonprofit

group for educators working with technology. “It makes a real difference for your hardest to reach students.”

Boosting student engagement with interactive whiteboards

Research into interactive whiteboards in British schools suggests this technology also has the potential to help students pay attention and learn. Interactive whiteboards are whiteboard-sized touch-sensitive displays connected to the teacher’s computer.

A study published in 2003 by researchers at Britain’s Keel University found that students stayed on task more frequently when their teacher used an interactive whiteboard to teach math.

The students, who were all in the upper half of a normal ability spread, paid attention and were productive on average 96 percent of the time while teachers used interactive whiteboards. This dropped to an average of 86 percent when the whiteboard was not the focus of teaching.

“This suggests that when the lesson is not driven by the IAW [interactive whiteboard], pupils revert to a more typical classroom approach. . . . We conjecture that use of the pupil whiteboards, instead of an exercise book, might maintain pupil engagement,” the

study’s authors wrote. That kind of engagement can translate into improvements in a variety of skills.

According to a literature review published by the International Society for Technology in Education, a 1999 study out of San Mateo, California, showed some encouraging results regarding student multimedia projects. After students completed the first multimedia project, teachers reported increased student knowledge in the following areas:

- Research skills
- Locating content resources
- Applying learning to real world situations
- Organizational skills
- Engagement in the content

Teaching teachers is key to successful technology integration.

Unlocking this potential means, of course, proper teacher training. When it comes to effective professional development, surveys show that teachers usually rank in-service training last and direct classroom experience first.

When teachers learn about technology in their own schools and classrooms, they are better able to absorb the lesson, says Swan. She points to a successful program in the New York capital district area, where teacher technology training relied on

“technology integration mentors” in local elementary schools to work with teachers in their classrooms.

Effective teacher training is crucial, because research into technology and teaching suggests students outcomes are positively affected only when teachers are comfortable with these new tools. That’s certainly the conclusion of a literature survey by the British Educational Communications and Technology Agency, an organization that helps educators integrate technology in the classroom.

In its 2005 review of the latest research, the agency concludes that technology “has helped address workloads for teachers, but this was only achieved when they were confident in using [technology]. Benefits reported included better management, storage and maintenance of work. In cases where [technology] saved time, this was reinvested in other tasks such as lesson preparation, which teachers considered resulted in higher quality teaching and learning.”

Sharon Oosthoek is a Toronto, Ontario-based journalist. She has worked as an education reporter for the Hamilton Spectator and as a freelance writer for various technology publications, including Microsoft Home and HUB.

RESOURCES

Interactive whiteboards enhance teacher preparation

Studies indicate that interactive whiteboards benefit student engagement, learner motivation and knowledge retention. The technology has also been successful in reaching students with a variety of learning styles, including those with special needs.

But educators benefit, too. Students are more involved, lesson preparation is more streamlined and lesson materials can be more engaging. Research supports the following observations:

- Interactive whiteboards allow computer-based learning without isolating students in front of individual computers

- Their large, visible workspace encourages a higher level of student interaction in both teacher directed and group-based learning situations
- They are easy for beginners to walk up and use, shortening lesson integration time
- They motivate educators to incorporate and develop more digital and interactive resources into their lessons
- Notes and materials can be saved for review, updated easily and used next class or next year.

Source: “Interactive whiteboards and Learning: a Review of Classroom Case Studies and Research literature,” 2004

by Paul Nastu

Savvy Tech Shopping

Diligence increases success in technology procurement



Before buying classroom technology, it's important to do all your homework.

Let's face it. Buying technology for a classroom, not to mention a school district, can be a daunting challenge. From software to hardware to networks to wireless, the amount of knowledge needed to make good decisions can seem overwhelming. One reason is that technology changes at such a rapid pace that what held true in one year can be different the next. Thankfully, many resources are available to help you make the right decision based on your school's or district's needs. The key is finding the right people to help. Here are four tips to get you started.

Know how much you can spend

Without knowing your budget for technology, it's hard to know where to spend money. Without knowing how much the technology you purchase will cost over its lifetime, it's hard to know the budget you will actually

need. That's where Total Cost of Ownership (TCO) comes in. TCO takes into account the costs for professional development, maintenance, operations and administration, hardware, software, replacements, upgrades and retrofitting. To make sure you're getting the best value for your money over time, take into account a system's estimated TCO when evaluating various solutions.

There are tools available that can help. The Institute for the Advancement of Emerging Technologies in Education (IAETE) has a tool that can help schools, and the Consortium for School Networking (CoSN) has a tool that can help with district-wide analysis.

Shop smart

These days, thanks to district, state and federal resources, shopping for technology is easier than ever. But you still have to shop smart.

The first step is to speak with as many people from your district and other districts in your state as possible about their technology purchases. Ask specific questions about the bidding process, vendors they spoke with and the vendor who ultimately received the contract.

If you're looking for a handful of copies of particular software, your best option might be to look online at academic software sites, where you're likely to find significant discounts. If you're shopping for big ticket items, it gets more tricky.

For software licensing, hardware or infrastructure, check to see if your state has a bidding program. One such program is the Pennsylvania

Educational Purchasing Program for Microcomputers (PEPPM), which is a bid-protected program that operates in Pennsylvania, California, Illinois and Ohio. Vendors preset prices on their hardware and software services, and districts do not have to negotiate price.

Another option is to work with your state's general services department and solicit bids through a list of preselected vendors who will negotiate.

Hire a consultant

Even if you have a top technology expert in your district, you might consider hiring a consultant to help guide you through the decision-making process. Consultants can help with everything from analyzing your current technology to overseeing the bidding process. Remember, consultants are there to make recommendations. All final decisions should be made by the technology group leading the search and the school board.

Also, keep in mind that all consultants are not created equal. Some consultants work for or have arrangements with particular vendors, so they are not in a position to work for you without having a conflict of interest. If you hire a consultant, make sure the person will be working for you and not a vendor. Always check consultants' references, and speak with the districts they've worked for in the past.

Requests for proposals (RFPs)

Make sure you consult your school or district code on the competitive bidding process it has in place. There are laws that govern the process of bidding, and districts vary on such

items as the rules specifying when the lowest qualified bid must be accepted. A great first step is to involve the school board, its attorneys and any district or school ethics board in the process right from the start.

A recent report from the Software & Information Industry Association (SIIA), a nonprofit group, outlines practices that schools and vendors can adopt to streamline the RFP and competitive bidding process.

The aim of the report is to communicate concerns about the bidding process from both the vendor and education agency point of view so that the process can be improved to the benefit of all parties. According to SIIA, addressing the issues raised in the report should help companies

respond to RFPs more efficiently and agencies increase the probability that they will obtain the solutions they need at competitive prices.

The report provides an outline for what it considers a clearly written RFP and information on what you can expect from vendors during the competitive bidding period.

Two final thoughts to keep in mind: go after discounts below the list price, and always check the vendor's customer list by contacting districts on the list to discuss the vendor.

Read industry publications and join online technology forums. Remember, like anything in life, the key to good technology purchasing is having the information in hand to make a confident decision.

IAETE

<http://129.71.174.252/tcov2/index.cfm>

CoSN

<http://classroomtco.cosn.org/>

PEPPM

<http://www.peppm.org/>

SIIA

<http://www.sii.net/>

Paul Nastu has taught college courses and worked in college and K-12 writing labs. He has written for eSchool News and Safe Schools Today, and has served as editor and writer for many business publications, including Retail Delivery News, Credit Risk Management Report and Firehose.

RESOURCES

Budget Checklist for TCO

Some additional costs you should consider when buying new technology

Retrofitting and additional hardware

When you're buying technology, consider whether or not you'll need to hire a professional to complete the installation or if you'll need to buy additional components in order to use your new technology. Will you need to upgrade your operating system, buy additional cables or purchase other technology to go with your purchase?

Professional development

There's no point buying technology if you aren't going to teach school staff how to use it. Find out if training materials are available or if the vendor you're purchasing from offers training sessions. You'll also want to know if there is a charge.

Technical support

Another TCO consideration is whether, and to what extent, technical support is offered free of charge by the dealer or manufacturer. You'll want to know how long the warranty is valid and what it covers, and whether free technical support is available by telephone or e-mail.



Software

Some companies offer free software upgrades, while others charge a fee. Find out if there is a charge for upgrades and factor these costs into your budget. Also take into consideration whether the software you buy has a limited number of installations. You may need to purchase a few copies of the software in order to install it on the right number of computers.

Replacement costs

Also consider any costs associated with damage to your hardware and its accessories. Are replacement parts available? If so, how much do they cost? If you need to return a large piece of hardware for repairs will the manufacturer cover the shipping costs?

by Cara Erenben

Virtual Training by Design

Planning is key to online professional development



Virtual training programs provide options that save time and money while still offering quality professional development.

As ease of delivery and cost savings push an increasing number of states and school districts toward online teacher training, professional development experts caution school leaders to design their online programs with care.

While there is no data that suggests online professional development saves time and money, “there’s a perception that it’s more convenient and economical,” says Joellen Killion, director of special projects at the National Staff Development Council.

Virtual programs eliminate the

need for teachers to travel to training centers, which appeals to educators in rural areas or those who would have to commute across town. Plus, teachers can often complete the coursework whenever and wherever they choose. In this case, schools save money on stipends, substitute teachers, and renting and maintaining training facilities.

Budget cuts prompted the South Carolina Department of Education (www.nsdc.org) to move its education technology training online. With its training staff reduced from 13 to 6 to

service 86 school districts, the state has maintained its training program by running 50 courses a year online.

“We think this is the best we’ve ever done,” says Mike Thun, South Carolina’s online professional development coordinator. The courses are now taught in a standardized way and reviewed regularly he says, adding that this past year, the minimum number of students for each course was reached in all but two classes.

With nearly 1,800 new teachers each year, Clark County School District (www.ccsd.net) in Las Vegas has unique needs because it is one of the fastest growing school districts in the country. “We believe in multiple modes of professional development,” says Christy Falba, director of the district’s K–12 math, science and instructional technology.

“We’re trying to give teachers options,” Falba says. “It doesn’t matter what time of day a teacher chooses to go online and do the coursework.” Clark County’s online course offerings cover topics such as classroom management, setting up literacy programs and preparing students for the state’s high-stakes math test.

A third of the schools in the United States are reaping the benefits of online teacher training. According to the latest technology survey by Market Data Retrieval (www.schooldata.com), 34 percent of U.S. schools offered online professional development during the 2004–05 school year. Rural and remote states – such as Alaska (57 percent) and Wyoming (50 percent) – cited a higher penetration of online professional development.

Without thoughtful planning,

however, there's a concern that online professional development could erode the quality of teachers in today's classroom. In fact, Killion fears online professional development is "pushing professional learning backwards."

Despite its rewards, she explains, learning is happening outside of a teacher's workday. This means teachers are more isolated from each other, the quality of the learning experience is not well monitored, accountability to apply what is learned is lacking and support doesn't always happen. "Most of the learning experiences I have seen are not using technology to the full extent," Killion adds.

Online learning interfaces do have great potential for offering simulations, interactivity, collaboration and discussion, though. "I am absolutely an advocate of what it can do," she says. "The one concern I have is the quality of the programming."

Dianne Griffin, staff associate at the Southern Regional Education Board (www.sreb.org) and co-author of the 2004 report, "Standards for Online Professional Development," offers many suggestions for producing quality online professional development courses.

She says, "We never suggest that all professional development should be online, but we suggest that part of the professional development should be offered online."

Most importantly, online training needs to provide teachers with collaboration and ongoing support. "In the past, professional development was a one-shot deal. The expert would come in, share those strategies and then leave," she says. Online professional development is best when it includes a means for ongoing communication, whether that's achieved by e-mail, message boards, chat rooms or telephone.

Programs should also emphasize interactivity. Teachers in training should be asked to practice the strategy and report back. They need to do more than just read and watch video. They need to try and then reflect on what they did, Griffin says.

She adds that it's also important for online professional development to be focused, tied to what's happening in the classroom and covering effective teaching strategies. Classes should be facilitated by a certified instructor. The instructor's writing and organizational

"In the past, professional development was a one-shot deal. The expert would come in, share those strategies and then leave."

abilities need to be greater when working online. A wonderful face-to-face teacher may not be a wonderful teacher online, she explains.

Falba agrees. "People have to be good at time management to be successful online." Having to report to a facilitator also keeps teachers on track.

Tutorials are not considered true, quality professional development, Griffin adds. They can be a great resource, but they have no greater value than reading a textbook.

"School leaders need to realize that work done online still takes time and effort. It's not easier," Griffin says. Often, online learning is not valued as much as traditional professional development, and their workload is not reduced. Teachers often do online professional development on their own time, and it's just as rigorous.

Griffin recommends school leaders plan every detail of the online professional development program before

beginning. They should know how teachers' needs will be assessed, how instructors will be selected, what content will be used, how the program will be sustained, how it will be scalable, and how the course and its participants will be evaluated.

For further information, school leaders can download "Standards for Online Professional Development" from the SREB.org website. This site also offers a multi-state online professional development toolkit.

Additionally, educators can download "E-Learning for Educators," a 53-page guide available from the National Staff Development Council website at www.nsd.org. It asks school leaders to think about how the program is designed, how flexible and adaptable the content is and whether it is platform interdependent.

Because course development can be a costly and lengthy process, purchasing prepackaged curriculum might be an alternative. "I'm all about not re-creating the wheel," Griffin says.

Many organizations offer for-fee or free courses, including the Education Development Center Inc., PBS TeacherLine, Classroom Connect's Connected University, the U.S. Department of Education's Teacher-to-Teacher Workshops and more.

Some organizations that provide lessons and resources in addition to professional development content include MarcoPolo (www.marco-polo-education.org), Element K LLC (www.elementk.com), Atomic Learning (www.atomiclearning.com) Smart Technologies Inc. (www.education-smarttech.com) and Annenberg/CPB's www.learner.org.

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by Wendy McMahon

Expanding At-Risk Options

Better scores, attendance, attitudes



Students in the Jennings School District improved more than just test scores once technology was integrated into their classrooms.

Jennings School District is an at-risk district in a low-income area of Missouri, where 77 percent of students qualify for free and reduced-fee lunch programs. Students often come to the district two or three years behind their grade level, and for years the school was only partially accredited due to low test scores. Despite these socioeconomic issues, Jennings is now the only fully accredited at-risk school in Missouri, and district staff feel

they've closed the achievement gap. The question is – how did they do it?

Reaching the turning point

Dr. Terry Stewart, Jennings' former superintendent of schools, and his colleagues decided in 1997 that it was time for a paradigm shift. Teachers from Jennings had just taken part in the MINTS (Multimedia Interactive Networked Technologies) project, which put computers with Internet connections

in Missouri classrooms and provided teachers with technology training. This project eventually became eMINTS (enhancing Missouri's Instructional Networked Teaching Strategies).

After seeing the positive effect technology had on the classroom environment, Dr. Stewart and his colleagues decided to create a new education plan. They focused on teacher training, inquiry-based learning and classroom technology such as the SMART Board interactive whiteboard.

Finding the funding

Although Dr. Stewart recognizes the financial challenges around buying technology, he believes the solution lies in taking a unique approach to budgeting for technology. "Some of the greatest budgetary hurdles are hurdles we create ourselves in schools. I think school leaders, school superintendents, people like myself, have to develop a different approach to integrating technology and to funding the technology into the schools."

Jennings' approach was to reallocate funds and apply for e-rate money. "One of the things we've done is take money that was previously used for textbooks – I wouldn't say all of it, but a great deal of it – and use that for technology. Because the computer and a SMART Board interactive whiteboard function as a textbook, we just rerouted existing money," explains Dr. Stewart.

Jennings now has 52 classrooms equipped with SMART Board inter-

active whiteboards for students from third to twelfth grade. Cindy Kicielinski, district instructional technology specialist, says interactive whiteboards are in all core-subject classrooms, so all students are exposed to this type of learning at some point throughout the school day.

The district also has a two-to-one student-computer ratio and an in-house technology training program for teachers that runs year round.

Learning a new way

With the addition of this technology, Jennings initiated a new inquiry-based approach to learning.

“I think the most powerful part of having a SMART Board interactive whiteboard in the classroom is the way in which students are able to present information they gather during the unit,” says Kicielinski. “You’ll see students in front of the room doing collaboration in teams, being able to talk effectively about the knowledge that they have and present it back in a way that everyone understands it. And that is a lifelong skill that will prepare them for the job market.”

Improving more than test scores

Dr. Stewart and his staff believe student performance should not be defined by test scores alone, but also by attendance levels, motivation and behavior. Since putting technology in the hands of properly trained staff, Jennings has noticed improvements in each of those areas. They have even noticed an increase in teachers’ satisfaction levels.

“The SMART Board interactive whiteboard definitely has improved the scores here at Jennings,” says Margaret Wagner, a third grade teacher at Fairview Elementary in the Jennings district. “I’ve seen it in social



Teachers at Jennings notice that students now come to class willing and excited to learn.

studies. I had a class for two years, and the scores went up 66 percent in the two years I had those students.”

Wagner adds that, “the greatest benefit is to the students because they become so engaged. And when they’re engaged, they learn a lot faster than they would if you were just standing there in the room lecturing to them.”

Larry Lewis, an eighth grade teacher at Jennings Junior High, has been teaching for 29 years. Lewis says the behavior problems he had in his traditional classrooms have all but disappeared now that he is teaching in a technology classroom with a SMART Board interactive whiteboard. Now, he is more excited to teach, and his students are more excited to learn.

“It has made a difference in student performance as well as student behavior. Because of technology, students come to class with a willingness to learn. And that’s something I didn’t see in most of my students as a traditional teacher,” says Lewis.

Creating lifelong learners

Many of the students who were attending Jennings in 1997, when this technology shift began, are now getting ready to graduate from the district’s high school. Staff say these students have become lifelong learners. As Kicielinski explains, “Most of them are going on to college with scholarships and are very much excited about their future. They really do feel that technology has played an important role in helping them become better students.”

Dr. Stewart and his colleagues believe this new approach to learning helps bridge the digital divide and equalize opportunities for students. They realize that Jennings students are not only equipped with skills that are vital to their future success in the classroom, but also in today’s high-tech job market.

Wendy McMahon is a freelance writer based in Calgary, Alberta, who specializes in case studies about the successful use of education technology in schools.

by Nancy Knowlton

21st-Century Learning

Multiple paths lead to expertise



Interactive whiteboards are just one of the many technologies that contribute to 21st-century learning.

Some people say that the problem with education today is having some memory of what we liked and didn't like when we went to school. If something was good enough for students then, it should be good enough for students today, the thinking goes.

The problem with this thinking is that the world has dramatically changed since we attended school. Today's students face a different environment and have different expectations than we had. They also have different challenges ahead. Only a 21st-century education focused on developing 21st-century skills will do for these young learners.

Just who are the children entering our classrooms today and what are

the skills that they will need to succeed in the 21st century?

Digitally switched on

There is no question that students today are the most switched-on generation the world has ever known. They have never known life without computers. They take special effects in movies for granted. They text message and use Instant Messenger. They find the information that they need on the Internet. They connect and collaborate with others around the world.

Time slicers

Students today have several tasks underway at one time, applying their attention to each one for only a short period. They move from task to task

quickly, keeping track of everything easily. (While some may call it multi-tasking, it's really just quick movement from task to task.)

Curious experimenters

Today's students expect to be able to experience things, and it is perhaps their preferred mode of learning. They discover the special levels in video games that most adults wouldn't even know to look for.

Anytime, anywhere learning

Watching how 21st-century students undertake a homework assignment can provide particular insight into their learning style. They start their computer and get onto the Internet. They open up several Instant Messenger sessions with classmates and friends. They might text message a friend on their cell phone while they have a multi-party call with their study group.

With these experiences, it is no wonder that children in today's classrooms have different expectations of their education than we had. At the same time, the skills demanded of these children will be different as they enter the workforce.

Ability to adapt and re-learn

Twenty-first-century students must be prepared for multiple careers, not just multiple employers. Skills that they learn in university will quickly become passé as technology takes a leap forward or whole industries shift in a global economy. Students must know that they will have multiple careers requiring continuous learning as their lives and

careers progress. Lifelong learning will be a personal commitment.

Global players

The world is becoming a smaller place and that means that 21st-century students need to be able to compete not just against students wanting to get into a university in their home province or state but for 21st-century jobs anywhere in the world. Students will need to know more about the global community in order to fully participate.

Collaborators and team players

While individual contributions will

still be highly valued, 21st-century students must be able to function as team players, making strategic contributions to the overall whole.

Emotional intelligence

Because 21st-century students will work with people in other cultures and time zones, emotional intelligence and maturity will be expected. Forming teams quickly and productively will separate winners from losers.

Technology literacy

Part of the skills to be mastered will encompass new technology that

changes the world of work. It's just a given that technology will be assimilated and put to productive use quickly after it emerges.

It's not life as we knew it when we were growing up. Our classrooms and schools need to reflect this new reality.

Nancy Knowlton is the President and co-CEO of SMART Technologies Inc., the company whose name has become synonymous with interactive whiteboards. Ms. Knowlton travels the world speaking with educators about integrating and using this new technology. Here, in "Nancy's Notebook," she transcribes her notes on the technology topics she hears about most in her travels.

RESOURCES

The Responsive Classroom

Many education reformers have talked about the intelligent classroom. I prefer the term responsive classroom. In a recent *TechNation* podcast, Dr. Moira Gunn interviewed John Beck, a senior research fellow at the USC Annenberg School's Center for the Digital Future and author of the book *Got Game: How the Gamer Generation is Reshaping Business Forever*. Beck describes how video gamers have become accustomed to an information environment that is incredibly responsive to them. As they play, the game responds to their every action, providing immediate feedback on the wisdom of their move. This kind of environment provides good insight into how the responsive classroom should operate.

The best way to help students master new literacy skills is by teaching them from within the new information environment. This means that networked and digital information must be available to teachers and students in overwhelming abundance, and they must have the capacity to communicate compellingly with a variety of information formats.

At times, the teacher will teach the class. At other times students will make presentations, acting as the teacher, sharing what they have learned. The presenter must be able to project the full range of media to the entire class via a projector that is a permanent part of the classroom's infrastructure – like the lights, heating and air-conditioning.

The presenter's content will be projected on a display board that is fully interactive so the presenter can manipulate information at the board by touching, dragging and directly tapping the content. Teams of students will also collaborate with digital information. A large interactive screen helps create the interactive environment where they can discuss, adjust and finalize their work.

Students will also need personal access to networked digital information. In the responsive classroom, that information will be something that students carry with them. It may be a notebook computer or Tablet PC. When extreme mobility is important, it may be a handheld computer. But the classroom as a whole will not display any more technology than most classrooms today. The technology will come in with the students and teachers, under their arms or in their backpacks, and be shared through a central information hub like an interactive whiteboard.

These computers will feature software capable of accessing, retrieving, manipulating and producing all forms of information. Using these computers, the classroom will largely be about conversation: conversations between teacher and class, conversations among the class, conversations between teacher and students, and conversations between student presenters and the class. The conversation will be rich and meaningful, and all students will be participants.

by David Weinberger

Knowledge in Transition

How access is changing the very nature of technology



David Weinberger

We used to know what knowledge was all about: It was some sort of reflection of the world in its parts and in its organization. Our culture has been aiming withering postmodern fire at that idea of knowledge for decades. Now, in just a few years, geeky technologies such as blogging, tagging and the rest of the Internet's arsenal have done without trying what the smartest academic thinkers of our age have been laboring at. The question is: Now what? What will knowledge become?

The traditional idea of Western knowledge goes back to the Greeks. They had an intensely practical problem: When the citizens of the city spoke up in Athens' democracy (no women, poor people or slaves need apply), how could they decide whom to believe? The craft of rhetoric was advancing. Could human judgment keep up with it? Are there ways of discerning a true opinion from a false one? What makes an opinion worthy of belief? Thus did the quest for knowledge begin.

The philosophers addressed the

question apart from its practical implications. That's what made them philosophers, after all. To know what something is, they noticed, requires looking past the individual thing itself: To know what Socrates is, you have to be able to see that he's a human being, a trait he shares with others of his ilk. To know what something is means to see its type and what makes it different from others of its type. But what does it mean to be a human being? Look past the particularities of humanness and you see that humans are a type of animal: The categories are themselves members of higher order categories. So knowledge assumed the familiar shape of a tree.

This tree was assumed to have certain properties. First, it's only a knowledge tree if it accurately reflects the way the world is structured. Second, because of that, it's the same tree for everyone. There is one knowledge for all. Third, because it's the same knowledge for all, it exists independently of the person speaking it. Fourth, as more people worked on discerning the branches of the tree, some areas got very detailed. No one person could comprehend the entire tree of knowledge. So we need experts to work on the different branches and stems.

The Web, simply by its architecture, is knocking that notion of knowledge apart. It can do this because knowledge is not simply a neutral set of true sentences. The tree of knowledge has given rise to industries. Experts sell their expertise. Publishers make knowledge from the few available to the many. Educational systems impart knowledge to the young and train

them in the ways of expertise.

The Web's architecture suggests other possibilities. Our participation makes those possibilities real. For example, take one simple assumption about knowledge: Experts put knowledge into documents to communicate what they know. The postmodernists have been saying for a while that authors have no special privilege when it comes to interpreting their work. Now the Web has made that idea real.

At the increasingly popular book-marking site Delicious (<http://del.icio.us>), users tag Web addresses with simple words and phrases so that they can keep track of pages that are interesting to them. For example, someone interested in the history of slavery might tag a page that has a biography of George Washington as "colonial slavery," whereas someone interested in dentistry might tag it "wooden teeth," and someone who hates America might tag it "root of all evil." The author of the page would not characterize the page in any of these ways. But the author's tag isn't all that useful to readers who read the page for reasons other than the author's for writing it.

Readers now get to say what pages are about. This shift may seem like a small thing. But it has big implications. Imagine that tagging catches on. (There are reasons to think so: Yahoo bought a popular photo tagging site, and Microsoft is showing interest in tagging as a way to organize desktops.) Tags at Delicious and elsewhere are publicly available: I can see all the pages everyone has tagged as "colonial slavery," "Iraq," "humor" or anything else. There are already millions of tags

at Delicious and more at other sites. Applications called aggregators already enable us to sort through the tagged objects other Internet users have created. For example, since I'm interested in taxonomy, I subscribe to the tag "taxonomy" and thus every day can see the latest pages and other resources that people around the world who share my interest have found.

Think how different this form of knowing is from traditional knowledge. First, with tagging, everyone is an expert. Second, there is no impediment to publishing one's knowledge. Quite the contrary: On the Web, nothing is easier than posting your views or tagging someone else's. Third, tags do not form trees. They form big piles of leaves. Fourth, we sort through the pile as we want at any one moment. The pile has no stable, shared organization.

But the biggest change in knowledge is most visible in the "blogosphere," that is, the linked world of blogs. The same four points hold for blogs as for tags, but blogs chop away at perhaps the most important assumption about knowledge: There is one knowledge for all the world.

Blogs are a conversational form. They are not primarily little op-ed



columns that stand alone. They are frequently in response to other blogs and very frequently contain links. That's how the blogosphere gets built. As a result, you can follow a conversation across time and space by following the links in a blog to the next blog to the

next blog. A single topic gets refracted through dozens, hundreds or thousands of minds. The single clearest lesson of participating in the blogosphere is that there is no one knowledge. And there never will be. The conversation will continue forever because our world is too diverse.

We've known that for a long time. Blogs make it apparent. But blogs also take these many subjective viewpoints and for the first time let us hear them not simply as voices shouting out their views but in conversation. This is a type of multi-subjectivity that can have some of the epistemological heft that objectivity has typically reserved for itself.

Educators therefore face a different set of challenges. Very different. Their authority is in question since we've learned that we can learn more from talking with others than by listening to any single expert. But, more important, if knowledge emerges from conversations, then just about all our educational focus ought to be on learning how to be good conversationalists: how to listen, how to kindle a conversation, how to evaluate claims, how to speak in a voice worth hearing. . . and, most of all, how to share a world in which knowledge is plural, for that's what conversation – and knowledge – is about.

RESOURCES

Resource helps build information literacy

Teachers and library media specialists searching for new and innovative ways to educate their students about effective research practices now have a new online tool at their disposal: S.O.S. (Situations, Outcomes, Strategies) for Information Literacy.

Launched Oct. 7 at the American Association of School Librarians (AASL) conference in Pittsburgh, this Syracuse University program – made public now for the first time – is a free multimedia resource for K–8 teachers and media specialists who want their students to learn more, and become excited, about research.

Information literacy – the ability to locate, organize, evaluate, manage, and use information – is critical for today's learners, researchers say. These skills lay the groundwork for success in every student's life.

The project includes an online resource page where educators can view lessons plans, video clips, and other teaching materials submitted by teachers and library media specialists.

S.O.S. for Information Literacy
<http://www.informationliteracy.org/training/Home.htm>





There's a teacher behind everything we do

Every day, SMART's interactive products are used by millions of teachers and students across North America and around the world. Why? Because we've been listening to teachers like you since we shipped the world's first interactive whiteboard in 1991. Your knowledge and experience have helped shape our technology, ensuring that SMART products make it easier for teachers to teach and for learners to learn.

We're the world's leader in interactive classroom technology for one very good reason: the experts we consult the most are especially well schooled.

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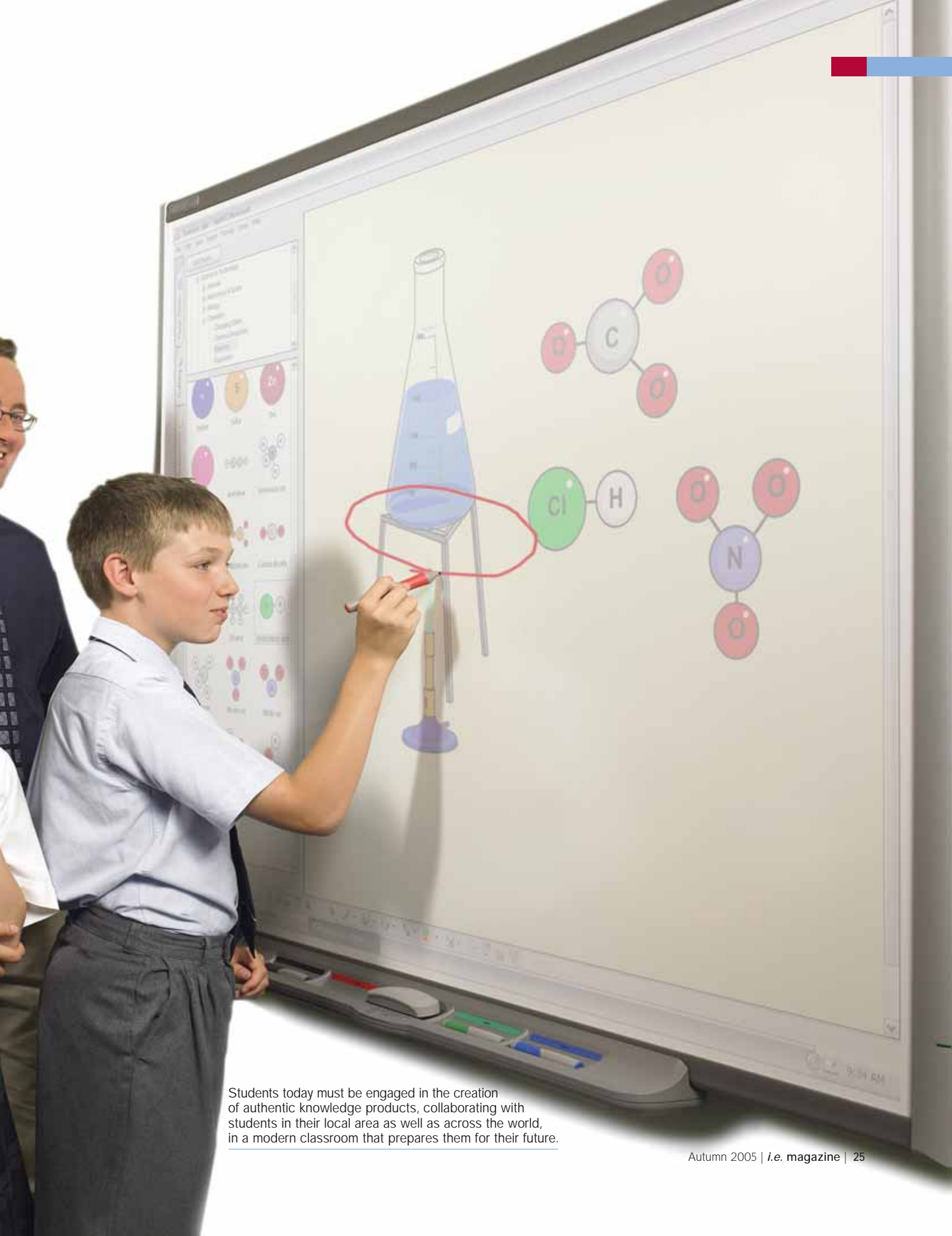
THE Digital Face OF 21ST-CENTURY Curriculum

How digital content is changing teaching and learning

Angus King, former governor of Maine and principal architect of the Maine Technology Learning Initiative (www.mainelearns.org), enjoys telling a story about Wayne Gretzky, the greatest hockey player of all time. Gretzky was once asked how he was able to score so many goals. He answered that he always skated to where the puck was going to be, instead of skating, like everyone else, to where the puck actually was.

In the education arena, stakeholders at all levels need to consider the applicability of this metaphor for teaching and learning in the 21st century. The availability of digital content and communication tools is revolutionizing curriculum and education activities for learners of all ages. Recognition of these opportunities and actual adaptation to them varies widely. Despite common reticence to change, the face of education curriculum is undergoing a fundamental transformation. Educators at all levels who wish to remain relevant and effective in the 21st century need to pay attention.





Students today must be engaged in the creation of authentic knowledge products, collaborating with students in their local area as well as across the world, in a modern classroom that prepares them for their future.

Flattening the world

Digital content and communication tools are “flattening the world” and removing communication barriers that have existed since the beginning of recorded history. *New York Times* columnist Thomas Friedman identifies in his book, *The World Is Flat: A Brief History of the Twenty-First Century*, 10 “flatteners” that have made outsourcing and offshoring to other countries a relatively easy and cost-effective business practice. Companies today can and do locate their call centers in Bangalore, India, instead of North America or Europe and save millions of dollars as a result.

teach students to sort through the information available, understand it and process it. But since the information is unfiltered by editors and publishers, it is all the more important that students learn to rein in all that information. That includes teaching them to effectively gather, evaluate, verify, comprehend and create information from a huge array of sources in myriad forms.

As educator David Warlick has noted, accessing and using information available online is just the starting point for digital literacy in the 21st century. Students must be engaged in the creation of authentic knowledge products, collaborating with students in their local area as

“Accessing and using information available online is just the starting point for digital literacy in the 21st century.”

Many of the same “flatteners” that have transformed the face of international business are also changing curriculum in basic ways. We have entered an age where, in order to be globally relevant, content must be digital. Increasing numbers of students with access to the Internet at home go to online sources first when investigating a research question. They consult analog, text-based resources (the school library) second, if at all.

Educators and librarians may wring their hands at this trend, but despite their objections, it is likely to continue. Access to information via the World Wide Web is flattening the educational playing field. Google (www.google.com) places an unimaginably diverse world of content literally at the fingertips of every Internet user, and this ubiquitous availability of content represents a fundamental shift in educational curriculum and the corresponding role of schools as well as teachers.

Managing information on the loose

One reason contemporary schools were originally created was to attempt to manage and control the flow of information in society. Writing in *Technopoly* in 1992, educator Neil Postman observed that the most obvious reason for the rapid growth of schools was that it was a necessary response to the rise of the printed book and the resulting anxieties and confusion surrounding information on the loose.

With information now wildly and extensively on the loose via the Internet and other digital resources, a major role of schools is still the same as Postman suggested – to

well as across the world, in a modern classroom that seeks to prepare them for their future.

Removing barriers with technology for collaboration

Geography and financial resources used to be enormous barriers to communication in educational contexts. If you wanted to collaborate with someone living on the other side of a nation or the world, you had to travel to see them, write and mail letters, pay them to travel or pay phone charges to talk for a limited amount of time.

The digital face of curriculum and communication tools has changed this. Free instant messaging software and services (www.aim.com, <http://messenger.msn.com>, <http://messenger.yahoo.com>) permit free and profuse text-based communication on a wide range of devices, including cell phones and computers. Free Internet-based telephony software and services (www.skype.com and www.talk.google.com) extend collaboration to voice chat, ignoring national and international boundary lines normally critical in calculating POTS (plain old telephone service) fee-based charges. Websites like ePals (www.epals.com) enable educators from around the world to connect and collaborate on projects of shared interest.

Desktop videoconferencing is quickly becoming a viable technology for any Internet user. Peer-to-peer connections using software like Apple’s iChat (www.apple.com/macosx/features/ichat/) or server-based tools like MacroMedia Breeze (www.macromedia.com/software/breeze/) and Codian’s MCU and IPVCR (www.codian.com) permit

people with standard desktop and laptop computers to engage in rich-media collaboration over any high-speed Internet connection.

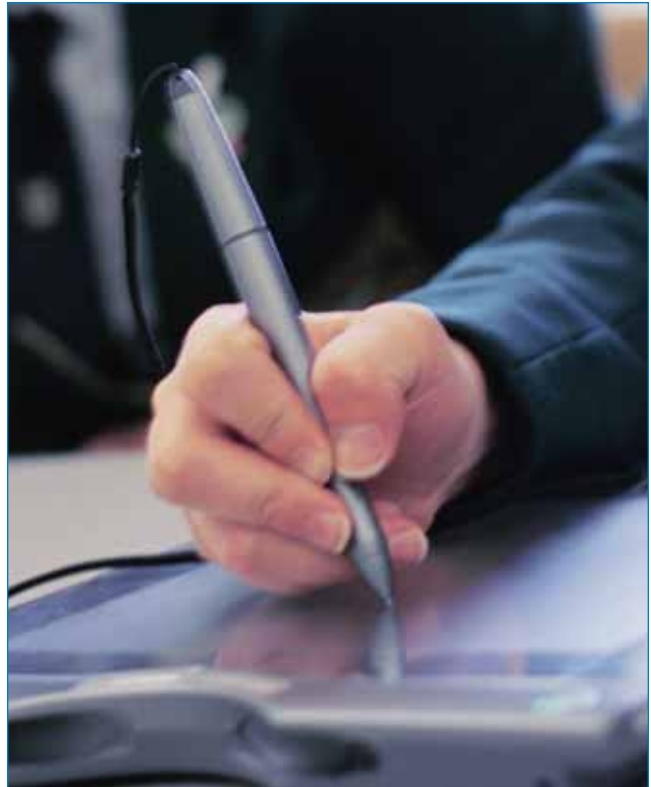
Although many school IT departments block network ports to try to prevent teachers and students from using these collaborative communication tools, these are the very tools that should be embraced and creatively used in our “flat world” to develop multimedia and critical literacy skills. Traditional and nontraditional students inside and outside classrooms can and should now collaborate with peers on the other side of the planet as easily as people living in their same city. Technology has broken down communication barriers, connecting teachers and students around the world and supporting collaboration in ways that would have seemed impossible even a decade ago.

The Web as a platform

Traditional education has been described as the passive transmission of content from the mouth of the teacher to the brain of the learner, and the subsequent recitation of content by the student at the cue of the instructor. Learning in a collaborative education environment where access to information is ubiquitous, however, involves the active engagement of the student in both the process of comprehending information and reconstructing it into knowledge. Information does not become knowledge until it has passed through the mind of a learner. This fundamentally active process requires resources and tools that are nontraditional. The digital face of curriculum and educational software tools is providing these resources and many of them are free.

Traditional education technology purchases have included computer hardware, operating system licenses, productivity software and computer-aided instruction or learning management system software that provides exercises and drills for students on specific curriculum content. The majority of North American schools in 2005 continue to purchase education technology using this paradigm.

In the digital world of the early 21st century, however, this purchasing pattern is both fiscally naïve as well as pedagogically counterproductive. Open source software tools offer functionally comparable options for both teachers and students in the areas of productivity and communications tools (<http://del.icio.us/wfryer/OpenSource>). Any school or district technology coordinator not planning or already implementing a transition plan for many of the organization’s desktop computers to an open source operating system (www.linux.org) and free productivity software tools (www.OpenOffice.org) should



In the 21st-century classroom, students must be actively engaged in the comprehension of information and the creation of knowledge.

get the process started.

Students in the 21st century need to be actively engaged in the collaborative creation of authentic knowledge products using technology tools, rather than sitting in front of drill-and-practice software helping them answer multiple-choice questions for an end-of-year standardized test.

Operating systems are not yet irrelevant, since they can be extremely important for people wanting to easily create content like digital movies and interactive DVDs (www.apple.com/ilife). Increasingly, however, the Web is becoming a platform itself for both content creation as well as distribution and access. The emergence of the “read/write web,” or “Web 2.0,” has been documented and explained fairly recently in the blogosphere. “Web 2.0 is a term often applied to a perceived ongoing transition of the World Wide Web from a collection of websites to a full-fledged computing platform serving Web applications to end users,” notes the English Wikipedia. “The proponents of this thinking expect that ultimately Web 2.0 services will replace desktop computing applications for many purposes.”

Examples of free read/write Web tools include online blogging services (www.blogger.com), feed aggregators (www.bloglines.com), wikis (<http://wikipedia.sourceforge.net/>), social bookmarks (<http://del.icio.us>) and online rubric tools (<http://rubistar.4teachers.org>). A more detailed description of these and other read/write Web tools available for educational uses is available in the article, "Teaching & Learning with the Read/Write Web" (http://www.wtvi.com/teks/04_05_articles/read-write-web.html). A more exhaustive list is available on <http://del.icio.us/wfryer/ReadWriteWebTools>.



Free read/write Web tools are ideal for one-to-one educational settings or for one-to-many settings, such as this one.

Students and teachers need more than hardware and software tools to become literate in the 21st century, however. Learners still need high quality curriculum, but that curriculum is increasingly available in digital formats. Many textbook companies have attempted to maintain their near monopolistic control over classroom content (via the printed textbook) by creating digital supplements to print materials, including CD-ROMs and websites. However, these offerings attempt to buttress the primacy of the textbook in the classroom rather than replace it with a superior digital alternative.

Subscription-based, online curriculum alternatives falling into this preferable latter category include Nettekker (www.nettekker.com), MyAccess! Writing (www.vantagelearning.com), BeyondBooks (www.beyondbooks.com), ExploreLearning (www.explorelearning.com), KidBiz3000 and TeenBiz3000 (www.achieve3000.com),

and UnitedStreaming (www.unitedstreaming.com). These flexible software tools are ideal for one-to-one educational settings where every student has a wireless, mobile computing device as well as for one-to-many settings in which classrooms are equipped with interactive whiteboards. They offer levels of interactivity and differentiated instruction impossible in a traditional classroom even for the most advanced master teacher.

As an example, MyAccess! Writing provides immediate feedback for students on their writing drafts, not only offering assistance with spelling and grammar concerns like a modern word processor, but also providing more sophisticated feedback involving sentence construction, voice and other writing aspects. IntelliMetric, the Web-based essay scoring engine developed by Vantage Learning, uses artificial intelligence (AI) technology. According to the company's website, the application emulates the process carried out by expert human scorers and achieves levels of scoring accuracy that equal or exceed expert graders.

Technologies like these do not replace teachers. Rather, they free them from having to be the only source of experienced and trained feedback for student writers. These software tools empower both teachers and students, enabling them to go farther in their journeys of learning than they could without technology tools.

What next?

In the absence of a global energy and communication crisis like that predicted by some for Y2K, digital curriculum is here to stay. Our educational as well as economic situation in the early 21st century has changed dramatically. The world is flattening and the implications of this trend are enormous for education as well as business. Educators at all levels need to consider not simply where the metaphorical "puck" of teaching and learning is today, but where it will be moving in the next year and the next decade. Its destination may be subject to debate, but its nature is not.

Curricula will continue to have an increasingly digital face. The sooner educators adapt to this new reality and engage students on terms suitable for the flat, 21-st century world, the better prepared the graduates of our school systems will be for a future we can barely begin to imagine.

In the early 20th century, John Dewey wrote, "If we teach today's students as we taught yesterday's, we rob them of tomorrow." Let's give our students keys that will open the doors to their future. It's a journey we have to go on together because the puck of teaching and learning is moving faster than ever. Fortunately, this is a game where everyone can win, but we need team captains with the vision, courage and stamina to lead us on to victory.



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I N F O R M A T I O N OVERLOAD

As digital content proliferates, literacy becomes as much about proving information as understanding it

It was a typical Friday evening for my family. With my daughter off at college, it was just three of us. My wife sat upstairs by a window reading a book, while I sat in my home office watching a DVD on my laptop, probably the *Bourne Identity* for the twentieth time.

My son was in the TV room, playing a video game with a friend from his high school. His game system was connected to the Internet, so they were playing with several other people in various locations.

Suddenly, I heard the booming voices of five or more teenaged boys. Dashing into the TV room, I was surprised to see only my son and his friend. However, they had connected speakers to the game system so they could participate in the ongoing team conversation as they planned how they were going to approach their task. There was the occasional joke and teenage razz.

It occurred to me how different my generation's information experience was from our children's. My wife and I were merely consuming information. My son, on the other hand, was interacting with the content. As a result, he was controlling the plot of the experience and collaborating with other players to accomplish a larger goal and enjoy fellowship with friends. As I walked back into my office, I continued to listen, trying to figure out if I was hearing people playing at work or working at play.

In the context of how technology is used in education, perhaps the more important question is, "In terms of learning, is there a difference?" Admittedly, these are high-minded questions for an education environment that is so rooted in basic literacies. But perhaps it is the literacies that we should be thinking the most about when trying to integrate technologies into our classrooms.

What information looks like

The very nature of information has changed in just the last 10 years. It has changed in terms of

- What it looks like
- What we look at to view it
- Where and how we find it
- What we can do with it
- How we communicate it

Our children use mobile phones not only to talk with each other, but to text message (Short Message Service or SMS) and even publish content to the Internet, using their thumbs with remarkable skill. With instant messaging (IM) on their computers, they have invented a new grammar that helps them communicate effectively and richly through these mobile and increasingly ubiquitous devices. Through the World Wide Web, they enjoy a depth and breadth of information that we could not have imagined when I was young.

The fundamental features of the new information environment

When considering literacy for the digital age, it is essential that we first define the fundamental features of the information environment within which our children will work and play. There are three ways that information has changed that are critical to the basic skills of operating in this environment. Information today is

- Networked
- Digital
- Overwhelming



Networked information

Information is increasingly networked. If you did not access the information you are using directly from a local area network or the larger Internet, then at some point during its life it has ridden the pipes of a network in the process of becoming the information product you are holding.

The networked nature of information has enormous implications for literacy. Before networking, information was produced at great expense. Editors and publishers selected only the information that was valuable in terms of its acceptability and worth to customers. In addition, information was made available in containers, such as books, magazines, newspapers, bookstores and libraries. Each container would hold only so much information, limiting our access to only that information that was immediately and physically available. In this published, print-based information environment, the principal literacy skill was the ability to read the information that was in front of you. But as the nature of information and how we access it evolves, that is no longer the case. Educators need to replace practices that teach students to assume the authority of the content around them and instead teach students to prove the authority.

Consider, for instance, that Encyclopaedia Britannica's 2005 print set comes in 32 volumes holding 65,000 articles. Finding the information you need involves skill in using a print index and a working understanding of the alphabet. The Wikipedia (<http://wikipedia.org>), on the other hand, comprises 738,124 articles (as of September 2005) in English and another 1,000,000+ articles in nine other languages.

Finding valuable information in this environment requires a new set of skills. We must understand and think about the problem we are trying to solve, imagine the information that will help us solve it and identify a keyword or combination of keywords in order to search for and find information. Then there is the added task of evaluating our results, refining our search strategies and going at it again. Factor in the use of hypertext to explore cross references, and reading becomes as much about how we get to the information as it is about decoding the text.

These are not skills that should be taught, assessed, checked off and filed away, any more than reading skills should be taught only up to the third grade. Both finding and reading information are working skills involved in learning to learn, and both are elements of literacy.

In this expanded model of literacy, finding informa-

tion is an integral part of the general learning experience in much the same way that reading is an integral part of being a student. It is not enough to simply teach students the skills and then require them to practice. The finding part of content should become part of the conversation. As teachers, we should use our presentations as an opportunity to tell the story about where the information came from. For instance, as the teacher asks the class to consider a handout that has just been distributed, she should tell the story of how she found the information, explaining her evolving search strategies and why she made certain decisions about keywords and hyperlinks.

As students present their reports, their paths to the information should be part of the delivery. Conversations about finding the information should become an integral part of teaching and learning.

Returning to Wikipedia, it is important to note that this enormous information source mirrors the larger Internet in some important ways. Since Wikipedia resides in a wiki, virtually anyone can add to the articles, and changes are almost immediately available to the public. This is open source content. Some safeguards are designed into Wikipedia's environment, but it illustrates clearly that as content becomes increasingly collaborative, we can no longer rely on its validity and reliability to the degree that we could 10 years ago.

should not hesitate to use a resource like Wikipedia. However, as we present content from this (or any other source), we must also, as part of the lesson, explicitly provide evidence that the information is accurate by pointing to other resources, both electronic and print. It is another opportunity to tell a story about the information.

Textbooks are no exception. Teachers should be able to support the content in the book by talking about the author and his or her credentials. But increasingly, and systematically, we should be offering supplemental digital information as part of our instruction. The Internet provides a warehouse of content that is available as text, images, photographs, video and audio. Making students your partner in finding and selecting content for the class gives them the opportunity to tell their stories as well, describing how they found the information and why the information is appropriate for the lesson.

Digital information

Nearly all of the information that is generated today is digital. Regardless of its final format, information is expressed as ones and zeros – binary code. Text, pictures, sound and video all speak the same language and, as a result, we can now mix and re-mix them in infinite ways.

When most of us were in school, producing a multimedia information product required that you either write or

// Conversations about finding the information should become an integral part of teaching and learning. //

We should not despair, however. The trade-off is a good one. In a time of rapid change, we need information that is more immediate and interactive. We need access not only to the experts, but also to less credentialed people who simply have good ideas. In other words, content becomes more a matter of conversation and less a formally published and packaged product.

The implication for educators is that literacy has now become even richer. It is no longer enough to be able to simply read the information or even to be skilled at finding it in a global, digital network. We must also master investigative techniques and critical assessment skills in this new environment because the reliability of information cannot be taken for granted.

Like finding information, this skill cannot be taught, checked off and then filed away. It must be integrated into every aspect of how and what we teach. For instance, we

type the text that you wanted your audience to read. Pictures had to be hand-drawn or cut out with scissors and then pasted (with glue) directly onto the typed paper. If you wanted to add audio, you had to include a cassette and carry a cassette tape player with you. Video required a VHS tape and VCR or, in my time, 16 mm reel and projector. Today, with a single piece of computer software (software that is available on most classroom computers), teachers and students can produce an information-rich multimedia product that can be displayed as a presentation to an entire class via an interactive whiteboard or other medium, or e-mailed or blogged to an even larger audience.

A social studies teacher who wants to provide a multimedia lesson on the history of ancient Egypt can download a map of the country from the Internet and images of various archaeological relics from its history. Then, using common graphics software, she can highlight and extract the

essential parts of the pictures and superimpose them onto the map, producing different versions for different periods of this early civilization. Integrating the maps into a slide presentation, the teacher is able to use the visual information that she has created in order to better present her topic.

Another scenario might have students working together to take posed pictures of each other. As they study different countries in Asia, they can combine the extracted pictures of themselves with a picture from the country and create contrived travel logs where they describe what they've learned by talking about a tour of the country. Students might also combine their pictures with images of a plant cell, hydrogen atom or the surface of Mars in a way that expresses what they are learning. Sound can also be easily manipulated with open source software that is available on the Internet (<http://audacity.sourceforge.net/>) and video editing software that comes pre-installed on many computers today.

Overwhelming Information

Information is increasing. We are overwhelmed by the abundance of information that is available to us. Our task, from a literacy point of view, is deciding what information to use and how to present it so it successfully competes for our audience's attention. This is why, as we teach students how to write, we must also – and for the same reasons – teach them how to communicate with images, sound, animation and video.

Communicating through the information storm is part of being a teacher today. We, ourselves, are competing for the attention of students who take for granted a multimedia, interactive and increasingly ubiquitous information environment. Chalk and talk mean little to them. Competing for their attention requires presentations that move and change. Our information must glow.

It is not enough to use linear presentation software that mimics paper-based communications. Teachers and students both must use information that expresses itself compellingly. This means making conscious decisions about whether to use video, animation, sound or text, or a combination that will most likely lead to learning. We learned to write so that we could communicate. Mastering these other mediums is about the same thing – communicating.

Students can be taught to communicate in these other mediums through such exercises as preparing slide presentations that teach aspects of a current unit, but without using text on the slides, or they can capture video or still

images that illustrate a concept in science and then have the class choose which concept is being demonstrated. On an ongoing basis, teachers can encourage students to express what they have learned using the most appropriate mediums and explain why they have chosen a specific medium and how it enhances communication.

The new power of information

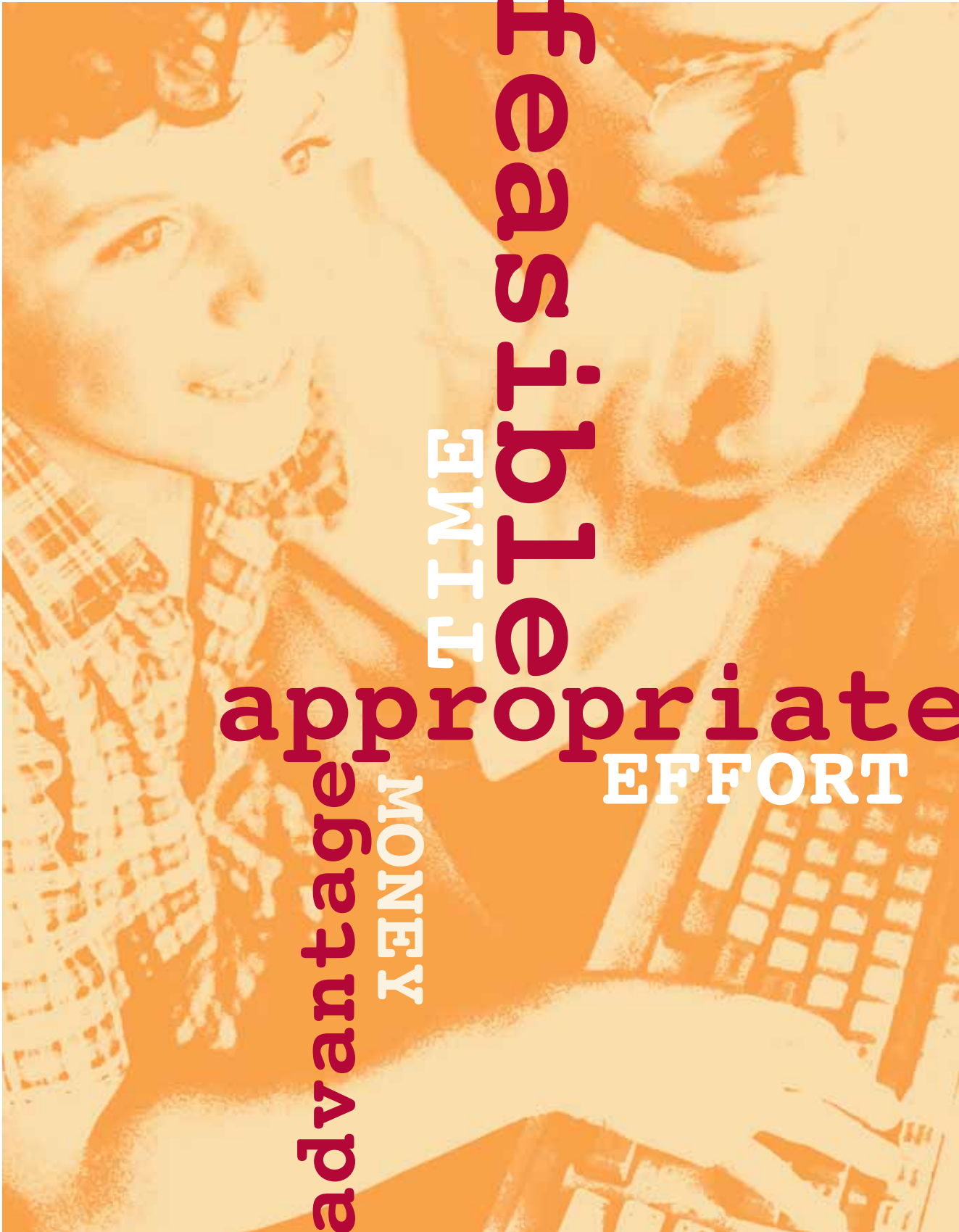
In his book, *The World is Flat*, *New York Times* columnist Thomas Friedman reports that Google is now processing approximately one billion searches a day. The question that immediately comes to mind is, "How were people answering these questions before the Web?" Almost as quickly, I realize that there is no chance our libraries, magazines, newspapers, encyclopedias or any published print-based information environment could handle that many inquiries. A billion Google searches a day is the measure of how reliant we have become on networked digital information, and this reliance is growing. Three years ago the giant search engine was processing only 150 million searches a day. This dependence on information is not limited to the United States. Friedman continues to



report that only a third of the searches are U.S.-based and that less than half are in English, according to Larry Page, one of Google's co-founders.

Before Google and the Web, the information we used was sold to us by publishers and networks, and they practiced (with varying degrees of faithfulness) standards of ethics related to their services. Now, the selection, manipulation and production of information are responsibilities of people sitting at their computers. Thus, it becomes a critical part of literacy that people understand and practice codes of ethics regarding information ownership, information reliability and information infrastructure.

The fundamentals of literacy remain at the core of what all people should be able to do with information. However, in this new information environment, these skills are richer and much more interesting. Reading expands into a range of skills involved in exposing the truth about information in a networked information environment. Writing expands into a range of skills involved in expressing ideas compellingly despite the overwhelming amount of information that surrounds us. And our responsibility becomes understanding the influence we have by accessing, working and expressing information to uphold the ethics of the new information environment.



feasible
advantage appropriate effort
MONEY
TIME
EFFORT

Is it worth it?

Deciding if technology is worth the time, effort and money

I begin this article with a warning of sorts. I warn you that I plan to tell it like it is with reference to regular, classroom-based use of digital education technologies. Specifically, I offer advice to help you decide which curriculum-based instructional activities to attempt to integrate into classrooms, with which students and when to do so. In making these practical suggestions, I am referring more to what is than what could be.

Deciding which uses of education technologies are most worth the additional time, effort and expense doesn't have to be guesswork. By weighing the learning outcome probabilities of new technology-based strategies against the success of existing pedagogical techniques we can decide, on a case-by-case basis, whether each new learning activity possibility is worth it.

Who decides?

i.e.'s pages are filled with promising ideas about implementations of education technologies. Yet no matter what the imagined potential is for any new implementation or idea, whether or not it truly gets used as a normal part of classroom activity is largely a result of teachers' professional decisions. Curriculum mandates, personnel evaluation procedures, standardized testing schedules, peer influence and community pressure can appear to force educators into implementing change before they are willing to choose it themselves. But frankly, we all know that once supervisors and concerned community members are at least temporarily appeased, teachers are still left with a good measure of academic freedom, even if they feel they have to exercise it covertly at times. Once teachers close the doors to their classrooms, what happens (and doesn't happen) inside is still largely the result of their individual pedagogical decisions.



New tools will become everyday implements in learning and teaching only as a result of teachers' conscious choices to make this happen and only to the extent that they deem the tools suitable for students and themselves. Key to deciding whether to implement a new learning activity is deciding whether it is worthwhile. In other words, is a particular digital tool or resource for a specific group of students and teachers worth the time, effort and expense required to use it? Will teaching with these tools help increase the quality, amount and depth

of their learning? If teachers believe it will, they will try to use the tool or technique at least once. If not, use of the innovation will be resisted.

It's important to note that these decisions are not about all uses of all digital tools and resources for all time. Rather, these questions arise each time the use of an unfamiliar technology or technique is considered. Answers to the question, "Is it worth it?" will change as people and resources change. Access to digital tools and resources in schools and classrooms will continue to change. What is possible, available and expected will continue to change. Teachers, students and education leaders will also change as they learn more about new education technologies and what they can do.

How to decide

How can educators best make decisions about whether to use particular technology tools and resources for specific educational uses, keeping in mind the standards-based knowledge and skills that students need to learn? I suggest they apply a three-part instructional activity assessment comprised of three self-administered tests, each in the form of an activity assessment question.

The purpose of these tests is to provide a structured and

reliable way to decide whether an activity, project or unit is worth the time, energy and resources necessary to implement it successfully in specific scenarios given the contextual facilitators and inhibitors of successful implementation. The three parts of this assessment, each in the form of a question for teachers to consider, are the

- Feasibility test: Will this learning activity, project or unit idea work given the technological, interpersonal, logistical and contextual factors currently operating in your particular learning environment?
- Appropriateness test: Is this learning activity appropriate for your students given what you know about their learning needs and preferences? Is it appropriate for you as a teacher targeting specific curriculum knowledge and skills?
- Relative advantage test: Can the same learning outcomes be accomplished as well or better using more readily available and easy-to-use tools and resources?



advantage – that is, if answers to the first two questions are yes and the third is no – should the activity be attempted.

Sample decisions

It may seem obvious to suggest that teachers and students use new tools and approaches only if the technologies and accompanying techniques can be applied in innovative ways to help new and worthwhile things happen in classrooms. Yet, whenever educators are offered unfamiliar tools, something interesting happens. Most of what we do at first with the new tools looks very

similar to what we did with older tools that seem functionally similar to the innovations.

For example, when teachers first began to use electronic mail and electronic bulletin boards in the early 1980s, what kinds of projects were most prevalent? Keypal (online penpal) projects. This makes sense if we consider that e-mail was first seen as a very close relative of surface mail. Penpal projects, in which students used paper, envelopes and stamps were successful educational

// Only if teachers deem a learning activity under consideration to be feasible, appropriate and to have relative advantage – should the activity be attempted. //

Though there are six possible response combinations to these questions, only one combination serves as a pass for the learning activity being assessed. If the response to the feasibility test question is no, even if responses to the other two questions are yes, then the activity should not be attempted because it would probably be unsuccessful given the current contextual conditions. Similarly, if the response to the appropriateness test question is no, then there is no reason for this particular learning activity to be attempted. If the answers to all three questions are yes, there is probably no good reason to use the particular education technologies in the way being considered. If students can learn just as well or better with tools and approaches they've already mastered, it doesn't make sense to invest in new tools.

Only if teachers deem a learning activity under consideration to be feasible, appropriate and to have relative

advantages in classrooms long before computers appeared in schools.

At first, electronic mail was seen as faster surface mail. Later, as users learned more about how to exploit this global communications tool, educators' visions of how e-mail could be used for education purposes expanded. Now there are at least 10 different types of learning activities involving e-mail (of which keypals is just one) that can assist students' curriculum-based learning. Information about other examples of curriculum-based learning activities that would surely pass the three-part self-assessment is available through a variety of websites. (See Resources box on next page for a sample).

Influencing decisions

But what if teachers decide that a particular digitally enhanced learning activity is not worthwhile, and that

decision is based upon a lack of knowledge or understanding of the true instructional potential of the activity? The hard truth is that a teacher's perception of whether a new teaching tool or technique is worthwhile is what determines if, when, how well and for how long it will be implemented regardless of whether or not other teachers or teacher educators would agree.

So if teachers are the ultimate arbiters of instructional decision-making with regard to which tools and techniques are to be used by students for curriculum-based learning in classrooms, it is critically important to help teachers and administrators stay abreast of emerging technology integration models, examples and techniques that are relevant to their current instructional assignments and their imminent instructional decision-making. This type of professional development requires sharing specific and practical instructional tools and techniques, done with and by professionals, intended to persuade decision making with classroom-based evidence and relevant, practical instructional examples.

Unfortunately, many district- and university-based professional development personnel assume that teachers will choose not to change their practice unless forced to



do so by their supervisors. Yet more than two decades of education technology implementation experience in schools has taught us that although top-down mandates can be fulfilled superficially, lasting pedagogical change associated with technology integration happens only when teachers are successfully persuaded by direct or vicarious experience that a new technique is more worthwhile. The new way must be adequately feasible, specifically appropriate and more beneficial to students' learning than the old way.

This process of professional persuasion, best done teacher-to-teacher, is not a simple task. Yet, like the process of integrating education technologies into curriculum-based learning and teaching, the process of influencing teachers' pedagogical decision-making about new tools and techniques is challenging, worthwhile and ultimately achievable.

Reprinted with permission of ISTE®. Portions of the information contained in this article will be published in the second edition of Judi's book, Virtual Architecture: Designing and Directing Curriculum-Based Telecomputing, to be published by the International Society for Technology in Education in 2006.

RESOURCES

Recommended resources for curriculum-based learning activities

- *Edutopia*
<http://www.edutopia.org/index.php>
published by The George Lucas Educational Foundation
- *Learning and Leading with Technology*
<http://www.iste.org/>
"Publications," published by the International Society for Technology in Education
- The Global Schoolhouse
<http://www.globalschoolnet.org/GSH/index.html>
provided by the Global Schoolnet Foundation
- CIESE's K-12 Education Projects
<http://njnie.dl.stevens-tech.edu/currichome.html>
supported by the Center for Innovation and Engineering in Science Education at the Stevens Institute of Technology
- WebQuest Portal
<http://www.webquest.org>
"Find WebQuests," maintained by Dr. Bernie Dodge at San Diego State University
- Virtual Architecture's Web Home
<http://virtual-architecture.wm.edu>
maintained by Judi Harris

by Kathy Schrock

All the Rage for a Reason

Portables connect kids to the world – and each other



Handheld computers can meet many of the same needs as laptops at a fraction of the cost.

Cell phones. MP3 players. Handheld gaming devices. The students of today use personal electronic devices on a daily basis, often using multiple devices at the same time.

They use them for communication, entertainment and collaboration with their peers. They turn to these devices to seek out information, such as text messaging their friends to get their homework. They use them to listen to music while they perform other tasks. They are

responsible and careful with these devices – they keep them charged, close at hand and store them in cases in their backpacks.

Individually, there are ways these devices can be used to support teaching and learning. For example, MP3 players can be loaded with software programs that allow them to function as a software and data-storage device. Digital cameras on cell phones can be used to record a field trip or event.

However, there is a single type of

personal electronic device that can be used for writing, computing, reading, graphing, presenting, record-keeping, photography, videotaping, surfing the Web, e-mailing, blogging, Web conferencing and instant messaging. This device has software available to support math, science, English, social studies, physical education, family and consumer science, music, drama, foreign languages – all for under US \$500!

This breed of device is a handheld computer, commonly referred to as a Palm or Windows Mobile PC. The capabilities of these handheld computers are approaching those of laptops. One-to-one laptop research indicates each student having the use of a personal portable device 24 hours a day, 7 days a week, can positively impact student achievement. The handheld computer can easily meet many of the same educational needs that a laptop is able to fill at a fraction of the cost for the device, the software, the upkeep and the repair.

Schools can outfit students with handheld devices that fall in the price range of US\$250–300 and include, with additional equipment, the ability to connect to wireless access points to browse the Web, have enough internal memory to run over 50 educational programs and include digital cameras. Considering the extra cost and fragility of the external wireless cards and the smaller amount of internal memory, however, it is better to spend about US\$500 to get everything in one neat package.

From a hardware perspective, the following should be considered when deciding on a handheld for classroom use:

- The most readable and brightest color screen possible
- A large amount of internal memory to run programs and store data
- Flash memory storage slots for expanding internal memory
- Bluetooth and 802.11b/g networking capability built in
- An infrared port, headphone jack and microphone jack
- An external infrared or Bluetooth keyboard

The current models for classroom use that would best support teaching and learning, and meet or exceed the above specifications, are the Palm® Lifedrive™, a handheld computer with a 4GB hard drive; the HP iPAQ rx3715, a multimedia powerhouse with 152MB of internal memory; and the Dell Axim x50, a high-end handheld computer with enough memory storage for hundreds of programs.

As a piece of hardware, the handheld computer has advantages over the laptop or desktop computer. It has a longer battery life. It turns on and off immediately, thus allowing students and teacher to work more efficiently. The various connections (Bluetooth, wireless and infrared) allow the students to easily share data and collaborate. And, most importantly, it allows students to be mobile. The handheld computer becomes another treasured personal portable device that is carried at all times and can even replace some of the student's existing devices, such as portable music and video players.

Hundreds of software programs are available for the handheld computer in virtually every subject area. Teachers can easily embed these devices into their teaching to improve student learning. Wesley Fryer, in an article entitled "Competing Visions of Handheld Computer Use in the Classroom," (see <http://www.wtvi.com/teks/>) discusses the use of

handheld computers to support sound teaching and learning principles. He outlines how available commercial software can individually track student progress via handhelds, thus allowing differentiated instruction strategies to be implemented when necessary and formative assessments to become more frequent. Mr. Fryer also offers examples of authentic, engaging activities that use technology throughout the curriculum.

"The handheld computer becomes another treasured personal portable device that is carried at all times, and can even replace some of the student's existing devices."

As well as commercial software that traditionally has a desktop component for record-keeping, free and low-cost software options are available for students to keep records. In addition, many useful programs are packaged with handheld computers. A typical student's handheld computer might include the following:

- A full-fledged word processing, spreadsheet and presentation suite that interfaces with the desktop computer
- A built-in handheld browser for accessing information on the Web
- An audio player to listen to music and podcasts
- An e-mail program for peer communication and contributing to blogs
- A voice recorder for "taping" notes as well as creating audio tracks
- A media player for viewing video, Macromedia Flash and photographs
- A program for keeping track of homework assignments and projects that interfaces with the built-in

calendar on the handheld computer

- A database of books to read or keep track of for research assignments that can easily be shared with others via infrared "beaming"
- A Bluetooth-based collaborative discussion tool and interactive whiteboard to allow students to work easily in cooperative learning groups
- An e-book reader to allow both purchased books and teacher-created texts to be read, searched, bookmarked and notated
- A handy conversion program to allow access to over 40 conversion topics such as volume, weight and measurement
- Various software programs to support specific areas of the curriculum, such as a tangram set, an abacus, a Roman numeral calculator, a price inflation database, an interactive chart of the night skies, a dictionary, an interactive periodic table, a survey collection tool, an animation drawing program and a concept-mapping program

With the handheld computer as the personal portable device of choice in classrooms, with the positive impact of equal access to resources by all students in a one-to-one initiative, and with the creative minds of teachers and students coming together to explore new ways to use these low-cost devices, the transparent infusion of technology throughout the curriculum can become a reality.

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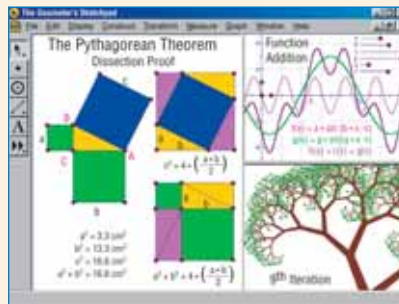
by Cara Erenben

Tools for Schools

Digital resources for the interactive classroom

Sketchpad adds up to learning

Teachers can enhance their geometry, algebra, trigonometry, precalculus and calculus lessons with the Geometer's Sketchpad Version 4, a mathematics software program from Key Curriculum Press. Ideal for middle school to college-level mathematics students, Sketchpad helps students explore, understand and visualize the mathematic properties of calculations and functions in full color. Sketchpad works well on an interactive whiteboard, with one or two classroom computers, or in a computer lab. The software's tools include plotting, graphing, trans-



formation, animations and more. The Geometer's Sketchpad Version 4 costs US\$119.95 for a single license and US\$1,299.95 for an unlimited-user school site license. Go to www.keypress.com/sketchpad

Journey to adventure

An interactive whiteboard offers students participating in JASON Expeditions a front-row seat to some of science's most amazing discoveries. The Jason Foundation for Education regularly invites middle school classrooms to become part of a virtual research community, accompanying

genuine researchers in real-time as they explore oceans, rainforests, Polar Regions and volcanoes. Working with renowned partner organizations such as NASA, and with Dr. Robert Ballard and a team of scientists, students can conduct investigations and unravel the mysteries of Mars, disappearing wetlands, humpback whales and more. Every expedition includes lessons, articles, videos, live interaction with scientists and hands-on activities. Viewing the satellite feeds or streaming video on the large screen of an interactive whiteboard enhances the experience. Expeditions and broadcast times vary throughout the year. Check the website for more details. A subscription to the *JASON Expedition: Mysteries of Earth and Mars* for 2005–06 cost US\$339.

Go to www.jason.org



Discover on-demand video

Discovery Education's video-on-demand service, unitedstreaming, is a hassle-free way to show movies in classrooms equipped with interactive whiteboards. Award-winning content such as the *Jeff Corwin Experience* and *Greatest Discoveries with Bill Nye* can be piped directly onto the whiteboard via the Internet. No longer will teachers need to order videos from the library or book television carts and projectors. Instead, a simple word search lets



teachers quickly find content to enhance their lessons. At unitedstreaming, there are more than 40,000 video clips tagged by content-matter, grade level and state standards in subjects ranging from social studies to science. In addition, unitedstreaming makes teachers' jobs easier by highlighting relevant and timely videos and lesson plans each week. An annual site license to unitedstreaming costs US\$995 per K–8 buildings and US\$1,495 per high school. Free 30-day trials are available at the website.

Go to www.unitedstreaming.com

by Colleen Seto

New SMART Board

The 600 series offers larger sizes and new accessories



The 600 series offers brand new features and functionality but keeps all the basics that users know and love.

After years of shipping the world's most widely used interactive whiteboard, SMART has recently launched a new version of its award-winning product. The SMART Board 600 series interactive whiteboard is the next-generation interactive whiteboard with larger screen sizes, sophisticated styling, an easily accessed Help button, a hardware expansion slot and new accessories. What hasn't changed is the range of features and functions that SMART Board interactive whiteboard users know and love, like finger-touch control, the SMART Pen Tray and the easy-to-use software.

"The 600 series has been redesigned with the latest technology in mind and delivers added functionality while maintaining SMART's established user experience," affirms Robert Abbott, product line manager. "We feel that it achieves the best possible balance of

features and usability, and, when used with SMART Board software, is hands-down the best interactive whiteboard solution available."

The 600 series is the culmination of many years of research, customer feedback and product development. To better meet the needs of its customers, SMART implemented three main enhancements. The 600 series offers larger board sizes – up to 77" (195.6 cm) – to address the needs of larger classrooms, a stylish new look and a pen tray that makes access to basic functions such as the Help button easier and quicker. The pen tray is also equipped with an expansion slot to give the product more flexibility and address the issue of hardware upgrades.

"The expansion slot allows the hardware to evolve over time, much like our software does," explains Abbott. "SMART Board interactive whiteboard

users can rest assured knowing that the product they buy today will keep its value as other technologies and content change." The slot will house features such as a USB hub as well as room to add new accessories. The first accessory available for the expansion slot is the SystemOn button, which starts the computer, projector and SMART Board interactive whiteboard with a single button press.

The ability to expand the hardware over time without having to purchase an entirely new model is especially important to educators, who cannot afford to simply replace their technology products every few years.

The updated look isn't just for aesthetics either. The 600 series features less obtrusive bezels, and there is also a more durable writing surface that reduces glare, but it is still easy and fun to touch and write on.

"The last generation of front-projection models has been shipping for five years, and it was time for a redesign to make the product more visually appealing and to incorporate many of the improvements that our users have suggested," says Abbott.

SMART has taken many of the individual ideas for improvement, and collectively addressed them with the 600 series. This latest model also simplifies mounting, and provides a new Help button and several optional accessories, such as an improved floor stand, new speakers and an enhanced wireless module.

Ultimately, the new 600 series is a natural step forward for a product that is constantly striving to make the classroom more engaging and interactive for teachers and students.

by Wendy McMahon

Q&A: Teacher of the Year

New tools help solve old problems in teaching and learning



Jason Kamras, U.S. National Teacher of the Year

With a bachelor's degree from Princeton and a master's from Harvard, Jason Kamras had a host of career paths he could have followed, but rather than chase power and a high income, Kamras chose to become a math teacher.

His decision was a result of the two years Kamras spent working for Teach for America, a national, nonprofit organization that recruits leading university graduates to teach for two years at inner city or rural schools in poor communities, where it's difficult to fill teaching positions.

Kamras spent his two years teaching at John Philip Sousa Middle School, an inner city school in a low-income area of Washington. He quickly saw that his students, and many others from low-income areas throughout the United States, don't have access to a high quality education and are being denied learning

opportunities because of where they live. He felt the best way to address these inequities was by becoming a teacher.

For eight years Kamras has continued to teach at Sousa. But he does more than teach. He develops a connection with students and their families in an effort to bring education into their entire lives. He takes the time to get to know students outside the classroom by going to chess tournaments and basketball games, and getting to know students' families by making home visits.

His approach works. Kamras has had major successes at Sousa, including initiating major improvements in student achievement in math. He worked with his principal to double the amount of instructional time students received in math, redesigned the curriculum to put math in a real-world context and increased the use of technology in math classes. In one year, the percentage of students scoring below basic on the Stanford 9 test dramatically decreased.

For these achievements and his devotion to his students, Kamras was named 2005 National Teacher of the Year this past April.

Kamras knows from experience that technology has its place in the classroom. His classroom is equipped with a computer, an LCD projector, an opaque projector, e-instruction software and a SMART Board interactive whiteboard. But he also understands the fine balance between treating technology as a tool to enhance learning and treating it as a universal answer to problems in education.

i.e. asked Kamras to share his thoughts on the importance of technology in the classroom and how schools and teachers can use technology more effectively.

Q: Why do you use technology in your classroom?

A: I've found that many children need to *see* something in mathematics to fully understand it. Whether it's demonstrating an algorithm or fractions, using a visual technique or doing geometry – being able to project that type of information and show it to students visually is much more compelling to them. I also think technology just has inherent value. It can really be of great use pedagogically. So being familiar and comfortable with technology in school is going to help students learn and achieve throughout the rest of their academic careers.

Q: How receptive have your students been to technology?

A: I think in general they're really receptive. Most of my students don't have computers at home. Probably only about 10 to 15 percent do. They haven't had a lot of experience with computers and software and that sort of thing. That's one of the reasons I think it's so important in school, particularly in low-income communities, to give students that access and give them the opportunity to learn to use technology.

Q: What role did technology play in your success with increasing math achievement at your school?

A: I don't want to suggest that it was strictly the technology which did everything. But technology in concert with some other things really led to some dramatic gains. Students in years past had been performing at below 80 percent of the basic level on our standardized assessment test. When I developed this new math program, of which technology was an important part, we cut that number in half in just one year – students came down to under 40 percent. We're now working to get that down to zero percent and expanding the program to the entire school.

Q: Is technology changing the way teachers teach and students learn?

A: I'm hoping that it will change the way teachers teach. And in doing so, better meet the needs of students. I'm not sure that students suddenly learn differently. I just think what technology will allow us to do better meets the way students actually learn.

Q: Should teachers rely on themselves or their schools for technology training?

A: I think it's both. As a teacher and a professional you have an obligation to be the best teacher that you can for your students. That means keeping yourself abreast of the latest tools and techniques. I also think it's the



Jason Kamras' efforts to develop connections with his students works. Among other things, his approach has led to major gains in student achievement in math.

responsibility of the school system and the school to make sure there is robust training for quality use of technology in the classroom.

Q: What's the best way for teachers to learn more about using technology in the classroom?

A: The best way to teach is to show. So give teachers the opportunity to observe other teachers who are using technology in actual settings with actual students in similar environments to those in which they teach. That's the most compelling way to bring teachers around to this idea that technology can be a very powerful tool for them in class. Schools then need to back that up with training so teachers can take what they see and use it in their own classroom.

Q: Do you see any downsides to having technology in the classroom?

A: Sometimes in education people run to certain things as the panacea for all education problems. I think sometimes people run to technology for that. Technology can be a very effective tool in the hands of a good teacher. But at the end of the day, it's just machinery that needs to be used in a thoughtful and creative way. We spend a lot of money buying technology and it ends up sitting in classrooms or being used to a limited extent. So I see the next frontier for technology being that training piece – really getting beyond writing a paper on a computer or doing a simple addition and subtraction math game on a computer and really getting at the heart of what it can do in a classroom.

Online Library

Web resources for the interactive educator

Science

Backyard Jungle

www.backyardjungle.org

Explore this excellent tool for teaching students about the flora and fauna in local communities. Students and teachers can load photos, drawings and descriptions about their natural surroundings.

Secondary

ISAW - Interactive Science Activities on the Web

www.bridgewater.edu/departments/physics/ISAW

Try out the free activities about interactive visualizations of scientific concepts. While designed primarily for high school and college students, this website is a terrific resource for anyone interested in science.

Secondary

Neuroscience for Kids

faculty.washington.edu/chudler/neurok.html

Explore the nervous system in this detailed website that includes many activities, experiments, articles, research and other resources.

Elementary

EcoKids

www.ecokidsonline.com/pub/index.cfm

Learn about the environment through interactive, educational games and activities on this award-winning website that encourages learners to form opinions and get involved.

Elementary

Language Arts

Dr. Seuss WebQuest

www.harwich.edu/depts/lmcelm/seussqst.htm

Discover the world of Dr. Seuss. This website offers links to sites where students can listen to songs, play games and work through challenging puzzles.

Elementary (second grade)

Online Poetry Classroom

www.onlinepoetryclassroom.org

Visit forums where teachers can share ideas, seek help from colleagues and explore curriculum units, lesson plans, biographies of hundreds of poets and nearly two thousand poems.

Secondary

The Neverending Tale

www.coder.com/creations/tale

Check out this choose-your-own-path story site where readers can add to stories, which encourages independent learning of reading and writing.

Elementary/Secondary

Reading is Fundamental (RIF)

www.rif.org/educators/activities/online.msp

Take your class on a reading adventure and access fun activities, lesson plans, articles and Web resources.

Secondary

Math

AAAMath.com

www.aaamath.com

Access hundreds of pages to enhance math skills with interactive practice for every kind of math problem. This is a great resource with basic teacher resources and challenging math games for students.

Elementary/Secondary

Aplusmath.com

www.aplusmath.com/

Check out this online resource designed to help students improve their math skills interactively with the use of flashcards, worksheets, puzzles and a game room.

Elementary

ArithmAttack

www.dep.anl.gov/aattack.htm

Download the free ArithmAttack program and test your math skills with these computer-generated arithmetic problems.

Elementary/Secondary

CoolMath.com

www.coolmath.com/

Explore a world of math where difficult problems can be fun and discover hundreds of resources, exercises and an amusement park devoted exclusively to math.

Secondary

NCTM: Illuminations

www.illuminations.nctm.org

Explore the future of math in schools with this website's extensive listing of lessons, standards, tools and Web resources compiled by the National Council of Teachers of Mathematics.

Elementary/Secondary

Mrs. Glosser's Math Goodies

www.mathgoodies.com

Check out this free math help site featuring interactive lessons, puzzles and worksheets. This site has provided free homework help since 1999 with over 400 activities for parents, students and teachers.

Elementary/Secondary

Cross-Curricular

AOL@School

school.aol.com

Explore this resource that provides educator-reviewed classroom resources for K-12 students and teachers. You will quickly find activities, research materials, multimedia resources and lesson plans for math, science, language arts, social studies and more.

Elementary/Secondary

edHelper.com

www.edhelper.com/

Check out this subscription service website that was created by teachers to offer educational resources, including worksheets, lesson activities, classroom helpers and monthly themes in math, science, language arts and social studies.

Elementary/Secondary



Win an AirLiner™ wireless slate!

All you have to do is tell us about your favorite digital resources. Send your responses with your name and contact information to ieeditor@smarttech.com by January 9th, 2006. Please include information about how you came across the resource (e.g., school board or colleague recommended) and who produces the resource.

For more information about SMART's AirLiner wireless slate, visit www.smarttech.com/airliner

5 lucky winners will receive their very own AirLiner wireless slate.

In 250 words or less, describe your favorite website, CD-ROM, software or other digital resource, and explain why you like it. Does it provide you with the latest information about education technology? Does it model best practices? Does it enhance your teaching so you can be more effective in the classroom? What do your students say about it?

Send your favorites to ieeditor@smarttech.com by January 9th, 2006. One entry per person please.

About AirLiner wireless slate

Interact wirelessly with your SMART Board interactive whiteboard or Sympodium interactive pen display from 52 feet (16 m) away. The battery-free tethered pen lets you control any software application, write notes and highlight information in digital ink.

EDUCATION BY THE NUMBERS

by Colleen Seto



Percentage of school leaders who reported that their **technology budgets have been unchanged or reduced** in the past three years: **62**

Percentage of districts that **do not consider** or use **ROI calculations** to **buy or evaluate** the effectiveness of **technology**: **66**

Percentage of school leaders from large districts who report problems with **district leadership** viewing technology as an **add-on** rather than as **essential to instruction**: **37**

Percentage of school leaders who believe **technology motivates students** and **provides** them with important **life skills**: **68**

Percentage of U.S. **fourth-grade** students tested scoring **proficient in reading** in 2004: **31**
(same percentage as in 2003)

Percentage of U.S. **fourth-grade** students scoring **proficient in math**: **36**
(compared to 32 percent in 2003)

Percentage of school leaders who **believe technology helps raise** student **test scores**: **41**

Percentage of U.S. **eighth-grade** students scoring **proficient in reading** in 2004: **31**
(compared to 32 percent in 2003)

Percentage of U.S. **fourth-grade black** students **performing below basic**: **40**
(compared to 46 percent in 2003)



Number of U.S. school districts that will receive fewer Title I funds than they did last year: **8,800**

Number of U.S. schools that will gain in Title I funding: **4,400**

Percentage increase in Title I grant funds for U.S. districts in 2005: **3**

Percentage increase in the number of U.S. children in poverty: **6**

Sources: "Digital Leadership Divide" by CoSN and Grunwald Associates, 2004. "Bush Education Law Shows Mixed Results in First Test" by *The New York Times*, October 2005. "Title I Funds 2005-06 Update" by the Center on Education Policy, July 2005.



Get the easily digestible cure for technology headaches

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Good to grow



The new SMART Board™ 600 series interactive whiteboard

As educators like you work to integrate technology, digital content and pedagogy, schools are recognizing the value of SMART Board interactive whiteboards in the classroom. Students can use them to grow ideas through brainstorming, researching and collaborating on projects. You can use them to grow the skills and knowledge you need to encourage inquiry-based learning with digital content.

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