Get their attention and keep it

Marzano’s Building Engaged Schools Institutes 2012
Houston, TX | April 12–13
Charleston, SC | October 11–12

My students are...

A B C

Bored Distracted Disinterested

All of the above
Integrate technology into every subject with easy, affordable ReallyEasyData probeware.

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FEATURES

Infographics
More Than Words Can Say
Jane Krauss

As the old adage goes, a picture is worth a thousand words, and pictures can be essential when complex relationships are difficult to convey with words alone. Develop your students’ critical-thinking skills by teaching them to interpret and create infographics.

Teach Your Students to Fail Better with Design Thinking
Christian Long

Design thinking combines collaboration, systems thinking, and a balance of creative and analytical habits. And it just might help your students make the world a better place.

Give Your Old-School Curriculum a NETS Makeover
Jen LaMaster

Integrating digital age technology into an industrial age educational system is hard enough. Imagine introducing ed tech to a 450-year-old Jesuit educational paradigm. Find out how to seamlessly combine the NETS with a centuries-old framework to create an effective ed tech strategic plan.
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Communication and Collaboration in the Digital Age

By Anita McAnear

Anita McAnear is L&L’s acquisitions editor and national program chair for ISTE’s conference and exposition. A former middle school math and language arts teacher, McAnear has been with ISTE since 1983.

What does communication and collaboration mean in the digital age? We have so many ways to communicate with other people that I find myself constantly thinking about the best way to reach a particular person or group. Should I email, text, tweet, Facebook message, Skype, or send a meeting request? I know if I want to hear back from my younger daughter that I had better text her. When should I just pick up the phone and call or get up and walk over to someone’s desk?

The same is true for collaboration tools. We have Google Docs, wikis, Ning groups, Facebook, Google+, and numerous other tools to choose from. In this issue, Shelly Terrell discusses how to embed free widgets and tools to turn your wiki into a virtual classroom where students can contribute from anywhere with an internet connection and in the medium of their choice (see page 34).

Video is one of many powerful media for students to share their learning. Shooting and editing video files or combining still images and adding voiceovers is fast becoming a required skill for many jobs. Author Laurie Campbell provides many ideas for getting young students started by using the video cameras on mobile devices, such as iPods. She covers all the curriculum areas and provides implementation tips on page 30.

Tasha Candela asked students in her web design class to create a website from scratch for a local bowling alley. Much like the real world, students collaborated in pairs to develop concepts, put their site-building skills to work, and present a finalized website to the owner of the lanes. Creating collaborative opportunities like this is the hallmark of the teaching profession and a great way to build communication skills (see page 40).

An infographic is another interesting medium that can help students communicate the results of investigations or answers to questions, especially questions that lead to data sets. Jane Krauss explains what infographics are, how they relate to standards, and how to teach them (see page 10). Creating infographics gives students a chance to grapple with data and figure out the best way to communicate the story that the data tells. L&L’s editors and art director had fun figuring out how to use infographics to tell this story. Communication and collaboration was key to coming up with innovative ways to illustrate Krauss’ ideas and concepts using compelling visual elements.

Having so many available tools forces us to pause for some critical thinking about how to achieve effective communication and collaboration. You have to know your tools, fellow collaborators, and audience, and you have to match your resources to the task and team.

The digital age has provided us with great tools, but modern times have also ushered in complex problems. Giving students the skills they need to tackle these problems is crucial. Design thinking is a great framework for engaging students in the development of these skills. Author Christian Long describes this framework and how he uses it to “challenge students to become agile thinkers and collaborators in an effort to solve meaningful problems anchored in authentic experience” (see page 16).
Is BYOD the Answer to Our Problems or the Worst Idea Ever?

Is it the worst idea of the 21st century or a concept that will bring more connectivity to our schools? "Bring your own device" (BYOD) is the notion that schools should expect students to use their own computing tools—smartphones and the like—in class. The idea has prompted a vigorous debate among ed tech bloggers.

On the face of it, it seems simple. If we let every kid with a smartphone bring the device to school, more kids will have access to the internet. No more excuses about budget constraints preventing access. No more digital divide, right?

Not so fast, says Gary Stager in his post "BYOD—Worst Idea of the 21st Century" (http://stager.tv/blog/?p=2397). Stager thinks that expecting students to use their own devices in schools will actually widen the digital divide because some students will have much better devices than others, and some will get the school hand-me-downs. He also says that BYOD increases teacher anxiety and diminishes the potential of educational computing to the weakest device in the room. (You can read his arguments in Point/Counterpoint on pages 6–7.) Stager says:

Education must not be viewed as some competitive, commercial, “every man for himself” enterprise that relies on children to find loose change behind the sofa cushions. Democracy and a high-quality educational system require adequate funding.

Stager’s post drew more than 50 comments, some in agreement and others taking issue with his arguments, such as this one from a commenter named Dylan:

BYOD is the future (like it or not) largely because schools lack the resources (money) and some lack the knowledge to successfully implement 1:1 technology. BYOD allows collaboration, sharing of resources, and mirrors the outside world. Tough reality out there, but some people drive a Mercedes and some drive Fords.

Other commenters sided with Stager:

Can you imagine the possibility of 25 students walking into a classroom with what could amount to 25 different devices and not knowing or having the ability to be able to troubleshoot all the different devices? With a teacher afraid of computers? —Angie

Nothing wrong with kids using extra devices if they have them, but if we want kids to actually use tech in a meaningful way, we should provide it.—Chris Lehmann

Stager’s arguments contrasted sharply with the opinions of another prominent ed tech blogger, Lisa Nielsen. In her post "Ideas for Bringing Your Own Device (BYOD) Even If You Are Poor" on The innovative Educator blog (http://tinyurl.com/5s94y79), she wrote:

While I believe schools should be wired places where community members can access the internet, I do not believe all students need the same tool nor do I believe all students need the government to provide them with the learning tools they deem best. When we shift our thinking from demanding the government provides one-size-fits-some solutions and move it to let’s empower families to take ownership of securing tools for their learning, change can happen.

Nielsen’s post also drew responses from both sides. One commenter, who goes by the screen name Realist… sorry, wrote:

hmm, I’m sure the poor will love eating the scraps thrown from the table. I’m sure you’d loooove the rest of the class to snicker at your out-dated this or that. School reform or school deform?

But a commenter who goes by Mr. C. backed Nielsen:

The key is in cell phones. Figure out how many kids have them. It is my view that that number will be overwhelming. Then remove the ban! What can a teacher do? Try “If you have a connectable device, take it out and connect it.”

Like all good debates, both sides make valid points. But what would happen if we refused the sucker’s choice of assuming that BYOD is an either/or proposition and tried to find a solution that suits both sides?

Diana Fingal is the senior editor for L&L. She has been writing for and editing periodicals for more than 20 years.
Yes

On a recent Friday, I was trying to activate 27 seniors into our AMDG.brebeuf.org Google Apps for Education domain. The laptop cart was short by five computers, and the access point had crashed, so the only wireless signal came from down the hall. In the past, this would have ended the activity right then and there. But this time, it wasn’t a problem. Many students simply pulled out their own smartphones and went to work. Those without phones teamed up with their neighbors. By the end of the period, all 27 students were working on their assignments collaboratively on personal devices. And they had done exactly what we educators always dream of:

They assessed their learning needs and found the right tools to satisfy those needs without adult intervention.

Marc Prensky wrote about nouns and verbs in technology integration. He said it's not what we use to complete the task (the noun) that matters, but how we construct the learning objective and present...
the mastery (the verbs). The devices (nouns) the students carry are often more powerful, personalized, and efficient at accomplishing what the teachers want them to demonstrate (verbs) than the computers that their schools own. Ideally, the students create their own verbs, constructing education in ways that are meaningful to them. And the limited resources of every school can be used instead to acquire the latest technologies for students who lack the means to provide their own. Isn’t this a much better use of resources than buying dozens of low-bid-winning, underpowered devices that students, teachers, and techs all agree are shaky, slow, and unable to meet anyone’s needs?

Allowing students to use their personal devices in the classroom is imperative in a world full of ever-changing technology. Our students are remarkably adept at discerning the right devices for their needs. Because contain microprocessors and batteries, but as of today, their functionality is quite different.

We should not make important educational decisions based on price. A mentor told me that basing important educational decisions on price is immoral, ineffective, and imprudent. Doing the right thing is a matter of priorities and leadership, not price point.

BYOD narrows the learning process to information access and chat. Information access, note taking, and communication represent the tiniest fraction of what it means to learn. Looking up the answers to someone else’s questions online to type an essay or make a PowerPoint reinforces the status quo while failing to unlock the opportunities that computational thinking provides.

BYOD increases teacher anxiety. Schools have largely failed to inspire teachers to use computers in even pedestrian ways after three decades of trying. A cornucopia of devices in the classroom will only amplify their anxiety and reduce use.

BYOD diminishes the otherwise enormous potential of educational computing to the weakest device in the room. The computer is an intellectual laboratory and vehicle for self-expression that makes it possible for children to learn and do things in ways unthinkable just a few years ago. We impair such empowerment when we limit educational practice to the functionality of the least powerful device.

BYOD contributes to the growing narrative that education is not worthy of investment. We reap what we sow. If we placate those who slash budgets by making unreasonable compromises at the expense of children, we will find ever fewer resources down the road. We must not view education as some “every man for himself” enterprise that relies on children to find loose change behind the sofa cushions. Democracy and a high-quality educational system require adequate funding.

Check out the new Macbook Pro, iPhone, iPad, and high-def video camera carried by the tech coordinator who decided that students should be happy with whatever hand-me-down devices he can scrounge up. The message here is: “Let them eat cell phones!”

It takes chutzpah to ask a school to buy something for every student. You better make sure you ask for the right device. Kids need a computer capable of doing anything you imagine they should be able to do, with plenty of room for growth and childlike ingenuity.

Our students are remarkably adept at discerning the right devices for their needs.

The only way to guarantee equitable educational experiences is for each student to have access to the same materials and learning opportunities.
READERS respond

POLL RESULTS

Should students use their own devices in the classroom?
Most respondents believe that “bring your own device” (BYOD) is a solution whose time has come.

BYOD Is Not to Blame
As districts struggle to meet the challenge of unfunded mandates with shrinking budgets, it makes sense to explore ways to maximize return on technology investment and leverage the potential of all available technology to transform teaching and learning. While opponents argue that mobile technologies contribute to student distraction and facilitate cheating, the truth is that distraction occurs when students lack meaningful, relevant interaction with content, and cheating is greatly diminished when assessments require students to apply what they have learned to solve complex, real-world problems.

Jeannie Galindo
Supervisor of Instructional Technology
Bradenton, Florida, USA

Three BYOD Benefits
First, students could become more engaged in academics because their favorite toys are linked to what they do in school. The portable nature of these devices means students can extend their learning activities beyond the classroom. Second, additional technology assets would benefit classrooms where such assets are lacking. Students could take pictures/videos, record notes, communicate with group members, or measure objects while away from school. Third, it’s an opportunity to link students’ lives with the content they study. Why create the false impression that technology tools are for personal and social use only?

Gregory Sucre
Project Coordinator, ALEC
Pikesville, Maryland, USA

Tech Support Reality Check
For an IT department to effectively support students, devices need the best warranties available to protect against defects and damage. Devices need to be insured to ensure they can be replaced in the event of loss or theft. Parts, supplies, and hot-swap replacement units should be on hand so equipment is down only temporarily. When students and their families are responsible for acquiring equipment, corners will be cut, and every configuration will be different. Repair work on laptops can be lengthy and costly and would lead to excuses for missing work rather than the productivity expected from a one-to-one program.

Mark Petit
Systems Administrator
Phoenix, Arizona, USA

Pay Attention!
Not long ago, computers in the classroom were seen as giving students too much freedom to get themselves into trouble. Teachers were concerned about keeping track of what students were viewing on their monitors. How did we overcome this perceived obstacle? We taught our students procedures and expectations. We signed acceptable use contracts. We explained our expectations for proper computer usage. We hammered in the consequences of what would happen if someone decided to abuse this privilege. We did what good teachers do—we were aware of what was happening in our classrooms.

Cherona D. Hicklin
Assistant Professor
Joplin, Missouri, USA

Give Them Their Freedom
Every day in school, students must “forget” about the information control and functionality their phones give them to browse, research, monitor, network, shop, and entertain. While they might view a photo just posted to Facebook from a friend’s mobile as the catalyst to a conversation, their teacher considers it a distraction from learning. But curating all their web content and interactions doesn’t teach them responsible use, it just sequesters them behind a firewall.

“Suspicion invites treachery.”—Voltaire

Peter Pappas
Educational Consultant
Portland, Oregon, USA

You Can’t Cheat at Critical Thinking
You can’t provide a 21st century education without using 21st century tools. When I first began my teaching career, I taught my students how to enter a three-line BASIC program to check their answers to their math problems. “How do you know the students aren’t going to cheat?” parents asked. “Well, that’s not the point,” I said. Through the use of this new piece of technology, all of my students had the opportunity to apply problem-solving skills, critical-thinking skills, collaboration skills, and self-assessment, leading to improved self-confidence and a lifelong love for learning. How do you cheat at that?

Robert Stackpole
Technology Coordinator
Waterboro, Maine, USA

L&L wants your opinion! Send comments to letters@iste.org. Participate in our reader poll at iste.org/LL.
Knezek Appointed to UNESCO Tech Board

ISTE CEO Don Knezek has been appointed to the 11-member governing board of UNESCO’s Institute for Information Technologies in Education (IITE), located in Moscow, Russia Federation. He was appointed by the director-general of UNESCO, the United Nations Educational, Scientific and Cultural Organization.

IITE provides countries with expert and technical support in the realm of educational technology, supports educational planning and policy implementation as it relates to information communication technology in education, and develops course and training materials for educators at all levels.

Free Webinar Archive Now Available

ISTE members can now download a free webinar about cloud computing.

Mike Silverton from Cilaire Elementary School in Nanaimo, British Columbia, Canada, presents tips and tricks for introducing collaborative teaching using cloud-based online tools, such as Moodle and Twitter. Viewers will learn how to build a personal learning network, create online literature circles, develop collaborative projects with wikis, and support curriculum with interactive games.

The archived webinar was a joint project between ISTE and HP. View the webinar at http://youtu.be/u83wIHKbXYg.

2012 ISTE Awards Deadline Approaches

If you haven’t yet nominated yourself or someone you admire for an ISTE award, time is running out. Nominations close March 1.

Each year ISTE recognizes outstanding individuals who, through their exceptional work and achievements, have made a significant impact on the field of educational technology. These nine prestigious awards strive for the highest degree of excellence in several categories, and winners are recognized each year at ISTE’s annual conference and exposition.

Award winners receive complimentary ISTE standard memberships, registrations for ISTE 2012 in San Diego, and other prizes, which may include travel stipends and cash awards. For more information, go to iste.org/awards.

Newest ISTE Affiliate Is in Philippines

The Coalition for Better Education (CBE), based in Cebu City, Philippines, is ISTE’s newest affiliate. CBE is made up of members representing students, parents, governments, educational institutions, nongovernmental organizations, and businesses. Its mission is to create empowered learning communities.

Affiliates are like-minded organizations around the world that advance the ISTE mission in local, regional, national, and global arenas. There are 78 ISTE affiliates in five countries.

ISTE Launches Online PD Courses

ISTE has launched several online professional development courses, all of which embed the NETS.

- The NETS Leadership Academy is a series of three six-week facilitated courses introducing educators to the NETS and explaining how to bring them into the classroom.
- Edutrek: Project Based Learning is a series of three six-week courses that aim to teach educators how to design and implement project-based learning experiences.
- Digital Storytelling is a facilitated eight-week course on creating digital stories.
- Universal Design for Learning is a six-week course that will help teachers differentiate instruction for their students.

In addition to the facilitated courses, ISTE is offering self-paced courses on digital citizenship, project-based learning, and web 2.0.

For more information, visit http://tinyurl.com/7jct3rv.
More Than Words Can Say

Infographics

Good learning experiences ask students to investigate and make sense of the world. While there are many ways to do this, K–12 curriculum has traditionally skewed toward reading and writing to interpret and express students’ sense-making. But there is another way. Infographics represent data and ideas visually, in pictures, engaging more parts of the brain to look at a problem from more than one angle.

Infographics ask for an active response from the viewer, raising the questions, “What am I seeing?” and “What does it mean?” As the old adage goes, a picture is worth 1,000 words, and pictures can be essential when complexity demands more than words can say.

Meet the Standards

The NETS for Students address skill sets that include the interpretation and creation of infographics. The NETS’ Creativity and Innovation indicators include creating original works and using models, its Communication and Collaboration indicators speak to communicating information and ideas using a variety of media, and the Research and Information Fluency section refers to processing data and reporting results using a variety of tools.

iste.org/standards/nets-students

The “anchor standards” in the Common Core State Standards define college and career readiness, in part, as the ability to “integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.”

www.corestandards.org
Boost Comprehension

Robert Marzano
www.marzaroresearch.com

Education researcher Robert Marzano confirmed that learners acquire and store knowledge through linguistic systems, which they use when they read or listen to lectures, and nonlinguistic systems, which they tap to process computer simulations and kinesthetic activities. The more students use both systems, the better they are able to store, recall, and apply new understandings.

Teach Computational Thinking

Much of the mental processing that goes into the development of infographics has parallels in computational thinking (CT), the thinking patterns that computer scientists use to solve problems. CT skills have value beyond computer science, as they help us approach problems and apply processes to solve them. CT can help students practice with data sets of any size, manipulate that data, and represent it in an infographic. For example, students can collect statistics about their friends’ Facebook connections, analyze the data, and present their findings graphically.

Recent technological advances have led to an explosion of available data, allowing students and teachers to access a much wider variety of real-time statistics on such topics as weather patterns, deforestation, and population movements.

CT is essential for working with these large data sets and creating infographics to help analyze them. Imagine how your students might use CT skills to collect, process, and render raw data into infographics, with or without the aid of computer programs.

For more information about computational thinking, visit iste.org/computational-thinking.
Does your curriculum ask students to engage in analysis and interpretation to derive meaning? You can use infographics as a tool for developing these capabilities in your students, both when they interpret the graphics and when they create them.

**Interpret**
- Present infographics that ask students to make sense of dynamic systems, relational data, or change over time.
- To build their critical faculties, present both good and bad charts, graphs, and infographics for students to examine.
- Part of information literacy is being alert to the intentions of the person or group that puts forth the information. Help students determine whether statistics reflect value judgments, are presented in a distorted scale, or lie in other ways.

**Create**
- By making infographics, students learn that the ways they represent data are as important as the data they collect.
- Students learn how to make sense of statistical data by representing the important features of a data set and the relationships between data sets.
- Teach students that in the pictorial “narratives” of their infographics, the data have to be valid, and the representation has to be true.

**Introduce Infographics**
Ask your students to pretend they work for the Utah tourism bureau. Their charge is to design a promotional poster that will convince visitors that Utah’s slogan, “The Greatest Snow on Earth,” is true. Let them talk to one another and noodle around a bit with sketches.

Share Michael Greenberg’s Ski Utah infographic. Display an enlarged view from his Graph the Info blog at www.graphthe.info.

Ask students what they learned about skiing in Utah from Greenberg’s pictorial representation. Encourage them to examine the legend, which describes an unusual representation of area. Ask what they can infer about the mountains that may get the most and least business. Ask them to make conjectures about how many data sets the infographic represents and how Greenberg derived them.

Ask how they could represent other data of interest to someone contemplating a Utah ski vacation, such as the distance from the airport or winter temperatures.

Together, read what Greenberg writes on his blog about the five-step process he used to create the Ski Utah infographic.

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Research has shown that, of the sensory receptors in our body, 70% reside in our eyes.
Solve a Problem

A middle school class is studying livability in their town. After a student’s grandmother breaks her hip on a broken sidewalk, a project emerges that asks students to respond to the question: “Can everyone get where they need to go?”

Students notice that many sidewalks are broken, making them impassable for people using strollers, wheelchairs, walkers, and canes. They notice that trash cans and cars block bike lanes. They begin to survey their neighborhoods, recording their neighbors’ mobility challenges and identifying the worst impediments.

Imagine the data they can collect. How might they present their information pictorially to tell a story and make the case for resolving these problems? What might their infographic look like? Who might the audience be for a persuasive appeal that incorporates the infographic?

Government Function

In Diana Laufenberg’s 12th grade social studies class at the Science Leadership Academy in Philadelphia, Pennsylvania, USA, students learn about U.S. government functions managed by the executive branch. Laufenberg has her students interact with federal functions as anyone might who navigates a bureaucratic process. They “apply” for federal student aid or a green card. They make a request permitted by the Freedom of Information Act. Along the way, they analyze each process, make a pictorial representation of that process, and recommend ways it might be improved. By approaching what they are learning from many different angles—including participating in real-world tasks and creating infographics—their understanding of the myriad ways that citizens interact with the government is much deeper and more memorable than it would be if they had just read about it and written a report.

Tell a story. Supply a context for the information you are trying to present with titles, pictures, a legend, or even a key question, such as, “How well do citizens in our town get around?”

Be clear. If someone can’t tell how different elements contribute, it’s back to the drawing board.

Use good data. Use only “fresh” data from reliable sources. This includes data you may have collected yourself!

Pay attention. As you move through the world, you’ll notice infographics everywhere. Look at each and think about how it might be a launching pad for learning in your classroom. Encourage students to bring infographics to your attention too. As you and your students become infographic literate, you’ll want to start creating infographics of your own.

More Rules

Several sets of guidelines are available to help students represent data accurately and convincingly with infographics:

Atlantic Magazine Online
www.theatlanticwire.com/technology
Search for rules for homemade infographics.

Flowing Data
www.flowingdata.com
Search for simple design rules.

The National Council of Teachers of Mathematics recommends that students at every grade level undertake investigations in which they collect and represent data graphically.

More Lesson Plan Ideas

Imagine students pondering:

- An interactive map showing the percentage of family income that goes toward food in countries around the world
- A visualization of time-travel plots in films and TV
- An infographic that represents the largest bankruptcies in history by showing insolvent companies as sinking ships of relative size

The Oxford English Dictionary added the term infographic in 2011.

Bill Gates felt compelled to fund malaria eradication efforts after seeing a 1997 New York Times infographic about the disease.


The National Council of Teachers of Mathematics recommends that students at every grade level undertake investigations in which they collect and represent data graphically.
Infographic Resources

Good Data Sources
CIESE Real-Time Data Projects:
www.ciese.org/realtimeproj.html
Google Public Data Explorer:
www.google.com/publicdata/home
Jane Krauss’ list of bookmarked infographics:
www.delicious.com/jkrauss/infographics
United Nations Statistics Division:
http://unstats.un.org/unsd/default.htm
Wolfram Alpha Computational Knowledge Engine:
www.wolframalpha.com

Infographic Sources
Cool Infographics: www.coolinfographics.com
Floating Sheep: www.floatingsheep.com
Flowing Data: http://flowingdata.com
GapMinder: www.gapminder.org
GOOD/Transparency: www.good.is
Infographics Showcase: www.infographicsshowcase.com (author grades infographics on information and display qualities)
Information Aesthetics: http://infosthetics.com
Information Is Beautiful: www.informationisbeautiful.net

Tools for Creating Infographics
For Purchase
Adobe InDesign: www.adobe.com/products/indesign.html
Adobe Photoshop: www.adobe.com/products/photoshop.html
Lucid Chart: www.lucidchart.com

Free Online
Google Spreadsheets: www.google.com/google-d-s/spreadsheets
Inkscape: http://inkscape.org
Many Eyes: www-958.ibm.com/software/data/cognos/manyeyes
Rhino 3D: www.rhino3d.com
Science Pipes: http://sciencepipes.org/beta/home
Tableau Public: www.tableausoftware.com/public

On Hand
Graph paper
Presentation software (Powerpoint, Keynote)
Protractors and compasses
Spreadsheet software (Excel, Numbers)

Sources for infographics abound. Make their interpretation one of the regular ways you bring the outside world into your classroom.

Infographics Gurus
For a little infographic inspiration, check out these people:

Edward Tufte (www.edwardtufte.com) has one simple but powerful idea: Represent as much data as possible with as little ornamentation as possible. Let the data speak for itself.

Nathan Yau (http://nathanyau.com) plays with data. His focus is on visualization and data for non-professionals, and he blogs about statistics and visualization at FlowingData (www.flowingdata.com).

David McCandless (www.davidmccandless.com) has a passion for visualizing information—facts, data, ideas, subjects, issues, statistics, and questions—all with a minimum of words. He is interested in how designed information can help people understand the world by revealing its hidden connections, patterns, and stories.

Hans Rosling (www.gapminder.org) uses visualization software he developed to animate observations about broad social and economic trends. A professor of global health at Sweden’s Karolinska Institute, Rosling uses infographics to dispel common myths about the developing world.

Jane Krauss, a past director of professional development at ISTE and co-author of Reinventing Project-Based Learning, is a curriculum and program development consultant. Her new book, The Project Leap, will be published in 2012.
In February, members save 40% on books

Books for Every Educator
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Teach Your Students to Fail Better with Design Thinking

Design thinking combines collaboration, systems thinking, and a balance of creative and analytical habits. And it might just help your students make the world a better place.
I f you were able to create your own classroom for the future, with your choice of resources, furniture, tools, and technology, how would you design it so that your students would be most capable of adapting in an increasingly complex world as a learner, professional, and citizen? And how would you design it so that your students were likely to have the greatest impact on the world around them? I believe this is the driving educational question for all of us in the digital age, and it has been tugging at me with increasing intensity over the past few years as technology has begun to dominate the larger conversation about learning and teaching.

Fail Better
Last spring, I was invited to speak at TEDxOverlake, a learning-focused event held at the Overlake School outside of Seattle, Washington, USA. When the event’s curators asked me what part of education I wanted to speak about, I answered decidedly, “failure.”

In fact, I didn’t want to speak about just the general concept of failure, but I wanted to celebrate the words of Samuel Beckett: “Fail, fail more. Fail better.” And I wanted to do so with an eye toward empowering students to thrive.

At first glance, Beckett’s provocation appears to be counterintuitive. After all, our current system remains predicated on the belief that we should eradicate failure and guarantee that every student “succeed” at all costs. And yet, when we really look at what learning in the digital age is about—fostering multidisciplinary collaboration to solve increasingly complex problems with no clear answers—it seems impossible to imagine that an educational culture built on confirming “right answers” within predictable training scenarios offers our students a viable way forward.

Perhaps in the past when learning outcomes were more static, we needed students to be predictable. Tomorrow, however, we’ll need agility, divergent thinking patterns, and an ability to test ideas in messier ways.

In other words, we need digital age learners to be comfortable with failure. And we need learners who know how to fail better.

From Designing Curriculum to Design Thinking
As a former high school English teacher and longtime experiential education leader, I spent years searching for innovative ways to combine the best of traditional academics with hands-on projects my students accomplished outside the classroom.

My students successfully ran international blogging projects mentored by professional jury members around the world, undertook an 8,000-mile creative writing/research road trip to discover the “real America,” debated literary ideas via Skype with students around the world, created a pop-up black-box theater in the woods behind our school to bring Shakespeare to life, and spoke at national educational technology conferences.

Sometimes these projects were fueled by emerging technologies. Sometimes they were analog in nature. They all, however, had one thing in common: I was ultimately in charge of identifying the problem to be solved. And to be honest, I always struggled with that.

I didn’t struggle because teaching in such circumstances was hard. Quite the contrary, I was amazed by my kids’ passions and abilities, and I loved conjuring up new problems for them to solve. What I struggled with was the contradiction of being the “designer” of my students’ experiences on the one hand while wanting them to truly “own” their learning on the other.

While I spent years trying to perfect engaging project-based/problem-based learning experiences, I never quite made peace with the fact that:

- I was always in charge of the problems they would solve.
- The problems were not always anchored in the real world (even if they were useful in terms of academic skill development and general engagement).
- Deploying cutting-edge technology was often becoming the primary driver of the project itself.
- All too often, I felt pressured to prevent students from truly risking failure (and thus learning) in a meaningful way.

Most project-based/problem-based learning examples I ran into (or created myself) still treated school and the real world as distant allies, not as rigorous partners that had to work hand in hand.

It wasn’t until I discovered the concept of design thinking (DT) that I could finally see a new way to challenge our students to become agile thinkers and collaborators in an effort to solve meaningful problems anchored in authentic experience. Even better, DT demonstrated how my students could create their own learning from beginning to end.

Defining a Design-Thinking Mind
DT is about using design to improve the human experience. It combines the ideals of what we want for our students: collaboration, systems thinking, and the development of a balance of creative and analytical habits. It also fuels what our students want for themselves: making an impact on the real world in real time.
and having adults take their passions seriously.

The process essentially comes down to a continuously evolving feedback loop with four elements: empathy, ideation, prototyping, and testing.

**Empathy.** DT is a creative process grounded in practical experience. By learning to observe human behaviors and needs in the context of real life, DT participants discover human-centered questions and problems worth trying to solve. Better yet, it does so within a remarkably empathetic process that puts the experience of human beings at the center of the equation. It is no longer about answer keys with static facts that seem separate from the day-to-day lives of learners.

**Ideation.** Once a DT participant is able to identify a real-world problem worth solving, the next step is to explore ways to respond. The goal is not to find a perfect solution at this point. Instead, DT participants seek novel perspectives with a bias toward innovation. DT values the creativity and insights of all participants, regardless of specific expertise or a need to be “right” at first blush. It encourages outside-the-box thinking, which leads to unexpected creative solutions. DT relies on a creative process based on “building up” ideas (rather than the typical analytical process that looks to “break down” ideas). Key to this is the belief that there is no place for value judgments early on. The DT process rewards “and, and” responses from participants, as opposed to the “yeah, but” reactions that are typical of traditional academic experiences.

**Prototyping.** Once participants identify a wide range of possible solutions, the next step is to rapidly mock up examples. To DT advocates, the idea is to help make an idea real, tangible, and accessible. Ultimately, DT has a natural bias toward action. The best way to approach this—as many designers will tell you—is to use a rapid prototyping process fueled by an attitude of “fail and fail fast,” something ideally suited for learning in a complex and often messy 21st century world.

**Testing.** Creativity and open minds aside, DT deeply values testing all assumptions. Solutions need to work. And better yet, solutions need to work in the real world and have an observable positive impact on the human experience. Because problems are found in the real world, answers need to be agile enough to adapt over time. Such a pedagogical framework naturally provides learners with the thinking tools to respond to an unpredictable future while remaining focused on the human experience.

**Prototype Design Camp**

Given this understanding of DT, let’s go back to the original question: Imagine you were invited to create your own version of the classroom of the future. Where would you start?

This was precisely the question that members of the eTech Ohio conference planning team presented to Be Playful, a design firm I founded, a year ago in advance of their annual statewide conference.

For the eTech Ohio team, this was not a theoretical question. In essence, they wanted to design a classroom space placed physically in the middle of the conference that would creatively suggest the possibilities for learning and teaching at the front end of the 21st century.

Furthermore, this “classroom of the future” needed to integrate dynamic and cutting-edge technology. It needed to inspire large numbers of the estimated 6,000 conference attendees to come explore and collaborate. It also needed to compete for attention in an exhibit hall surrounded by student-built robots, Wii dance contests, and a range of innovative educational programs.

More important, the solution needed to be unlike anything they had tried in the past.

As a passionate advocate for emerging technology inspiring real-time innovation in the classroom and a designer working in the international school architecture field, this project offered precisely the type of challenge that brought together all of my passions.

However, my first answer was a conditional “yes” that I wasn’t sure the eTech Ohio team would accept. While many previous ideas celebrated emerging technology (and the impact of architecture), our energy focused more on what students (and teachers) would be challenged to do in a digital age learning environment.

Our proposal essentially stated:

- The classroom can’t just be a showcase for technology.
- Students must be the center of the program.
- Adults must serve as mentors, sherpas, and allies.
- Students must solve real problems that they come up with.

To our pleasure, the eTech Ohio team said “yes.” They were willing to support our idea of “seeing” students actively working, collaborating, solving problems, communicating, creating, and presenting.

To that end, DT made for the perfect partner as 45 high school students from 14 diverse schools in Ohio (as well as a school in Indiana and another in Georgia) trekked their way through the snow and ice to participate in the first-ever Prototype Design Camp.

Their process took the following form:

**Find a problem worth solving.** Students spent three intense days (from 7:30 a.m. to 5 p.m.) working in teams of six to seven that set out to find, explore, and solve a remarkable problem fo-
By learning to observe human behaviors and needs in the context of real life, Design Thinking participants discover human-centered questions and problems worth trying to solve.

Focused on the future of learning, students—as researchers and ethnographers—interviewed conference attendees, global partners, and virtual participants (via several digital platforms) on Day 1, leading to a range of design problems they wanted to consider.

Explore a range of remarkable possibilities. Once students returned to the classroom, they filled the space with colorful Post-It Notes and sketches rich with multilayered questions and descriptive idea sparks until each team identified their preferred problem. Problems ranged from how to empower young people to become global journalists while still in school to how to stretch the boundaries of a physical classroom and how to redesign the underlying relationship between learners and teachers. Working face to face with a cadre of professional designers, educators, and technology experts from around Ohio and the United States, design teams spent a day and a half exploring ways to come up with solutions worth prototyping.

Ask big questions of innovative thought leaders. In addition to having access to mentors within the physical prototype classroom, students also worked virtually with a range of national and global experts via Skype and various social media channels. This included ed tech visionaries Stephen Heppel in England and Ewan McIntosh in Scotland, Ming-Li Chai from Microsoft’s corporate futures team, “Project Runway” finalist Althea Harper, TEDx curators, and others. Simultaneously, Prototype Design Camp students and mentors collaborated with educators around the world via Twitter, Facebook, live streaming of key conversations, and live blogging.

Rapidly prototype a physical concept. Student teams spent a full day trying to make their most inspired ideas come to life. In addition to an assortment of cutting-edge technologies, including 3D projectors, iPads, and an immersive menu of web 2.0 tools and social networks, the students had a range of art supplies, building materials, and props. We gave them permission to redesign the classroom as needed, from deploying an array of furniture to crafting just-in-time spaces. The attitude was “by any means necessary.” Perfection was not
Learn about design thinking in general.


Watch “Deep Dive: IDE’s Shopping Cart” episode on ABC’s Nightline: www.youtube.com/watch?v=M66ZU2PCiCM.


Watch “Design Thinking Can Be Learned,” an interview with David Kelley (of IDEO), Stanford d.school) in Businessweek: www.businessweek.com/video/x/noGrMjqu9x85wJL8y08-79_pIMMSxF.


Read Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown.

Explore how design thinking is applied to education.


Explore how DT is being applied in classrooms, schools, and education at a variety of levels.


Learn more about Studio H: http://www.studio-h.org.

Learn more about Project H Design: www.projecthdesign.org.


Learn about Public Workshop: http://publicworkshop.us.


Consider providing your students a chance to use DT to solve a real-world problem they are passionate about.

If that sparks curiosity, see if your students would like to join a global group of young people using DT to solve real problems.


Seek out professional development that supports educators incorporating DT into classroom practice.

Explore the K12 Lab wiki via the Stanford d.school: https://dschool.stanford.edu/groups/k12/lab.

Attend professional development courses at Stanford’s d.school K12 Lab.

In short, DT is about using design to improve the human experience.

Next Steps

Here are a few ways to learn more about design thinking and customizing your classroom practice and professional development.

Present to a live jury of professionals and the globe. At the end of the three days, Prototype Design Camp teams presented their solutions to more than a dozen jury members from different professional perspectives. They included the founder of a nationally recognized theater group, an architect who had designed libraries around the world, an architect rebuilding schools in Africa, a professional writer based at a modern art museum, a range of artists across various media, an engineer working in both mechanical and software realms, an internationally known librarian, a graphic designer, marketing specialists, and others. We asked judges to avoid “yeah, but” reactions. Instead, they were expected to invest in the students’ ideas and offer real-world applications of those ideas. The final presentation was broadcast to the entire 6,000-person eTech Ohio conference and to the world via various social media channels.

Realize that even three intense days is only scratching the surface. Despite a remarkably immersive experience where our Prototype students successfully used a DT mindset to develop exceptional solutions to authentic learning problems, the real success lay more in students and mentors committing to the process itself than in the answers they presented.

Christian Long is an educator, designer, school planner, educational futurist, and advocate for innovative learning communities. He is vice president of Cannon Design and founded Be Playful, a collaborative global design agency, and Prototype Design Camp.
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Integrating digital age technology into an industrial age educational system is hard enough. Imagine introducing ed tech to a 450-year-old Jesuit educational paradigm.
became the educational technology coordinator for Brebeuf Jesuit Preparatory School in Indianapolis, Indiana, USA, in 2008. Brebeuf is a Catholic-based, Jesuit-run, interfaith high school dedicated to developing men and women for service to others. I soon learned that my new colleagues expected the focus of my job to be on tools and processes rather than on engaging, motivating, and facilitating learning. I had different ideas, though.

And I had support in Brebeuf’s educational compass, the Ignatian Pedagogical Paradigm (IPP). (See “The Ignatian Pedagogical Paradigm” to the right.) This framework, based on the Spiritual Exercises developed by St. Ignatius Loyola, has been directing Jesuit education for nearly 450 years, so I felt it was due for an update. As I saw it, ISTE’s NETS was the perfect set of standards to modify the IPP for my purposes. Here is how I successfully integrated technology into an ancient system of schooling by mixing a little bit of the old (the IPP) with the new (the NETS).

**Context: Meet Them Where They Are**

The first step in my quest to integrate technology was to begin framing technology integration in the language of the academic culture, because a shared vocabulary is a critical element of change management. In the book *Disrupting Class*, Clayton M. Christensen talks about “charting the degree of agreement.” An organization moving toward a change event needs to create cooperation tools to bring the organization together. For me, a shared vocabulary was that tool.

Both the IPP and the Jesuit charism *cura personalis*, or “care of the whole person,” demand that educators consider all learners in their personal context. For our learners, that context is digital age skills. As the Speak Up 2009 survey illustrates, “Students, regardless of community demographics, socio-economic backgrounds, gender, and grade, tell us year after year that the lack of sophisticated use of emerging technology tools in school is, in fact, holding back their education and, in many ways, disengaging them from learning.” Our students were already engaging in digital environments outside of class and wanted to try them out in school. Our teachers just needed to meet them where they were.

At the end of the 2007–08 school year, I looked at the state of the school’s infrastructure. We were running a stable wireless network (802.11b/g). We had a 3:1 student-to-computer ratio. All teachers were equipped with Toshiba Portege M400-S5032 tablets. Every classroom had a desktop PC, DVD/VCR combo, and ceiling-mounted projector. About 25% of the classrooms had electronic whiteboards.

The main problem, I had heard, was communitywide “resistance to technological change.” I saw little evidence of true resistance, although I did see some hesitancy due to several years of poor communication between staff and IT. I remedied this by starting a biweekly ed tech newsletter, instituting a guaranteed one-hour IT response to any tech request, and prioritizing classroom needs over all other requests. Open doors and coffee maker also helped the hesitancy issues to drop dramatically.

Because I was new to Jesuit education, I spent time reading the guiding documents of the Jesuit Order. I read not only about the Ignatian Pedagogical Paradigm, but also documents such as *What Makes a Jesuit High School Jesuit* and the Jesuit Secondary Education Association’s (JSEA) “Profile of the Graduate at Graduation.” I reviewed the strategic plan that the board of directors created to steer the direction of the school. And I listened to teachers, students, administrators, and parents talk about their dreams of the perfect school setting.

**Experience: Engage and Learn**

Now it was time to align the educational objectives to the technology objectives. I enrolled in the PBS Teacherline/ISTE Certificate Program, Teaching with the 2008 National Educational Technology Standards for Teachers. One of the first assignments in the program is to create a “My NETS Organizer.” This simple chart asks the responder to reflect on current practices according to each of the NETS-T indicators, including how each indicator manifested in the teaching environment, specific examples of the indicator in practice, additional ideas for implementing the indicator, and tools and resource links relevant to the indicator. (See “My NETS Organizer” on page 26 for an excerpt.)

Once I finished the chart, I used the specific indicators of both the Jesuit booklet *What Makes a Jesuit High School Jesuit* and the NETS-T to create an ed tech strategic plan that aligned
the educational paradigm with the edtech framework. (See “Ed Tech Strategic Plan” on page 26 for an excerpt.) This plan was my compass for the next three years of intentional integration experiences.

Armed with all my charts and edtech objectives, I was ready to start integrating. This proved easy! After I approached a few teachers with the offer of tool development, team teaching, and help with grading, the rest of them came to me. By taking on some of their workload, IT was able to alleviate the stress of integration. You can find specific, detailed integration activities in my PBS/ISTE Capstone Portfolio (see Resources on page 27).

One of the best collaborations was with Linda Smoot, a social studies teacher. Each year, her AP U.S. Government students filled three-ring binders with definitions, laws, and other factual information necessary for study. She and I collaborated on a wiki where students created, shared, and accessed information online 24/7. The wiki had a password to protect students’ privacy but was left up so that Brebeuf graduates could continue to access the content.

Beginning with Smoot, I started intentionally using the NETS-T vocabulary in my conversations with teachers. When the next teacher came to me asking about a wiki as a tool for collaborative book discussions in an English class, I said, “Oh, you want a digital age learning environment?” She laughed. Yet slowly but surely I started to hear the terms model, facilitate, and even digital age learning environment around the school in casual conversation.

Reflection: What Works, What Doesn’t
By March 2010, many of my goals from the ed tech strategic plan were becoming reality. All teachers were using a new learning management system, Edline. We were using Skype to web conference with former students in El Salvador and sustainability groups in California, USA. Students were using wikis and blogs in a multitude of environments to reflect on course material. YouTube was off the filter list, and students and faculty were using video to differentiate instruction. I advised teachers to model digital age tools for educational purposes so that the students would begin seeing technology as a tool rather than a toy.

But before I could celebrate the might of my integration powers, I knew I could not forget the next, crucial step in the IPP: reflection. I looked over the accomplishments and failures of the past 18 months. The IT team created a survey in Edline to gauge the attitudes toward, concerns about, and successes of our attempts at technology integration. We held town hall meetings for students to voice their opinions about the state of technology. In classroom collaborations, I asked students to evaluate their experiences with technology in school. The IT team analyzed all this data to discern the areas of capital growth, policy reconsiderations, and trainings that we would need to implement.

Action: Take It to the People
It was time to take initiatives proven in the Experience phase to the broader school community. The first step was bringing in enough computers to

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**Tech Integration Guide at a Glance**

With a little help from the NETS, the Ignatian Pedagogical Paradigm works for technology integration as well as it does for the education of students. Here is an abbreviated outline of my tech integration variation on the IPP:

**Context**
- Assess current technology infrastructure.
- Assess history of technology resistance or successful implementation in the past.
- Assess educational objectives, including paradigms, state academic standards, data goals, and mission statements.

**Experience**
- Brainstorm alignments between your educational objectives and the NETS.
- Gather a small group of supportive teachers and start integrating existing or free technologies into their learning activities.
- Introduce the NETS vocabulary (model, facilitate, engage, real-world problem solving, digital age learning experiences, etc.) to discussions with staff.

**Reflection**
- Survey students and faculty using online or paper surveys, focus groups, or interviews.

**Action**
- Implement resources, policies, and workshops to take integration successes to the broader community.
- Intentionally integrate the vocabulary of the NETS.

**Evaluation**
- Create next strategic plan for growth, paying close attention to language of NETS framed within specific learning objectives unique to institution.
make all the web-based tools accessible to all students. Some had reported that during their personal responsibility times (breaks during the day when all students have 20–35 minutes to work on whatever they wish), the library and open labs were full, so we lowered the student-to-computer ratio to 2:1. After lifting the filter on YouTube and other streaming media, we also had to increase the bandwidth running into the building. Fortunately, we are located in an urban area and already had a fiber line (Viola 20 MB).

We needed to update policies as well to reflect increased use of collaborative tools. First, we realized that if adults and students were going to interact in electronic environments, we needed a policy guiding behavior in those environments. The coordinator of special projects and I drafted a social media policy that is now approved for inclusion in the Faculty/Staff Handbook.

Next, we looked at the appropriate use policy for students, as increased use of electronic tools could create increased opportunity for academic dishonesty. We modified the language to preserve academic integrity in our digital environments.

I devoted much of my time to training. I couldn't expect people to use Edline, blogs, wikis, and social networks if they didn't know how. Through one-on-one sessions, small-group instruction, on-demand video uploads, and lots of newsletters, I communicated the basic “how to” information to assist teachers in creating and maintaining digital environments.

As we entered the 2010–11 school year, we had a solid technology infrastructure to support student learning as well as policies to protect and support learners and teachers. Professional development opportunities are available via video and documents on Edline, newsletters, and one-on-one or small-group sessions, and we offer delayed-start professional development days for faculty to meet in learning communities, many of which revolve around digital age learning. We share a vocabulary based on the IPP and the NETS. The students have accepted our learning management system as a primary tool for communication and collaboration supported by digital environments, such as wikis, blogs, and social networks. The focus of educational technology is no longer how to use the computers; it’s now where it should be, on cura personalis.

**Evaluation: Evaluate to Evolve**
No process would be complete without evaluation. The IPP is no exception.
Evaluation precedes the next step in evolution. To help me assess technology’s impact on student learning, I asked Smoot to reflect on her experiences with technology integration. She said there have been definite improvements in class discussion quality and conversational maturity since she integrated blogging into her government class. Students are more prepared and illustrate more competencies with the material because they reflect on readings prior to class in their blogging exercises.

Students’ confidence in their personal knowledge has also improved. In reflection writing after participating in the University of Southern California’s Annenberg Center “Redistricting Game” (www.redistrictinggame.org), students reported increased confidence in conversation with friends, peers, and others outside of class related to the topic of redistricting in light of the 2010 census.

When we asked students to evaluate how technology affected their learning experience, the comments revolved around ease of communication in a 24/7 learning environment and preparation for their future. While one student admitted that not all integration activities were effective, she added that her experiences with interactive quizzes delivered via texting were “fun and helpful. It was a good interactive way that got everyone to pay attention in class.” Another student wrote, “Wikis and blogs have aided in the process of learning because they provide an easy platform for communication and discussion among students.” Finally, a third student felt the online environment had prepared him well for college. He wrote, “I am not even
on campus, yet it is becoming readily apparent that some of the online work I have done at Brebeuf has been a good warm up.” Although we have not addressed all issues, overall student evaluation of the learning environment has been positive.

Now it’s time to make a new strategic plan that takes into consideration the evaluation of the previous one. I am asking myself several questions along the way, including: What are the areas for advancement of success? What has changed in the technology available in the past three years? Where is student learning lagging? This school year, we also created an open student wireless network, setting the stage for our Bring Your Own Tech initiative.

Incorporating this process into any learning environment takes time (three years in our case), colleagues (I am part of an amazingly dedicated IT team), and a plan. The NETS offer a framework for creating this plan, but without a clear educational paradigm, technology integration goes nowhere. After all, education is what school is all about; technology is a tool we use to get there.

Resources
NETS•T: iste.org/standards/nets-for-teachers/nets-for-teachers-2008.aspx
PBS Teacherline Capstone II Exhibit (2010); http://tinyurl.com/3p39yys

Jen LaMaster is the director of faculty development for Brebeuf Jesuit Preparatory School in Indianapolis, Indiana, USA. As a mentor/teacher/girl/nerd, her focus is on technology as a resource for achieving educational objectives. You can find her at www.jenlamaster.com or @40ishoracle.
We can trace both highly illustrated textbooks and children’s information books to Johann Comenius’ *Orbis Sensualium Pictus* (1657), translated as *The Visible World in Pictures* (LaSpina, 1998). Comenius, creator of the first illustrated Latin primer, believed that we begin our learning through our senses. He saw both real objects (realia) and pictures as essential components of instruction.

In the 21st century, we have moved beyond the illustrated printed page into a digital world. Digital projectors, wired to classroom computers, connect learners to a virtual universe of on-demand content. Today’s students carry powerful computers in their pockets that allow them to read a poem, access information about the poet’s life in an encyclopedia, and even contact the poet directly—all during a morning bus ride.

Comenius stressed the senses. Digital textbooks are becoming commonplace in today’s schools, but they omit physical objects and kinetic elements from which learners can develop a more complete understanding of how things work in the world. To address this need, we have created the transmedia book. Transmedia refers to the ability to cross media. In our case, we have combined the power of text with digital fabrication to create a new instructional format: the t-book.

Digital fabrication, enabled by emerging technologies, allows students to translate digital design into a physical object. We have been working with 2D fabricators—computer-controlled die cutters that can cut paper, cloth, and vinyl with great precision—and 3D fabricators that produce three-dimensional objects. These fabricators enable us to produce working physical models of objects pictured in books.

**Transmedia Books Defined**

A prototype t-book titled *Make to Learn: Exploring Wind Power* illustrates several characteristics of a transmedia book. This book tells the story of a young inventor who brought electricity to his remote rural village by building a working wind turbine.

As students read the story, they participate in a series of activities, culminating in the production of a working model wind turbine that illuminates lights embedded in the back pages of the book, “lighting” the homes in a rural village. You can download the PDF of this prototype t-book at no cost from the Make to Learn design center (www.MakeToLearn.org/wind).

In some ways, a t-book resembles a traditional activity book, but its transmedia power allows for sophisticated learning through elements that incorporate digital and physical manipulatives in the activities. *Exploring Wind Power* includes quick response (QR) codes linked to both videos and online simulations that extend the printed content in the book. The t-book also contains links to digital designs that allow students to fabricate physical objects depicted in the book. With fabricators, students can precisely cut their own functioning gears from cardstock for an exploration of mathematical ratios.

Learning core mathematical concepts extends beyond the t-book through supplemen-
tary work pages available at the Make to Learn website. Placing these pages outside the book permits a more effective narrative flow within the text. These web-accessible pages also give teachers the freedom to print additional worksheets to encourage alternative solutions. In this way, t-books differ distinctly from traditional activity books that provide single, bound worksheets. With the flexibility and nimbleness of digital technology, publishers can now update existing work pages in response to user feedback.

**T-Books in the Classroom**

Early pilot testing of *Make to Learn: Exploring Wind Power* confirmed some of our assumptions about the power of t-books in the classroom. The multimodal nature of the book engaged students. They smiled as they employed mobile devices to follow QR codes to online videos, and they intently explored the physical manipulations that helped them understand the embedded math and science concepts. One student remarked after completing the tactile activities, “If I don’t play around with it, it won’t stick in my head.” Another spoke of the delight that accompanies overcoming a design challenge: “I really liked building the windmill and the circuit because it was challenging…. Once you got the blades to spin or the bulb to light up, you felt proud.”

The t-book guided the successful accomplishment of related hands-on tasks. In the process of doing, children found mathematical and science concepts relevant. One said, “The thing I liked about the t-book was that it explained a lot more than most textbooks would have done.”

**A Transmedia Experience for You**

Major publishers are now exploring the possibilities afforded by t-books. Until commercial examples come to market, we are working in conjunction with a select group of teachers to create shorter transmedia activities and post them on the Make to Learn website. To stimulate exploration, we have created a pop-up example illustrating a line of reflection and congruent angles within a quadrilateral that you can download and incorporate into the fold of this column.

Download the example at www.MakeToLearn.org/ISTEfeb2012 and have a pair of scissors and a glue stick handy. The website provides directions explaining how to create the pop-up and glue or tape it to your copy of *L&L* as well as mathematical curricular connections that you can make with the pop-up.

If you would like to explore examples that are more complex, computer-controlled die cutters, such as the Silhouette Cameo, sell for less than $300. These 2D fabricators, which are the forerunners of printers that create 3D objects, facilitate the production of elements you can incorporate into transmedia books. Examples of transmedia activities that make use of fabricators are also available on the Make to Learn site.

The illustrations of *Orbis Sensualium Pictus* delighted the children of the 17th century. One of the most gratifying results of the dramatic increase in availability of technology for teachers is the ability to enhance our students’ learning as Comenius did for his—blending elements and senses to create an engaging and powerful new tool. A new generation of connected books extends the possibilities of the connected classroom.

Jonathan D. Cohen is a graduate fellow in the Center for Technology and Teacher Education in the Curry School of Education at the University of Virginia. He coauthored this column with Laura Smolkin, a professor of children’s literature and chair of the Department of Curriculum and Instruction, and Glen Bull, *L&L*’s Connected Classroom columnist and co-director of the Center for Technology and Teacher Education.
Laura Numeroff’s book *If You Give a Mouse a Cookie* begins: “If you give a mouse a cookie, then the mouse will want some milk.” This cause-and-effect tale details the antics of a mouse who eats a cookie and then wants more. Apply that scenario to the classroom: If you give a student a personal mobile device, such as a video camera, he will want to use it to learn more.

Students love to watch and create their own videos using iPods, iPads, cell phones, or portable video cameras. Just look at the sheer volume of online videos that children post. So it makes sense that students benefit when teachers adopt the mindset of using appropriate mobile video technologies in meaningful ways.

**Ask the Right Questions**

When deciding how to use a technology tool, ask the following questions: How does using the technology deepen students’ understanding of the content? What are the pedagogical advantages and disadvantages of using the tool for the content being taught and the students who need to learn the content? What role will the device have? These planning questions, adapted from the Technological, Pedagogical, and Content Knowledge (TPACK) framework, help teachers determine whether to incorporate a particular technology into a lesson.

Once you have appropriate use in mind, get creative and use video to teach any subject. Here are some examples of how to use video cameras in the language arts, math, science, and social studies or history classrooms.

**Using Video in Language Arts**

- **Make one-minute videos.** If a picture is worth a thousand words, how much more is the multimodal experience of video worth? I recently had preservice teachers create one-minute vocabulary videos for their future students on iPod touches for whole-class, small-group, or individual instruction. Each short video offered multiple exposures to a vocabulary word in a variety of contexts. These strategies increase the likelihood that students will remember the word and its meanings. The student teachers used the videos to preteach vocabulary. The next step was to assign their elementary students to create their own vocabulary videos using the same iPods.

- **Analyze progress.** Just as a football coach reviews film with his team, a teacher and student can review video of the student reading. Together they analyze the student’s reading, and the clips provide a record of the student’s progress.

- **Provide feedback in learning centers.** Using video can facilitate immediate and relevant reflection about an activity just completed in the learning center. They can answer prompts related to the best and worst part of the activity, providing feedback for future activities.

- **Sending messages to a pen pal.** In addition to sending handwritten letters, have your students prepare a video clip and email it to a pen pal, send it on a DVD, or post it on an interactive blog. Recently, students in Irving, Texas, USA, participated in a cross-cultural dialogue with students in Spain. The Texas students made short videos to share with their middle school counterparts in Spain. The English language learners in Spain felt they benefited from hearing the actual voices of learners their age.

- **Create book reviews.** Have your students prepare and video record themselves doing book reviews and then make the files available in the school library for other students to watch.
Using Video in Math

Enhance the math scavenger hunt. A math scavenger hunt is a classic elementary school assignment. Students venture around campus in small groups to identify and measure obtuse, isosceles, and acute angles commonly found throughout the school. Students write the information down, and the task is complete. Now imagine conducting the same assignment using video devices. Students get their assignments directly from their iPods and also use the devices to record their findings. As students identify and measure angles, they video record the activity. During the playback and evaluation of the video snippets, students discuss the details of the scavenger hunt. They can participate in a metacognitive discussion regarding their process for determining and measuring the angles and discuss the work of their peers.

Create math story problems. Dan Meyer, a former math teacher, blogger, and Stanford doctoral fellow, incorporated video into his lessons to make math story problems more relevant. He asked students to figure out which line in a grocery store would move faster. This assignment landed him a stint on Good Morning America. He also did a TED Talk on the need for math curriculum makeovers where he detailed examples of how video provides realistic contexts for learning math. Expanding on Meyer’s video idea, have your students create their own story problems using video.

Record student thinking. When solving math problems, video provides a record for the student and teacher to review the student’s thinking and gives the teacher the opportunity to redirect any misunderstandings. Further, students organize and communicate their mathematical thinking, which is a math process standard from the National Council of Teachers of Mathematics. Creating a video portfolio of students’ understanding of math demonstrates accomplishment but can also be a future reference for the student.

Multidisciplinary

Steps for Successful Video Implementation

Before you pass out video devices to your students, make sure the cameras are well protected, easy to clean, and properly logged.

Buy some inexpensive clear covers to protect the devices’ faces and lenses. Scratches happen easily, and dropping the device can render the camera useless. On unprotected areas, such as the glass face or the navigation wheel, add a clear plastic overlay. Not only does this prevent scratches, but with a quick wipe of an antibacterial cloth, you can eliminate germs without damaging the device. Additionally, make sure students have their own headphones to avoid spreading germs.

Keep the mobile devices’ original packaging, assign a number to each unit, and label the box and device with the corresponding numbers. By labeling the storage boxes, you can identify missing devices. Keep a sign-out list with the device numbers and serial numbers, and make sure you check that all the pieces are there when students check them back in. Before giving the mobile video devices to students, have them sign an agreement outlining appropriate use and proper care of the devices.

Consider introducing the device as an inquiry-based activity. Hand students the mobile video devices with a sentence or two of instructions, and let them experiment. Within minutes, proficient users will be more than happy to share their knowledge with classmates. It is best for all students to make two or three one-minute videos of their backpacks, textbooks, or other school-related items in the classroom while you and their proficient classmates are available to answer questions. The students will gain valuable experience before taking the cameras out on their own.

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Using Video in Science

Document steps. While conducting an experiment, a lab group can record their steps. The addition of student-recorded videos of the process adds a new dimension to learning. Students can analyze differences in the outcome of the experiments after watching the videos from each lab group. The video provides an accurate record of the process, the subsequent reaction, and the outcome for analysis.

For example, in an outdoor egg-cooking experiment designed to measure solar energy, students watch the progress of a raw egg cooking in the sun. In the past, students recorded hourly observations of the egg either by writing or drawing pictures. By adding video, a more complete observation record is available. As the egg cooks, students take several 10-second videos throughout the day in addition to recording written observations. The video shows the visual impact of the sun’s energy on the egg, and it provides an audio record too. Video recording the sun’s effects on the visual characteristics of an egg, alongside the audio record of the sun’s power to create the sounds of a cooking egg, allow students to understand the power of an accurate and complete observation.

Watch grass grow. Observing slow processes can be tedious and difficult. By video recording the growth of seedlings into plants, students can “watch” a process that’s too slow for the human eye to register. Other examples of this would be observing cloud types, changes in shadows, etc.

Using Video in Social Studies

Make maps. An elementary class can use a video camera to facilitate the creation of a map. Students count their steps from one location to another and record the information with the video device. Students can also use a video camera to capture visual landmarks for a digital map or use the voice recording as an auditory map for students who are visually impaired.

Interview people. Middle and high school students learning about U.S. wars can interview veterans about their experiences and opinions. Students can then analyze the videos for common themes that come up in past and contemporary battles. The National Council for the Social Studies Standards encourages students to look at the past and consider its influence on the present. They can also interview family members about historical memories, cultural practices, or other significant events.

Create primary source records of events. Students can record the aftermath of hurricanes, tornados, or other natural disasters. They can also record other events of historical significance, such as protests, campaign visits, or local news happenings.

Demonstrate abstract concepts.

Students can create video clips demonstrating and explaining abstract concepts in economics to help them better understand basic economic principles, such as supply and demand or diminishing returns.

Video Cameras in the Classroom

There are other uses for video cameras in the classroom besides academics. Here are some great ideas for these inexpensive devices:

• Give directions to a substitute teacher in a video message, which will allow you to elaborate and show the sub exactly what your plans are.

• Have a classmate record a lesson for students who are absent. You can also outline the homework that you assigned.

• Make a digital record of field trips and classroom activities to give as a keepsake for students at the end of the school year.

• Make a video of instructions for an assignment so students who need to can watch it again and again.
Problem-Based Learning

Video has value beyond subject-matter learning. Students can video record field trips so those who could not attend can benefit from the experience. Having students record key experiences during the excursion will extend the learning experience back to the classroom.

You can also use video as summative assessment for class or individual inquiry. Uploading presentations of proposed solutions of problems to a secure YouTube channel or another secure video webhosting site allows your students to collaborate with students from other local, national, and even international schools. During the 2010 oil spill in the Gulf of Mexico, grade school children posted video solutions to YouTube. Some newscasters asked experts to comment on the validity of some of these ideas. Interestingly, some of these simple, spontaneous, child-created videos offered relevant solutions.

Mobile video devices are engaging and obtainable tools that teachers can use in all subject areas to help students deepen their understanding of academic content. Using a mobile video device alone does not educate the student. Rather, like a pencil or pen, the device records what the students think, see, and understand. But mobile video devices can also engage and motivate students in a way that other tools cannot. If you give a kid a camera, she is going to want to learn.

Resources

Math Curriculum Makeover, Dan Meyer’s TED Talk: www.youtube.com/user/TEDxTalks+p/search/0/BlvKWEvKS8
National Curriculum Standards for Social Studies created by the National Council for Social Studies: www.socialstudies.org/standards/strands
National Science Education Standards created by the National Council of Teachers of Mathematics: http://standards.nctm.org/document/appendix/process.htm
Technological, Pedagogical, and Content Knowledge framework: www.tpck.org—Laurie O. Campbell is the director of undergraduate programs and an assistant clinical professor at Southern Methodist University in Dallas, Texas, USA. Her research interests include the effective use of technology and the one-minute video.
Collaborative Learning through Wikis

During my 10+ years of teaching, I have seen how excited students become after accomplishing learning goals with the help of their peers. If you aren’t using collaborative online tools in your classroom, one way to get started is by using wikis, which are ad free for teachers if you sign up at Wikispaces for Educators or PBWorks for Educators.

Educational sites allow students to collaborate in real time with their peers via audio, chat, and video. Their creations—presentations, research reports, stories, websites, videos, and podcasts—can be posted online and become part of another person’s learning process.

Put Wikis to Work
Many schools may have a free school website on their servers, but wikis allow for more collaboration and participation by both students and teachers. A wiki allows learners to add, edit, and revise information on the site. And by embedding free widgets and tools, educators can bring a social networking aspect to the curriculum. Think of a wiki as a virtual classroom where learning takes place seven days a week because students can contribute their ideas from anywhere with an internet connection. They can also consume the information they choose using the medium they prefer. In this way, a wiki also helps students personalize and take responsibility for their own learning.

Learn from Social Networks
Students already use social networking sites, such as Facebook, to share information and learn from each other. So when creating your wiki, it is important to mimic the design and features available on popular social networking sites to enhance communication, sharing, and collaboration.

What motivates our students to participate habitually on these networks? Social networks allow students to contribute audio and video recordings, images, and other content that represent each student as an individual. Students choose how to contribute.

In the same way, teachers can let students decide how to demonstrate their learning of a topic. We can give guidelines but allow them to choose the medium, such as a podcast, video, or multimedia presentation. You can embed, upload, or store these projects on the wiki for other students and parents to access and comment on.

Give Students Choices
You can also allow your students to decide how they want to brainstorm with each other. Some will use chat, which you can accommodate by embedding a chat widget. Others may want to collaborate through a forum. Wikispaces templates already include a discussion forum page, and PBWorks will allow you to embed one. Students may want to collaborate on a Google Doc or through mind-mapping tools, which you can embed in a wiki using HTML code.

Embed Collaboration Tools
You can easily embed widgets in a wiki by clicking Edit and then choosing from a menu of tools. Or you can select the HTML and paste the embed code. Here are a few tools you can embed to make your wiki support collaborative and participatory learning:

Wallwisher. This is a wall where students add digital sticky notes of text, images, audio, video, or links. You can embed the entire wall in a wiki page so students can easily offer tips, opinions, video recordings, or ideas on any topic. For example, if students are researching a topic, they can report their findings on the Wallwisher.

Twtpoll. This poll allows students to survey each other on various topics. Twtpoll has a nice layout when embedded in your wiki and shows a pie chart of the answer after students vote.

Photopeach. This is a multimedia tool that looks like a slideshow. In addition to using it to create a presentation with music and images, students can create animated quizzes about specific topics or vocabulary.

Fotobabble. This is a great tool for sharing personal stories quickly and easily. Students narrate the images they upload. They can even create their stories using their iPhones if they’ve downloaded the free app. Students can narrate a specific point in history or introduce themselves to their peers. Add a comment widget so peers can leave feedback.

Google tools. When students collaborate using docs, spreadsheets, presentation slides, and forms, they can embed them on the wiki. These documents continue to stay open to editing. Using Google Forms, students can survey others’ work, then view the results in various charts and graphs.

VoiceThread. This site allows students to upload videos or images collaboratively in a presentation format. Viewers can upload an avatar image
Great Classroom Wikis

A wiki for young learners: English Story Time [http://englishstorytime.pbworks.com](http://englishstorytime.pbworks.com)
A student-created wiki for an international exchange: Going Westward [http://goingwest.wikispaces.com](http://goingwest.wikispaces.com)
A collaborative wiki with profile pages: Blog4Edu [http://blog4edu.pbworks.com](http://blog4edu.pbworks.com)

Collaborate!

A wiki should not be just another means to share class notes, instructions, and resources that the teacher has created. A wiki should show what the learning in your classroom looks like. Your students are an important part of the equation, so ensure they are part of the design and development of the wiki. Ideally, they should contribute a majority of the materials and resources. If you want students and parents to visit the class wiki and participate, they have to feel as if they are part of the website and its development.

Let Students Play

Wikis allow your students to create their own pages. Let them play with the various widget options and design their own learning spaces on the wiki. They can add speaking avatars with the Voki widget to provide a welcoming message. They can add slideshows, digital stories, visitor maps, and more. Keep these pages organized by adding links to the navigation bar. Make sure your students tag their pages for easy searching and navigating.

Resources

Fotobabble: [www.fotobabble.com](http://www.fotobabble.com)
PBWorks for Educators: [https://plans.pbworks.com/signup/edubasic20](https://plans.pbworks.com/signup/edubasic20)
Photopeach: [www.photopeach.com](http://www.photopeach.com)
Presentation: Extending Learning Beyond the Classroom Walls Through Wikis: [www.americantesol.com/tesolcafe/v/10071_tesol_lecture_-_wikis_for_the_classroom.html](http://www.americantesol.com/tesolcafe/v/10071_tesol_lecture_-_wikis_for_the_classroom.html)
Twtpoll: [www.twtpoll.com](http://www.twtpoll.com)
VoiceThread: [www.voicethread.com](http://www.voicethread.com)
Wallwisher: [www.wallwisher.com](http://www.wallwisher.com)
Wikispaces for Educators: [www.wikispaces.com/content/for/teachers](http://www.wikispaces.com/content/for/teachers)
Wiki Tutorials and Resources on my presentation wiki: [http://technology4kids.pbworks.com/wikis](http://technology4kids.pbworks.com/wikis)

—Shelly Sanchez Terrell has been an educator in the United States and Germany since 1994. She is also the vice president of Educator Outreach for Parentella and the social community manager for Consultants-E. She is a creator of Edchat, the Reform Symposium E-Conference, and the Virtual Round Table conference. Read her blog, Teacher Reboot Camp, at [http://teacherrebootcamp.edublogs.org](http://teacherrebootcamp.edublogs.org). Find her on Twitter @ShellTerrell.
Manipulate Cells on the iPad

Digital age skills teach students to learn how to learn for themselves, which is the foundation of the 5E science learning cycle that includes engagement, exploration, explanation, elaboration, and evaluation. In my AP Biology class, students used this process to explore the concept of mitosis through three learning stations. This allowed them to work in small groups, which fostered their collaboration and communication skills.

The first was a craft station. Students created a cell-cycle flipbook and discussed what happened during each phase and subphase of mitosis. The second was a laptop station where students received a list of websites that included texts, interactive illustrations, videos, and a simulation game intended to introduce them to the concept, teach the concept, and allow them to apply the concept. The final station included three iPads loaded with the Mitosis app, a free download from the Apple iTunes store.

The Mitosis App
The highlight of the day for most students was the third station because most had never used an iPad before. The lesson began with three or four eager students gathered around each iPad. They turned the iPad to change from landscape to portrait view and clicked on the app.

Once students clicked on the Explore tab in the Tutor section of the app, they were tapping, pulling, and manipulating each phase of the cell cycle. The students had to drag the centrioles/centrosomes to opposite poles during interphase and then tap the cell until the membrane broke apart, spilling sister chromatids into the surrounding cell during the prophase. Students connected mitotic spindle fibers to each of the sister chromatids at their kinetochore during prometaphase. They pulled their thumbs and index fingers in opposite directions to pull apart the sister chromatids and then swiped their fingers down the metaphase plate to fully separate the chromosomes in the anaphase. Students connected mitotic spindle fibers to each of the sister chromatids at their kinetochore during prometaphase. They pulled their thumbs and index fingers in opposite directions to pull apart the sister chromatids and then swiped their fingers down the metaphase plate to fully separate the chromosomes in the anaphase. They completed the cell cycle by using their fingers to circle cell contents to create two new cells and pinch the cells apart during cytokinesis.

This app allowed students to manipulate each phase of the cell cycle. They explored on their own and then read accompanying text for understanding, actively participating in the engagement, exploration, and explanation portions of the 5E model. After they viewed all phases of mitosis, they moved to the Read and Listen tab to recap the cell cycle. The final portion included a 10-question quiz, which completed the elaboration and evaluation portions of the learning cycle model.

Students performed well on the quiz following the Explore section of the Mitosis app. They worked in pairs to discuss answers before selecting their choices. My supervising teacher and I walked around each group to check quiz results, and no group missed more than one question.

The Library section of the Mitosis app offers videos, images, a glossary, and resources, but it requires an internet connection because the videos are on YouTube. The images embedded in the app, which depicted the phases of the cell cycle through a microscope, were the same images in our class textbook.

The app’s glossary defines all terms associated with the cell cycle in a clear, concise way. My students, however, were too busy separating chromosomes with a swipe of their fingertips and didn’t use the glossary. The app also offers lectures available through iTunes U and additional images in the Resources section. Lectures are from the University of Maryland, Loyola Marymount University, and the University of Colorado at Boulder, and they range from less than 2 minutes to nearly 40 minutes.

By Jessica M. Richardson
The 5E Model

<table>
<thead>
<tr>
<th>Stage</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engagement</td>
<td>Students discuss what they remember about the cell cycle, outlining each phase and the terms associated with them. If they cannot remember a term, they create one.</td>
</tr>
<tr>
<td>Exploration</td>
<td>Students explore the phases of the cell cycle using the Mitosis app. Students pull, tap, and separate chromosomes with their fingertips. Students are encouraged to read the text below each phase.</td>
</tr>
<tr>
<td>Explanation</td>
<td>Students visit the read-and-listen portion of the Mitosis app. They review their initial thoughts about the cell cycle from the engagement phase and compare them to what they learned in the explore phase. Students revisit the Explore section of the app to explain each phase as they manipulate the app with a partner.</td>
</tr>
<tr>
<td>Elaboration</td>
<td>Students visit the resources available within the Mitosis app, including images, links, videos, and lectures.</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Students complete the 10-question quiz within the Mitosis app and report their results back to the teacher. They revisit any sections of the app they missed in the quiz.</td>
</tr>
</tbody>
</table>

Digital Age Skills

Digital age skills are difficult to define, but most educators agree that students need more than just content knowledge to succeed after high school. Digital age skills prepare students to think critically, analyze information, and become innovative learners. An iPad is a tool that allows students to use, learn, and apply these skills with a new technology, which is another digital age skill. Students take charge of their own learning and self-assessment.

Survey Results

I had my students complete a pre-technology survey before participating in the learning stations activities and a post-technology survey after they completed the learning stations. On the first survey, students indicated the devices they use most often were computers (desktops, laptops, and netbooks) and cell phones. Forty-one of the 49 students agreed or strongly agreed that it is important for students to use technology in the classroom.

The second survey asked students to rate their experience with the iPads. Thirty-seven of 47 students who completed the survey agreed or strongly agreed that iPads were useful in learning and understanding science concepts. Students responded that iPads do not offer the size of a laptop or a true keyboard, but the ability to simultaneously use apps to manipulate concepts and access websites outweighs the device’s limitations. Forty-three students said they would like to use iPads in the classroom again, and 44 responded positively when asked to discuss in writing the reasons why they enjoyed or did not enjoy using tablets. The answers I received were varied but form some common threads: iPads can be manipulated, are easy to use, and are enjoyable. One student commented, “I enjoyed using the iPad because it was a more hands-on learning experience, which made it a lot easier for me to remember.” Another answered, “It was more engaging than a textbook.” And another wrote, “It was easy and interactive and helped me understand the concept more clearly.”
Laptop Station Resources

Cell cycle and cell division video
(www.youtube.com/watch?v=G6ucKWilFmg): This video shows the interaction between cells.

Control of the Cell Cycle
(www.nobelprize.org/educational/medicine/2001/): Students can play this interactive game on the Nobel Prize website. It may take them a few tries to complete it successfully.

Meiosis video
(www.youtube.com/watch?v=D1_-mQS_FZ0&feature=related): This video explains meiosis.

Mitosis rap song
(www.nclark.net/MitosisRap.mp3): This song explains the process of mitosis.

Nova’s “How Cells Divide”
(www.pbs.org/wgbh/nova/body/how-cells-divide.html): Click the Launch Interactive tab and compare the two processes side by side.

Pearson’s mitosis webpage
(www.phschool.com/science/biology_place/biocoach/mitosisisg/intro.html): This page explains all the steps of mitosis. Students can test their knowledge at the end by taking a quiz.

In the Future

The lesson was successful because students could see, hear, and do something at each station to better understand the material. The craft station allowed students to spend time searching their textbooks, reading the material, and creating their own products. The laptop station presented the material in an interactive way and allowed students to test what they had learned. The iPad station offered interactive experiences unlike any others students have had in the past. I think it was more valuable to the students than the other two stations because they enjoyed it more. The next day, students were still talking about what they had done in the Explore section of the Mitosis app. Giving students the opportunity to control their own pace really made a difference in what they learned and remembered later in class. I look forward to seeing how tablets can revolutionize the classroom after witnessing how much my students used, enjoyed, and learned while using the iPads.

—Jessica Richardson is a graduate student at the University of Alabama in Tuscaloosa, Alabama, USA. She’s pursing her master’s degree in secondary science education.

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I wrote an article last year about 10 iPad apps that I find useful in health and physical education classes (see “PE: Bring Your Sneakers, Rackets, and iPad,” L&L, May 2011, pages 32–33). The options ranged from a BMI calculator to a pocket yoga app.

I’d like to add to that list a number of apps that make a PE teacher’s day easier, even if they aren’t directly related to physical education activities or curricula. In fact, many of these apps would be useful to teachers of all subject areas.

**Gradebook Pro.** This virtual gradebook supports weight- and standard grading and student attendance. It also provides data backup and restore on Dropbox, and you can track multiple classes and terms. This app has all the basics as well as the bells and whistles any teacher could wish for.

**My LessonPlan.** This app offers instant access to all of your lesson plans. You can create, customize, save, email, and print lesson plans. You can even save them as a backup in iTunes.

**Splashtop Whiteboard.** This app turns your iPad into a mobile interactive whiteboard. Connect to a computer over Wi-Fi; control audio, video, and desktop applications; and annotate content directly from the iPad. Splashtop Whiteboard works with all major interactive whiteboards.

**Grader.** Since 1894, teachers across the United States have been using the Kurtz Brothers E-Z Grader to calculate percentages. Using that same concept, educators enter the number of questions on a test or assignment, and Grader generates a chart that displays grade percentages.

**Weather Channel Max.** This app provides forecasts and up-to-date radar screens, bringing joy to any physical education teacher who has had to plan both indoor and outdoor lesson plans for the same activity when there is a threat of rain.

**Chronology Timer.** This app provides up to 12 timers (countdown/count-up), making it perfect for conducting various fitness tests with large groups of students.

**Calculator.** This app helps the mathematically challenged, and the calendar reminds users of upcoming meetings and appointments.

**iBooks.** A more specialized function of the iPad is the ability to download e-books to the bookshelf app iBooks. Several other sources of EPUB (iPad format) books provide access to free books for download, such as Google Books, ePubBooks, FeedBooks, and Project Gutenberg. One other website to consider is [http://calibre-ebook.com](http://calibre-ebook.com). This website provides a free open source tool for creating EPUB books from a variety of files, including HTML, LIT, PDF, and TXT, among others. Additionally, iBooks allows users to upload PDFs through iTunes and view them within iBooks.

**LogMeIn.** This app allows a user to access the desktop of a computer through an iPad. Although I don’t see the current iPad replacing a desktop computer for most teachers, its size, weight, internet access, battery life, and apps make it an extremely useful tool in today’s classroom and gymnasium.

**Prezi Viewer.** Go to [http://prezi.com](http://prezi.com) and create a presentation by placing images, videos, and other media on a virtual canvas and grouping content in frames. Then download the finished prezi to the iPad. You can drag to pan and pinch to zoom for an on-the-fly presentation.

Personally, I have used the iPad to take roll, track and calculate grades, show YouTube videos and movie clips, and play audiobook segments. In addition, it has enabled me to create presentations, time student activities, calculate BMI, conduct nutritional analysis, and support other health and physical education curricular areas. The most exciting part is that we’ve just begun to scratch the surface.

I’m excited to share and hear how other educators are integrating the iPad into their lessons. The phrase “limited only by your imagination” seems to apply to the potential for iPad use in health and physical education.

**Resources**

- ePUBBooks: [www.epubbooks.com](http://www.epubbooks.com)
- FeedBooks: [www.feedbooks.com](http://www.feedbooks.com)
- Google Books: [http://books.google.com](http://books.google.com)
- Project Gutenberg: [www.gutenberg.org](http://www.gutenberg.org)

—Ken Felker is a professor of health and physical education at Edinboro University in Edinboro, Pennsylvania, USA. His research interests include mobile fitness data collection and exergaming. He is the author of Integrating Technology into Physical Education & Health.
Standing out in the crowd is essential in a job interview. Employers judge you on the content of your responses, the design of your application materials, and the color of the fonts on your resume. Just like an interview, establishing a web presence and standing out with quality content, design, and color is key to attracting business.

In my advanced web design class, I asked students to create a website for Lakeshore Lanes, a local bowling alley. Using basic design principles and their skills in HTML, CSS, and photo editing techniques, each pair presented a website to the owner by the end of the trimester. Students had roughly 35 hours—or 13 class periods—to complete their websites.

Because the NETS were my guiding principles in determining how I would facilitate this project, I will briefly outline all six and share how my students mastered each one.

Creativity and Innovation
“Everyone who has ever taken a shower has had an idea. It’s the person who gets out of the shower, dries off, and does something about it that makes a difference.” That quote by Atari founder Nolan Bushnell was the guiding principle of this project.

On Day 1, when I walked my juniors and seniors through the advanced web design syllabus and told them about the Lakeshore Lanes project, I could see sparks. Each student was buzzing about their thoughts. As a teacher, it is wonderful—and a bit startling—to see everyone enthusiastic about an assignment. I knew that I had them hooked. I also knew that it...
would take a lot of work to pull it off. The facilitation part proved to be easy. My students had superior ideas. They were excited about the opportunity to create a product for someone else and show it off for the world to see.

**Communication and Collaboration**
Allowing students to work with a partner offered countless benefits. As they collaborated about their ideas, passion ignited from their conversations. At first I suggested having one person in charge of the copy and the other in charge of graphics. But the longer they worked on the project, the more they collaborated on all aspects of the site.

Sometimes students became frustrated by faulty concept ideas or partner absences. But they learned how to work through problems. From late-night phone calls and sleepovers to idea-sharing conversations in class, students began to master the art of getting along and learning from each other.

**Research and Information Fluency**
I felt it was important to choose a business that students had a connection with, so I picked Lakeshore Lanes, the bowling alley where the kids bowl for PE class. They knew the owner, Jim La-Hood, and they were familiar with the place. Another plus was that the bowling alley is close to school, as it would be expensive and time consuming to travel too far by bus to gather information or shoot photos. Lakeshore Lanes is a five-minute walk from our school, making the two-hour field trip to the bowling alley much less of a hassle.

My students had no problem getting the info they needed to create the framework for the website. The biggest task was piecing it all together.

*Students in Tasha Candela’s advanced web design class are: (back row, from left) Ian McCain, Spencer Owens, Sean Kokenos, Brooke Dombrow, Matt Kukulski, Andrew Wilson, Jordan Morgan, Lisa Nye, Kayleigh Barnowske; (middle) Sarah Carter, Allyson Whiteman, Ashley Scalabrinio, Tiffany Kish, Kerstyn Klein, Domonique Blackshear, Taylor Plotzke; (front) Katie Verner, and Marie Scheppman.*
Critical Thinking, Problem Solving, and Decision Making

Throughout this project, students had to think critically, solve problems, and make decisions. I distributed a rubric and gave them guidelines to help them create the content of each page. Students drafted a prototype of their website and then began building it on the computer. Using LaHood’s specs as well as research from other bowling websites, each team created its own look and feel.

LaHood wanted the students to use their best judgment and come up with the material on their own, so he didn’t give the students much direction.

This was a challenge for some students. Marie Scheppman said, “Sometimes working with customers is not easy. With little information, my partner and I had to conceptualize everything. It was a problem at first, but we adapted and created a website that merged our personalities with his audience’s needs.”

Digital Citizenship

Teaching kids about copyright laws, plagiarism, and internet safety helps them understand how to use technology properly, and it is imperative to model understanding of social, ethical, and legal issues and responsibilities related to digital culture.

I generally don’t allow students to download text or pictures from the internet. Instead, my students write their own copy and take their own photos.

If a student felt it was necessary to include a previously published photo or article, he or she would create a citation page using Calvin College’s Knight Cite. In class we discuss social, ethical, and legal issues, and students ask a lot of questions during these talks. They wanted to know the answers and do the right thing.

Technology Operations and Concepts

I taught three major technology components: code, graphics, and blogging.

We used Notepad as our editor and manually coded all items. With their knowledge of basic design principles, HTML, and CSS, students were able to design a professional layout.

I used the Lynda.com tutorial The Essentials of Using Adobe Photoshop Elements 9 to teach students how to use the full-edit workspace, work with layers, make selections, add special effects, and touch up photos. This tutorial provided powerful graphic-design lessons that students used to improve their bowling photos.

The students also maintained a blog to document the project. Posts ranged from finding examples of good bowling webpages to posting graphic edits with reflections. All the blogs were linked with each other, so students were able to peek at each other’s ideas, which motivated them to revise and improve their own sites.

A week before the last day of school, LaHood chose seniors Marie Scheppman and Katie Verner as the winners of the web design contest, and their site went live last summer.

LaHood said the choice was not easy. “Selecting one winning site was most difficult because all student work was noteworthy,” he said. “I cannot thank these students enough for their generosity.”

Verner had planned to become a nurse, but she has now changed her mind and will pursue a degree in graphic design and web development.

“It is a great feeling knowing that I won something that relates to the career I am going into,” Verner said. “I couldn’t be happier right now.”

Scheppman is majoring in video production and has already landed a part-time position with Epic Motion, a video and photography studio.

—Tasha Candela is a business teacher at Lake Shore High School in Saint Clair Shores, Michigan, USA. Find her on Twitter @bethetigger, and visit her class blog for this project at http://bethetigger.edublogs.org.
This High School Student Is Keeping It Real

It's a familiar story. At 13, Philip Chrzanowski disliked school. It's not that he struggled with his studies or that he clashed with his teachers. He was just plain bored.

“I was always a good student, but school just didn't interest me,” he says. “I would answer the questions, but not in depth, because I just didn't care.”

So when one of his teachers suggested that he attend high school at Nex+ Gen Academy (https://sites.google.com/a/aps.edu/nex-gen), a magnet school within his Albuquerque, New Mexico, USA, district, he jumped at the chance. The academy is different than most public schools. Its focus is project-based learning with a strong technology component. All students get laptops and access to software that they use to make movies; learn programming; and study math, languages, and more. They work in teams, and the students decide how to handle their assignments.

So how does Philip like school now? “I've learned so much from this school in such a short period of time,” he says. “Our school offers a way for you to come and challenge yourself. The creativity comes from us, and we make our own education.”

Take the award-winning film that Philip, now 15, created last year with three teammates, Adelle Blauser, Deven Mettling, and Hannah Couse. The assignment was to make a film that would be a sequel to a popular children's book that they could show students at a nearby elementary school. Philip's team chose The Rainbow Fish, a story about a conceited fish with beautiful scales who loses all his friends, until he chooses to share his glittering scales with others.

Philip's team wanted to do something different. Instead of making a sequel to the book, they created a prequel. “We decided to take the story in an alternate route and make him an ugly fish and explain how he got his scales,” he says.

Under Philip's leadership, they wrote the script, created the artwork and animation, and narrated the video (www.youtube.com/watch?v=iSyVGG24SMg). Philip, who has experience in graphic design, worked on the colorful underwater backgrounds.

“We all worked together,” Philip says of his team. “Without one person, it would have been difficult to pull off.”

Julie Lopes, the teacher who assigned the video project, says Philip thrives on authentic, hands-on projects. “He loves how ‘real’ our projects are,” she says. “He is quickly disengaged if he perceives work is simulated.”

Lopes entered the video into the Digital Desert Youth Film Festival in Albuquerque, where it took third place last spring. After the film was complete, Lopes asked Philip if he and his team would discuss the project-based learning process with dignitaries from the New Mexico Department of Education, and he immediately agreed.

“Although this required a great deal of preparation and work above and beyond all his other responsibilities, he willingly gathered his group and developed a presentation,” Lopes says. “He took a leadership role in scheduling meetings and work sessions with his team to get the job done. And he did this as a freshman!”

Philip's passion is design and programming. He's learning C++ mostly on his own, with some guidance from teachers. He wants to design video games one day.

“I was never good at art or writing, so this is my art. I know a lot about video games and programming,” Philip says.

And he's lucky to attend a school, he adds, that takes his passion seriously.

—Diana Fingal is senior editor of L&L.
The January 1982 issue of Classroom Computer News had an article titled “Schooldays 1991: Vision of Student Life in the Next Decade.” In it, Ricky Carter wrote about children in the distant 1990s, “carrying a dynabook: a book-sized electronic device with a display screen and a small touch-sensitive typewriter keyboard.” Students could edit and illustrate a story; use a spellchecker; compose music; participate in teleconferences; receive alerts about their schedules; and communicate with teachers, other students, and a national network. Thirty years later, these prophecies have come true in the form of tablet computers, along with many functions that would have boggled our minds back in the 1980s.

Today there is a growing number of apps that are ideal for the classroom. For no cost, you can have instant access to History: Maps of the World, Shakespeare: The Complete Works, every conceivable reference book, and more than 25,000 free classic books. The reading experience is enhanced with images, audio, and video. Students can write in “the margins” and use an integrated dictionary.

Organizational tools, such as Evernote, store notes, images, and websites. Tegrity, a lecture capturing tool, lets you bookmark important segments of a talk. These, like other cloud-based apps, store information at a secure location, and can be accessed by computer, phone, or tablet.

Almost half of all educational apps are free, and the majority of other apps are less than five dollars. Some companies offer a free version as well as a premium edition that may have more functions or no advertising.

Exciting possibilities come with advances in hardware. Several manufacturers include features missing from the iPad, such as SD card readers and a USB port, though there are now iPad accessories to address these needs. Most tablets have accelerometers, which detect the tilting of the device in three dimensions. Combined with a built-in GPS and maps, the feedback that tablets provide makes navigating the world an interactive delight.

Because of their portability and lower cost, students are more likely to read digital textbooks on tablets than desktop computers. Tablets incorporate e-reader software but have many other functions. The Kindle Fire and the Barnes & Noble nook tablet are examples of e-readers that have evolved into tablet-like devices with email, internet browsing, and a growing number of available apps.

All of the models included here have touchscreens and Wi-Fi capability. Other than the Fire and the nook, these units have an option for cellular connectivity that requires a short- or long-term contract for coverage.

Most devices have adapters for projectors that turn a tablet into a classroom presentation device. For those of us who prefer a traditional keyboard, there are wireless Bluetooth options, including a fold-up, soft rubber keyboard that is resistant to liquids.

Carter’s prediction was spot on, but even he did not anticipate that you would be able to download an app such as Star Walk that would enable you to stand under a starry sky; point your tablet to the heavens; and identify the stars, constellations, and satellites. Move over, Sir Isaac Newton. Our students will soon be writing apps that will do even more.

—Maureen Yoder, EdD, is on the faculty of Lesley University’s Technology in Education Program.
<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>OS</th>
<th>Memory</th>
<th>Dimensions</th>
<th>Display (diagonal)</th>
<th>Cameras</th>
<th>Battery (hours)</th>
<th>Notes</th>
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<td>Kindle Fire</td>
<td>$199</td>
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<td>E-reader with tablet features, including web browsing, email, and apps; access to all Amazon resources, Hulu, Netflix, Pandora, and other Android apps</td>
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<td>iPad 2</td>
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<td>iOS 5</td>
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<td>9.7&quot; (246.38 mm)</td>
<td>Front 3 MP Rear 7 MP</td>
<td>10</td>
<td>Photo and video geotagging over Wi-Fi, digital compass, VoiceOver screen reader, educational apps website and resources</td>
</tr>
<tr>
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<td>10.1&quot; (256.54 mm)</td>
<td>Front 8 MP Rear 1.2 MP</td>
<td>12</td>
<td>Nvidia’s quad-core Tegra 3 processor, docking keyboard available for $150</td>
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<tr>
<td>Nook Tablet</td>
<td>$249</td>
<td>Android 2.3 Gingerbread</td>
<td>16 GB</td>
<td>8.1&quot; × 5.0&quot; × 0.48&quot; (205.74 × 127 × 12.19 mm)</td>
<td>7&quot; (177.80 mm)</td>
<td>No camera</td>
<td>11.5</td>
<td>E-reader with tablet features, including web browsing, email, and apps; access to all Barnes &amp; Noble resources, Hulu, Netflix, and Pandora</td>
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<td>10.1&quot; (256.54 mm)</td>
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<td>Corning Gorilla Glass and splash guard</td>
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<td>10.1&quot; (256.54 mm)</td>
<td>Front 1.3 MP Rear 3.2 MP</td>
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<td>Ultra-thin, four-way accelerometer and gyro</td>
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<tr>
<td>Tablet S</td>
<td>$499</td>
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<td>16 GB</td>
<td>9.5&quot; × 6.8&quot; × 0.3&quot; (241.3 × 172.72 × 7.62 mm)</td>
<td>9.4&quot; (238.76 mm)</td>
<td>Front 0.3 MP Rear 5.0 MP</td>
<td>8</td>
<td>Built-in universal remote, full-size SD card slot</td>
</tr>
</tbody>
</table>
WHAT'S new

Pitsco Education has launched **Signature Math**, a tech-based program that offers individual lessons, whole-class presentations, and small-group activities. Signature uses 180 individualized lessons and 35 group activities to teach learners in grades 7 through 10 pre-algebra and Algebra I concepts. The program assesses students’ grasp of core math concepts, prescribes lessons, and then gauges students’ comprehension with mastery tests.

**MORE INFO:** [http://tinyurl.com/3pmszwf](http://tinyurl.com/3pmszwf)

APTE has released a portable scanner that is no bigger than a ruler and weighs less than a tube of toothpaste. The **APTE Handheld Scanner Bundle** can scan paper, photos, artwork, wallpaper, and fabric. To operate, just run the scanner over what you want to scan.


Audrey Watters, who writes the Hack Education blog, and Steve Hargadon, a pioneer in using social networking tools in education, have started a weekly ed tech podcast. The **Hack Education podcast** is a conversation about trends and controversies in educational technology. Watters, formerly the special interest group project manager for ISTE, contributes to several blogs, including NPR’s MindShift, Edutopia, ReadWriteWeb, and O’Reilly Media’s Radar. Hargadon is the social learning consultant for Illuminate/Blackboard Collaborate and the founder of Web 2.0 Labs. Listen to the podcast at [http://audio.edtechlive.com/cr20/2011-10-14.mp3](http://audio.edtechlive.com/cr20/2011-10-14.mp3).


PBS has created **LearningMedia**, a free multimedia portal that features photos, maps, videos, and lesson plans from organizations such as the U.S. National Aeronautics and Space Administration, the U.S. Library of Congress, and the U.S. National Archives. The LearningMedia portal’s library contains curricula for math, science, reading/language arts, social studies, health, physical education, and world languages. LearningMedia also allows users to search, save, and share content.

**MORE INFO:** [www.pbslearningmedia.org](http://www.pbslearningmedia.org)

Dictionary.com has launched **Word Dynamo**, an online and mobile learning experience that combines the engagement of gaming with study techniques. Word Dynamo lets students take full control of their education with tailored study programs they can access anywhere, anytime. It features a game-based assessment that estimates each player’s vocabulary size and skill level; sequenced challenges that offer 20 levels of skill-building word games as well as organized sets for subject-focused learning; and a study dashboard that allows students to track their learning levels, monitor progress, and create their own word lists to review.

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The children’s movie-making website ZimmerTwins.com has launched a new site aimed at teachers and students. Zimmer Twins at School bundles the moviemaker with new teacher-friendly class management tools and privacy settings designed specifically for use in the classroom. The site’s movie-making tool is designed around elements of sentence structure and creative expression, which reinforce reading and writing skills. With a wide assortment of characters, props, and settings, Zimmer Twins animations enhance almost any subject, including media literacy, online safety and citizenship, history, social studies, and the environment. A free basic membership allows teachers to set up five student accounts and create up to 12 movies. Zimmer Twins at School VIP memberships unlock the full potential of the site for $9.95 per month or $89.95 per year.

MORE INFO: www.zimmertwinsatschool.com

Promethean has launched its next-generation Learner Response System, ActivExpression2. More than a clicker, the ActivExpression2 is equipped with a QWERTY keyboard and has full text capability, allowing students to easily answer in full text or multiple choice as well as other input modes. The new version has a larger screen to accommodate both questions and answers, and it comes with a mathematical equation editor.

MORE INFO: www.prometheanworld.com/server.php?show=nav.22357

Griffin Technology has launched the Stylus + Pen + Laser Pointer, a tool for the projection screen and touchscreen as well as for paper. This tool features a soft rubber tip designed to mimic the press of a finger, giving users more control as they write, sketch, tap, and drag on iPads, iPhones, and other touchscreen surfaces; an integrated laser pointer for screen presentations; and a refillable ballpoint pen for writing on paper.

MORE INFO: http://store.griffintechnology.com/stylus-pen-laser-pointer

ISTE has released two new titles this month designed for school leaders—Data-Driven Decision Making: A Handbook for School Leaders by Chris O’Neal and the NETS•A Profiles booklet. Data-Driven Decision Making is a workbook that will help administrators get a true picture of the health of their schools and districts, including areas of success as well as issues that need to be addressed. It costs $13.97 for members and $19.95 for nonmembers. The NETS•A Profiles booklet provides administrators in four roles—superintendent and executive cabinet, district-level program director, district-level technology director, and campus-level leader—with information on the kinds of job-specific requirements they need to perform as effective technology leaders. The printed version costs $3.47 for members and $4.95 for nonmembers, and the e-version is available for $1.37 for members and $1.97 for nonmembers.

MORE INFO: iste.org/store

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COMING NEXT ISSUE

**Student-Centered Instruction**
As districts struggle to do more with less, how can school leaders provide students with the digital age skills they will need to succeed? Officials from the Virtual High School Global Consortium offer strategies and free web-based resources that enable a more teacher-efficient and student-centered approach to classroom instruction.

**Digital Design for Elementary Schools**
How can schools teach STEM subjects along with the more right-brain skill of creativity? Sheena Vaidyanathan of Los Altos School District in California, USA, writes about the district’s digital design program. Rather than learning about technology or learning with it, students in this innovative program focus on creativity and innovation through technology.

**Use Online Courses to Bolster Options**
For many rural school districts with limited staffs, online learning is a lifestyle that bolsters enrichment choices for advanced students and helps struggling students retake courses they need to graduate. Don Brown, from Lane Education Service District in Oregon, USA, writes about four rural districts that have tailored online learning to fit their unique situations.

**Multitasking: Boon or Bane?**
Debate this and other controversial issues at www.iste-community.org/group/LandL.
We set aside each February to celebrate you, our wonderful members, during Member Appreciation Month—four weeks packed with special free resources and opportunities to win valuable prizes (iste.org/memberappreciation). We applaud the commitment you make to pursue your own professional development. It is your driving passion for innovation—despite the roadblocks and detours along the way—that is transforming learning and teaching and preparing students for their rapidly changing world.

The road to innovation can be lonely, with no maps or street signs to guide you. Educators are often isolated in their classrooms, unable to see around the next bend what others may be trying. Think of ISTE as your personal GPS that will show you the way just when you need inspiration and new ideas the most! We take this journey seriously, knowing you depend on us to connect you with the latest trends and thought leaders. Staff and volunteers are committed to developing the very best print and online resources and professional development opportunities.

But make no mistake. You are our best resource. The enthusiastic members who make up ISTE’s communities generously offer a wealth of knowledge and resources. The ongoing connections they foster support not only ISTE members like you, but also your students and colleagues who benefit from your new ideas and experiences. Some of our most active communities are the special interest groups (SIGs), which offer year-round book clubs and webinars; databases of resources; newsletters; and workshops, sessions, forums, and networking activities at ISTE’s annual conference. With 21 groups, you’re sure to find one or severally that match your interests—and they are free to join!

Our members also work on ISTE-led projects to advance the field and advocate for change. Members support the development of ISTE’s NETS, digital age standards for students, teachers, and administrators. Others write for ISTE’s membership magazine, blog, and journals; review papers; judge awards; present at conferences; and serve on ISTE’s committees or board of directors. Thousands of ISTE members are contributing their time, expertise, and leadership year-round to a whole much greater than themselves. We encourage you to explore these communities, access great peer-generated resources, and see what everyone’s talking about. It’s easy to get started! Visit iste.org/volunteer to find out how.

In January, ISTE launched a new volunteer program. This call for participation lists a wide range of volunteer engagement opportunities. If you have an area of expertise you’d like to share, wish to grow your leadership skills, or want to meet others with similar interests, please do jump in. Progress requires individuals stepping forward to lead and contribute. We can’t do it without you!

Perhaps you’re only beginning to daydream about your trip to the annual conference this June in San Diego, but at ISTE we have been on the road since October. An amazing crew of 450 volunteer reviewers has culled through more than 2,200 conference proposals looking for great new ideas, best practices, success stories, and inspiration that will make up this year’s program. We hope to see you in San Diego, but for now, please come with us on a virtual road trip to explore your member benefits—accessible to you at work, home, and on the go!
February is Member Appreciation Month!

ISTE thrives because of members like you. To show our gratitude, we want you to come along with us on an ISTE “road trip.” The entire month will be filled with fun prizes and great free resources. So, come along and discover your member benefits with us!

Thank you for being an ISTE member!

**VIEW**
- a webinar via Adobe Connect mobile

**READ**
- the digital edition of *L&L* on your iPad

**POST**
- photos to ISTE’s Facebook page or on the ISTE Community Ning

**DOWNLOAD**
- “I Love School” for your road trip mix

**STAY**
- connected with ISTE’s mobile app

**PARTICIPATE**
- in #edchat and follow #ISTE12

**OPPORTUNITIES AHEAD**
- Scan the QR code to start your ISTE road trip and win some techy travel prizes!

iste.org/memberappreciation
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“The ISTE conference is a gigantic meeting hall of amazing minds! It’s a one-of-a-kind place to connect with fellow educators who are passionate about technology in education.”
—Nicholas Provenzano, English teacher, Michigan, USA

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Let America’s Finest City inspire you to expand your horizons as an educator and recharge your passion for learning and teaching!

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register and reserve housing now!
Catch the excitement of ISTE 2012 via the conference Ning: iste2012.org; Twitter: #iste12; and ISTEConnects.org.