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NEW!
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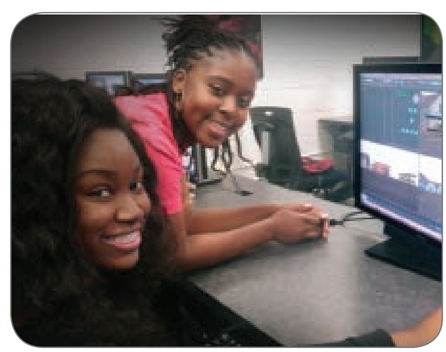

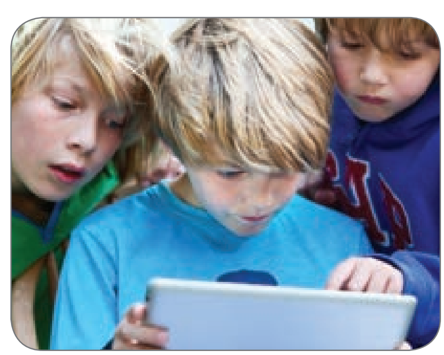

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ISSUE ORIENTED

KATE CONLEY
Periodicals Director

Cool Tools, Cooler People

One person's cool tool is often another's useless gadget. Witness my 86-year-old father, who is on Facebook, compared to my 82-year-old mom, who won't even use a computer for a doorstop. But as you *L&L* readers well know, how cool a tool really is has more to do with how and why it is used, not its mere presence.

I came across what I think is a cool tool called Raspberry Pi while attending an event during the Computing at School meeting in Cambridge, England, UK (computingatschool.org.uk). Why is it called a raspberry, you ask? Because, I was told, "It's neither blackberry nor apple." All kidding aside, Raspberry Pi is a computer that is only slightly bigger than an Altoids tin. The $25 device, according to the creators' website, "plugs into your TV and a keyboard. It's a capable little PC which can be used for many of the things that your desktop PC does, like spreadsheets, word processing, and games. It also plays high-definition video." Organizers want to see kids across the globe use it to learn programming. Find out more about this project by reading the FAQs on the Raspberry Pi site (raspberrypi.org/faqs).

In this issue, ISTE author Mark Gura shows us how cool robots can be for teaching STEM and teamwork while meeting standards, such as the NETS (see page 12). In a related article, Nancy McIntyre details how to establish a robotics team using the FIRST Lego League framework (see page 17). Among other cool tools discussed in this issue are *Time* magazine's 50 best inventions and iPads, which first grade teachers from Minnesota used to help struggling readers succeed (see page 24).

Tools are cool, but the coolest things in my book will always remain you—the *L&L* readers—who use technology in inspiring ways to grow really cool kids who become lifelong learners.

—Kate Conley is ISTE's periodicals director and the editor of L&L. *She holds a master's degree in journalism and a bachelor's in English. Conley has worked at ISTE for more than 13 years.*

"From start to finish, this project has convinced us that using iPads with at-risk learners creates an environment that meshes nicely with the learning styles of our youngest digital natives.

—See page 24 to read the full article."

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www.facebook.com/pages/ISTE/8828374188
Look for links to *L&L* articles and Point/Counterpoint questions.

iste-community.org/group/landl
Join the *L&L* group on the ISTE Community Ning to interact with other readers, send us messages, and take part in Point/Counterpoint discussions.

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letters@iste.org
Send letters and comments to the editor.

iste.org/LL
Find *L&L* and other great ISTE resources online.

tech we like

Here are a few of the *L&L* team's favorite resources from this issue.

Raspberry Pi: http://raspberrypi.org
Kate Conley likes this credit-card-sized computer for kids. Read about it on this page.

TED-Ed: http://ed.ted.com
Paul Wurster likes TED's new site featuring videos by inspiring educators. Read about it on page 10.

Specky Boy: http://tinyurl.com/d2dudj
Tamara Kidd likes this site featuring Lego art. Read about Lego Robotics on page 13.

Kid Whiteboard: http://tinyurl.com/76zgn2e
Andra Brichacek likes this app, which turns any iPad into a whiteboard. Read about it on page 25.

Journey North: www.learner.org/jnorth
Diana Fingal likes this app to teach kids about wildlife migration. Read about it on page 44.

Are Computer Labs Obsolete?

Jessica Parker

YES

Traditional computer labs are obsolete in terms of digital age teaching and learning as well as notions of good design. Labs are relics of a 20th century method for skill-based learning that views the student as an isolated individual attempting to master specific tools for future factory-based employment.

During its best days, computer labs were a one-size-fits-all approach to mastering basic skills: typing up an assignment, creating a presentation, practicing QWERTY keyboarding, or researching a topic. During its worst days, the lab was either a barren dust bowl with outdated and rarely functioning hardware or a fun-filled reprieve from the classroom—an easy method of babysitting that kept kids occupied with frivolous work and the shiny glare of the computer screen.

The outdated design of a computer lab harks back to a time when computers were large and unmovable, so technology had to be contained in one room. This design assumes that students are working by themselves rather than engaged in a collaborative inquiry or project. It also assumes that the teacher is walking around the lab, monitoring students and making sure they are on task. Pedagogical practice in most instances did not change in a computer lab.

Our modern technology, in contrast, has allowed our learning opportunities to take place anywhere, anytime. Some of the main benefits of today's computer hardware are its portability, wireless nature, and ability to be integrated into a classroom setting, as blended learning demonstrates. With these advancements in technology, we are finally able—and have the responsibility—to create fluid spaces for students and teachers to foster a community of learning.

Learning is interactive and socially dependent. We need to design

Tim Telep

NO

Direct instruction in computer skills in a lab doesn't compete with technology use in the classroom, it improves it. What takes place in the lab gives students the confidence to use technology effectively in other classes. Lab instruction centered on the NETS also frees classroom teachers to focus on using technology to further their content goals without losing valuable instructional time to teaching computer skills. And regular direct instruction in computer skills in a lab validates its importance as a subject.

I am the computer teacher for more than 500 students in grades 1–5 in a small rural community. Teaching students over five years allows me to present a structured curriculum that aims to send our students into sixth grade with a basic understanding of keyboarding, documents, presentations, wikis, internet research, and digital citizenship. Regular instruction from a computer teacher in a lab also provides consistency that an array of classroom teachers with varied technological skills and a host of other learning priorities cannot offer. Many of our students also do not have computers or access to the internet at home. Direct instruction in computer skills ensures they too will be able to use technology in their future endeavors.

Required assessments consume a growing percentage of class time, which adds pressure to make instruction as efficient as possible. Teachers here are making increased use of our laptop cart and the lab because they are confident their students will need minimal assistance with the technology, freeing teachers to focus on their content goals. Technology enhances their instruction, and their work with computers furthers their progress toward NETS proficiencies—a win-win.

How we use our time, space, and resources shows our students what we value. When students receive regular instruction in technology, in a computer lab, from a teacher dedicated to learning spaces that promote engagement, foster creativity and collaboration, and support peer-based learning and knowledge creation. This redesigned space should be flexible, intuitive, comfortable, and user oriented, shifting the focus from individuals sitting in front of screens to a more inspired environment dedicated to teaching and learning. Let's revolutionize our relationship with educational technology and metaphorically blow up the anachronistic computer lab!

—Jessica K. Parker is an assistant professor in the School of Education at Sonoma State University in Rohnert Park, California, USA. She is the author of Teaching Tech Savvy Kids: Bringing Digital Media into the Classroom.

the topic, they see that it is important knowledge. Eliminating the lab experience would dilute this message.

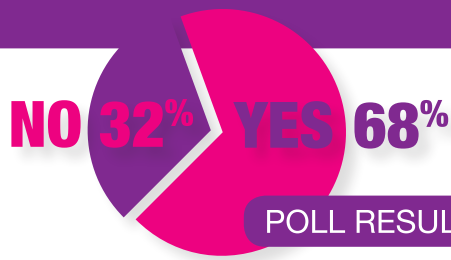
The ever-expanding presence of technology reinforces our responsibility to make sure our students graduate with the knowledge to use it confidently wherever their lives lead them. Our task is not to dismantle computer labs but to make sure our lab practices give students the support, skills, and knowledge they need, enhancing the use of technology in all classrooms.

—A former classroom teacher and middle school teacher, Tim Telep is currently a computer teacher at Bayfield Elementary School in Bayfield, Colorado, USA. Visit his computer lab wiki at http://beskid.pbworks.com.

readers respond

Here's what other *L&L* readers had to say about this topic.

Participate in our reader poll at iste.org/LL.



Uninterrupted Access

At Beijing BISS International School, we closed our remaining computer lab last year. We are a one-to-one school in grades 3–12 and support this with wireless connectivity, online learning portals, web 2.0 tools, and a customized approach to learning. Access to information and tools to connect with others and co-create products should be available in the classroom and ubiquitous to the needs of individual learning. A lab approach just cannot support this and never did support it effectively for all learners.

Julie Lindsay, E-Learning Coordinator
Beijing, China

The Right Head Space

I have found that "going to computer lab" puts my K–6 students in a different frame of mind. They are more focused on instruction. And most computer labs are set up for instruction, with a projector, screen or interactive whiteboard, classroom management software, and teacher station. All of these are a big help when introducing something new.

Theresa Pierce, Staff Development
New Castle, Indiana, USA

It's Not All About the Technology

The technology is only a small part of why the lab concept is obsolete; far more important is the role pedagogy plays in enhancing teaching and learning. Parking students in front of screens and away from the rich experiences more flexible deployments can provide borders on unethical. We need to focus on workplace readiness skills, such as collaboration, creativity, and communication. These require human contact—and our classrooms require designs that enable it.

John Hendron, Instructional Technology Supervisor
Richmond, Virginia, USA

Show Me the Money

To say that computer labs are obsolete is to be ignorant of the current state of education funding in most U.S. school districts. The physical tech lab is a financially practical solution to obtaining full class access to powerful computers with a reliable power source and consistent network connection.

Michele Bond, Library Media Specialist
Stewartsville, New Jersey, USA

Beyond Time and Space

Schools should look beyond time and space to maximize access to digital resources for students. Many schools use their computer lab budgets to implement one-to-one programs, laptop carts, or tablet pools, where students bring technology when it is needed. Learning is freed from constraints of the computer lab as access becomes immediate. And with advances in technology, any resource that would be available in the lab is available in the classroom.

Matt Harris, Head of Learning Resources
Singapore

We're Just Not Ready

Computer labs are not obsolete, or won't be for at least the next seven years. The cloud market is not mature, the school infrastructure is not equipped, and the teachers are not prepared enough for BYOD to take off.

Bill Pickett, CIO
Elliott City, Maryland, USA

Labs Don't Work for Students

My experience is that students bring netbooks and tablets both to lessons and labs. They feel more comfortable having their own set of programs, tools, utilities, and data. Another reason is mobility. Students can easily continue in the lab the work started at home and then move with it. Last but not least are new communication opportunities. Our university is almost entirely covered by stickers with QR codes. Desktops are useless for this technology.

Igor Bessmertny, Associate Professor
St. Petersburg, Russian Federation

LETTERS

Send comments to letters@iste.org.

L&L Makes a Difference

Thank you for the great ideas in *L&L*. The issues you choose to debate, and each *L&L* issue, are interesting, helpful, and readable. I like the idea of different contributors and information from many people. Keep up your good work. It makes a difference!

Susy Ogden, Retired Computer Teacher
New York, New York, USA

To contribute to this and future discussions, visit www.iste-community.org/groups/LandL.

Welcome New

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As a teacher, you can use Autodesk technology to reimagine your classroom, help inspire creativity and critical thinking in your students, and maybe add just a pinch of wonder to their day.
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Common Sense Media

Common Sense Media, an independent non-profit, provides comprehensive, free resources for schools and trustworthy information for parents to ensure kids learn how to be safe, smart, and responsible digital citizens who thrive in a world of media and technology.
commonsense.org/educators

Edmodo

Edmodo provides teachers and students a secure place to connect and collaborate; share content and educational applications; and access homework, grades, class discussions, and notifications.
edmodo.com

Epsilen

Serving institutions worldwide, Epsilen provides a social learning environment with tools to enhance the teaching and learning experience. Epsilen offers exclusive access to *The New York Times* Content Repository, a rich collection of digital resources.
epsilen.com

McGraw-Hill Education Center for Digital Innovation

The McGraw-Hill Center for Digital Innovation is a leading innovator in the development of digital-age learning and teaching solutions for K–12 education markets.
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Microsoft

Supporting bold education reform, Microsoft's mission is simple—help prepare students for today's highly competitive workforce and support our nation's educators with software and programs that fuel powerful learning and 21st century skills.
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penveu, an Interphase business, offers an affordable handheld device that enhances the functionality of installed projectors and large-screen displays to make any flat surface an interactive display system.
penveu.com

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Super Duper Publications creates, develops, publishes, and sells K–12 supplemental educational materials. We have a special emphasis on materials for children with special needs and language delays.
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HP Summit in Beijing, China, Draws 130 Educators from around the World

More than 130 educators from 15 countries came together in Beijing, China, in April for the annual summit of the HP Catalyst Initiative.

ISTE partners with HP's Department of Global Innovation to put on this event for educators who have received grants from HP for consortium projects. The grantees created projects designed to show how emerging technologies can lead to learning experiences that promote creative thinking, open-ended problem solving, and cross-cultural collaboration.

Summit participants visited Beijing No. 80 High School, created work plans to promote their projects and grow visibility, and shared collaboration tools and best practices.

ISTE Garners Verizon Grant

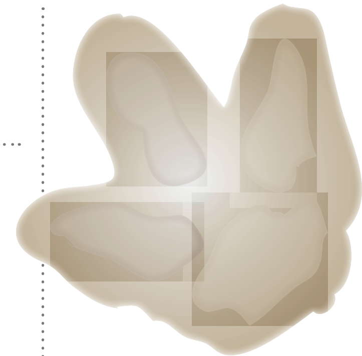
ISTE will provide professional development and other services for Verizon's Innovative Learning Schools project, which aims to increase mobile technology use, student engagement, and academic success.

ISTE will provide needs assessment and evaluation services in addition to professional development. ISTE faculty will work directly with leadership, project leads, and teachers at 12 U.S. schools to train educators to facilitate, model, integrate, and apply mobile technologies to support digital age STEM learning.

ISTE will put on face-to-face workshops, virtual conferences, and webinars as well as provide coaching for each school. All resources will be posted on http://tinyurl.com/72ttye4.

All Books in the ISTE Store Ship Free!

Did you know that all books in the ISTE Store now ship for free to addresses in the United States and Canada? You'll receive free standard shipping on all U.S. and Canadian orders, but you can still opt to pay extra for expedited shipping. Weight limits may apply. Visit iste.org/store for more details.



TREx Ate the CARET

Looking for the Center for Applied Research in Educational Technology (CARET)? It has been replaced by TREx—the Technology Research Exchange at http://trex.iste.org.

TREx is an online interactive repository of reviews about research pertaining to educational technology, annotated with implications for practice. You can search the database to learn what research says about many uses of educational technology and comment about your experience with the tools and techniques cited.

To keep the database up to date, ISTE is offering a Research to Practice course that will teach you how to evaluate research and contribute to the database. For more information on how you can participate, email trex@iste.org.

TREx
Technology Research Exchange

CONNECTED CLASSROOM

Inventing the Flipped Classroom

The Flipped Classroom is an instructional strategy that is receiving considerable attention. A flipped classroom dedicates more class time to hands-on learning, replacing lectures with supplemental materials, such as screencasts and videos, that students can view outside of class.

Thoughtful observers note that the effectiveness of this approach depends on the skill and pedagogical strategies you use. You can't magically transform an ineffective lecture by transferring it to video. Teachers are implementing flipped classrooms in a variety of ways, and some methods are more effective than others are.

Educational leaders such as Stanford, MIT, and Harvard are now experimenting with variants of the flipped classroom. The crucial question is: How can we use this instructional paradigm to best effect?

ISTE book authors Jonathan Bergmann and Aaron Sams, two high school science teachers who pioneered the concept, are quick to note that their use of the method is still evolving. They observed that students who stalled on chemistry problems at home were not able to complete subsequent problems until they received help at school the next day. So Bergmann and Sams created more time for students to work on problems during class by transferring their lectures to video.

A glimpse of the videos shows, however, that these teachers are taking full advantage of the medium to create instruction that goes far beyond chalk and a blackboard. One clip shows them flying down a mountain on bikes to illustrate the effects of altitude and atmospheric pressure on a balloon. In another clip, a graph illustrates the effect of a chemical reaction.

By working together, the two teachers had more time to create innovative instructional materials that they could use in both of their classes. ISTE has just published their book, *Flip Your Classroom*, which describes their approach, and additional information is available on their website, http://flippedlearning.org.

Daphne Koller, a Stanford professor experimenting with the flipped classroom, developed an online platform called Coursera in partnership with another Stanford professor. Coursera embeds short quizzes in videos to test student understanding before continuing to the next segment. She found that classroom attendance doubled when she used class time for group problem-solving sessions instead of lectures. As an added bonus, the interactive video materials created for Coursera are freely available to anyone at www.coursera.com.

Most teachers are familiar with TED talks, short videos presented by leaders in the fields of technology, entertainment, and design (TED). Inspired by innovation centered on flipped classrooms, TED's educational division, TED-Ed, developed tools to support this instructional method. The TED-Ed flipped classroom tools (available at http://ed.ted.com) allow teachers to create customized lessons using online videos. The tools allow teachers to add context, questions, and supplementary materials for use with either their own videos or video available on sites such as YouTube. Classroom management tools allow a teacher to see which students have viewed a video and each student's success in answering related questions.

The phrase *flipped classroom* has encouraged dissemination of the concept because it is short and memorable. However, it also has resulted in some misconceptions about the method. The term *flip* implies an all-or-nothing reversal, but that is not the case for the flipped classroom. A central goal is to provide more time for interactions with students in class. Teachers can do this in a variety of ways and with different degrees of adoption, ranging from just a few class sessions a year to a complete reconceptualization of a course. The way a flipped classroom may be most effective depends on the context of a class, so there is not a single flipped classroom method. Use and adoption depends on the instructor.

Digital equity is one issue that educators must address during implementation of flipped classrooms.

http://ed.ted.com

www.coursera.com

http://flippedlearning.org

Because the concept is relatively new and still evolving, little research is available to guide best practices. There are a number of questions that you might explore.

The hour-long lecture block, for example, is an artifact of scheduling. Videos developed for flipped classrooms typically cover a particular concept and often are 5–10 minutes long. This potentially allows students to review them at separate times rather than in a single session. A considerable body of research suggests that distributed learning can contribute to more meaningful learning than massed practice. Whether students will take advantage of new options to study the material through the week rather than in a single session just before an assignment is due remains to be seen. However, it is now possible to track use of this type of supplemental material to determine how students use it.

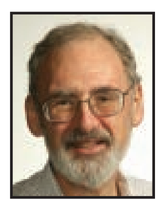
Use of the medium in this way will permit instructors to conduct assessments with greater granularity. Teachers can embed questions throughout materials to determine when and where students begin to struggle, rather than waiting for an assessment at the end of a unit.

Digital equity is one issue that educators must address during implementation of flipped classrooms. A survey by the Pew Foundation Internet and American Life project in 2012 reported that differences still exist in high-speed internet access among demographic groups. Bergmann and Sams addressed this issue in their classrooms by providing students who did not have adequate internet access outside school with instructional materials on a CD.

This year we collaborated with a teacher who provided students with video and other instructional materials on an iPod touch. Several nonprofit organizations have begun collecting recycled smartphones for use by schools. Users now upgrade phones every 18 months on average, and just 10% of used phones get recycled, so this is potentially another untapped resource to ensure equitable access. Students could download materials at school to view offline at other times.

Another strategy involves development of lower-bandwidth delivery systems for video. PrimaryAccess, a tool that we developed to allow history students to combine their own text, primary source images, and audio narration to create short online documentary films (see *L&L*, February, 2010, page 36), makes use of this technique. Moore's law, in concert with technological advances, may in time reduce the bandwidth required and provide more equitable access to wireless technologies.

The flipped classroom concept opens the door to exploration of many instructional approaches and formats. Interactive video is evolving rapidly, offering access to primary source documents, new types of visualizations, and innovative instructional strategies. At its heart, the flipped classroom lies at the intersection of emergent technologies, novel approaches to content enabled by new affordances, and new pedagogical strategies facilitated by both. Ongoing research on best practices related to these new capabilities will provide guidance on ways of facilitating student learning in the most effective manner.


Glen Bull is co-director of the Center for Technology & Teacher Education in the Curry School of Education at the University of Virginia. Reach him at gbull@virginia.edu.


Bill Ferster is a research professor at the University of Virginia. His research focuses on visualization and innovative uses of digital video. Reach him at bferster@virginia.edu.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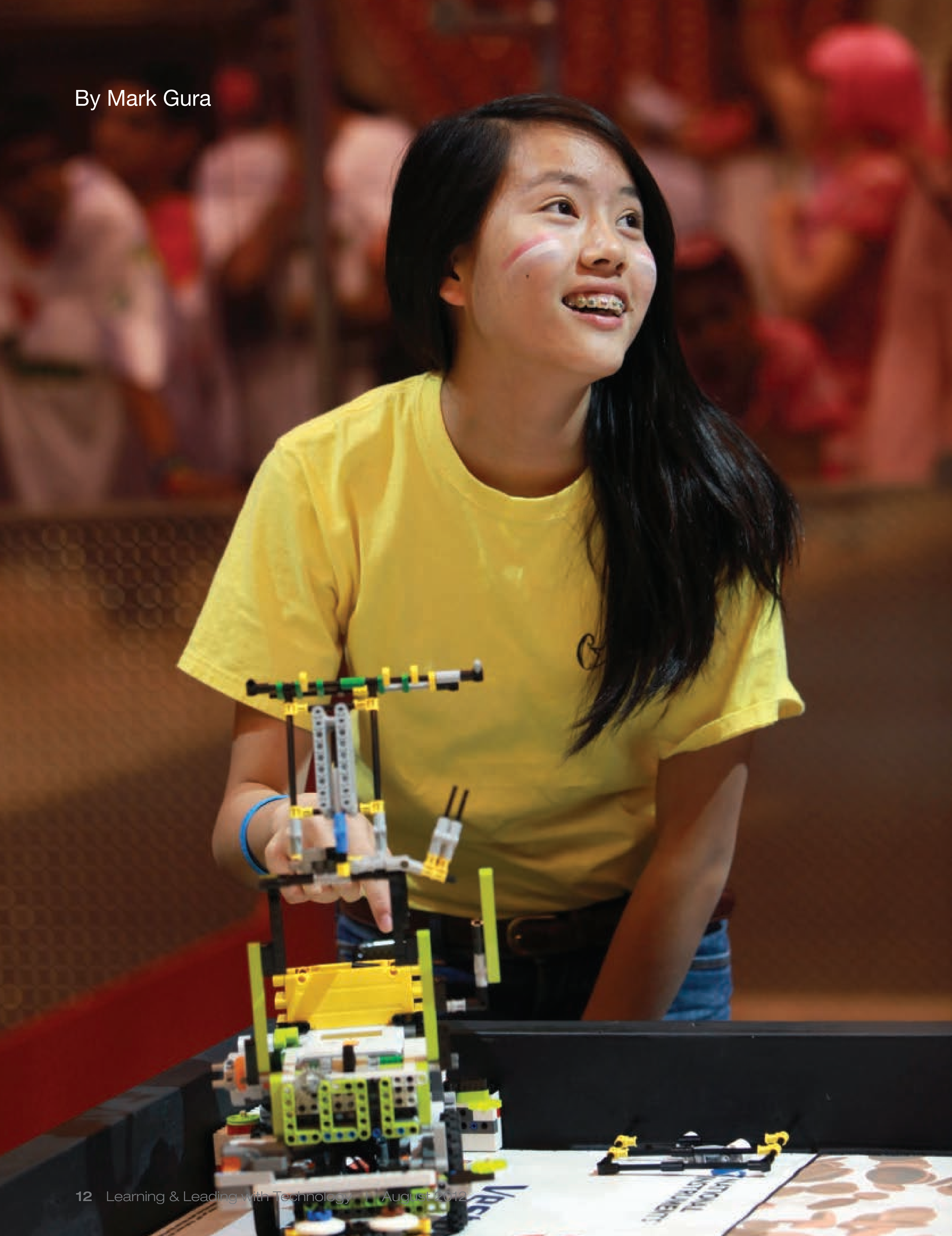
By Mark Gura



Lego Robotics: STEM Sport of the Mind

Lego Robotics is not just for after-school clubs anymore. It's engaging and hands on, aligns with the NETS, and teaches students how to use digital age skills in the real world. In short, it's just what they need in the classroom.

I had come to the old stone building to observe a FIRST Lego League (FLL) qualifying competition. As I entered the public school that Saturday morning in New York City, I was expecting to witness a few dozen middle school robotics geeks putting their creations through paces that only fellow enthusiasts could appreciate. But nothing could have been further from the truth.

I was shocked when I opened the doors to find a huge, animated crowd. In addition to the members of the participating FLL teams that I expected to see, there was a roiling mass of enthused parents, classmates, and onlookers, all cheering wildly. Embedded STEM learning or not, this struck me as nothing less than a high-energy sporting event.

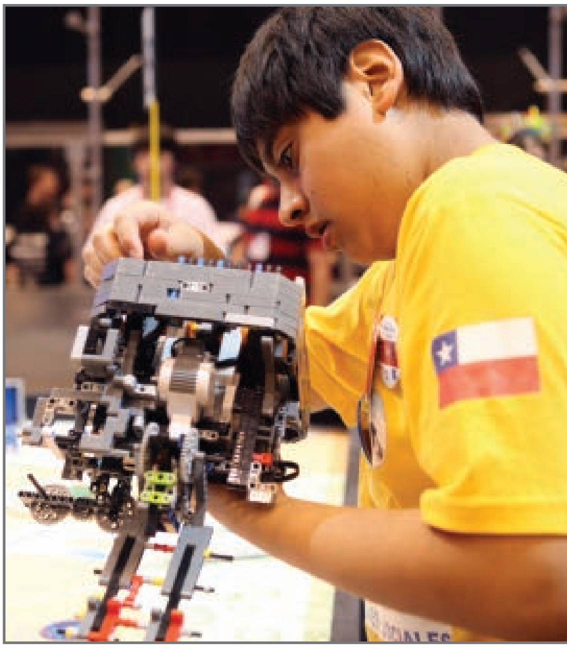
After thinking about it, that made sense. When Lego Robotics, with all its user-friendly technology resources and applications, is in its FLL role, it is very much a sport of the mind (see "A Day at FIRST Lego League," page 17). All the challenges, thrills, and satisfaction of traditional school sports are there. The kicker, though, is that the students involved are also experiencing some of the best science, technology, engineering, and mathematics (STEM) learning opportunities available. And that's when it hit me: Why not harness this engagement and excitement in the classroom to get students excited about STEM?

PHOTOGRAPHY BY ADRIANA M. GROISMAN

A Fun Way to Meet Standards

Schools often begin their involvement with Lego Robotics by establishing an after-school FLL club. FIRST, which stands for "For Inspiration and Recognition of Science and Technology," is an international not-for-profit organization that inventor Dean Kamen founded 20 years ago to engage students in hands-on, mentor-based robotics programs. FLL, one of four programs at FIRST (including Junior FLL for ages 6–9 and two high school programs), is for students ages 9–14. Once a group of students and a teacher or two have accrued some experience and confidence with Lego Robotics materials, they are ready to move on to the International FLL program.

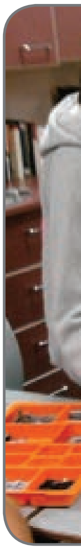
Many would argue that FLL is the most popular and visible way that students participate in Lego Robotics. But often only a small number of a school's students participate in its robotics clubs and teams. That's why a crucial next step is implementing Lego Robotics in the classroom. This ensures that many more students reap the STEM learning benefits that Lego Robotics has to offer. Teachers around the world are beginning to implement Lego Robotics in a variety of ways in the classroom to provide rich, hands-on, standards-based STEM learning.



When students work on robotics projects, they learn important science and math concepts, including standards-based content and skills. Simple machines, for instance, is a core curriculum concept that is also an important part of many robotics activities.

But the great advantage of Lego Robotics is that it provides an alternative to learning from textbooks and teacher-driven, lecture-style lessons. Lego Robotics activities are hands on and experiential. In typical projects, such as constructing and programming a mobile robot to climb a ramp or lift a crane to move objects, students use wheels and axles, inclined planes, pulleys, levers, and screw gears. As students stretch their imaginations to come up with solutions to real-world problems, they are also learning the varieties of simple machines outlined in science standards.

In the classroom, these middle school students are learning standards-aligned science and math content while also building digital age skills such as collaboration, creativity, critical thinking, and problem solving.



How Much Does It Cost?

Many experts agree that Lego Robotics projects work best when students work in pairs or groups of three to share materials (groups of four may also be functional but less ideal). Robotics kits come with enough parts and equipment for a single robot. These can be recycled for the next robot after completing a project. By multiplying the number of pairs or work groups by the price of a kit, you can approximate the cost for the class or group. See the Lego Education website (see Resources below) for the exact cost of kits, which currently are below $300 apiece.

Students will also need access to computers or laptops to program their robots, and schools must purchase the programming software separately, although students can share.

To participate in FIRST Lego League, you'll also need to pay a registration fee (currently $225 for each team) and purchase a Field Kit, which establishes the "field" or environment where the robots will perform their tasks, for under $100. And you'll need an FLL Challenge table, which teams build themselves for $75 or less. See your local FLL chapter website for up-to-date costs.

Resources

Lego Education: www.Legoeducation.us

Lego Mindstorms class package: http://tinyurl.com/6sepyko

Lego Mindstorms Education NXT Base Set: www.Legoeducation.us/eng/product/Lego_mindstorms_education_nxt_base_set/2095

Lego Mindstorms Education NXT Software: http://tinyurl.com/89ptjbh

In addition, few practices better embody the NETS than Lego Robotics, which give students opportunities to learn creativity and innovation, practice communication and collaboration, conduct research, use information, think critically, solve problems, make decisions, and use technology effectively and productively in ways that mirror the real-world work of scientists and engineers, for whom robotics is of increasing importance.

Robotics for Science

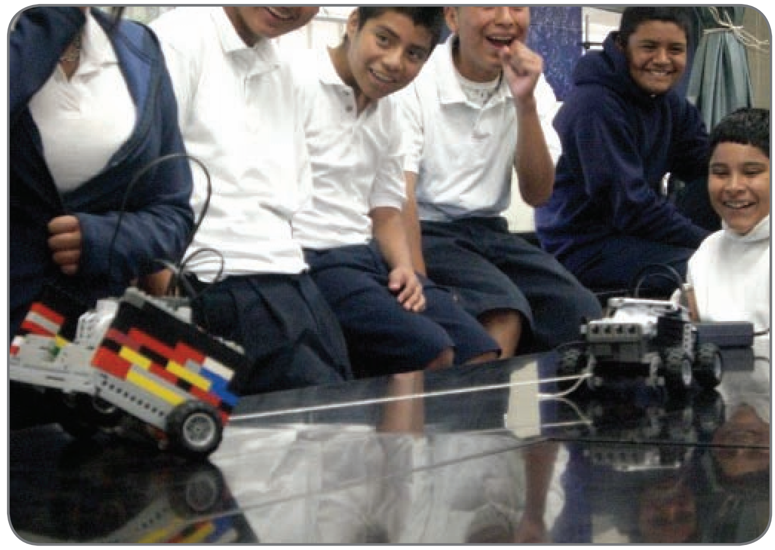
At El Camino Junior High School in Santa Maria, California, USA, science teacher Luke Laurie, with the enthusiastic approval of his administration, has reworked the school's eighth grade science curriculum to add a robotics course to the traditional physical science course. Students get to choose the version they prefer. Students in the robotics course learn the same required curriculum that those in the regular science class do, except they learn it through the hands-on experience of designing and building robots, and then by reflecting on the processes and the discoveries they make along the way. Robotics has proven extremely popular, and its students have shown significant growth and high levels of proficiency on standardized tests.

In Laurie's class, students solve problems that involve designing, building, programming, and operating robots to move from location to location and to carry and deposit objects, all within specified parameters. This involves the same type of problem-solving and decision-making thinking and work processes that professional roboticists perform as they create bots to perform industrial, domestic, social, medical, and military and security tasks.

In Pearl City, Hawaii, USA, Highlands Middle School teacher and technology coordinator Dwayne Abuel has trained science teachers from a number of schools to teach with the Lego Robotics NXT Mindstorms system, highlighting its use of sensors for data collection as part of the state's Stewards of the Island program.

Part of the regular daytime instructional program at 16 schools, the Stewards program applies contemporary science to traditional Hawaiian cultural activities centered on sustainable agriculture and maintaining the land. The result is a highly relevant,

The great advantage of Lego Robotics is that it provides an alternative to learning from textbooks and teacher-driven, lecture-style lessons.



highly engaging, STEM-rich body of student activities.

Students in Abuel's class use Lego equipment to record temperature, soil moisture, pH levels of liquids, and ultraviolet emissions readings. They make decisions about which environmental factors to measure, which probes to use, and which approach would be effective in programming the mobile robotic processor for the specific job at hand. Then they use the processor they build to collect, download, interpret, and report the data, just like a professional environmental engineer/scientist would.

Robotics for Math

Designing and programming a robot also involves math skills, including counting, measuring, and estimating—all required learning in pre-algebra and beyond. A typical project might involve constructing a robot to travel a set distance down a hallway, stopping to take temperature readings at set intervals of distance, and recording these measurements. To accomplish this, students would need to measure a robot's wheel circumference, calculate the number of revolutions required to have the robot travel a given distance, and use the icon-based programing software to direct its movements accordingly. It's a scenario much like what they would face if they worked for a real mining company that wanted to send a robot through a horizontal shaft to test the safety of the environment before following it with human workers.

Robotics activities provide both meaningful challenges and the means by which to solve them.

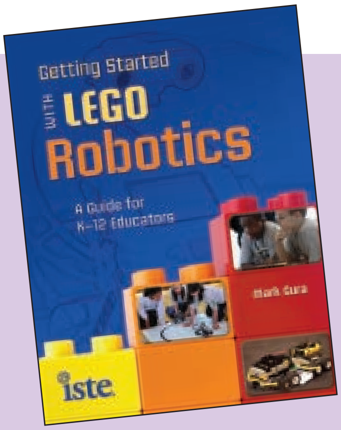
Robotics for Engineering

Lego Robotics weaves together subjects that would otherwise be taught in isolation. Bringing together science, math, and technology gives students exposure to engineering, which is the practical application of these subjects to solve problems. Robotics activities provide both meaningful challenges and the means by which to solve them, and they align easily with the Engineering Design Process, a framework that NASA recommends for learning and doing engineering. This eight-step process begins with identifying the problem and works its way through identifying criteria, brainstorming possible solutions, generating ideas, exploring possibilities, selecting an approach, building a prototype or model, and refining the design for a final solution.

Evan Weinberg taught high school physics, engineering, and math for nine years at Lehman High School in the Bronx, New York City, New York, USA, and currently teaches at Hangzhou International School in Hangzhou, China. He's made extensive use of Lego Robotics in his engineering classes, an approach he finds to be highly effective for teaching engineering concepts, programming, and the design process.

He has also employed Lego Robotics as a demonstration tool in his AP Physics class to collect data from a rotation sensor as a Lego car accelerates from rest, which is an easy way to generate graphs of position and velocity versus time. In another activity, a Lego car moves according to a preprogrammed pattern, and students sketch their predictions for the graphs. The final part of this series involves students trying to move a car with a rotation sensor so that its position versus time matches a provided graph. Relating these graphs to the movement of an actual object is a fundamental concept emphasized in the AP Physics B curriculum.

Weinberg also uses Lego constructions to teach the relationship between force and torque. He's found a number of ways to apply Lego motors to electric circuit problems and calculation



Read More about Lego Robotics

If you're interested in learning more about using Lego Robotics in your classroom or starting a FIRST Lego League club, check out ISTE's book on the subject, *Getting Started with Lego Robotics: A Guide for K–12 Teachers* by Mark Gura. Written for beginners, this book explains Lego Robotics in detail—what it is, what student activities look like, how to begin, how to manage a class, how robotics relate to standards, and much more. It includes more than a dozen interviews with educators, trainers, and students and makes a case for using Lego Robotics in STEM education. Order it at iste.org/robots.

of power, which are important parts of the curriculum. One of his favorite lessons involves demonstrating that rotating a DC motor turns it into a generator, enabling students to generate electric currents to light an LED. When they connect two motors together and rotate one, the other motor also rotates but in the opposite direction. This is an application of Lenz's Law, which can be a tricky concept for students to understand without a hands-on demonstration.

Hard and Soft Skills

Ian Chow Miller, a teacher at Frontier Junior High School in Graham, Washington, USA, teaches an Introduction to Robotics course. Students take it as an elective in seventh or eighth grade and use Lego Robotics materials to learn two separate sets of skills—hard and soft.

The "hard" skills include gearing and gear ratios in the course's drag race competitions; basic engineering concepts, such as torque and acceleration; programming concepts, such as loops, forks, subroutines, and logic; and the use of light, ultrasonic, and infrared sensors. These skills change depending on what project the students choose, but Chow Miller feels that they are actually secondary to the soft skills they learn.

"Soft curriculum" learning is closely associated with digital age learning and the NETS. A big part of soft skills are the opportunities they provide for process learning, which is so important to STEM education. The Conceptual Framework for New Science Education Standards (from the National Academies) speaks of "key scientific and engineering practices" that all students should learn, such as "asking questions and defining problems, planning and carrying out investigations, and engaging in argument from evidence." While these are difficult to learn in textbook-centered, traditional classrooms, they are aspects of learning that are central to robotics projects.

For instance, Chow Miller describes an activity his students do called the "Wave" that engages both their hard and soft skills: "Each class programs their robots to do a coordinated dance. Each class designs their own dance, and individual groups are responsible for figuring out how to program their robot to do their part but also have to coordinate with all the other groups in the class to be successful. Groups use math to figure out the timing to get their robots to perform in a perfectly choreographed manner." (See Resources for a URL to a video of this activity.)

Chow Miller reports that his robotics students learn problem solving, teamwork, math sense (understanding distance, time, power, force, etc., as opposed to just paper-and-pen calculation), thinking skills, working like an engineer, and how to reflect on and develop their own learning.

Chow Miller says, "The students remain engaged and excited throughout the course, and this is one of the only classes I have taught where students want to continue working past the bell."

The class is so popular that they have had to turn students away. To meet the demand, every middle school in the district will offer a robotics class as an elective beginning in the 2012–13 school year.

Sure, Lego Robotics is hyper-engaging for students, but equally important are the ways that it moves STEM education into new and important territory. It's an opportunity for teachers to finally realize many long-sought instructional goals and ideals: problem solving, authentic student research and information gathering, real-world application of basic skills, and practical student collaboration. Lego Robotics is an ideal way to teach these skills while integrating STEM elegantly and authentically in projects that give students hands-on experience with the things they will need to know as digital age learner/workers in the world beyond school.

Resources

FIRST: www.usfirst.org
Ian Chow Miller's "Wave" activity video: http://tinyurl.com/6q4lkct
Lego Robotics Mindstorms: http://mindstorms.Lego.com

Mark Gura was a middle school teacher for 18 years before becoming director of instructional technology for New York City Public Schools in New York, USA. He has developed several programs to establish Lego Robotics and FIRST Lego League in NYC schools.

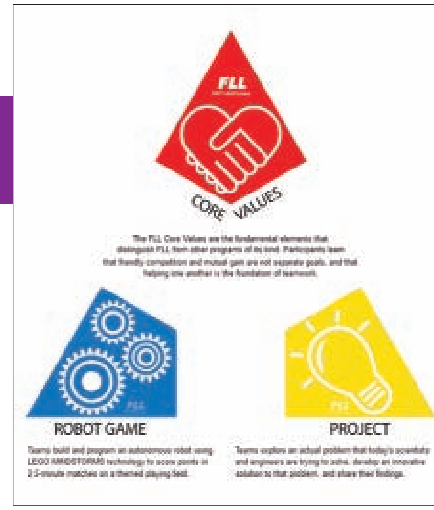
By Nancy McIntyre

A Day at FIRST Lego League

As the 3 p.m. bell sounds at Chaminade Middle School in Chatsworth, California, USA, a thundering herd of middle school students heads up the stairs to the sixth grade science lab, which is home to four FIRST Lego League (FLL) teams. The lab tables are arranged to hold two playing fields, and the students' many hands make light work of the setup. They eagerly place their Lego models—or field elements—around their mats and engage in various challenges. As one of their teachers, Steve Clark, arrives, the kids quickly take their seats to start the FLL meeting.

After Clark makes a few announcements about team shirts, a local tournament, and his willingness to let programmers come in during lunchtime, the students break into groups and move to four areas of the classroom to discuss their progress on their robots, programming, projects, and plans to move forward.

The seventh graders help the younger students, as they remember what it was like to be new but now know what they need to do to be successful on the team and at the competitions.



The Program

Clark, who is a science teacher, and Jeff Bean, an English teacher, run the FLL team meetings after school twice a week. Together, these two teachers showcase concepts that the students learned in the classroom and demonstrate how they fit into the real world. They help students solve problems, conduct research, make technical presentations, work in teams with adult mentors, and prepare for the regional competition. Next year, we hope to make this a two-day event and allow 96 area teams to participate.

Our after-school FLL program feeds into the high school FIRST Robotics Competition (FRC) program that I coach. When these aspiring young engineers come to the high school team

with several years of FLL experience, they easily make the transition to the FRC team, and when they head off to college, they leave with seven years of robotics experience.

The Chaminade FLL program has grown over the past eight years and now serves 40 students in grades 6–8. There are no admission requirements for the team, but all participants and coaches have to make a commitment to attend work sessions two afternoons each week as well as a few tournaments throughout the year.

The Teams

Teams consist of 10 students, each of whom chooses the role of engineer, programmer, or researcher. Everyone helps out where needed, but these subteams specialize in one aspect of the competition for the season and lead the team in that portion.

Traditionally, the eighth grade students lead and oversee all the builders, programmers, and research team members. The new sixth grade students are eager to contribute to the team using the laptops issued at the start of the school year. They love finding information on a variety of topics and organizing their projects into PowerPoint slides for their presentations. The seventh graders help the younger students, as they remember what it was like to be new but now know what they need to do to be successful on the team and at the competitions.

Most of these kids played with Legos when they were younger and are interested in science, technology, engineering, and math (STEM), so being able to work with robots is a perfect stepping stone to their dreams of becoming engineers or scientists.

The FLL experience also provides an opportunity for students to work alongside several local engineer mentors in our lab each week. Today, Cindy Chung, who is a mentor engineer from Xerox, meets individually with the Lawngnomes, Robotic Hotdogs, Explosive Legos, and Jelly Bellies to see how each team is progressing on the research portion of its project.

The Challenge

FIRST issues a different challenge each year to each of its programs. The FLL students have to tackle a two-part challenge: researching a current issue and solving the issue with a robotic solution.

In 2010, the FLL challenge was called "Body Forward: Engineering Meets Medicine" (http://tinyurl.com/7ud5mqf). The teams were challenged to design, build, and program an autonomous robot using a Lego Mindstorms NXT kit, with a goal of scoring as many points as possible in the 2.5-minute matches that they play on the themed playing field. Some of the tasks they program their robots to do include:

- Setting a broken bone and applying scaffolding, which will allow a bone to grow back together when the normal healing process is not working

- Inserting a stent to help expand and support constricted vessels where fluids need to pass through
- Creating a dispensing system to separate different simulated medications so patients can be more self-sufficient

In the research portion of the competition, teams choose and explore a problem that today's scientists and engineers are trying to solve. They develop an innovative solution to the problem either by creating something that does not exist or by building on a current solution. They also share their findings in the local community.

In today's meeting, students share their latest research and discuss how they can better organize their programming missions to be more efficient and collect more points in an FLL match. Many of the kids on the FLL team have never participated in traditional team sports, so this is a new concept to them.

The students have been focusing on how biomedical engineering has been used throughout history and how current applications are solving problems in all areas of the body. They have brainstormed ideas for the problems that need to be solved, and now they are applying this groundbreaking research and technology to ways that they believe could improve lives.

The teams design their robots to perform a variety of tasks, and it is up to the programmers to make the autonomous robots come alive and tackle the challenges on their own. A huddled group of students collaborates to figure out which route the robot needs to take to maximize its efficiency to complete each of the missions, which will allow them to score as many points as possible. The returning students show the younger ones the ins and outs of writing and testing the programming and encourage them to help with the program. They happily make multiple trips back and forth between the computer stations and the playing field.

Final Results

As it approaches 5:15 p.m., Clark announces that it's time to begin the clean-up process. This is met with many groans because it means that the build session is nearly over for the day and homework is not far behind. He adds a reminder for an upcoming parent meeting about our school's help in hosting the regional tournament, and everyone is on their way.

As the future engineers gather their books, musical instruments, jackets, and backpacks, their engineer mentor Cindy Chung and I take a seat to catch up. She relays a story about the last competition, where Chris from the Robotic Hot Dog team came dressed as a giant hot dog to cheer on his team.

I check in with the teams every week, along with members of my high school team, who come to help mentor their younger colleagues. Watching the transformation of these young students over the season into cohesive teams that are helping each other to reach their goals is what FLL is all about. When these students come to the high school for dual campus events, they always give me an update about their lives.

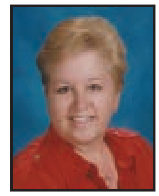
At the end of the season, after a well-earned pizza party, the teams shared with me some of their proudest moments, including:

- The Lawngnomes earned Best Robot Performance and the Champions Award.
- The Lawngnomes earned first place in the Teamwork category at the L.A. FLL Championship.
- The Explosive Legos took first place in the Teamwork category at our qualifying event.
- The Explosive Legos took fifth place in the FIRST Core Values category at a showcase event at Legoland in San Diego, California, USA.

I am confident that our FLL teams will continue to do great things at the middle school level and that the students will be well prepared to join their high school classmates in the next couple of years, providing us with many more opportunities to continue to strive toward the National Chairman's Award, which is the most prestigious recognition that FIRST offers.

The greatest reward for me, as a teacher and mentor, is seeing how exploring, learning, and thriving in FIRST programs spur students to find a purpose and passion in engineering. Their FIRST experiences enhance their natural curiosity and maximize their learning. They see classroom lessons come to life as they engage in hands-on engineering lessons, solve problems, and build robots to complete complex challenges.

Every year, I graduate seniors from our high school team who go on to engineering schools across the United States with a variety of scholarships. Last year, several young men had been part of our program since sixth grade. Eric, our team president; Chris, our lead in electronics; and Garrett, our lead builder, are perfect examples of how FLL develops in students not only a love of STEM but also leadership skills and the ability to confidently solve problems, work together, complete a job on time and within budget, and make friendships that will last a lifetime.



Nancy McIntyre is the program director of the Eagle Engineering Team at Chaminade High School in Chatsworth, California, USA. She oversees the robotics programs at Chaminade Middle School and Chaminade High School and is the Southern California FIRST senior mentor.

By Denise Spence

A Certified Success

Find out how Dunbar High School administrators and staff turned their struggling school around by offering students the opportunity to train in a professional learning environment and earn industry-level IT credentials.

A transformation is going on at Dunbar High School. Administrators, parents, teachers, students, and community partners are excited about the new opportunities offered to students enrolled in our award-winning technology programs. But this was not the case more than a decade ago.

In the fall of 2000, Dunbar High School in Fort Myers, Florida, USA, opened its doors with a diverse student population under the direction of Principal Carl Burnside. By 2004, enrollment had significantly declined, and the school had one of the highest percentages of low-performing and low-socioeconomic students in the district. Advanced-level students and their parents were asking, "Why should I select Dunbar in a school-choice district?" And we needed a great answer.

What We Did

Our principal knew that something needed to be done to revitalize Dunbar, or our school would be in deeper trouble. Burnside reached out to a grant writer, Jana Hambruch, who had a simple but revolutionary vision: offer high school students the opportunity to train in a professional learning environment while giving them the chance to earn industry-level IT credentials. We won a grant from the Magnet Schools of America to design a program to help students develop the digital age skills they would need to participate in a technology-savvy workforce. By offering industry-certified credentials, we were able to structure the content in a way that would prepare students for college and career.

Our first program, the Academy for Technology Excellence, offered 9th–12th grade students hands-on IT experience taught by IT-certified instructors. Students had the opportunity to earn more than 18 Microsoft, CompTIA, and Cisco certifications by the time they graduated from high school (see "Academy for Technology Excellence" on page 22). The program earned the distinction of being the first Microsoft Certified High School in the world.

Soon the academy program began attracting not only technology enthusiasts, but also students looking for IT training on the creative side of the genre—digital media and arts. We realized we needed to broaden the range of skills offered through the program to satisfy our arts-oriented students. In 2009, we created the Academy for Digital Excellence, which also offered courses taught by IT-certified instructors and industry certifications.

With the initial model already in place, we easily incorporated the Academy for Digital Excellence into the Career and Technical Education (CTE) model. The Academy for Digital Excellence students were a good fit for courses we already offered, such as web development, digital design, and TV production. The core program requirements were to train students in the digital-arts skills needed for a career or college education. These students had the chance to earn entry-level IT certifications in Photoshop, Dreamweaver, Flash, and Premiere Pro (see "Academy for Digital Excellence" on page 22).

Courses Helped Students Succeed

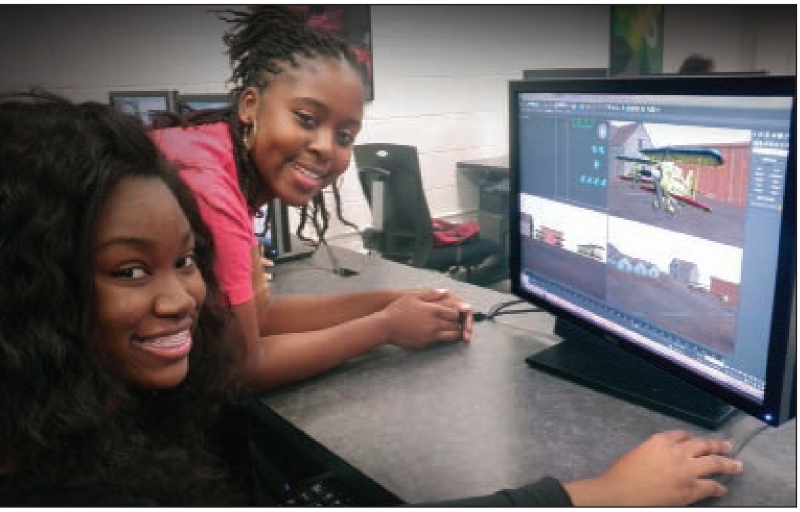
Students of all abilities, drawn by the open-ended structure of the curriculum, flock to these courses. They love that they are getting real-life experiences, such as creating websites, brochures, and presentations. One of our students designed a public service announcement for the Florida Department of Education. Dunbar's TV production studio leads students through all the facets of creating a live broadcast. And in the summer, our technology students organize the local YMCA's Tech Quest digital design camp for middle school students.

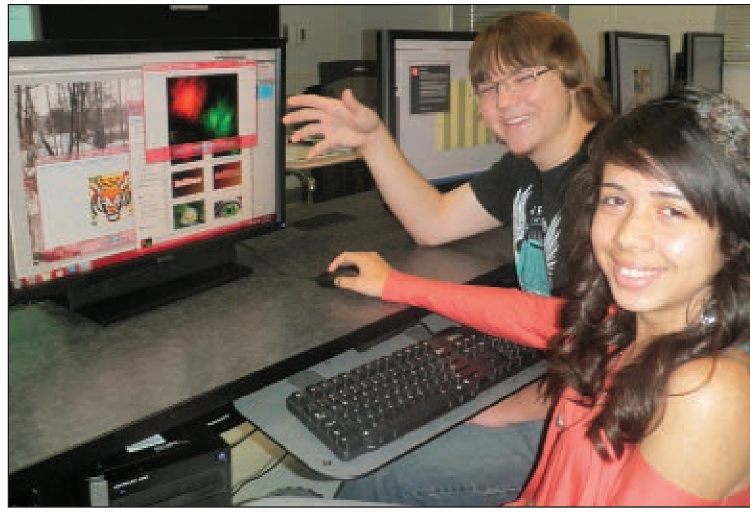
Even traditionally low-performing students from other academic areas excelled in these classes. And the more students gained confidence and success in academy classes, the better they did in standard academic courses and on standardized tests.

It seemed that earning industry certification amplified their feelings of success and motivated them to work harder on other tests. Students enrolled in the academies have consistently scored above the district and state averages on the Florida Comprehensive Assessment Test.

Many Played Important Roles

From the beginning, our academy programs have relied on several key people, including the district CTE program director, district IT director, principal, assistant principal for curriculum, and local technology support technician. Each played a valuable part to ensure that the program received up-to-date resources, technology upgrades, support, and the proper training tools. Having industry-certified instructors for the program ensures that the teachers are competent, and it lends credibility to the program. Finally, having a dedicated lead teacher to directly manage the content and structure, coordinate testing, collect and report





Academy for Technology Excellence

Tier/Year/Age	Certification Focus	Career Connection
Tier 1 Freshman Ages 13—14	Microsoft Office Specialist CompTIA A+	Administrative assistant Enterprise technician PC Support Technician
Tier 2 Sophomore Ages 14—15	CompTIA Network+ Cisco Certified Network Associate	Network administrator Network technician
Tier 3 Junior Ages 15—16	Microsoft Certified Desktop Support Technician Microsoft Certified Systems Administrator CompTIA Security+	Customer support technician System manager
Tier 4 Junior Ages 16—17	Microsoft Certified IT Professional Microsoft Certified Technology Specialist CompTIA Server+	System administrator

Academy for Digital Excellence

Course	Certification Focus	Career Connection
Web Development	Adobe Certified Associate: Photoshop, Dreamweaver, Flash	Web design and development Marketing Graphic designer Multimedia designer/developer Animator
Digital Design	Adobe Certified Associate: Photoshop	Visual and print design Marketing Graphic designer
	Adobe Certified Expert: Illustrator	Illustrator Desktop publishing
TV Production	Adobe Certified Associate: Premiere Pro	Multimedia production assistant Marketing Multimedia designer/developer

Academy programs have not only enabled each student to experience real-world achievement, but also have given students real passion and commitment for learning.

data, and serve as the community liaison is a must. This person facilitates the collaboration between school personnel and business partners.

Another important feature of our program is our Business Advisory Committee (BAC), which is made up of people from local businesses as well as representatives from area colleges and universities. The BAC advises us on local business needs, so we can make sure our students are learning relevant skills. They are our experts in the field as well as guest speakers. They share insight and information about new technologies and help students understand how their learning applies in the business world.

Our partner universities and colleges also play a vital role. We have established articulation agreements allowing our students to earn college credits for coursework and certifications. Nearly every college and university in our area is a member of our BAC, so we know the curriculum and sequencing align with what colleges and universities expect.

How We Paid for It

Initially, we started with a Magnet School of America federal assistance grant that enabled us to retrofit a modern IT infrastructure into our aging building. Once the grant ran out, we looked for help from the Florida Department of Education's Career Academies initiative, which was charged with commissioning the state's high schools to develop small personalized learning environments that focused on career-related coursework and industry certification. Any high school that meets the standards of a Career Academy is eligible to receive a grant. Each student who receives a certificate earns funding for the school.

In addition to the grant, we also receive funding from our business partnerships. Many other sources of funding are out there as well. The Adobe website lists information about how a district can pursue government funding (see Resources).

Positive Outcome

The academy programs at Dunbar High School have become the unifying agent that bonds our students and faculty together. Students in these programs learn to work with each other on collaborative projects. The evolving environment has produced significant changes in how students in the academy programs perceive themselves. Now, for the first time, they experience success beyond the classroom. Cody, a graduate, wrote:

> Because of the program and certification, my idea of school has improved and going to school is something that I love to do. The chance to certify is invaluable and I hope that I will be able to continue to receive certifications later in life. This program has truly changed my life and nothing will ever be the same for me. I already feel like I succeeded.

Through our relationships with our local and global partners, students have learned that they can be valued citizens of our global IT economy because of the knowledge base they've gained in our programs. Academy programs have not only enabled each student to experience real-world achievement, but have also given students real passion and commitment for learning.

Resources

Adobe list of government funding sources: www.adobe.com/education/resources/k12/funding/stimulus

Dunbar High School: http://dhs.leeschools.net

Florida Department of Education Career Academies: www.fldoe.org/workforce/careeracademies/ca_home.asp

Denise Spence has been an educator for more than 17 years and holds a master's degree in curriculum and instruction: instructional technology. She has managed all the IT programs at Dunbar High School for five years.

By Sara Getting and Karin Swainey

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First Graders with iPads?

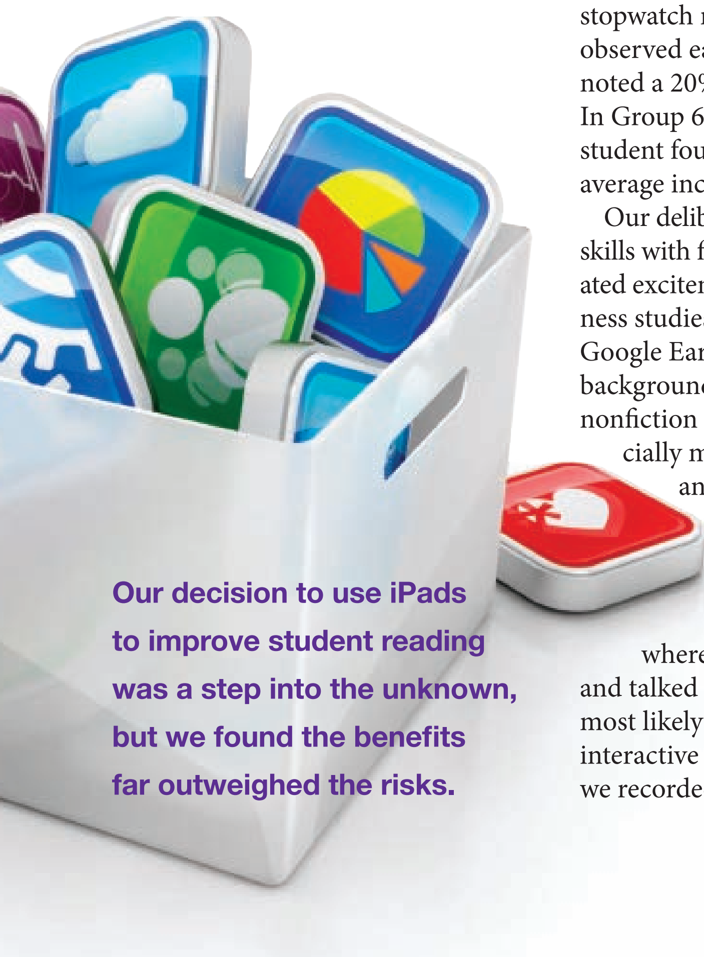
Find out how two teachers took on the challenge of improving elementary reading, achieved surprising success with their youngest at-risk readers, and learned some interesting things along the way.

Giving iPads to first graders is a leap of faith that many teachers are understandably hesitant to take, especially if their students need immediate reading intervention and school leaders want guaranteed results. Our decision to use iPads to improve student reading was a step into the unknown, but we found the benefits far outweighed the risks.

We set out to determine if using iPads would help increase reading achievement with our two lowest reading groups during the 2010–11 academic year at Hilltop Elementary School in Inver Grove Heights, Minnesota, USA. Our project targeted key areas of reading but also aimed to incorporate digital age skills into our teaching strategies and lesson plans. The ultimate goal was to offer meaningful opportunities to our young learners as they began their journey toward digital age readiness.

We grouped our students based on "response to intervention" (RtI) levels. RtI is a homogenous system of grouping students by ability in specific areas based on their needs. We then set about putting appropriate interventions in place to measurably improve scores in sight-word recognition, fluency, comprehension, and vocabulary recognition and meaning to meet targeted benchmarks. We used AIMSweb scores as well as other informal assessments to compare data between the 2009–10 group and the 2010–11 group, which had routine practice on apps and websites with the iPad.

Our moderately at-risk learners, Group 5, were receiving services through Tier 2 or Title 1 support. Our most at-risk learners, Group 6, were students receiving services in tiers 2, and 3 and special education. Although there were exceptions, the data confirmed elevated average gains and/or higher end-of-year scores for students with routine iPad use.



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Encouraging Conclusions

Managing iPads with first grade students was easier than we expected. Because of their age, we initially didn't even allow them to walk around the room with the iPads. Instead, the teacher or paraprofessional sat students down and brought the iPads to them. From the beginning, we discussed the privilege of using iPads as learning tools and took them from students who chose not to comply immediately. This contributed to students' attentiveness significantly. In fact, it became a highly motivational learning tool for some who demonstrated undesirable behavior elsewhere, and that inspired us to collect "time on task" (TOT) statistics for one student in each group.

We asked a special ed teacher to gather data as we facilitated learning, including TOT data collected with a stopwatch. Anytime the student was off task, the stopwatch stopped. When the student regained focus, the stopwatch resumed. In Group 5, we observed each student four times and noted a 20% average increase in TOT. In Group 6, we also observed each student four times, and noticed a 15% average increase in TOT.

Our deliberate focus on digital age skills with first grade students created excitement. For global awareness studies, for example, we used Google Earth on iPad to provide background for places mentioned in nonfiction selections. This was especially meaningful as we researched and tapped students' prior knowledge of dinosaurs. As a large-group activity facilitated by the teacher, we discussed Pangaea, where dinosaurs may have lived, and talked about which dinosaur most likely walked in Minnesota. For interactive communication lessons, we recorded students reading a selection with the Voice Memos app, then swapped iPads to listen and follow along as a peer read. This was exciting for students, as it was a nice change of pace with a surprise ending. We asked students to identify themselves verbally after completing the story. Sometimes it was a student from our class, while other times we swapped between classrooms.

For data analysis, we created weekly "stoplight" charts. Students would graph their progress by hand for vocabulary and comprehension quiz scores with the goal of staying in the green zone. This was a fascinating phenomenon to observe, and students would willingly participate in dialogue to reflect on their scores.

Favorite Apps

We discovered some favorite apps and websites along the way.

Sight Words. For sight-word recognition, which was the best use of iPad apps in our case, we loved K–3 Sight Words, Smiley Sight Words, and ABC Pocket Phonics.

Fluency. For fluency, we found Talking Tom, K–12 Timed Reading Practice, and Voice Memos most useful.

Comprehension. For comprehension, the trickiest area to locate apps for, we used a website called Reading A–Z (see Resources on page 27). Their leveled readers in PDF format, along with their comprehension tests, helped us practice reading strategies and led to meaningful discussions.

Vocabulary. For practicing vocabulary recognition and word meaning, we used Kid Whiteboard, Glow Draw, Doodle Neon Glow HD Free, and Doodle Buddy for iPad. Using these productivity apps allowed us to create our own games, such as a vocabulary word cakewalk, word mingle, and iPad concentration.

Literacy. Other notable apps for general literacy practice that we loved included Magnetic Alphabet, ABC Tracer, Clifford's Be Big with Words, Word Families, and Word Magic. We liked these apps because they were easy to navigate, engaging for the learners, and provided numerous opportunities for differentiation.

Facilitation

Our collaborative effort was essential to the project's success. With a continuous cycle of planning, implementation, reflection, and planning again, we found that meeting twice a week helped us modify and make immediate adjustments.

Although the two of us had been teaching together for four years, we had been viewing some minor details in common assessments differently. After discussing the items, we came to a common agreement.

We planned a staff training session to offer iPad basics as well as tips and tricks for management of the devices with small- and large-group situations. After the training, we encouraged our staff to check out iPads for use outside of our literacy instruction time with their own students.

Finally, for app organization and evaluation, we learned of Harry C. Walker's App Rubric on Tony Vincent's marvelous blog, Learning in Hand (see Resources). We contacted Walker, who granted permission for its use. After completing rubrics on chosen apps, we let our technology department know which apps would be most useful for our learners.

iPads provided leadership opportunities for our first graders. Once the project was under way, our students became comfortable navigating the iPads in no time. With their help, we presented to our school board in October 2010. We asked a small number of students to stand between board members to demonstrate some of the apps. We then gave school leaders a short presentation about our plans for the future.

Our students also participated in our district's first-ever Student-Led Technology Conference. At this public event, four first graders led a session on iPad basics. The students presented an overview of the iPad and gave ideas about how they could use the device in their daily lives. Because of this activity, along with support and implementation of action research projects, the Consortium for School Networking selected our district to join a cadre of 14 leading-edge school districts in the nation. The goal of the cadre is to develop effective leadership and policy that relates to the use of digital media by sharing experiences, challenges, and best practices for innovative uses of new media in K–12 education.

Areas of Frustration

There were definitely a few obstacles to overcome. At times, this self-directed project was humbling and discouraging.

On our own. As we began back in May 2010, we knew we would have to pave our own path and arrange the action research to best suit our needs. Our district office offered very little direction, other than advice on how to comply with funding requirements. It was our decision to choose the pace—a leisurely walk or an all-out sprint—and we've had our running shoes on ever since.

We proposed the plan to our superintendent and had to clearly specify how it would relate to best practices in action research. An equally important requirement was to show how we would share our evaluation with others.

Limited by subject matter. We found that a 90-minute literacy block with an already demanding daily schedule was not conducive for modern project-based learning activities that could include critical thinking, systems thinking, and collaborative problem solving. We felt limited by the subject matter and knew we had to be diligent about making sure to get through our intense curriculum. Instead, we chose to be more deliberate about incorporating higher-order thinking skills into our teaching strategies and were able to document activities for global awareness, interactive communication, and data analysis.

Technical problems. We discovered early on that our devices would not always sync properly in mass quantities. We were the first in our district to attempt this type of project, and we had no previous experience, which may have contributed to this setback. We now know that software management is an ever-changing process. Many of the management tools we use now were not available when we began. Our district now uses Filewave to manage our iOS devices.

We had trouble getting our VGA cord to work properly through our computers and interactive whiteboards. We discovered that the iPad 1 was not compatible for projection with the VGA cord. Instead, we used our document cameras to project to the whole group when necessary.

We would have loved to use websites that require Flash, but it wasn't until the end of the school year that we discovered iSwifter, a free app that allows access to some websites if you enter them through the app. Cloudbrowse is a paid app that serves the same function.

Noisy apps. Although some of the noisiest apps were also extremely fun, it made for some distracting learning environments. To combat the issue, we applied for and received a mini-grant from our Parent Teacher Student Association to purchase a set of 12 headphones that two teachers shared for small-group activities.

Missing apps. We did not have much success locating apps for comprehension, although we found a handful of them later. Unfortunately, they were paid apps, which limited our accessibility.

Cost. Although we understood the need for Apple's volume purchasing plan, it increased the cost of our project. We received U.S. stimulus funding, which allowed our district to shift money to its capital fund for iPad purchases.

Variable data. Even though we tried our best to make authentic comparisons in our data, there were variables. The 2009–10 and 2010–11 class sizes were not identical. In 2009–10, Group 5 had 12 students, and in 2010–11 it had 16. In 2009, Group 6 had nine students, while in 2010–11 it had 11.

All of us were veteran teachers, but neither of the groups had the same teacher for the two consecutive years of data collection. Because of this variable, there was one data point collected only for Group 6, as Group 5 was without a previous comparison.

Lessons Learned

Our students continue to help each other in the classroom. Movement from one leveled reading group to another occurs often to ensure students' proper placement based on their abilities. In fact, Group 5 and Group 6 sustained extensive amounts of movement—20 changes per group throughout the year! Whenever a new student would join our group, most often during iPad activities, our support was not necessary. Students would instinctively help each other, creating a wonderfully collaborative environment.

From start to finish, this project has convinced us that using iPads with at-risk learners creates an environment that meshes nicely with the learning styles of our youngest digital natives. iPads truly make a difference in sight word recognition, fluency, comprehension, and vocabulary recognition and meaning.

Resources

Harry Walker's app rubric: http://learninginhand.com/blog/evaluation-rubric-for-educational-apps.html

Inver Grove Heights Community Schools app lists: www.invergrove.k12.mn.us/usefulapps.html

iSwifter: www.iswifter.com

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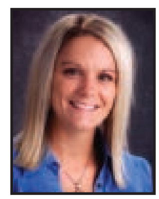

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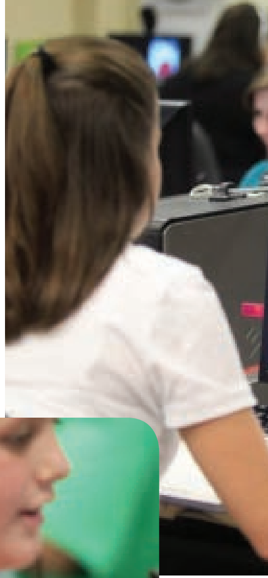

Preservice Teachers Tutor K–12 Students

By Cynthia Vavasseur, Courtney R. Hebert, and Tobey Naquin

PHOTOS COURTESY OF NICHOLLS STATE UNIVERSITY.

While sitting at a cafe after attending several intriguing sessions at ISTE 2011 in Philadelphia, Pennsylvania, USA, my graduate student, Tobey Naquin, and I discussed our biggest concerns back home in Southern Louisiana, USA. Naquin, a fifth grade teacher, talked about her students' lack of interest in vocabulary and reading comprehension. My challenge, as a university professor in the field of educational technology, was finding meaningful field-based experiences for my preservice teachers. As we talked, we began to imagine the possibilities of our students learning together. That's how Colonel Chat, a program matching fifth grade students with student teachers for online face-to-face tutoring, was born.

Training Opportunities Hard to Find

Field experience for preservice teachers traditionally involves identifying K–12 classroom teachers willing to allow candidates to observe classroom activity. Such opportunities can be hard to find, because some teachers regard a student observer as an intruder in the classroom. That's one reason why there aren't enough classroom observation options available near our university for preservice students. So occasionally they must travel great distances for a chance to observe a short classroom lesson.

Too often, preservice teachers show up to a classroom only to find that the students are taking a test, doing seatwork, or engaging in other forms of inactive learning. These kinds of observations hold little value for candidates who are looking for model lessons to observe.

Courtney Hebert, a current graduate student, was frustrated by this approach. "As an undergraduate candidate, I understood that part of learning how to teach was by watching others, but one of the reasons I decided to enter the teacher education program was because I wanted to get out there and do it myself," she said. "I wanted to interact with both teachers and students, not simply observe them."

Colonel Chat emerged as a way to offer student teachers a meaningful and convenient field experience that would also give young readers quality one-on-one tutoring that they wouldn't otherwise get.

How It All Began

Our Colonel Chat pilot project began with 14 third- and fourth-year students from Nicholls State University (NSU) in Thibodaux, Louisiana, USA. They were all majoring in grades 4–8 elementary education, and each was taking a mandatory reading methods course.

Colonel Chat, named after the Nicholls State University mascot, followed traditional roles of face-to-face tutoring. Each fifth grade student was paired with a preservice teacher. During twice-per-week, 15-minute scheduled sessions, preservice candidates used various methods to assist in vocabulary acquisition and comprehension.

The first session suffered from technical glitches that might have frightened off less tech-savvy educators but did not intimidate these preservice teachers. Webcams were turned off, volumes were muted, and settings on computers were not appropriately controlled. Seeing similar technical problems around the room allowed us to easily identify and fix common glitches. Once connected, the preservice teachers used oversize flashcards, slideshows with vocabulary from a text, and reciprocal teaching

strategies to help students learn vocabulary. The tutors discovered which techniques worked best with their students and continued using them throughout the sessions.

Chat Benefits Students and Tutors

Colonel Chat was an immediate hit among the fifth graders. Students were constantly asking when they were going to meet with their tutors again. But the best indication of success was how well students were doing on vocabulary acquisition. Classroom teachers began noticing that the fifth graders were using vocabulary from their reading when discussing the stories. Naquin, who supervised the Colonel Chat pilot program, said that students acquired a real understanding of the vocabulary rather than memorizing the definitions dictated to them by the text. She gave all students in the two participating fifth grade classrooms pre- and posttests on the subject matter. Students participating in Colonel Chat showed a 23% increase in achievement after the eight sessions of Colonel Chat, compared with a 14% increase in achievement for those not participating.

The preservice teachers got a lot out of the experience as well. Kristen Kenney, a junior majoring in middle school education, put down her headphones after her third session and exclaimed, "That just made my day. He was so excited when he got the answers right that his face just lit up."

Colonel Chat was also a good option for the classroom teachers, as there were no interruptions. The program provided individualized instruction for struggling students with little or no time taken away from other students.

Technology Motivates Students

Part of the appeal for both students and preservice teachers was the element of technology. Technology engages students and allows them to take hold of their own learning while giving them a platform on which to work and grow.

Kenney said the kids loved using Google Chat. "Even though we were tutoring them through the computer, a personal touch was added because we could see and hear each other through the webcam and microphone," she said. "Using Google Chat with the students heightened their motivation while allowing us to provide a tutoring experience that went much further than just paper, pencil, and a textbook."

Spreading the Word

In the spring of 2012, Colonel Chat was extended to four additional classrooms. Although using the program with kindergarten and first grade students presented additional challenges, we observed similar positive outcomes in motivation and achievement. Next we want to buy kits to lend out to K–12 schools. The kits would contain webcams, headphones, and a manual showing the teacher how to connect via Google Chat, use Google Docs, and troubleshoot common problems.

Finding tutors and equipment has not been a problem. In the state of Louisiana, teacher education candidates are required to complete 180 hours of field experience before graduation. Colonel Chat offers a way to provide meaningful virtual field experiences to our candidates.

The only "problem" is that the program has become too popular. As more classroom teachers and university faculty gain interest, it's become too big for one professor to manage. So we have written a small research grant for a dedicated graduate assistant to help in the day-to-day tasks of Colonel Chat.

Finding interested K–12 classroom teachers has not been a problem. As word spread about the program, I received dozens of emails from teachers and principals wanting to join. The biggest barriers have been the quality or quantity of equipment and lack of bandwidth at the K–12 schools, the need to gain parental permission, and scheduling limitations. But none of those hurdles has been too high to overcome.

As I sat in my office and watched the final session of the Colonel Chat pilot program, I was moved beyond words watching my preservice teachers. Many were in tears or close to it speaking with the young students. Not only did this program nurture learning, but it also helped build relationships. Perhaps the experience was best summed up by Kenney, who said, "Today was my last day of Colonel Chat with my buddy. He was so sad that he used one of this week's vocabulary words, *linger,* to tell me he was 'lingering' because he didn't want to stop tutoring."

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—Courtney R. Hebert is a graduate of Nicholls State University in secondary English education and a member of the second cohort for the MEd concentration in educational technology leadership.

—Tobey Naquin is a veteran fifth grade elementary teacher at South Thibodaux Elementary School and a graduate of the first cohort for the MEd concentration in educational technology leadership at Nicholls State University.

Global Collaboration for Elementary Students

I regularly reflect on how well I support my K–5 students' global awareness. Have I helped them realize that they are important members of an increasingly connected society?

I began my career as a third grade teacher at St. Joseph School in Hilo, Hawaii, USA. At the time, I thought my students weren't as globally aware as they should be. Our first experience connecting with learners elsewhere was with a class in Maine, USA, via Skype. My students loved it. We ended up connecting with a dozen third grade classrooms from all over the United States that year.

The Skype sessions were engaging because we were learning about other people and felt empowered as we shared our culture and lives. But I knew it was only the tip of the iceberg. There was literally a world of connections in front of me.

In 2010, when I became a K–5 technology teacher at the Kamehameha Schools Hawaii campus in Keaau on the island of Hawaii, I was excited about being able to support global collaboration for many more students. Since then, my first graders have created time-lapsed movies to compare seasons with students in Vermont, USA; my second graders have taught Australian students about native endangered animals; my third graders have collaborated on digital stories with third graders in Wales; my fourth graders have chanted in Hawaiian for students in New Jersey, USA; and my fifth graders have exchanged cultural knowledge with Cree students in Canada and learned about cancer and health from high school students in Oahu, Hawaii.

Clearly, technology tools are helping students understand that we have a special place in this world and have much to share and learn. Through this growing number of alliances, a few have stood out as model global collaborative projects.

The Baltimore Project

In the fall of 2011, Michael Fort, a specialist in the Office of Instructional Technology for Baltimore County Public Schools, in Maryland, USA, contacted me through the Skype for Educators (education.skype.com) website. He was looking for schools to work with on a variety of projects. He connected me with Dana Novotny, a technology integration teacher at Cromwell Valley Regional Magnet School of Technology. We established partnerships between first, second, fourth, and fifth grade classes, all of which were valuable experiences for our students. A truly special relationship, however, emerged from our fifth grade students' collaboration.

Skype. The first thing Novotny and I did was create an opportunity for our students to develop relationships. Using Skype as a communication tool, we kicked off the introduction with a "mystery" Skype session. Our classes tried to figure out where the other class was located by asking questions and studying a map. This clue-based activity built excitement for the students and supported their natural curiosity about other places. We asked geographical questions and were finally able to guess that our friends lived in Maryland, more than 4,000 miles away from us.

Edmodo. Although purposeful and useful, Skype sessions do not alone make for meaningful global collaboration. To build on the relationships established during the mystery Skype session, we used Edmodo, a secure online environment where students and teachers can communicate, collaborate, create, and share. In Edmodo, the

By Carmen Richardson

Multidisciplinary

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students were organized into groups of eight: four from Hawaii and four from Maryland. Creating small groups in Edmodo was an essential step in the collaborative process. It allowed for ongoing, student-directed interaction among students and teachers. The students shared things about themselves by creating an *All About Me* PowerPoint that they uploaded to Edmodo. Sometimes students don't get excited about creating a simple PowerPoint presentation. This time, they were energized. They had an audience that reached beyond the walls of our room and thousands of miles across the sea. The interaction and discussion that occurred based on what the students shared about themselves strengthened and deepened the bonds that had been established during the initial Skype session.

After these get-to-know-you activities, students began interacting online, guiding their own discussions and spontaneously sharing their work. As they learned more about each other, they became more curious. Edmodo allowed them to communicate, but it wasn't long before they were asking to Skype with their "buddies" again. This time, small groups of students Skyped face to face.

Video. Once the relationships had been established, we moved on to curriculum-driven projects. The first undertaking was a video project. Small groups of students conducted their own Skype sessions to find out what their buddies wanted to know about them, their school, and their community. That information guided the planning and recording of the groups' videos. I have never seen a group of students so excited to create a video. There was purpose and meaning because there was an audience.

VoiceThread. The next step was a poetry project orchestrated by Baltimore fifth grade teacher Florence Falatko, who simultaneously taught students in Maryland and, via Skype, students in Hawaii. We listened to music, learned about rhythm and beat, and practiced reading poetry for two voices. The students formed pairs, with one from Maryland and one from Hawaii, and used Edmodo to collaboratively write a poem for two voices. The students then used VoiceThread to practice and study the two-voices poetry. Using VoiceThread, we listened to and performed for the students in Maryland.

The culmination of the project was an exciting day indeed. The fifth grade teacher in Hawaii, Karyl Ah Hee, said, "I could feel the excitement in the air. The student-to-student connection via Skype promoted shared leadership, collaboration, cooperation, and, of course, shared learning. I think the kids thrived because they knew that success or failure was dependent on them."

The students were asked to reflect on the process. Many of them noted that they had never worked on a project like this with someone far away. The topic of the unit may have been poetry, but the students identified multiple pieces in their learning, including poetry, communication skills, collaborative skills, and technology tools. My

students suggested that we do another project like this with our Baltimore buddies because it was more exciting than writing on their own.

Engaged Learners

The result of this collaboration was meaningful engagement in a global collaborative learning experience. The students had the tools they needed, the teachers and administrators to support and celebrate their work, and the freedom to guide their own learning.

The tools. In their reflections, many of the students mentioned the power of technology as a communication tool. One of the students thought it was amazing that she could make such a good friend in Hawaii through the use of technology. Another reflected that the tools allowed them to learn *with* each other, not just *about* each other.

Novotny noted that using collaborative tools such as Edmodo, Skype, and VoiceThread were key. "They renewed the love of learning for our students," she said. "Students are excited to learn, collaborate, and communicate. The understanding of various cultures and geography, along with the content-related projects, provide rigor and enrichment for our students."

The educators. The use of Edmodo and VoiceThread made it possible for the teachers to support and celebrate student work. It meant the world for the students in Hawaii to have teachers from Maryland giving positive feedback on their work. It was a wonderful feeling to know that someone so far away cared about what they were producing.

One of the most critical and challenging aspects of a successful global collaborative project is finding educators who are dedicated, creative, innovative, and willing to take risks. The educators involved in this project were devoted to creating engaging learning experiences for all the students involved.

Freedom and choice. From the beginning, a goal of the project was giving students choice. Throughout the collaboration, there were opportunities for students to guide their own learning. This allowed students to deepen the relationships they formed with one another. One of the students said, "Who would have thought I could write a partner poem with someone all the way in Hawaii!" Not only did they write poetry, they became friends.

It was a wonderful feeling to know that someone so far away cared about what they were producing.

There is no doubt in my mind that because of projects like this, my students are beginning to view themselves as members of a connected global society. As a teacher, I sometimes feel like I am "convincing" students to complete a project. During this collaboration, I never felt that. My students faced challenges along the way, and there was an immense amount of learning, but it was all for a purpose. They wanted to create the best work they could for their buddies. I was proud of the hard work and devotion that the students showed. During the video making, I had students coming in at recess to work. During the poetry-writing phase, students would log on to Edmodo outside of technology class to work on their poems. The commitment to quality work was clearly evident in both the process and final products.

As an educator, I know we are doing something right. My Hawaiian students will never forget their Maryland buddies.

Acknowledgments

This project was possible thanks to the support of inspiring, visionary administrators, such as Darlene Morrison and Kahealani Naeole-Wong. As principals, they provided encouragement to the teachers and students in Maryland and Hawaii. Their commitment to innovation and creativity allowed the teachers and students to thrive.

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Tip

Yes You Can Take Notes on the iPad!

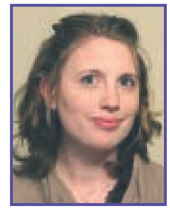
Problem: My students need a versatile note-taking app for their iPads.

Here's a solution: GoodNotes, a dynamic app designed for the iPad, is available in both a free and a paid version. Both versions feature an adjustable zoom bar that allows the user to write naturally at a comfortable size appropriate for finger or stylus. What makes this app stand out from others is the smooth transitions across the page while writing. The zoom bar automatically moves along with the writer. A resizable palm rest allows the user to comfortably position the hand for natural writing. A wide variety of background templates, pen colors, pen sizes, and highlighters complete the palette.

GoodNotes is not just a handwriting tool. Students can use the iPad's keyboard to type and use the camera to insert images. They can handwrite notes during class and quickly take pictures of lecture slides to embed into their notes. One of the most useful features for the classroom is the ability to open and annotate PDF files.

Both paid and free versions allow users to connect GoodNotes with their Dropbox or Box accounts. Teachers can upload student essays to Dropbox, annotate in GoodNotes, and email the files back to students.

The free version is limited to two notebooks. The upgrade to the full version is well worth the $3.99 price for unlimited notebooks and access to new features as they are released.



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Have a tip to share? Post on the comment wall at www.iste-community.org/group/landl or email it to dfingal@iste.org.

Research Cutting-Edge Inventions Using a Cutting-Edge Invention

What cutting-edge technologies are being invented? How will they influence society? What problem or need does the technology address? What other related technologies or inventions might be needed? These were the overarching questions that framed a project-based learning unit on cutting-edge inventions. Using iPads—a cutting-edge technology in itself—to investigate cutting-edge inventions proved to be a perfect fit for motivating and engaging students in a project-based learning experience.

Project-based learning is a model of instruction that is based, in part, on the inquiry learning strategies of questioning, research, and discovery. It is an engaging, nontraditional method that asks students to explore real-world issues and complete authentic tasks. Research shows that project-based learning is an effective way to teach students skills such as planning, communicating, problem solving, and decision making.

Grant Proposal

In December 2010, Flagstaff Unified School District in Flagstaff, Arizona, USA, awarded one set of 30 iPads to a team of fifth grade teachers. At the time, the iPad had been on the market for only about six months, and very few teachers in the district had access to one or any idea how to use it, let alone how to integrate a class set into the curricula. The key requirement of the grant was to develop a unit of instruction that incorporated project-based learning, Arizona core content and technology standards, digital age skills, and students' use of iPads and other technology devices and software.

The teachers who received the iPads worked at Thomas Elementary, a Title I school with 68% of the students qualifying for free or reduced-price lunches. The 2010–11 fifth grade students ranged from a small group identified as talented-and-gifted learners to about a quarter of the students with moderate to severe learning disabilities. The students were in full-inclusion classrooms. Involving students in project-based learning experiences was key to meeting their diverse learning needs.

The team of teachers decided to implement the project first with one class and then train those students to serve as peer mentors for the other fifth grade classes. Students in the first class had been involved in project-based learning since the beginning of the school year, so they were already able to communicate appropriately, collaborate equally, research effectively, and take ownership of their learning. And they were now ready for a new tool and challenge!

The Project-Based Learning Unit

The next step was to develop an innovative project-based learning experience that required students to use iPads to conduct research, reflect on their learning process, and develop a final product. Training students as peer mentors both in working with

By Cynthia Conn

Multidisciplinary

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other students on the project as well as in the use of the iPad was an integral part of the proposal.

We decided to focus our project on cutting-edge inventions and used *Time* magazine's 2010 issue describing the 50 best inventions of the year as the inspiration for the unit. The overaching question that framed the unit and aligned to Arizona fifth grade science, language arts, and technology standards as well as digital age skills was: What cutting-edge technologies are being invented, and how will they influence society? The primary science and technology standard that the project addressed was identifying and explaining the impact of inventions on society. Using entrepreneurial skills to enhance workplace productivity and career options was one of four 21st century skills aligned to this unit.

In keeping with the characteristics of project-based learning, we gathered student input and allowed the classes to vote on which final products they wanted to develop.

Stretching Individual Devices

The teachers involved in the project primarily had experience using only desktop and laptop computers. Therefore, they had to figure out what was possible with an iPad and to weigh the benefits when the process of retrieving work from individual devices was tedious or time consuming. The teachers agreed that daily access to the iPads proved to be a significant advantage over the computer lab for fully integrating technology into all aspects of the fifth grade core curricula.

Researching inventions and taking notes was a significant component of the grant project. One class used the Note application that comes installed on the iPad to take notes and eventually produced a final paper related to their research. Another class used Google Docs (through a license provided by the district) and was able to take notes on the iPads and then access them on the school's desktop computers in the lab. This class used Google Sites to produce a website that contained summaries of the inventions they researched. They also wrote and illustrated a fictional story, called "Zombies Out Teched," that incorporated the various inventions.

Sharing the research and writing tasks using Google Docs allowed students to collaborate—a key component of project-based learning. The

Sharing the research and writing tasks using Google Docs allowed students to fulfill a key component of project-based learning—collaboration.

first class split up into two groups. One group wrote and illustrated "Zombies Out Teched," and the second group focused on writing the nonfiction summaries of the various inventions. Students from each group shared their research with the other group, so information about all the inventions would be incorporated into both the fiction and nonfiction final products.

The students used Google Forms to survey classmates about their first, second, and third choices of inventions to research. The survey helped students consider a variety of inventions to research and allowed them to identify others interested in the same invention, so they could find a partner to work with. We used the blog tool available through the district's learning management system to gather reflective information from students related to their progress on the project and their use of the iPad.

Observations

After we distributed the iPads to the first class, students spent a considerable amount of time researching and reading about the cutting-edge inventions. Students were excited to use the iPads for research, to find out who invented the cutting-edge devices, to learn how they might be used, and to look into what other creations might be needed. And their work reflected that excitement. The fictional story they wrote and illustrated was a creative, funny, high-quality product. The nonfiction summaries were engaging, and many of the students—without being asked—took a persuasive or sales approach to describing the invention they researched.

Beyond the projects produced, the first class had the devices for six to eight weeks while working on the cutting-edge invention project and prior to taking a standardized test that assessed a variety of reading-related skills. The results showed that these students did especially well on the portion on comprehending information text. Teachers also noticed that these students showed more confidence with the devices and the content. Special needs and English language learners participated equally in the collaborative projects and in assisting with questions and issues that arose. Additionally, all students from the first class of fifth graders provided peer coaching support to the two other fifth grade classes and teachers—a valuable leadership experience.

Based on the results of this project, Thomas Elementary School received a second cart of devices and purchased two additional carts of individual computing devices, including one cart of iPad 2s and one cart of netbooks. During the 2011–12 school year, the carts were used for instructional purposes, such as improving math skills at all grade levels; focusing on literature studies related to fifth grade social studies standards; improving reading fluency, vocabulary, and comprehension skills in a fourth/fifth grade English language learner class; recording interviews and photographing historic buildings in downtown Flagstaff for a research project conducted by a fourth grade class; and teaching and improving reading skills in kindergarten and first grade classes.

Although iPads offer most of the same tools as desktop and laptop computers, the iPads were more affordable and have proven to be more durable than laptops. Having the iPads on a cart in the class allowed the teachers to implement the grant project, engaging students in a project-based learning experience while maximizing their use for a variety of other content areas.

Resources

Arizona academic standards: www.ade.state.az.us/standards/technology/Articulated_Grade_Level

"The 50 Best Inventions of 2010," *Time*: www.time.com/time/specials/packages/0,28757,2029497,00.html.

Thomas Elementary inventions researched: http://tinyurl.com/ipadresearchgoogleform.

Zombies Out Teched website: https://sites.google.com/a/fusd1.org/zombies-out-teched

Acknowledgments

Special thanks to Kamalene Nelson, Laurie Jeffers, and Annie Crego, the Thomas Elementary School lead teachers on this project, and Heather Zeigler, Brad Kamradt, and Mary Knight from the Florida Unified School District Technology Department, who provided the iPads as well as technical and instructional support.

—Cynthia Conn, PhD, is a Title I technology teacher at Thomas Elementary School in Flagstaff, Arizona, USA. She is also a senior lecturer at Northern Arizona University, also in Flagstaff.

Exploring NETS for Coaches, Standard 3

AS I SEE "IT"

By Kara Gann

Kara Gann is the information technology program administrator for Laramie County School District #1 in Wyoming, USA. She is also secretary for the Executive Committee of ISTE's Board of Directors as well as a member of ISTE's Policy and Procedures Committee.

While gathered around the dinner table, my family often has discussions that require more information. Inevitably, one of us will pick up our cell phone and begin to search the wealth of information that exists on the internet. That type of access brings challenges for the learning community. Students are not interested in sitting in class while a teacher shows them what to do. Students want to be involved in their learning. They are accustomed to having information at their fingertips.

As we look at Standard 3 of the NETS for Coaches, we focus on the digital learning environment (iste.org/standards/nets-for-coaches.aspx). It's critical that today's teachers and administrators select and evaluate digital tools and resources that create technology-rich learning environments. Coaches assist teachers and administrators to build teaching practices that are compatible with the school's vision, curriculum, and infrastructure. They guide the development of policies, guidelines, and system-level management of resources and equipment to support digital tools like never before.

Students no longer have to look in textbooks, watch movies, or trust their teachers to learn about their world. Blended learning opportunities create environments that extend learning beyond the walls of the classroom.

In Laramie County School District 1 in Cheyenne, Wyoming, USA, with guidance from technology coaches, second grade students are able to learn about Grand Teton National Park using video conferencing. A forest ranger came to the school and communicated with rangers who were on site at the park. The rangers used their iPads to connect with the students remotely and show them where they were, what the weather was like, tracks left behind by wildlife, and the outdoors at Grand Teton. The experience ended with the students taking the forest ranger's oath to protect the environment. The students didn't have to look at a book or watch a video; instead they could engage in the conversation. They could ask real-time questions and receive instant answers from the rangers.

We no longer look at the classroom as a place where knowledge is "given." We expect classrooms to foster thinking and experiences that facilitate learning. The teacher is the facilitator, and the learning is done by all. We are asking teachers to redesign the learning spaces in completely new ways.

Coaches are there to help teachers identify the vast assortment of digital tools available and help them create a vision for what these tools look like within their content area. Additionally, student conduct, material management, and classroom management are changing, and technology coaches are working to help the school community adjust to our changing digital society.

Today's students are working in small groups and they communicate and collaborate with students in other classes around the globe. The students of today think beyond the walls of their environment. The world is their playground, and they are searching, networking, and questioning the interactions around them. Students in a digital learning environment are using technology not for the sake of technology, but to enhance their learning, communication, and experiences.

KNOW THE nets

Can you observe the NETS for Students in practice?

Try this exercise: Read the scenario below, then check off any NETS•S performance indicators (on the right) that you think the lesson addresses. Next turn to page 40 to see how ISTE's Research & Evaluation Department would rate this lesson against the NETS using the ISTE Classroom Observation Tool (ICOT, iste.org/icot). You can also do this exercise online at http://surveymonkey.com/s/knownets2.

A sixth grade class in California, USA, is studying plate tectonics. In this earthquake-prone area, many of the students have experienced seismic events, and the topic is listed in the state standards.

The only computer in the room is the teacher's laptop, which projects a satellite image of the school's region. As students recall earthquakes they have experienced, the teacher uses a geographic information system (GIS) to display the epicenters. She turns her computer over to a student and shows her how to choose earthquakes from a menu in the application. The teacher does not touch her computer again during the observation.

Another student takes over the computer, and the teacher directs him to a menu that displays all the earthquakes for each year. The teacher asks students to discuss in small groups what the patterns say about planning where to live. When some wonder why people live in seismic zones, she agrees the question requires more information, particularly the question: "What causes earthquakes?" She accepts multiple shoutouts from the class and invites a student who mentioned "faults" to use another menu to overlay a chart of faults. She has the student navigate the visualization tool below the surface of the earth's crust to show the faults in three dimensions from the side. The teacher briefly lectures on the relationship between faults and earthquakes.

The class moves to a computer lab, where students are directed to a site with a tutorial, simulation, and quiz on tectonic plates, types of faults, and seismic waves. (The teacher says the archaic lab equipment will not support the GIS application used in class.) Students move through the tutorial and simulation rapidly. The teacher encourages students to help one another with the quiz if necessary, and they do. The quiz does not re-teach any missed items but merely provides a correct answer and moves on. The first students to discover this algorithm counsel their peers that the fastest way to progress is to hit the Enter key without reading the questions. The teacher says she had not used the website with students before and had not realized how the quiz module responded to errors. She says she will substitute a discussion for the quiz in the next period.

Creativity and Innovation

- ☐ 1a. Apply existing knowledge to generate new ideas, products, or processes
- ☐ 1b. Create original works as a means of personal or group expression
- ☐ 1c. Use models and simulations to explore complex systems and issues
- ☐ 1d. Identify trends and forecast possibilities

Communication and Collaboration

- ☐ 2a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
- ☐ 2b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
- ☐ 2c. Develop cultural understanding and global awareness by engaging with learners of other cultures
- ☐ 2d. Contribute to project teams to produce original works or solve problems

Research and Information Fluency

- ☐ 3a. Plan strategies to guide inquiry
- ☐ 3b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
- ☐ 3c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
- ☐ 3d. Process data and report results

Critical Thinking, Problem Solving, and Decision Making

- ☐ 4a. Identify and define authentic problems and significant questions for investigation
- ☐ 4b. Plan and manage activities to develop a solution or complete a project
- ☐ 4c. Collect and analyze data to identify solutions and/or make informed decisions
- ☐ 4d. Use multiple processes and diverse perspectives to explore alternative solutions

Digital Citizenship

- ☐ 5a. Advocate and practice safe, legal, and responsible use of information and technology
- ☐ 5b. Exhibit a positive attitude toward technology that supports collaboration, learning, and productivity
- ☐ 5c. Demonstrate personal responsibility for lifelong learning
- ☐ 5d. Exhibit leadership for digital citizenship

Technology Operations and Concepts

- ☐ 6a. Understand and use technology systems
- ☐ 6b. Select and use applications effectively and productively
- ☐ 6c. Troubleshoot systems and applications
- ☐ 6d. Transfer current knowledge to learning new technologies

Find our answers on page 40.

This is how ISTE's Research & Evaluation Department evaluated the scenario on page 39.

What was your interpretation of the NETS? Do you agree or disagree with ISTE R&E's coding below? How could a teacher modify this scenario to create a richer lesson? What additional time, student preparation, technologies, or other resources would the lesson need? Find out how other readers responded and share your insights, comments, and questions on the Know the NETS page of the NETS Assessment Wiki (nets-assessment.iste.wikispaces.net).

Creativity and Innovation

- [ ] 1a. Apply existing knowledge to generate new ideas, products, or processes
- [ ] 1b. Create original works as a means of personal or group expression
- [x] 1c. Use models and simulations to explore complex systems and issues
- [ ] 1d. Identify trends and forecast possibilities

Rationale: The lesson was all about simulations of complex systems, the poor instructional design of the quiz notwithstanding. It did not address other creativity attributes, but this was an introductory lesson.

Communication and Collaboration

- [x] 2a. Interact, collaborate, and publish with peers, experts, or others employing a variety of digital environments and media
- [ ] 2b. Communicate information and ideas to multiple audiences using a variety of media and formats
- [ ] 2c. Develop cultural understanding and global awareness by engaging with learners of other cultures
- [ ] 2d. Contribute to project teams to produce original works or solve problems

Rationale: The teacher used interaction to offset the lack of computers. Lacking classroom technology, she made the GIS software a center for discussion.

Research and Information Fluency

- [ ] 3a. Plan strategies to guide inquiry
- [ ] 3b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
- [ ] 3c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
- [x] 3d. Process data and report results

Rationale: Research was not a part of this lesson. The teacher was apparently trying to transmit basic standards-required information in a constructive way. One of these techniques was to have students reflect on the meaning of data.

Critical Thinking, Problem Solving, and Decision Making

- [x] 4a. Identify and define authentic problems and significant questions for investigation
- [ ] 4b. Plan and manage activities to develop a solution or complete a project
- [ ] 4c. Collect and analyze data to identify solutions and/or make informed decisions
- [ ] 4d. Use multiple processes and diverse perspectives to explore alternative solutions

Rationale: Opportunities for student inquiry and problem solving were limited in this lesson. However, the teacher did require students to access prior knowledge and consider questions implied by new information.

Digital Citizenship

- [ ] 5a. Advocate and practice safe, legal, and responsible use of information and technology
- [x] 5b. Exhibit a positive attitude toward using technology that supports collaboration, learning, and productivity
- [ ] 5c. Demonstrate personal responsibility for lifelong learning
- [ ] 5d. Exhibit leadership for digital citizenship

Rationale: While most of Standard 5's attributes were only implicit, the lesson would not have been possible without a class that had learned how to share and support one another around technology. Collaborating to foil the quiz was evidence of this.

Technology Operations and Concepts

- [x] 6a. Understand and use technology systems
- [ ] 6b. Select and use applications effectively and productively
- [ ] 6c. Troubleshoot systems and applications
- [x] 6d. Transfer current knowledge to learning new technologies

Rationale: As noted above, students adapted quickly to the GIS application and took up the online simulation. Identifying the algorithm behind the quiz required at least some of the students to have a sense of how the computer was processing their input.

In summary, this was an innovative approach to a potentially tedious task: the transmission of numerous facts about a new topic. The technology infrastructure was mediocre, but the teacher used it to her advantage. Overlooking the poor error-correction procedure in the simulation was probably embarrassing to this otherwise well-prepared teacher. Her experience illustrates the principle that poor instructional design is made worse by automation.

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BUYER'S guide

Writing instruments have evolved from sharpened stones used to draw on cave walls to feather quills, elegant fountain pens, felt tips, and ballpoints. The newest and most powerful writing devices are electronic "smartpens." For years, the military, health care, and many other industries have used electronic pens for surveying, filling out forms, and taking field notes. Educators are now discovering how these tools bring the simple task of writing on paper to a new level.

All of the pens listed here translate handwriting to an electronic form that teachers and students can save on a computer. Optical character recognition (OCR) software, which converts handwriting into text, allows you to search and edit your writing using a word processor and share just as you would any other text file.

Never Miss a Word

Two Livescribe pens go a big step further. The Pulse Smartpen, released in 2008, is Livescribe's original release. The Echo Smartpen, released in 2010, is the next generation. A Livescribe pen is larger than a traditional pen and can accommodate a microphone and video camera that record what an instructor says as students take notes. You must use the pen with Livescribe paper, which has a grid of small dots and comes in the form of journals and notebooks. As a student writes, the pen tracks every stroke of handwriting and time-syncs it with the recorded audio. Later, when the student clicks on a word or image, she will hear what the teacher said at the time, allowing her to review and reinforce class discussions.

Whiteboard in Your Hand

The Penveu is the newest type of smartpen. It functions as a presentation remote control as well as an interactive whiteboard pen, and you can easily toggle between pen and mouse modes. It can turn any surface into an interactive display, and teachers can use it up to 40 feet away from a screen.

Cost

After the initial investment, there may be ongoing expenses. Some pens have rechargeable batteries, yet others require replacements. Ink refills are necessary, but prices are reasonable. The special paper required for the Livescribe pens costs $25 for four notebooks of 100 pages each. Dictionaries and other reference apps are available for the Livescribe and range in price from free to $14.99.

There is some controversy about using recording devices in the classroom. Some teachers, particularly in higher education, may not want their lectures recorded because of intellectual property issues. Others, at any grade level, are concerned about student confidentiality. However, when students have special needs and an electronic pen can assist them, teachers often welcome and encourage their use.

If you or your students would rather handwrite than type notes, or if you would benefit from "pencasts" (the audio playback feature with some pens), you should definitely consider a digital pen.

—Maureen Yoder, EdD, is on the faculty of Lesley University's Technology in Education Program.

Smartpens

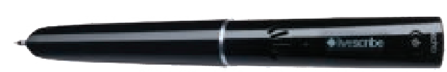
Company

Dane Digital
www.danedigital.com

Electroflip
www.electroflip.com

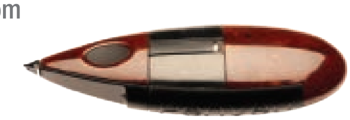
IOGEAR
www.iogear.com

Livescribe
www.livescribe.com



LogiPEN
www.logipen.com

Penveu
www.penveu.com

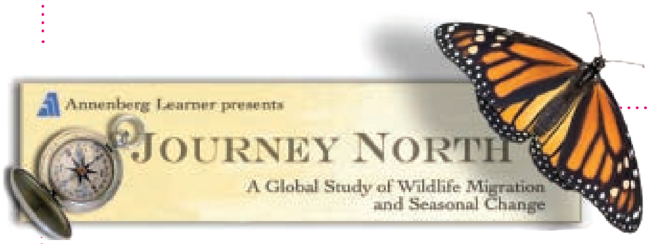


Model	Price	Storage Capacity	Writing Surface	OCR	Compatibility	Notes
Zpen	$39	1GB internal flash	No special paper required, uses external sensor that clips to standard paper	OCR software stored in pen's memory	Can be viewed and saved on PC or Mac, but conversion software is for PC only	External sensor doubles as a flash drive, USB 1.1 and 2.0 compatible
iNoteBlue	$110	Stores more than 100 pages	No special paper required, uses external sensor that clips to standard paper	OCR support for Latin-based languages	PC	Bluetooth compatible with iPhone, Android, and BlackBerry; functions as a mouse
iNote Mobile Digital Scribe	$96	Stores more than 100 pages	No special paper required, uses external sensor that clips to standard paper	OCR support for 17 languages	PC	MyScript Trainer tutorials
Echo Smartpen	2 GB $100, 4 GB $150, 8 GB $180	4 GB or 400 hours of content, 8 GB or 800 hours of content	Requires Livescribe dot paper	Vision Objects' MyScript OCR software ($30 or 30-day free trial)	Mac and PC	Built-in microphone, speaker, micro USB, audio jack
Pulse Smartpen	$100	2 GB or 200 hours of content, 4 GB stores more than 400 hours of content	Requires Livescribe dot paper	Vision Objects' MyScript OCR software (free download)	Mac and PC	Built-in microphone, speaker, audio jack
LogiPEN Notes	$130	Stores up to 50 full pages	No special paper required	Free MyScript OCR software supports 26 languages	Mac and PC	Functions as a mouse
Penveu	8 GB $699, 32 GB $799, 8 GB education version starts at $500	8 GB, 32 GB	No special paper required	OCR software	Mac and PC	Nine pen colors, pressing harder results in thicker line width, 40' range from interactive whiteboard

WHAT'S new

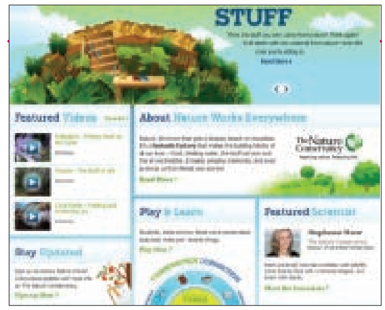
Sophia has updated its online platform and is now offering more than **25,000 tutorials**—bite-sized lessons created by experts on a wide variety of topics—that feature a mix of text, audio, video, slideshows, and more. Students can now complete a short learning assessment that helps them determine their learning preferences, so they can choose the format that appeals to their learning styles. The site also serves teachers interested in "flipping" their classrooms by allowing them to create their own content, choose tutorials, or use the newly developed Pathways, which are sequenced tutorials featuring full standards-based curricula. Each learning path contains hundreds of tutorials, with at least five educators for each concept who teach the material in different ways.

MORE INFO: www.sophia.org



Annenberg Learner has created an app that allows budding naturalists and scientists to use their iPhones, iPads, or Android phones to report sightings of birds, butterflies, and other migrating species to the **Journey North** website. The app provides tools including maps, a geographic locator, and a function to record and send field notes. App users can take and send photos of their quarry using their device and connect to a growing database of field observations used by students and scientists. The Journey North is an educational website dedicated to the study of wildlife migration and seasonal change. It features migration maps dating back to 1997, images and photos of wildlife, video, standards-based lesson plans, classroom activities, and information from scientists about specific species and seasons.

MORE INFO: www.learner.org/jnorth



The Nature Conservancy and Discovery Education have launched **Nature Works Everywhere**, a free website designed to teach the importance of environmental conservation. The site provides middle school teachers, students, and families free tools and resources to explore and understand nature. It includes videos, interactive lesson plans, and an interactive game that allows students to learn how nature helps create their favorite things, such as ice cream, sand castles, and lemonade. A Meet the Scientists section allows teachers to introduce their students to real-life scientists from The Nature Conservancy. Students can learn how modern scientists protect natural areas, restore natural systems, and help nature adapt to change to benefit people in all climates.

MORE INFO: www.natureworkseverywhere.org

The Gilder Lehrman Institute has launched a new website designed for U.S. history teachers and enthusiasts. **History by Era** is an online curriculum offering original essays by renowned historians, podcasts, interactive features, exhibitions, timelines, teaching tools, and primary source documents. The short-video series "Essential Questions in American History" is one of the many virtual learning tools available on the site. History teachers will find featured primary sources from the Gilder Lehrman Collection that are annotated and accompanied by teaching guides and questions to help bring history alive in the classroom. In addition to the content, social media features allow teachers to work together to deal with similar challenges and develop solutions.

MORE INFO: www.gilderlehrman.org/history-by-era

L&L senior editor Diana Fingal compiled this information from press releases sent to the *L&L* editorial office. The *L&L* staff does not review the products and resources, and they are offered here without recommendation. Send press releases to products@iste.org.

SparkFun has launched a new education website designed to help build and support a community of educators, newbies, kids, and everyone in between who are looking to get started in do-it-yourself electronics but don't know where or how to begin. **Learn.Spark.Fun** contains free curricula, tutorials, how-to guides, and information. Educators who use SparkFun's kits in their classroom will also receive a 20% discount on all future orders.

MORE INFO: http://learn.sparkfun.com

Net Texts has launched an iPad app that aims to transform the way teachers and students connect inside and outside of the classroom. The **Net Texts app** organizes and delivers a wide array of open educational resources already freely available on the internet. Using the Net Texts website, teachers can design customized multimedia courses and make them available on the app, which students can access on their iPads, replacing a backpack filled with heavy, often outdated textbooks.

MORE INFO: www.net-texts.com

Epson America has released the **PowerLite X15**, a projector that delivers bright images and advanced connectivity to small- and medium-sized classrooms and conference rooms. The projector offers 3,000 lumens of color and white light output, XGA resolution, and HDMI digital connectivity. The projector also has a USB slot for instantly projecting video and audio from a PC or Mac computer. In addition, the projector offers easy setup with Easy-Slide technology, a horizontal keystone adjustment slide control bar that allows teachers to place the projector off-center from the screen and easily make image adjustments with the touch of a finger.

MORE INFO: www.epson.com

Hitachi America has launched **TB-1 Wireless USB Tablet**, which allows users to write or draw over images from a compatible Hitachi projector. The TB-1 features an 8-inch by 5-inch touchscreen that lets users alter video or still images projected from connected sources, such as computers, DVD players, and other devices. No special software is required. Whiteboard functionality allows educators to write on the tablet and have the images appear on a screen. It offers a wireless range of up to 50 feet and has a rechargeable lithium-ion battery that lasts up to 16 hours per charge.

MORE INFO: www.hitachi-america.us/digitalmedia

COMING NEXT ISSUE

Save Your School with a Digital Conversion

In 2007, Mooresville Graded School District in North Carolina embarked on an extraordinary journey. As part of the Digital Conversion Initiative, the district employed technology to improve learning and teaching. Mark Edwards, Scott Smith, and Todd Wirt write about the stunning results of this paradigm shift.

Bring Presence to Online Schools

How can you build connections in an online learning community? Authors Amy Garrett Dikkers, Somer Lewis, and Aimee Whiteside explain how teachers at the North Carolina Virtual Public School did just that using the Social Presence Model to motivate students to take active roles in their online learning experiences.

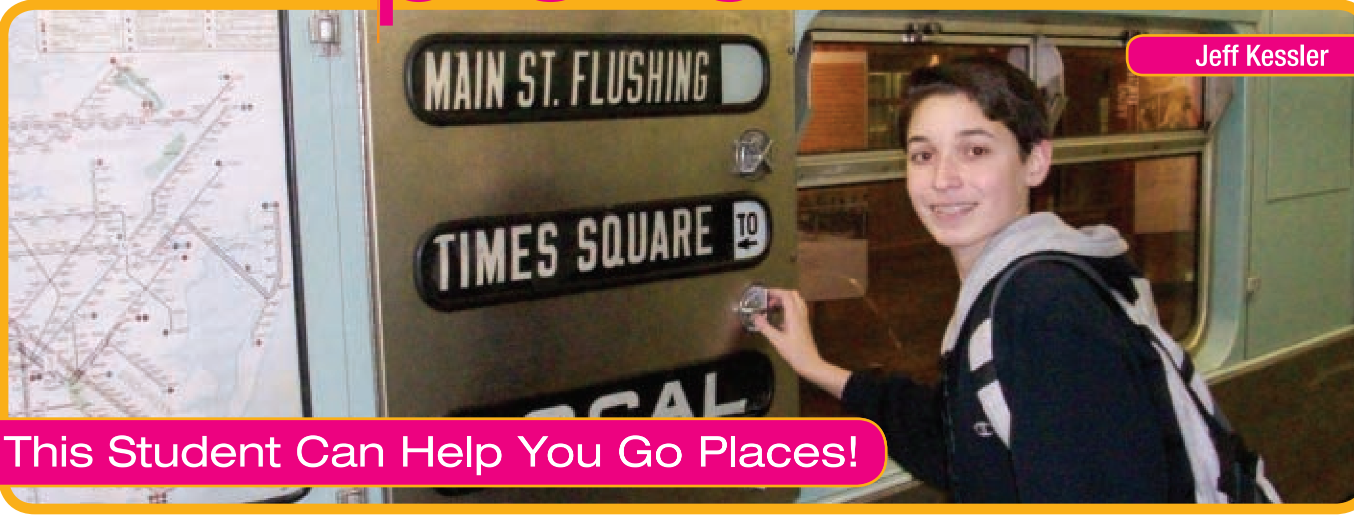
Better Than Real

Augmented reality simulations allow students to learn content while interacting with the world using their mobile devices. Researchers at the Harvard Graduate School of Education explain how to develop your own AR curriculum based on their experience implementing an AR math unit for middle schools.

Should iPads Replace Laptops?

Debate this and other controversial issues at www.iste-community.org/group/LandL.

STUDENT profile



Jeff Kessler

This Student Can Help You Go Places!

What do you get when you combine a passion for trains, a love of digital age tools, and an inquiry-based education? If you're Jeff Kessler, you get an awesome internship with Amtrak and the chance to create a couple of websites dedicated to helping people travel by rail and other forms of public transportation.

Kessler, now 17, was already a longtime train buff when he landed the opportunity of his dreams two years ago. His school, the Science Leadership Academy (SLA) in Philadelphia, Pennsylvania, USA, helped him arrange an internship with Amtrak. And it wasn't one of those internships where you make copies and fetch takeout for important people. Jeff visited every section of Amtrak's busy engineering department and got to do real work in the field that he loves.

He helped design track layouts, tested the new centralized electronic-train control system, worked with engineers on high-speed rail, and dispatched trains on one of the busiest days of the year for Amtrak—the day before Thanksgiving.

"The computers crashed, and it was a very chaotic experience," Jeff recalls.

But Jeff is no stranger to chaos. You might say that his senior project—developing a travel-related website—was born out of chaos.

Jeff came up with the idea of creating his first site, Edu Concierge, after handling logistics at EduCon, the education conference his school hosts each year. SLA—an inquiry-driven, project-based high school focused on digital age learning—depends on its students to help with the conference, which is devoted to fostering inquiry, collaboration, and innovation in schools.

At the 2009 conference, Jeff was assigned to help participants with tech issues, such as printing boarding passes. He enjoyed it but realized he could do more. So the next year, he printed timetables, told people how to get to the airport, and answered questions about the conference.

The following year, he created a one-stop service for technical, travel, and conference info. He started a Twitter account and had a spot at the conference where he was available to answer conference questions; hand out travel tokens, timetables, and maps; and assist conference-goers with Wi-Fi. "The reception was amazing," Jeff recalls. "People fell in love with it."

That gave him an idea for his senior project, known at SLA as the Capstone Project. He built EduConcierge.net to offer the same information online. While working on that project, he decided he wanted to offer transit information to the public, so he created The Transit Navigator, which has a website, a Twitter account, and a presence on Foursquare where users can find lists and tips on how to use public transportation in a variety of U.S. cities. Follow The Transit Navigator on Foursquare (https://foursquare.com/transit-nav), and you'll have access to more than 300 public transit tips, such as which side to exit the train at a specific stop.

What does the future hold for Kessler? Next month he'll join the University of Pennsylvania's Jerome Fisher Program in Management and Technology, where he'll pursue two degrees: one in economics from the Wharton School of Business and one in systems engineering from the School of Engineering and Applied Science.

But those are just his short-term goals. He's mapped out his plans beyond college as well. "I hope to employ my transportation passion and revolutionize America's transit network," he says. "With this in mind, I hope to someday lead America's transit system as the U.S. secretary of transportation."

—Diana Fingal is senior editor of L&L.

Student Profiles highlight kids who use technology in creative and authentic ways.

Real Educators, Real Issues, Real Solutions

Deputy CEO Leslie S. Conery outlines ISTE's new leadership conference coming in October.

October 21–23
JW Marriott
Indianapolis, Indiana
isteleadershipconference.org

ISTE's inaugural leadership conference for superintendents, their cabinets, and other district and school leaders happens October 21–23 in Indianapolis, Indiana, USA. The program committee designed a learner-focused, highly engaging experience built on a framework of what district and school leaders identify as important skills and knowledge for all school leaders.

Attendees will start with an opening keynote session on Sunday followed Monday by a briefing with change agent Michael Fullan and consultant Joanne Quinn on four drivers of systemic reform:

- Improving student performance by creating learning environments that are irresistibly engaging, are steeped in real life, and include 24/7 access to technology
- Building collective capacity and collaboration
- Using data to inform instructional practices
- Providing leadership to mobilize action and implement effective instructional practices districtwide

With this model in mind, attendees will engage in a deep learning experience designed to be a cross between traditional conferences, where attendees choose sessions that interest them and a workshop environment, where the learning experiences are more structured, giving participants time to engage in discussion and reflection.

ISTE did not solicit proposals, nor did we select people on the conference circuit to present. Instead, we started with the content framework and then found strong facilitators, moderators, and district-based presenters to give real-life examples of what it looks like when administrators lead the charge with technology to improve student learning and meet the needs of diverse learners, using the NETS for Administrators (NETS•A).

Here's a glimpse into the format and content of the break-out sessions:

NETS•A Interactive sessions. These two-plus hour work sessions focus on the five NETS: visionary leadership, digital-age learning culture, excellence in professional practice, systemic improvement, and digital citizenship. NETS•A experts and administrators who practice the standards daily will lead each session.

Panel sessions. These one-hour sessions focus on addressing one or two essential conditions. After each panelist describes the implementation of a solution, the panel and the audience will discuss what is necessary to replicate it and share strategies.

Digital Age Teaching and Learning Snapshots. These two-plus-hour sessions will demonstrate what the NETS for teachers and students look like in the classroom. Participants role-play as students in class or observe activities as they would happen. After experiencing three to four snapshots for various subjects and grade levels, they will discuss, reflect, and record ideas. Thanks to ISTE affiliate partner Indiana Computer Educators for contributing to this content area!

Bring Your Own Device sessions. These sessions provide hands-on exploration of software or resources that attendees use. Participants will learn about each others' tools to improve instruction, professional development, communication and collaboration, and productivity.

Attendees will gain concrete ideas that are immediately applicable, collaborate with and learn from other leaders who face the same or similar issues, and leave with an action plan for moving forward.