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STEM With an Environmental Focus

Jane Addams K–8 School in Seattle, Washington, is among the nation's schools that have adopted an E-STEM (environment, science, technology, engineering, and math) curriculum, which emphasizes the environment and sustainability. "We strive to teach students about Earth's systems so that they understand their impact on the environment and their role in sustaining it," says science specialist Christine Benita. "We adopted the ecospheres [biosphere, lithosphere, hydrosphere, and anthrosphere, the part of the environment that is made or modified by humans for use in human activities] as a way for each grade level to develop integrated units in science, literacy, and social studies. We incrementally added to these units essential questions, standards-based grading and assessments, and technology applications."

Why E-STEM? "Adopting an E-STEM curriculum allows us to continue increasing the rigor as we unpack and implement the *Common Core State Standards* in language arts and mathematics, and with the recent state adoption of the *Next Generation Science Standards* (*NGSS*), [unpack] the science and engineering practices," replies Benita.

Though the school's E-STEM curriculum is "in the developmental stages," its E-STEM Framework (see *http://bit.ly/1c0Os1S*) "supports the rigors of *Common Core* and [*NGSS*] within a K–8 continuum, [and] our students benefit," she maintains. "Our teachers have collaborated to create learning situations that incorporate prior knowledge, promote questioning and problem solving while the students are engaged with the project. In the middle school, teachers benefit because they help reinforce [one another] through standards-based content and process mastery. How students learn to read nonfiction text in language arts will be used in the science class. The data collected in the field will be analyzed in their math class and properly displayed in technology class."

Students also "will have multiple connections with teachers and multiple opportunities to show what they know. Our community benefits because they are an important part of curriculum support as we bring in their expertise to drive student innovation and curiosity about real-world situations. Teachers are happier with the level of engagement and the excitement generated by these experiences," she reports.

Jane Addams K–8 School will eventually move to a new building that will enhance its E-STEM program, says Benita. "The building design will be a learning tool for our E-STEM program with energy use monitors, an ephemeral pond, bioswales, green roofs, a footprint orientation for maximum sun exposure, spaces for solar panels and a living wall."

As part of the E-STEM program at Valley of Enchantment Elementary School in Crestline, California, students recycled plastic bottles to build boats. During the second-annual plastic bottle boat contest, their teachers rode in the boats to test their buoyancy.

See E-STEM, pg 5

HOLLYWOOD MAGIC CAN TRANSFORM STUDENTS' PERCEPTIONS OF BEING A SCIENTIST PG 3

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COMMENTARY: **Mayim Bialik**

Hollywood Magic Can Transform Students' Perceptions of Being a Scientist

By Mayim Bialik

Mayim Bialik

How many times have you heard your students say, "I wasn't born with the science gene" or something similar? Probably far too often, and truth be told, I felt the same way when I was younger. It never occurred to me that I could be a scientist because science didn't come naturally to me.

The good news is these perceptions can change, just like they changed for me. I not only have a PhD in neuroscience, but Hollywood and science have merged in my role as neurobiologist Amy Farrah Fowler on the television series *The Big Bang Theory.*

What changed my mind? First, I was fortunate to have a tutor during high school who made me realize that a scientist doesn't have to fit a particular mold, and a career in science was a worthy and attainable pursuit that would transform my life in wonderful ways. It didn't mean that learning science became any easier for me, but I knew that if I persevered and worked hard, I could be successful.

I believe the same is true for all students, and now more than ever, young people need that boost of confidence. While we've all heard the statistics about how the United States lags behind much of the world in science, technology, engineering, and mathematics (STEM), some other numbers surprised me. According to a report by STEMconnector and My College Options, 60% of students who begin high school with an interest in science or math lose that interest by graduation. Research shows interest wanes even more in college.

To change these statistics, we need to rethink how we teach STEM subjects. The confines of a classroom, combined with teaching methods that neither engage nor inspire, will not make today's students excited enough about STEM to desire a career in these fields. We need to use content that is relevant to their lives, and let them experience what it's like to be a scientist using technology and tools that real-life scientists use every day.

The STEM Behind Hollywood program from Texas Instruments and the National Academy of Sciences' Science and Entertainment Exchange is giving educators free tools to immerse students in these critical fields, using Hollywood topics like zombies and superheroes to kick start their scientific curiosity.

As it turns out, zombies can teach real science and mathematical concepts like exponential growth curves and the intricacies of human anatomy and epidemiology. Superheroes can prompt teachable moments that draw on physics, biology, chemistry, and much more. Countless entertainment topics can be explored through math and science, and STEM Behind Hollywood guides the discussion using real-world simulations developed for TI-Nspire graphing calculators, computer software, and iPad apps.

Hollywood movies and television can do more than entertain. They can ignite our children's imaginations and prompt them to explore the science behind the magic they see on the screen. It just takes one seed of curiosity in a student's mind to grow a lifelong love of science and learning. We all play important roles in making science accessible. One teacher changed my life and how I viewed the world, and I'm trying to share that gift with as many teachers and students as I can. Can you be that life-changing catalyst for your students?

I'm excited to be returning to the National Science Teachers Association's national conference this year. Please join me at the opening keynote session to hear more about being the inspiration for the next generation of scientists. See you in Boston! ●

Emmy-nominated actress Mayim Hoya Bialik received her bachelors of science in Neuroscience and Hebrew and Jewish Studies from the University of California, Los Angeles (UCLA) in 2000 and earned a Ph.D. in Neuroscience from UCLA in 2007. Bialik's path from child actress, to neuroscientist, to playing a scientist on The Big Bang Theory *has led to her role off screen as an advocate for science, technology, engineering, and math (STEM) education.*

NSTA Reports

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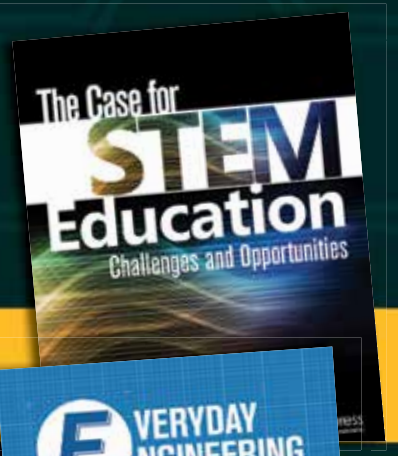
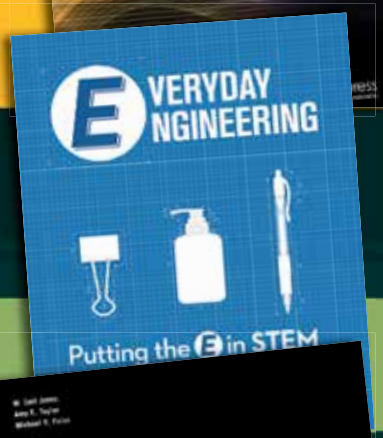
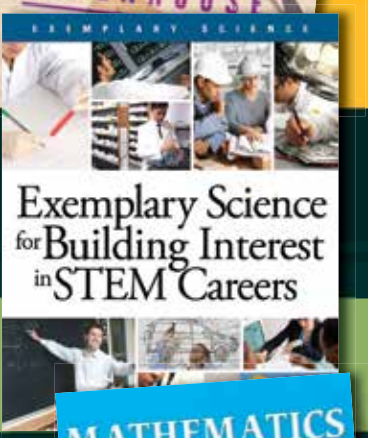
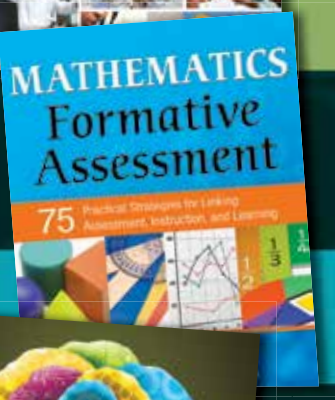
IT'S ALL ABOUT STEM









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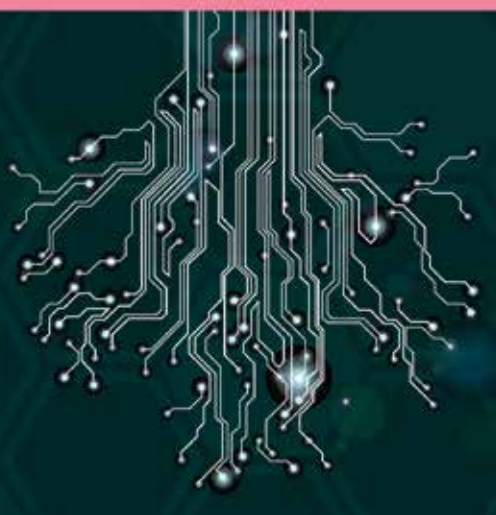


NSTA National Science Teachers Association

E-STEM, from pg 1

"The greatest challenge in developing an E-STEM program is the time needed to not only provide professional development in a systemic way, but to also have the time for teachers to collaborate," she contends. "Last year, we created an E-STEM Design Team and attended the NSTA STEM Expo and Forum in St. Louis. What we learned from the schools with strong STEM programs is the need to think outside traditional curriculum delivery models [and] to develop an efficient way for teachers to work [together], and with students, that best promotes innovation."

On the Cutting Edge

The E-STEM program at Valley of Enchantment Elementary School in Crestline, California, was created by fifth-grade teacher Mark Warhol about seven years ago after he and his colleagues formed a committee that he says sought "to think outside the box [regarding] educational programs. STEM was brought up, and since we live in the national forest with lakes, snow, [and] animals, I thought making STEM with an environmental focus was key in [attracting] more families to our community and district."

Attracting more families is important, he explains, because "we live in the mountains, and we've lost close to 40% of our students in the last 10 years due to [the nation's economic downturn]. All of our natural resources are up here, [so we said] let's tie in forestry, alternative fuels, gardening,…look at environmental issues and tie it into all four prongs of STEM."

Warhol and special education teacher Virjena Whitehead instituted E-STEM in fifth-grade classes three years ago and observed how adding the environmental component benefitted all the students, from special education students to those in a gifted and talented program. After the first year, "we [added] rotations in science and three project-based learning projects/contests (Bottle Boats/Buoyancy Unit, Spaghetti Bridges/Structure Unit, Bottle Rocket Unit) [during which] teams go through the NASA design process to create their own projects to enter [in competitions]," he explains. "In one project, the kids have to come up with a new way of living, building with recycled materials, gathering data, looking at multiple perspectives and solutions."

Warhol and Whitehead "added service learning into the program, working with our local Rotarians…[and implementing] two service projects a year. We built a community garden and developed a two-mile wilderness trail through the forest behind the school," he reports.

This year, six teachers and both fourth and fifth grades (nearly 250 students) are involved. "We now each specialize on a science topic, and we rotate classes to do mini-units with the students. All units involve hands-on projects. We also added solar ovens to our project-based learning this year and will be [studying] solar generators and generators charged through human power (alternator connected to bicycle). We've also partnered with our local lake to do trout stocking…, and over half [of] our school is farming worms and creating compost for our gardens," he relates.

When teaching about engineering, for example, "we look at how do you prevent erosion and landslides, which the kids experience living on the mountain. [In math,] every E-STEM class differentiates lessons for homogeneous groups (rotations). These groups change based upon the skill level of the kids in each topic of math... We are also starting a rotating math enrichment program that will focus on fun *Common Core* activities," he notes.

E-STEM is enhancing student learning, says Warhol, because "it truly makes connections to the world they live in and allows students of all levels to feel successful…E-STEM has helped us work across the curriculum, teaching kids necessary standards in real-world situations. It's not compartmentalized, and it's meaningful. This really helps with motivation and retention of what is being taught."

E-STEM learning, he concludes, "focuses on sustainability and technology focused on new natural energy sources. We are so excited about being on the cutting edge in this type of learning model." ●

STEM in the Driver's Seat

Building cars powered by mousetraps, balloons, and other everyday items is a common activity in many physical science classrooms. Now some teachers are using real automobiles to drive home science, technology, engineering, and math (STEM) concepts with their students. At Santa Monica High School in California, for example, students in Benjamin Kay's Team Marine environmental science educational outreach and service-learning club converted a fossil fuel–powered 1971 Volkswagen Super Beetle to a zero-emissions car.

Kay says his students undertook the project because Team Marine seeks to "use science as a way to communicate sustainability and leverage policies that effect positive changes in the community." They wanted the car, which was donated by a local family, to serve "as a lesson plan on wheels—a teaching tool for the public that raises awareness about climate change and ocean acidification while inspiring students to study electrical and mechanical engineering and environmental science," he explains.

Working with the school's automotive technology classes, Team Marine removed the car's combustion engine and gas tank. They then worked off-campus with a mentor to install the electric motor and lithium iron phosphate battery pack. Students worked "7–15 hours a week, mostly after school," with some "doing the hands-on work" and others conducting community outreach, teaching middle level students about the car, pursuing funding, and creating "a car-conversion manual that documented each step of the process," says Kay, who oversaw the four-year project.

Major funder Wells Fargo provided $26,000, most of which paid for the car's "state-of-the-art" batteries; the rest funded "propaganda materials for showcasing the car to the community," he relates.

Authenticity was vital to the project's success. "When students have a real, relevant project, it gets them more interested in the subject matter," he contends. They have "a greater desire to understand what ohms, watts, and amps are" when they "have a higher sense of purpose behind what [they're] doing." He thinks his students have received "great education for the steadily growing green economy" and the desire to pursue environmental science majors and careers.

COURTESY OF TEAM MARINE

Students in Santa Monica High School's Team Marine club converted a 1971 Volkswagen Super Beetle from gas- to electric-powered. Here mentor Greg "Gadget" Abbott explains to the students what the motor controller, shunt, and contactor do.

Additionally, "when students have to overcome technical hurdles and do troubleshooting, it bolsters their critical-thinking skills and reassures them that trial and error is part of science," he maintains.

As a marine biologist, Kay assures teachers that they don't need an engineering background to do this type of project. "Enlist the right people to get you to the next level," he advises.

STEM on the Speedway

Middle and high school teachers in racetrack communities can learn how to integrate professional motorsports in the STEM classroom through Driving SCIENCE, a three-day professional development (PD) institute that takes them from the classroom to the speedway. "Clemson University develops partnerships with motorsports venues in diverse communities. Teachers in these communities are invited to the Driving SCIENCE STEM Institute that takes place during [a] race week. To date, Driving SCIENCE has provided STEM [PD] in eight racetrack communities for 270 teachers in 84 schools, impacting 40,500 students," says Dot Moss, the program's project director at Clemson.

Teachers explore the world of motorsports through activities using readily available or low-cost materials, hear speakers, take tours, and then spend a day at the races watching STEM in action. In addition, "teacher leaders in each community are trained to facilitate the institute, and all teachers are provided with activities to take back to their schools," Moss explains. Partnerships with the race venues, businesses, and community groups enable teachers to attend free of charge; school districts typically fund the costs of substitutes and travel, she notes.

John Friend, a science teacher at T. Dewitt Taylor Middle-High School in Pierson, Florida, says Driving SCIENCE appealed to him because it provided a chance to work with a team of teachers to increase student achievement in science and math and provide "real-world application of science and math for students to care about." He discovered "there is a way for science and math teachers to work together to accomplish objectives in both curriculums by participating in the same hands-on activity."

Friend reports students now "are able to see abstract [topics] such as force and energy in action, and then are able to apply what they discover to real-world issues, such as increasing the safety of an automobile."

In North Carolina, middle school students have experienced NASCAR racing through the BioMoto STEM Challenge, a program that connects STEM with physical fitness and motorsports. At the end of the two-semester program, students compete in a modified pit crew in the BioMoto Capstone Challenge, held at Rockingham Dragway, using an apparatus they created at their schools.

Kurt Lawrence, science teacher at Northwest Cabarrus Middle School in Concord, coaches his school's BioMoto club. "I saw the value of a school club that allowed students to struggle with STEM principles. [Students] were getting the science and math in classes, but the technology and engineering parts required hands-on activities that are difficult to incorporate in a curriculum that must follow a tight calendar. The club setting allows our BioMoto team time to learn by experimentation and collaboration."

For example, "one of the BioMoto challenges is to build something to transport a five-gallon bottle of water. This year, I have challenged my team to build this using corrugated cardboard. They researched the strength of cardboard and the shape of NASCAR car frames and designed a cardboard box beam…When the beams collapsed during testing, the team collaborated and added a diagonal brace to the box beam," Lawrence relates.

Students "are learning to hear [one another's] ideas and collaborate on solutions. For the Pit Crew Challenge (a timed competition that involves changing a race car tire), they are using a timer app on an iPad to check their speed and discussing ways to increase their efficiency," he reports.

He also cites the value of a STEM competition. "The only other places where competition happens in schools are in sports and band class. BioMoto offers an opportunity for students who are not great athletes or musicians to demonstrate their strong points." ●

Data Collection for the Wireless Generation

Quotable

A good teacher must know the rules; a good pupil, the exceptions.

—Martin H. Fischer, German-American physician and writer (1879–1962)

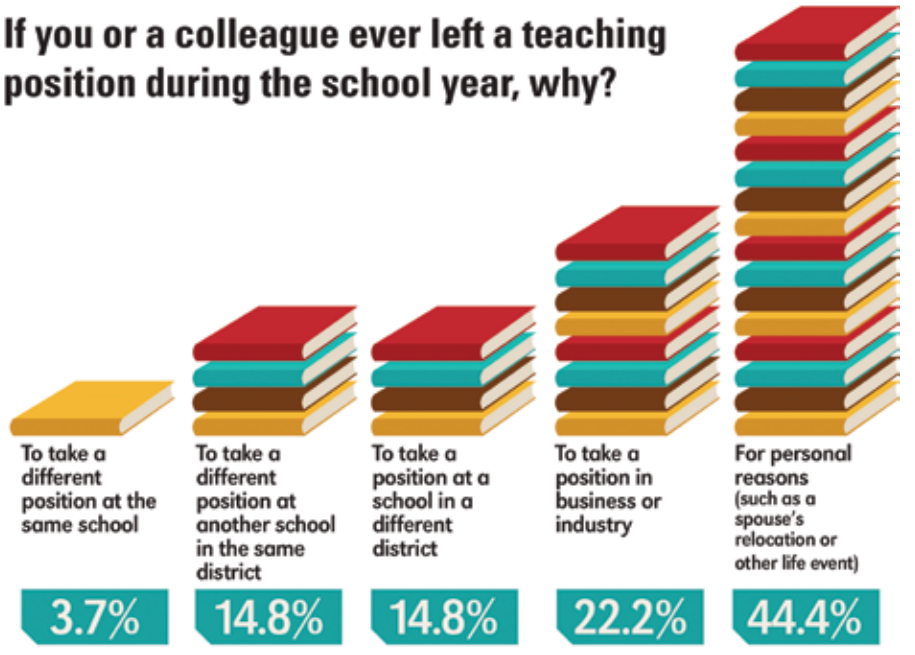
NSTA MEMBER POLL: **What You're Saying**

How Do You Ease a Departure?

It's not an ideal circumstance, but it happens: Teachers sometimes leave their positions during the school year. In a recent informal *NSTA Reports* poll, 92% of educators responded that they or a colleague have left a teaching position during the school year. Although 44% reported the departure was for personal reasons, 22% said it was to work in business or industry, and nearly 15% to work at a school in a different district. Of those who reported departures after accepting a different position, nearly half (47%) said a new position had been sought due to a bad fit with the school culture or administration.

Fourteen percent of respondents said they are required to give two weeks' notice when resigning, while 25% said they must give 30 days. A surprising 61% of respondents did not know how much notice their school or district requires from resigning teachers. Almost 30% said teachers who resigned would be eligible for rehire, but it would be unlikely to happen. Only 16% said a teacher would not be eligible for rehire after resignation.

Respondents advised giving as much notice as possible and keeping open communication lines with school administrators and replacement teachers to minimize the disruption of a teacher's departure to students.



Here's what science educators are saying:

Bring in the new teacher as soon as possible to observe the students while the teacher leaving is still there, if at all possible. Administrator must be proactive in providing the new teacher with the available resources and curriculum expectations of the district. Provide a mentor from the *same* department, even for veteran teachers coming into the position. [Use] co-teaching prior to new teacher, and continue for the remainder of school year.—*Educator, Middle School, High School, Iowa*

Care. Leave detailed overview plans that continue where he/she left off. Try to leave at a point [when] marking period/semester grades are finalized.—*Educator, Institution of Higher Learning, New Jersey*

Stay on task, and upbeat. Make sure grades are in.—*Educator, High School, Texas*

Have at least two weeks of lesson plans prepared ahead of time.—*Educator, Elementary, Florida*

Provide structure for students until a replacement can be found.—*Educator, Middle School, High School, Nebraska*

My colleague left two weeks' worth of lesson plans and let the students know that it was a personal choice for her and not because she didn't want to teach them anymore.—*Educator, Middle School, Illinois*

Establish a self-directed learning environment so the students can continue to learn no matter who the adult in the room is.—*Educator, High School, Vermont*

I lined up my long-term substitute ahead of time and maintained a presence in the school by visiting periodically and reminding [students] that what they were doing with the sub was valuable learning.—*Educator, High School, Connecticut*

Prepare students, and get their ideas. Give students [an] overview of what to expect.—*Administrator, High School, Maryland*

Have lesson plans ready for the next month.—*Educator, Michigan*

I left in November, and since my replacement had only been a math teacher before (my position was both math and science), I left all of my previous lesson plans, PowerPoints, labs, assignments, etc....to assist my replacement. This was especially helpful for him because he was teaching seven different preps in a small rural school.—*Administrator, Oregon*

Ensure that the class information and supplies are organized when they leave, and leave behind whatever plans they had in place—the longer, the better. I have had four colleagues leave in the middle of the school year, many of whom were leaving teaching for good. The worst part about the transition was the lack of information about individual students, their grades, their progress, any other important information we may need to ensure those students get the best education they can and not feel like we're starting from scratch.—*Educator, High School, Florida*

Even if the teacher was a bad fit, [there] will be an impact when that teacher leaves; it will be a positive impact, but an impact nonetheless.—*Educator, Middle School, High School, Virginia*

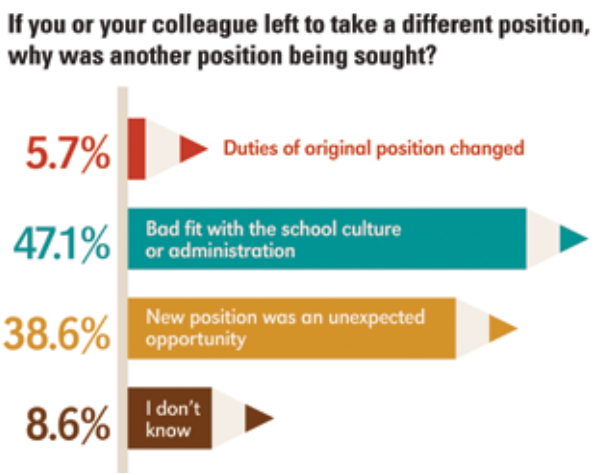
ensure support for the sub, whether [he or she] is a short-term or long-term sub.—*Administrator, High School, Nebraska*

In this case, my colleague left a poor district at a time when finding a long-term sub was next to impossible and the school had very little money to offer one. It was a huge disservice to the students.—*Educator, High School, Texas*

If you are leaving because the school is not living up to their commitment, then they need to figure out how to keep that from happening. It is not the teacher's responsibility, and it is out of [his or her] hands. No good teacher leaves a good job!—*Educator, Middle School, High School, Cairo, Egypt*

Views on Early Departures

Life happens. Hopefully the leaving teacher has clearly communicated [his or her] situation, from spouse transfer to job frustration. Whether it is spouse moving, death, jail, or job abandonment, it is the group of teachers and administrators left behind who have to work together to



BRAINSTARTER

GRAVITY

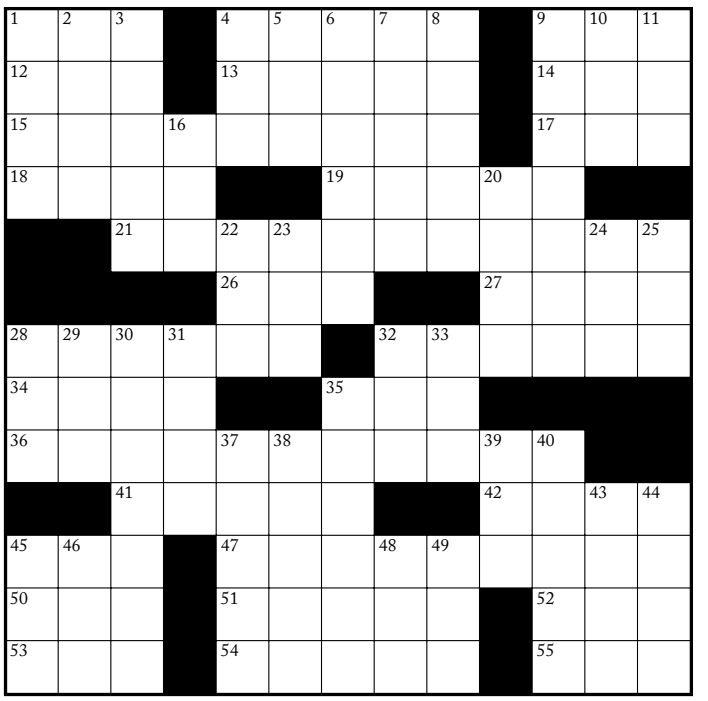
BY PATRICK MERRELL

ACROSS

1 Gorilla, for one
4 Many Saudis
9 Ground-hugging cloud
12 Male or female
13 "Don't Know Why" singer Jones
14 Amazement
15 Ancient Greek who believed an object naturally moved to its proper place in the universe
17 Lion in the sky
18 Shove
19 Online commerce
21 Leaning site of Galileo's famed gravity experiment
26 College building climber
27 Or more
28 Pancake relative
32 Thingamajig
34 "Now it makes sense!"
35 Sympathetic responses
36 English author of a 1687 book on gravity and motion, *the Principia*
41 More factual
42 Pair that walks
45 Abbr. on a highway sign
47 ___ curvature (principle behind Einstein's gravity explanation)
50 Raw metal
51 Cracker spreads
52 *Today* rival, briefly
53 The middle letter of 45-Across
54 Respond to an anesthetic
55 Corny actor

DOWN

1 Without-delay acronym
2 Neighbor of Brazil
3 Be alive
4 Insect in a plastic farm
5 Aussie hopper, for short
6 Vein's counterpart
7 Alaskan sled dog famous for completing a 1925 serum run
8 Wheat bundle
9 Pulled to earth by gravity
10 Have debts
11 Prefix with graphic
16 HBO competitor
20 Nano or Shuffle device
22 Wheaton of *Stand by Me*
23 First woman in the Bible
24 Take to court
25 Fitting
28 Nintendo game console
29 Burro
30 Item, along with a hammer, used in a 1971 gravity demonstration on the Moon
31 Possible response to a threatening stimulus



32 URL starter
33 Chem- suffix
35 Infuse with CO_2
37 Tooth tips
38 Mount Everest's home
39 Commonly, in poetry
40 *Equus ferus caballus* sound
43 Watson of Harry Potter movies
44 School debating unit
45 Kitchen-floor cleaner
46 Add-on before "meditated"
48 ___-Lo Green
49 Mind reading ability, briefly

ANSWER ON PAGE 19

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Online graduate credit courses for K–12 science teachers through National Teachers Enhancement Network, as well as online offerings for Masters of Science in Science Education. NSTA member discount.

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National Science Teachers Association

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BioInteractive. Looking for biology resources for high school students that spark interest in science and encourage students to consider careers in biomedical research? The Howard Hughes Medical Institute's (HHMI) website at *www.hhmi.org/biointeractive* contains animations, short films, lectures, interactives, apps, and other resources to enhance biology instruction. Check out The Molecular Evolution of Gene Birth and Death, a classroom lesson for advanced biology students that explores the role of mutations in genes, and *The Double Helix,* a short film that recounts scientists' quest to discover the structure of DNA.

Frontiers in Neuroscience for Young Minds. This scientific journal involves young people ages 8–18 in the article review process. Doing so offers the dual benefit of engaging students in scientific research and providing scientists a platform for reaching the broadest audience. Articles explore areas such as the Brain and Health (neurology, psychology); the Brain and Gaming (fun, action, learning); and the Brain and School (attention, decision making). PDF versions of the articles will be available soon, along with an e-book for classroom use. Learn more at *http://kids.frontiersin.org.*

Videos from *Curiosity Quest.* *Curiosity Quest,* a national Public Broadcasting Service (PBS) children's television series, explores what viewers of all ages are curious about. In each episode, host Joel Greene travels across the United States to find answers to questions posed by children and families. Each quest takes the audience on location for an unscripted, hands-on, educational and humorous exploration. Past episodes have featured such diverse topics as water education, skateboards, car recycling, firefighter training, hot air balloons, and cranberry harvesting.

Episode videos are posted on this YouTube web page: *http://bit.ly/1daFhSK.* Learn more about the series at *www.curiosityquest.org.*

Polar Educators International. An international network of educators and researchers dedicated to promoting a deeper understanding of current polar science has a web page at *www.polareducator.org.* K–12 educators can join the group and take Master Classes to build background knowledge of polar science. Led by polar researchers and master teachers, the Master Classes feature webinars and online demonstrations of student-tested activities that teach polar concepts. In addition, the site offers news and updates on polar research as well as links to outreach materials from arctic education organizations.

Chemistry Minute™. A new video series from Flinn Scientific presents tips and techniques to make teaching high school chemistry a little easier. The videos—featuring titles such as *Making Measurement Interesting, Molecular Origami,* and *Chemical Naming Scavenger Hunt*—are based on frequently asked questions from chemistry teachers nationwide. To access the videos, visit *www.flinnsci.com,* click on Teacher Resource Videos, and scroll to Minute Videos. (High school biology instructors can view Biology Minute videos that present teaching tips and techniques.)

Science Learning Guides for Teens. Shmoop, which has a website at *www.shmoop.com,* offers academically relevant content in core subjects for teen users. Science resources include multimedia learning guides for high school students on biology and chemistry topics. Guides explore Cells; Energy Flow and Enzymes; Animal Behavior; Microorganisms: Viruses; Solids, Liquids, and Gases; Organic Chemistry; The Periodic Table; and other topics. Each guide features video clips, colorful illustrations, and a student-friendly writing style and includes an introduction, in-depth topic pages, lab tips, big themes, real-world connections, study questions, quizzes, web links, and citations for each topic.

National Energy Education Development (NEED) Resources. At *www.need.org/educators,* K–12 educators can access more than 100 energy education curriculum guides for primary, elementary, middle, and secondary levels. In addition, teachers will find supplemental educational materials, including e-publications, animations, curriculum correlations, energy fact sheets, and other documents. For example, The Blueprint for Success (click on Supplemental

See Freebies, pg G2

Freebies, from pg G1

Materials) provides an outline of a basic energy curriculum unit and matrix of all curriculum options. The NEED Graphics Library contains high resolution graphics from NEED curriculum guides that can be used in classroom presentations and handouts.

PBS Parents. The education section of the PBS Parents website (*http://to.pbs.org/1hrosF9*) has resources and activities perfect for use in elementary (grades K–5) classrooms. Students and teachers alike will enjoy the ToyMakers article and video, which promotes math and science learning by making toys such as a balloon-powered car, an oscillating bird toy, and a Cartesian diver. Other highlights include family science activities such as Robot Body Language, in which students practice communicating without using their face or voice, and Parachuting Parade, in which students develop engineering skills as they build a parachute that gets a mini-figure to the ground slowly and safely.

ZYANCE

Make Your Own Paper. This lesson for grades 1–8 from Project Learning Tree (PLT) at *http://bit.ly/18FzFi8* provides step-by-step instructions for creating homemade paper, along with reading connections, assessment suggestions, and enrichment opportunities. As students investigate the papermaking process, teachers can supplement the experience with information on the History of Papermaking (*http://bit.ly/J6ULdL*), building an interdisciplinary lesson that helps students to make connections between science and social studies.

One Minute Mysteries. Each month, Science Naturally posts a different "mystery" from their award-winning *One Minute Mysteries* book series for students ages 8–14. Available at *http://sciencenaturally.com/mystery_of_the_month*, the mysteries are literature-based math and science brainteasers that take just one minute to read. The brainteasers work well as independent reading for students, a bell ringer for teachers, or an assessment tool for math and science knowledge and literacy. Recent titles include The Tune-Up, Halloween Hippie, Slow Boat, and Cool as a Cucumber.

Best Out-Of-School Time (BOOST) Collaborative. BOOST, an organization dedicated to supporting groups involved in serving youth in the before- and after-school hours, has a collection of science, technology, engineering, and math (STEM) resources for preK–college educators to use both in and out of the classroom. The resources at *http://bit.ly/198O1Ie* include STEM curriculum, projects, and technology tools and can be used as academic instruction or enrichment. You'll find everything from episode guides to Bill Nye the Science Guy to links to websites like Change the Equation, which provides current updates on each state's progress in STEM education.

Learning and the Net Generation: College Level. What do learning surveys tell us about the best teaching practices? Are students really the multitaskers they profess to be? Does student addiction to electronic devices and their in-class use impact learning outcomes? At the 2013 Astronomical Society of the Pacific summer meeting, astronomy educators Douglas Duncan (University of Colorado) and Alex Rudolph (California State Pomona) tackled these questions and shared insights on the topics in the lecture Learning and the Net Generation. View a video of the 45-minute talk *at www.youtube.com/watch?v=DR7pqOjg154*.

The Spangler Effect. Educator Steve Spangler presents videos at *http://bit.ly/1f9jQTZ* that elevate ordinary science experiments into extraordinary events that keep students engaged in learning. Titles include *The Science of the Persistence of Vision, The Science of Magnetism,* and *Hot Air Balloon Science.* For videos of attention-grabbing experiments that students can do at home—like *Insta-Snowball, Invisible Soda,* and *Floating Egg*—check out Spangler's Sick Science! video channel at *http://bit.ly/KtGF6C*.

Shutterbugs: Wiggle and Stomp. This game for ages 3–5 teaches children how to describe movement and motion while visiting rare animals at the Smithsonian National Zoological Park. Players follow Ada the zookeeper, who is seeking animals that are swimming, running, wiggling, and stomping. Once students find and photograph each animal in motion, they can access printable coloring pages. Shutterbugs is available for iPad and tablets at *http://bit.ly/19GWa4X,* or play it online at *http://bit.ly/JZsGoA*.

Física en Línea (Physics Online). This Spanish-language website at *www.fisicaenlinea.com* provides content, presentations, videos, and recommended links about the basic concepts and principles of physics. Most appropriate for high school and college levels, the site covers topics such as mechanics, measurement and mapping, energy, waves, optics, electricity, biographies, and modern physics. The "Other Topics" section includes hard-to-classify classroom resources, such as webquests and labs.

BirdSleuth Investigator 2013. Educators can download a free copy of this student research magazine from the Cornell Lab of Ornithology at *www.birdsleuth.org/student-publication*. In addition to student research projects investigating questions such as Which seed attracts more birds? Does the time of day affect when birds come to the feeder? and How does the type of tree affect the type of bird?, the issue contains bird illustrations and science writing and poetry from K–12 students nationwide.

Fit 4 the Classroom. This program for elementary (grades K–5) educators, students, and their families promotes "whole-body" health and wellness. Rooted in the four pillars of fit—mood, move, food, and recharge—the program promotes healthy habits through engaging lessons, interactives, and videos. For example, the Sugar Detectives, an interactive PowerPoint, guides students through the process of comparing sugar content in favorite beverages. Let's Get Moving, another interactive PowerPoint, suggests ways for students to incorporate more movement into their lives; the video *Effects of Exercise on the Brain* helps students understand how physical activities produce chemical changes in the brain. Learn more at *www.fit4theclassroom.com*.

K–12 Soil Science Resources. The Soil Science Society of America (SSSA) is a professional society of soil scientists, educators, and consultants focused on promoting soil science in schools. The group's website, *www.soils4teachers.org,* offers news, lesson plans, a glossary, career profiles, and opportunities to ask questions of soil experts. Teachers can also access "fun" soil resources, such as the I "Heart" Soil rulers and stickers; "12 Orders of Soil Taxonomy" posters; Soil! Dig Deeper bookmarks; and "Careers in Soil Science" posters and brochures.

Music Inspired by Astronomy. The annotated *Music Inspired by Astronomy: A Resource Guide Organized by Topic* presents more than 100 pieces of music inspired by astronomical ideas, discoveries, or history. The guide is organized into topical categories, such as black holes, planets, and comets, and is available at *http://bit.ly/1gBfYIy*. Both classical and popular music are included. Creator Andrew Fraknoi of the American Astronomical Society suggests introductory college astronomy instructors can use the music "as a change of pace, a technique for involving students, an honors paper topic, and a way to showcase that scientists and artists can have a common meeting ground."●

News Bits

- **According to a National Research Council report, the *Next Generation Science Standards* (*NGSS*) call us to rethink the way we currently assess student learning. Once the *NGSS* are implemented, the report says, we'll need new types of assessments to measure the kind of learning they require.**

Many current state tests, for example, often focus on factual knowledge, while the *NGSS* focus more on depth and the ability to integrate content with science and engineering practices. The standards have been adopted by eight states so far.

"The [*NGSS*] present challenges for assessment, but they are also an opportunity to address longstanding limitations with current approaches," says James Pellegrino, distinguished professor of education at the University of Illinois at Chicago, who co-chaired the committee that wrote the report. "Current assessments tend to ask students to define the scientific method absent specific content; assessments under *NGSS* should ask [them] to demonstrate that they understand aspects of scientific reasoning by applying particular science practices—such as designing a study or interpreting the meaning of a data set—to questions about genetic inheritance, for example."

The report suggests a range of types of assessments will be needed to meet the new standards and that one-time state tests should be supplemented with classroom-embedded assessments. In addition, states should monitor indicators of "opportunity to learn:" Do students have the opportunity to learn science the way the standards recommend, and do schools have the resources needed to support this learning? Read more at *http://bit.ly/1c7JXGX*.

- **A Thomas B. Fordham Institute study offers a solution to the problems of good teachers not being paid enough and too few students having access to great teachers.**

The study, based on data from North Carolina, suggests assigning the best teachers larger classes—with extra pay—and smaller classes to weaker or less experienced teachers. This would allow less effective teachers to concentrate on fewer students and give more students access to stronger teachers.

Study results suggest this could improve student learning in some cases, with no additional cost to taxpayers. The study cautions that universally shrinking classroom sizes may not always be appropriate. Read more at *http://bit.ly/1dmQKL9*.

- **Managing a classroom for the first time is challenging for many new teachers. A National Council on Teacher Quality (NCTQ) report found that five research-based strategies have consistently proven successful for classroom management, but frequently these strategies are omitted from teacher preparation.**

The study examined more than 100 traditional teacher preparation programs and found only 16% taught all of the following:

1. establishing rules and communicating expectations for behavior;
2. building structure and establishing routines;
3. using praise to reinforce positive behavior;
4. consistently imposing consequences for misbehavior; and
5. teaching interesting lessons that foster student engagement and include opportunities for their active participation.

While most programs cover classroom management practices, most do not draw from research, and instruction on the subject is often scattered throughout the curriculum, the report states.

"New teachers deserve better," says NCTQ President Kate Walsh. "It is time for teacher prep programs to focus on classroom management so that first-year teachers are prepared on day one to head off potential disruption before it starts and learning can take place." The report suggests ways to help states and teacher prep programs accomplish this. See *http://bit.ly/1fLCpKz*. ●

What's New

FROM U.S. GOVERNMENT SOURCES

National Institutes of Health (NIH)

Talking Glossary of Genetic Terms—en Español

NIH's National Human Genome Research Institute (NHGRI) has launched a Spanish version of its online Talking Glossary of Genetic Terms. Glosario Hablado de Términos Genéticos (*http://1.usa.gov/1dhQgoi*) includes more than 100 color illustrations and more than two dozen 3D animations showing genetic concepts in action at the cellular level. For example, all cellular organelles have animation sequences, as do many key terms such as gene, cell, and chromosome. The English version is also available as an app for iPhone and iPad at *http://bit.ly/1gAmCBs.*

AIDSinfo Website

In addition to news, research updates, and links to further information about HIV/AIDS health-related topics, a website from the U.S. Department of Health and Human Services and NIH at *http://aidsinfo.nih.gov* offers educational resources including a comprehensive glossary and fact sheets. Most appropriate for the high school and college levels, the glossary presents hundreds of frequently used HIV/AIDS terms in nontechnical language and has a section containing pertinent acronyms. The fact sheets feature clear illustrations to help students understand the virus and address topics such as HIV prevention, treatment, and the side effects of HIV drugs. A Spanish version of the site is available at *http://infosida.nih.gov.*

AIDS Portal

At *http://aids.nlm.nih.gov,* high school and college educators can access links to federal news, resources from reliable health industry experts, information about the latest policy and strategy, and links to websites for HIV/AIDS Awareness Days. A special section for students and educators at *http://1.usa.gov/JLqeTq* compiles resources from leading organizations and universities in categories such as Basic HIV/AIDS Information, HIV Policy, Programs, and Organizations; Medical Practice and Guidelines; Multimedia; Prevention; Specific Populations; and Statistics and Treatment. Selected highlights include a Global HIV/AIDS Timeline, which tracks key milestones in the epidemic from the first signs of discovery (pre-1981) to recent developments in treatment (2012), and See AIDS in Action, a series of multimedia animations from an AIDS researcher at the University of Iowa that show the life cycle of HIV from viral entry to gene transfer to exit.

National Aeronautics and Space Administration (NASA)

NASA eClips

These collections of short, educational video segments for K–12 students feature real-world applications of science, technology, engineering, and mathematics (STEM) topics and offer an inside look at the range of work NASA scientists do. For example, Our World, for grades K–5, contains seg-

ments as diverse as *Sleeping Onboard the International Space Station* and *NASA at Jamestown,* which shows how archaeologists are using NASA technologies to study the past without damaging artifacts. Real World, for grades 6–8, includes segments such as *Calculating Shuttle Launch Windows* and *Comets—It's Done With Math,* which emphasize the connections between math and science in scientific endeavors. Launchpad, for grades 9–12, explores NASA innovations and technologies through segments like *Curiosity Goes to Mars* and *Cryogenics—The Cold, Hard Facts.* Educator guides with ideas and activities are available for each collection at *www.nasa.gov/nasaeclips.*

Mapping Our World Interactive

This interactive visualization (*http://bit.ly/1b9Uobs*) allows middle and high school students to explore data sets from more than a dozen NASA Earth science missions. The artwork, created by Ginger Butcher, Aura mission education and public outreach lead, and Jesse Allen, visualization specialist for NASA's Earth Observatory, features data from NASA Earth observation missions. Click on an image to learn information about the type of data collected, ways scientists use the data to learn more about the Earth, and mission details.

U.S. Fish and Wildlife Service (FWS)

Conservation Essay: 'Thinking Like a Mountain'

Aldo Leopold, father of the modern wilderness conservation movement, reminds readers of the importance of protecting the environment in the essay "Thinking Like a Mountain," which first appeared in his book *A Sand County Almanac* (1949). Leopold recounts a time in his young adult life when he and his friends were in the woods, armed with guns. They saw movement tumbling down the hill toward them, and when they saw it was a wolf, they shot without thought because that was the normal practice.

Leopold said he saw a "green fire die" in the eyes of another wolf, and it changed him forever. He observed the mountain and the plant life growing there, to hold the soil together. He realized a mountain would be afraid of the herbivores that might graze it clean, not the predators who keep herbivore populations in check. Read the essay at *http://1.usa.gov/JLLjfQ.*

National Oceanic and Atmospheric Administration (NOAA)

National Severe Storms Laboratory Resources

The NOAA National Severe Storms Laboratory (NSSL) at *www.nssl.noaa.gov/education* presents basic information about severe weather events such as thunderstorms, tornadoes, lightning, floods, hail, and winter weather, as well as classroom resources for K–8 teachers, including coloring pages, quizzes, activities, games, and links for further learning. For example, the colorfully illustrated Weather Friends trading cards, featuring superheroes like Doctor Disaster, Heat Wave, Ice Queen, Deluge, Swirl Girl, and Radman, offer tips and information for staying safe during severe weather events.

U.S. Environmental Protection Agency (EPA)

Air Quality Activity

Originally created for use with Girl Scout Cadettes (grades 6–8), this activity at *http://1.usa.gov/1a0qaFq* can be used in any middle level classroom to introduce the EPA's air quality index program and investigate particle pollution in the local environment. In the activity, students make "air strips" from cardboard and tape, then hang them in various locations around the community. After a week, students remove the air strips and using a magnifying glass or a microscope, examine the particles (e.g., soot, pollen, dust, ash) on the tape. Students compare the findings and draw conclusions about particle pollution in the test areas.

National Science Foundation (NSF)

Science of Innovation Video Series

Whether it happens among students in a classroom or engineers in a laboratory, innovation is a process—a series of steps that begins with imagination and results in the creation of something of value for society. That process is emphasized in the Science of Innovation video series for middle and high school students from NSF and NBC Learn. Found at *http://1.usa.gov/19D3Chs,* the series describes the development and benefits of a different innovation in each episode; students will hear about biotic limbs, biofuels, 3D printing, electronic tattoos, fuel cell efficiency, "smart" concrete, synthetic diamonds, and self-driving cars.

U.S. Department of Agriculture (USDA)

Water Cycle Resources

"The Water Cycle: Nature's Recycling System," a new poster at *http://1.usa.gov/1gNyEr3* from the USDA's Natural Resources Conservation Service, shows the elements of the water cycle through a diverse landscape. The back of the poster has information on pollution and watersheds and activities to engage upper-elementary and middle level students in water conservation. In addition, teachers can access an animation of the water cycle to share with elementary and middle level students.

U.S. Department of Education (ED)

PISA 2012 Report

Performance of U.S. 15-Year-Old Students in Mathematics, Science, and Reading Literacy in an International Context—First Look at PISA 2012 reports average scale scores and the percentage of 15-year-olds reaching selected proficiency levels, comparing the United States with other participating education systems worldwide. Results for the three participating U.S. states (Florida, Connecticut, and Massachusetts) are also reported. Access the entire report or browse selected findings at *http://1.usa.gov/1csAXIi.*

STEM Attrition: College Students' Paths Into and Out of STEM Fields

This report analyzes the most recent national statistics on beginning bachelor's and associate's degree students' entrance into and exit from STEM fields. It provides a first look at STEM course-taking and examines how participation and performance in undergraduate STEM coursework, along with other factors, are associated with STEM attrition. Read it at *http://1.usa.gov/1hmZ8A4.* ●

In Your Pocket

Editor's Note

Visit www.nsta.org/publications/calendar *to learn about more grants, awards, fellowships, and competitions.*

Siemens Science Day Ultimate Cool School Sweepstakes

Two schools will win this year's sweepstakes: one from grades K–3 and one from grades 4–6. Each school will receive an interactive science assembly led by a Discovery Education science expert. Teachers who are legal U.S. residents and are employed in an accredited public, private, or parochial school in the United States can nominate their schools online by **February 27** at *http://bit.ly/ZDO1L1*.

Together Counts: Smart From the Start Awards

These awards, sponsored by Discovery Education, promote lifelong healthy habits in preschools and Head Start programs. Winning entries will provide plans for practical, long-term improvements in nutrition and physical activity at each school. One grand-prize winner will receive $20,000; 10 runners-up will receive $2,500. Each school will also receive a prize pack of books appropriate to its preK curriculum and needs.

Teachers ages 21 or older employed at early childhood education centers or elementary schools that offer a preK or Head Start program in the United States are eligible. Apply by **February 28** at *http://bit.ly/1gG9c6Y*.

American Electric Power Teacher Vision Grants

American Electric Power (AEP) awards grants to preK–12 teachers who live or teach in AEP service areas in Arkansas, Indiana, Kentucky, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, and West Virginia or in communities with major AEP facilities. Priority is given to teachers who have attended an AEP Workshop for Educators, participated in the National Energy Education Development project, or are affiliated with an AEP school-business partnership.

KELLY MARTIN

AEP funds projects with an academic focus that improve student achievement; those with an emphasis on science, math, technology, electrical safety, energy efficiency, and the balanced study of energy and the environment are preferred. Grant awards range from $100 to $500. Apply by **February 28** at *http://bit.ly/TCM6nl*.

Student Publishing Opportunity/Teacher Grant Giveaway

Students can publish their stories, essays, reports, and drawings in durable hardbound books for free through Student Treasures Publishing. Teachers select a publishing date, receive a free publishing kit, and submit student manuscripts for printing. Those who do so by **February 28** are automatically entered in a $100-A-Day Grant Giveaway for teachers. Learn more at *www.studentreasures.com/publishfree*.

Monsanto Fund Grants

To support the communities in which Monsanto employees live and work, the Monsanto Fund invests in educa-

tion programs across rural America. Grants go to K–12 schools, libraries, science centers, and academic enrichment programs. Projects might include science and technology fairs, family science nights, robotics programs, and school gardens.

Grants of up to $20,000 are available. Applicants must request an invitation code before applying by **February 28** at *http://bit.ly/TrUVgr.*

SIGOL Online Learning Award

The Online Learning Special Interest Group (SIGOL) award, sponsored by the International Society for Technology in Education (ISTE), recognizes one K–16 teacher who uses online learning networks to provide innovative learning opportunities for students. Applicants should have planned, implemented, or evaluated an online learning experience that has enhanced student learning in some way. The winner will receive a complimentary registration to the ISTE Conference and Expo for up to two people, $1,000 in travel expenses, and a one-year ISTE membership. Apply at *http://bit.ly/1bPjnhe* by **February 28.**

SIGLIB Technology Innovation Award

ISTE presents this award to a team consisting of one school librarian and one teacher who have conducted an exemplary technology program that extends beyond the library to meet the needs of classroom students and teachers. Teams should have planned a collaborative project that involves technology, was supported by the administration, and was successfully executed with supportive data and evidence so others may replicate it. The winning team will receive a complimentary registration to the ISTE Conference and Expo for up to two people, $1,000 in travel expenses, $1,000 for the school's media center, a $300 professional library from ISTE, and two one-year ISTE memberships.

One award goes to a team at the primary level (grades K–5; see *http://bit.ly/1i1w4hF*), and one to a team at the secondary level (grades 6–12; see *http://bit.ly/19cD2h5*). Apply by **February 28.**

Kay L. Bitter Vision Award for Excellence in Technology-Based PreK–2 Education

This ISTE award goes to a teacher who integrates technology with vision and creativity in the preK–2 classroom. The winner will receive a complimentary registration to the ISTE Conference and Expo, $1,000 in travel expenses, and a one-year ISTE membership. Apply by **February 28;** see *http://bit.ly/1cbpLpa*.

ISTE Outstanding Young Educator Award

ISTE presents this award to educators ages 35 or younger who use technology to improve teaching and learning in creative and innovative ways. The winner will receive a complimentary registration to the ISTE Conference and Expo, $1,000 in travel expenses, a $1,500 cash prize, and a one-year ISTE membership. Apply by **February 28** at *http://bit.ly/1i1xlFs*.

Presidential Innovation Award for Environmental Educators

The Environmental Protection Agency (EPA) recognizes outstanding K–12 teachers who employ innovative approaches to teaching environmental education and who use the environment as a context for learning. Up to two teachers from each of the EPA's 10 regions, in different states, are awarded this national honor. They receive $2,000 to further their professional development in environmental education, and their local education organization receives $2,000 to fund activities and programs that support the teacher.

K–12 educators at public schools are eligible; applicants must have a current teaching license and at least five years of teaching experience, including three years of teaching environmental education. Apply at *http://1.usa.gov/18yPuaj* by **February 28.**

Association of American Educators Classroom Grants

The Association of American Educators (AAE) provides grants of up to $500 for projects and materials, including books, software, calculators, audiovisual equipment, and lab supplies. Full-time educators who have not received a scholarship or grant from AAE in the last 18 months are eligible. Apply by **March 1** at *http://bit.ly/LC3Evc.*

Edward E. Ford Foundation Grants

The foundation supports independent secondary schools and challenges them to leverage their unique talents, expertise, and resources to advance teaching and learning. Schools must be members of the National Association of Independent Schools (NAIS) to receive a grant; program areas include science/environmental, general education, math, reading, social studies, and science, technology, engineering, and math (STEM).

All grants require a matching component. Most are for $50,000 or less, with at least a one-to-one match. Submit proposals by **March 1;** consult *http://bit.ly/18RkVre.*

Pentair Foundation Education Grants

The foundation provides grants to support education, sustainability, and workforce readiness in communities where Pentair operates: in Alabama, California, Colorado, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Minnesota, Missouri, New Hampshire, New Jersey, New York, Nevada, North Carolina, Ohio, Pennsylvania, Rhode Island, Texas, Virginia, Washington, and Wisconsin. The foundation funds education programs serving both traditional and nontraditional learners, from early education to postsecondary and beyond. Of particular interest are K–12 STEM and robotics programs. Apply by **March 1** at *http://bit.ly/L1hQbj.*

Arthur Holly Compton Award in Education

Sponsored by the American Nuclear Society, the award recognizes outstanding contributions to nuclear science and engineering education. The winner will receive $2,000; an additional $2,000 goes to the winner's academic institution. Nominees do not have to be ANS members or work primarily in education. Submit nominations by **March 1;** consult *http://bit.ly/Ylchv7.*

Mantis Tiller Awards

The National Gardening Association will present 25 outstanding applicants with Mantis tillers and cultivators. Nonprofit garden programs are eligible; past recipients have included schools, youth camps, community gardens, and parks departments. Apply at *http://bit.ly/1c7iyVR* by **March 7.** ●

Summer Programs

Editor's Note

Visit www.nsta.org/publications/calendar *to learn about more summer professional development opportunities.*

Summer Landmarks Workshop: Mesa Verde National Park. In this National Endowment for the Humanities (NEH) Summer Landmarks workshop, K–12 teachers will explore Mesa Verde National Park, Crow Canyon, and 1,800 years of Pueblo Indian history. Participants will do hands-on field work and laboratory analyses, guided by Crow Canyon Archeological Center's archeologists. Evening lectures and discussions provide resources for teaching anthropology and archeology in K–12 classrooms. Participants receive a stipend to cover travel, books, and other living expenses.

Two one-week sessions are scheduled: June 22–28 or July 20–26. No previous experience in anthropology or archeology is required. Applications must be postmarked by **March 4;** visit *http://bit.ly/1bOqHx6* for details.

Landmarks of American History and Culture Workshop: Atomic West Atomic World. This teacher workshop is also sponsored by NEH, in partnership with Washington State University and the NorthEast Washington Educational Service District 101. Participants will learn about the Hanford Nuclear Reservation in Washington, the primary site of plutonium production for atomic weapons during World War II. Teachers will explore this once top-secret location and investigate its scientific, social, and economic history. Two one-week workshops will be held for up to 40 teachers on July 6–11 and July 13–18. Teachers of any subject in grades 7–12 who will incorporate workshop content into their lesson plans may apply. Stipends will cover travel, meals, hotel stays, and other expenses. Postmark applications by **March 4;** see *www.esd101.net/atomicwest*.

Exploring the Past: Archaeology in the Upper Mississippi River Valley. This NEH institute for K–12 teachers will provide three weeks of intense, guided exploration of how Native American and Euro-American cultures have adapted to the Upper Mississippi River Valley in Wisconsin over nearly 14 millennia, and how humans learn about such cultures through archeology. Teachers will work in excavation sites; clean, process, and catalog artifacts; and even learn how to fashion wooden arrows and stone arrowheads.

Taking place July 14–August 1, this institute is based at the University of Wisconsin–La Crosse. Stipends are provided for travel expenses, books, and living costs. Continuing education units and graduate credits are available. Applications must be postmarked by **March 4;** visit *http://bit.ly/1cPjY7n*.

Mapping Nature Across the Americas. This five-week NEH institute is open to college-level teachers and graduate students in the humanities. It will examine, in a Pan-American context, the complicated and contradictory ways in which humans have mapped and conceived of their place in nature throughout history. Guest faculty will include specialists in geography and environmental, cartographic, U.S., and Latin American history. Participants will design their own research projects and gain access to primary materials.

The institute will take place July 14–August 15 at The Newberry Library in Chicago. Extensive prior knowledge of environmental or cartographic history is unnecessary, but educators should have enough familiarity to articulate why this concentrated study will enhance their teaching or research. Twenty applicants will be chosen, three of whom may be full-time graduate students in the humanities. Stipends will fund travel, books, research, and living expenses.

Applications must be postmarked by **March 4.** Consult *http://newberry.org/mappingnature*.

Physics of Atomic Nuclei. This free residential program for science teachers and high school students is held at two of the country's leading nuclear physics labs: the National Superconducting Cyclotron Laboratory at Michigan State University (MSU) and the Nuclear Science Laboratory at the University of Notre Dame (ND). Teachers attend the program at MSU; students may attend at either location. All participants will explore atomic nuclei and their connection to astrophysics and cosmology.

The program is open to all science teachers, though high school physics or chemistry teachers tend to find it most useful. Students must have completed at least one year of high school. The MSU program for teachers takes place July 27–August 1; students can attend the MSU program August 3–8 and the ND program June 22–27. Apply by **April 7;** see *http://bit.ly/WbSAVk*.

Institute for Climate Change and Energy Education. The institute allows educators to connect with others who care about these issues, hear presentations from key scientists, and receive training on award-winning climate change and energy curricula. This year's institute will take place August 4–6 at the Audubon Center of North Woods in Sandstone, Minnesota. The special guest scientist is Mary Spivey of the University of Minnesota's Cedar Creek Ecosystem Science Reserve. Scholarships are available. Refer to *www.willstegerfoundation.org/summer-institute* for details. ●

Integrating Geography and STEM

Integrating science, technology, engineering, and math (STEM) with geography enables teachers to use "our globally diverse environments, structured by equally diverse map designs, as an entry to communicating systems," says Betsy Stefany, project manager of the New Hampshire Math and Science Partnership (MSP) STEM Literacy Community of Practice. "The map tool models the joining of STEM languages (text, visual, and data), developing one process of understanding the *Next Generation Science Standards* concept of three dimensions. Using a traditional, yet transitioning tool that blends the practice of measurement, naming, and visualization with local environments [extends] place-based learning to a global exercise. The visual structure [allows] students to delve into how models are created through actual existing surroundings and currently used, but evolving designs."

As a result, "students gain understanding that physical images are not the same as physical elements; observation of systems and iconography in diagrams are an ongoing effort; and light and forces change based on multiple types of geographic conditions," she maintains. "Using geographic skills aids early modeling of matter and knowledge of local resources or hazards [that] may result in STEM community projects."

Joyanne Hamilton, who teaches at Innoko River School in Shageluk, Alaska, blends geography and STEM because "Shageluk is a *tiny* community in the rural remote interior of Alaska. It is always a challenge to get young students to see the bigger picture beyond our village…Teaching children [using] interactive maps helps [them] develop a perspective of where they live in relation to the rest of the world, their thoughts of citizenship, stewardship, and responsibility to the health of the Earth and humanity."

Combining STEM and geography "provides an authentic learning experience for students [that] can result in students' heightened interest in STEM education and lead to a future STEM career," asserts Christina Smith, fourth-grade teacher at Scott Computer Technology Magnet School in Topeka, Kansas. She adds that "No Child Left Behind inflicted many challenges on the education system, and unfortunately, geography was a subject that did not receive much attention. Therefore, geography needed to be integrated into math, reading, and science curricul[a] when possible."

Strategies for Teaching

"[I] extend the 'Maps' chapter of most Earth science/geology texts to other courses," says Seth Hodges, who teaches at Curlew High School in Curlew, Washington. Maps "can inform and expand the student's view in other disciplines. Ecosystems and biomes in biology link directly to Earth science concepts of climate, landforms, and plate tectonics through maps.

"Maps can also reinforce topics in math and physics," he points out. "By starting students with maps in my eighth-grade Earth science class, I can relate the Cartesian coordinate system to how we locate positions on a map or globe. If students begin playing with maps, directions, and angles…[then they are] more familiar with angles and coordinate systems in future math and physics courses."

Environmental science teacher Ashley Pereira of Connecticut River Academy in East Hartford, Connecticut, says the school is located along a river, "so my beginning environmental science unit is all about the surrounding watershed. This year, I partnered this unit with social studies for their five themes of geography introductory unit." In her unit, she combined scientific mapping skills and study of watershed characteristics with the social studies angle: comparing "similarities/differences of our watershed with others in the United States…Students created their own questions related to the five geography themes for the region they were exploring. These questions were then shared with different groups in a scavenger hunt activity using Google Earth tours."

If a school has sufficient funding for geographic information system (GIS) and global positioning system (GPS) tools, the STEM/geography integration can be further enhanced. Antonietta Quinn, resource teacher for the Elementary Science Program (ESP) in Monroe 2-Orleans Board of Cooperative Educational Services in Spencerport, New York, says the ESP "has started incorporating GPS/GIS into our curriculum. An example is in our ecosystems unit. Students [map] out their schoolyard with GPS units and [create] waypoints that identify the living and non-living things in the schoolyard. Then the class compiles the information on a map that can be printed using Google Earth or ArcView GIS."

BETSY STEFANY

Students from Kearsauge Regional Middle School in New London, New Hampshire, use a dichotomous key to develop a legend for a map.

Learning these skills is crucial because "universities are having difficulty keeping up with the demand of graduates needed to fill positions in GIS," she contends. "In addition, students [using GPS/GIS] aren't just gathering data…they *analyze* the data."

Student Gains

Stefany's MSP supported the creation of "a local school 'Quest' on the campus. By designing clues and creating maps, students gained practice with… tools like GPS. The use of data collection as an active skill and part of a numerical system gives math an active real-world application and value," she relates.

"When used to situate by active, physical measurement, with universally accepted coordinates that place items in space, the skills translate to the use of other mathematical systems," she contends. "These graphic organizers (like graphing and timelines) that rely on others to collect and may differ in scale can seem tedious to learn without relevance of geographic experience and superlatives that are linked to features (longest river, highest mountain, [and so on]). Students also appreciate that continued experience with their surroundings shows varied relevance over time to the same observations."

"When we [look] at graphs and charts in various STEM subject areas, now my students ask if they can find a map that shows the area we are studying," says Hamilton. "During the recent snowstorms in Cairo, Egypt, my students didn't just want to find it on the map, they wanted to check out maps showing annual rainfall in the area; they wanted to compare areas of rainfall with other similar latitudes; they wanted to learn about the ancient Egyptians and their relation to the Nile and compare it to our life on the Innoko River." ●

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NSTA National Science Teachers Association

MS. MENTOR, **Advice Column**

From New Teacher to Colleague, Feeling Overwhelmed

I'm a new teacher, and I took a job as a chemistry teacher in a different state. I feel isolated from the other teachers who know one another. I want to establish relationships with the other teachers and staff, but I'm not sure how to start.

—Jason, Boston, Massachusetts

No matter where you teach, teaching can be a solo job. Unfortunately, once the classroom or lab door closes, you're often on your own. But most teachers are helpful people. Your new colleagues and administrators want you to succeed, but they might be hesitant to offer advice, not wanting to offend you. They may not realize you're new to the area. And they're not deliberately ignoring you: They're busy with their own challenges. I offer some suggestions for connecting with your colleagues.

Greet other teachers (by name, once you learn them) in the hallway or the faculty room. Re-introduce yourself, and ask questions. Everyone likes feeling needed, and you can gather advice from veteran teachers: "How do you handle test makeups?" "What do you do to engage students?" Even experienced teachers like to be recognized for their work: "Your bulletin board gave me some good ideas." "My students were really excited about what you did in class yesterday." This could lead to more conversations. If teachers or administrators offer suggestions, don't act like a know-it-all. If a teacher offers advice, thank him or her.

During department or faculty meetings, you can observe the personal dynamics and listen to the conversations. But you don't have to be a silent observer. Speak up and ask questions: "Why do we…?" "What would happen if…?" These questions can lead to interesting discussions about school practices.

If you haven't done so already, get on good terms with those many cite as the most important adults in the school: the office and custodial staffs. Office staff members are the "go-to" people if you have questions about school procedures, supplies, and deadlines. As a science teacher, the custodians are invaluable allies in maintaining a clean, safe, and secure lab. A friendly greeting and thank-you are greatly appreciated. The school or district safety officer can also provide support in maintaining your inventories and fostering safe practices in your lab.

Attend school functions. Many other teachers will also be there, and the students and parents will appreciate your interest and support. You can also get to know other teachers by co-sponsoring an extracurricular activity or serving on a coaching team.

If the opportunity arises, volunteer for a committee or task force. Join professional development study teams or discussion groups. You can offer a fresh view from a newer teacher's perspective. You may have useful skills in technology, writing, or presenting. If you're a recent graduate, your science content knowledge may include cutting-edge topics.

While some suggest new teachers should avoid the faculty room, I've been in dozens of them, and most are welcoming places where teachers socialize, relax, and talk with one another. Eat lunch with other teachers there instead of alone in your room (it's not good to eat in a lab, anyway). If you do find the faculty room toxic, then by all means find someplace different. You'll want to be around colleagues who have a positive attitude.

If you're invited to join a group for coffee or dinner, accept the invitation. These social activities help you learn the school's culture.

This is my first year as a middle school science teacher. I teach two different grade levels, and after a few months, I still feel swamped. It seems like I spend every waking moment working either in my classroom or at home on lesson plans and student assignments. What can I do to save my sanity? Does it get any easier?

—Erin, Rochester, New York

Even the best preservice teaching or internship experience is not the same as being on your own in the classroom. It's not unusual for beginning teachers to feel overwhelmed: I was ready to quit the October of my first year! Fortunately, I had a principal and several colleagues who helped me.

You are not in this alone. If you don't have a mentor, find some positive people in your school with whom to eat lunch, share ideas, ask questions, and attend school functions. Partner with another early career teacher, or participate in online communities of teachers (such as NSTA's e-mail lists and Learning Center discussion forums) for mutual support.

Your health and sanity are nonnegotiable. Schedule some personal time several times a week (if not daily) just for you.Take a walk, go for a run or bike ride, work out at the gym, read a book, play a computer game or musical instrument—anything you enjoy (that's not necessarily related to school). Take care of your physical health, too. Don't skip breakfast or lunch. Keep some hand sanitizer in your desk and use it. Get enough sleep and exercise.

Science teachers have additional responsibilities like setting up lab investigations, managing inventories, and maintaining a safe environment. It's hard to do these along with other teaching responsibilities, so give yourself permission to prioritize your time. Rather than creating and installing new bulletin boards every month, have seasonal ones (or better yet, have students bring in materials to display). Use lesson ideas you've found online rather than trying to invent everything yourself. When faced with a stack of lab reports, consider whether you must grade every one. You could choose a few randomly to grasp how students responded. Decide if it's necessary to return every assignment the following day. Be sure students (and parents) know that you will return assignments after you've given them the attention they deserve.

Teaching two grade levels can be challenging. Try to avoid setting up two different labs on the same day, and schedule tests, projects, student presentations, and notebook reviews at different times. Keep yourself (and the students) organized. Divide your bulletin boards and shelves into two separate areas so students in each level know where things are and where to turn in their assignments. When I taught three different courses, I used a unique logo for each course, putting it on handouts, quizzes, or other documents. I used separate three-ring binders and separate folders (with the same logo) on my laptop for each course to organize lesson plans and other resources. I also had a tote bag for each course.

Your second question is tougher to answer. Anyone who says that teaching gets "easy" has never been a teacher! This year, you're spending a lot of time preparing lessons, but next year, you can reuse those lessons with some updating. But you'll have other challenges to occupy your time: finding new ways to engage students, creating different assessments, trying new strategies, and attending professional development activities. You could be assigned to a different subject or grade level. And of course, you have a personal life. So we can't really use the words *easy* and *teaching* in the same sentence. ●

Check out more of Ms. Mentor's advice on diverse topics or ask a question at www.nsta.org/msmentor.

BLICK ON FLICKS

The Hobbit: The Desolation of Smaug

By Jacob Clark Blickenstaff, PhD

Full disclosure: I have read *The Hobbit* and *The Lord of the Rings* several times. I've even read the extra stuff at the back of *The Return of the King*, so I'm pretty familiar with Middle Earth, and the timeline created by J.R.R. Tolkien in the books. I enjoyed *The Lord of the Rings* films despite the divergences from the books, and in spite of the long run times. I went to see *The Desolation of Smaug* expecting action, crazy elf stunts, and some changes from the book with which I'd disagree. I got all three in abundance. I'll leave aside my concerns about the film's quality for now, and concentrate on some fun that biology, physics, and chemistry teachers can have with scenes in the movie.

For those of you less familiar with Middle Earth than I am, *The Hobbit* is the story of Bilbo Baggins' journey to the Lonely Mountain with a group of 12 dwarves and a wizard (Gandalf). The dwarves hope to retake their kingdom under the mountain by defeating the dragon, Smaug, who has been living there for decades. In the first film, Bilbo, the hobbit of the title, found a ring of invisibility, but did not share his discovery. In *The Desolation of Smaug,* the group travels through Mirkwood to Lake Town and the Lonely Mountain. Bilbo saves the dwarves from giant spiders, releases them from the dungeons of the Wood Elves, and makes a solo trip into the dragon's lair.

A Web of Danger

In the depths of Mirkwood, Bilbo and the dwarves encounter giant spider webs and the giant spiders that wove them. One of the first things Bilbo does when he comes across the web is to pluck it with his finger, sending a vibration through the web that lets the spiders know exactly where they are. Though the spiders in the movie are far larger than any on Earth, their use of vibrations of the web structure is what real spiders do, though real spiders also distinguish between an isolated plucking of the web and the motions of a struggling insect.

Physical science teachers could have students do two calculations based on scenes in *The Desolation of Smaug.* The first examines buoyancy and the size of a barrel needed to float a dwarf down a river. The second is related to the molten gold in which Smaug is drenched near the end of the film. Both questions require several assumptions before one can even do the calculation, so at best they are approximations. As such, I will not closely track significant figures, and will report the final answers in round numbers.

Floating a Dwarf

Dwarves in *The Hobbit* are shorter than humans, but so muscular and stocky that I think it is reasonable to assume they weigh about the same as an average adult. I will use 70 kilograms for the mass of a dwarf. I was able to find some information about wine barrels made of oak online, so I will use that data as a starting point. Though wine barrels come in many sizes, a fairly typical one holds 225 liters of wine and has a mass of about 55 kilograms when empty. This means that the barrel and the dwarf together would have a mass of 125 kg, or a weight of about 1,220 Newtons. If the barrel and dwarf are to float, they will have to displace an amount of water that weighs 1,220 Newtons, or about 125 liters of water. Since the barrel is designed to hold 225 liters of wine, that should be no problem. In fact, the barrel would

float just a bit more than halfway submerged in the water. That's great if you're sitting in a swimming pool or still pond, but as the dwarves are riding down some pretty rough rapids, the barrels would be very likely to tip over, take on water, and sink. (Tolkien knew this about barrels, so in the book, Bilbo packed the dwarves into the barrels and closed the tops, making it harder for them to breathe, but much easier to float.)

Gilding the Dragon

Bilbo ventures deep into the Lonely Mountain into Smaug's lair, searching for the Arkenstone. Initially he finds only a giant pile of gold, and doesn't even notice the dragon sleeping buried in the treasure hoard. Without the benefit of the advice found in the Harry Potter books, Bilbo tickles the sleeping dragon, bringing to life some amazing animation, and initiating the film's final action sequence. The dwarves come to Bilbo's rescue when they hear the dragon awaken, and trick Smaug into lighting their long-dormant furnaces. Just a few minutes later, they have a huge gold statue of the King Under the Mountain. This made me think about just how much gold exists in the world.

Now I know that *The Hobbit* takes place in Middle Earth, not really on our Earth, but I'll use what we know about our Earth for this calculation. All the gold ever mined on Earth would fit into a cube with 20 meters on a side. (Knowing that gold has a density of 19.3 grams per cubic centimeter, we can calculate that that is 1.54×10^{11} grams of gold.) Assuming the dwarves were working with pure gold, how much energy would it take to heat it all up until it melts? Note that if they were working with an alloy, the melting point and density would both be lower.

We must do this problem in two parts, first determining how much energy it takes to warm the gold from its initial temperature (20° C) to its melting point (1065° C), then how much energy it takes to melt the gold. The energy needed to melt a solid is usually called the "heat of fusion" and depends on the material, and the mass, but as the temperature does not change during melting, no change in temperature (ΔT) term occurs. Gold has a specific heat of 0.129 J/g°C, and a heat of fusion of 63 J/g.

When I complete this calculation, I get 3×10^{13} Joules, or about half the energy released by the atomic bomb dropped on Hiroshima. This is a truly huge amount of energy, and more, I think, than even dwarf furnaces could produce in a few minutes. Students could use the definition of a watt (one Joule per second) to calculate the power output of the furnace needed to do this in five minutes.

High school science teachers can find connections to spider web construction, buoyancy, and calorimetry in *The Hobbit: The Desolation of Smaug*. ●

Jacob Clark Blickenstaff is the program director for Washington State Leadership and Assistance for Science Education Reform in Seattle. Read more Blick at http://bit.ly/amBgvm.

$$Q = mC\Delta T + mH_f$$

$$Q = (1.54x10^{11}g)0.129\ \frac{J}{g°C}(1065°C - 20°C) + (1.54x10^{11}g)63\frac{J}{g}$$

Try this TOPS IDEA!

letter weights

…adapted from WEIGHING #05 by TOPS Learning Systems

OBJECTIVE

To devise a simple method for estimating postage rates using an equal arm lever. To develop a kinesthetic feel for one ounce.

LAB NOTES

Photocopy the lab at right for each student or lab team. Black and white copies are fine.

Step 2. Roughly 3 sheets of paper plus envelope weigh 1/2 ounce; 7 sheets plus envelope weigh 1 ounce. Cut paper as needed to make precise weight standards.

Step 3. Let students grapple with this problem before helping. *Hint:* mention see-saw experiences.

MATERIALS

- An ounce scale or gram balance. *(In TOPS book WEIGHING #05, students improvise gram balances that serve well here.)*
- Envelopes, legal or personal size.
- Notebook or scratch paper; scissors.
- Domestic/international postal rates *(optional)*.
- A rigid 12-inch ruler or similar metric ruler.
- A pencil *(fulcrum)* and pinch of clay *(rider)*.

ANSWERS

3. ***(a)*** Put a pencil fulcrum under the center division mark of a ruler. ***(b)*** Add a clay rider, if needed, to make the ruler balance level. ***(c)*** Place either "letter weight" opposite a letter of unknown weight, keeping both envelopes equidistant from the center. ***(d)*** Notice how the unknown goes up (lighter) or down (heavier) relative to your letter-weight standard.

EVALUATION

Q. How would you use a 'two-by-six' board and a brick to determine the lightest person in class?

A. ***(a)*** Mark the center of the board and rest it on the brick. ***(b)*** If it won't balance level, rest a stone rider on the higher side to compensate. ***(c)*** Compare the weight of students, two at a time, by standing them at equal distances from the brick. ***(d)*** A lighter student will be lifted by a heavier student. *(Use spotters if you try this.)*

EXTENSION

Extend the capacity of your balance to 3 ounces. *Stuff 2 more envelopes to weigh one ounce each.*

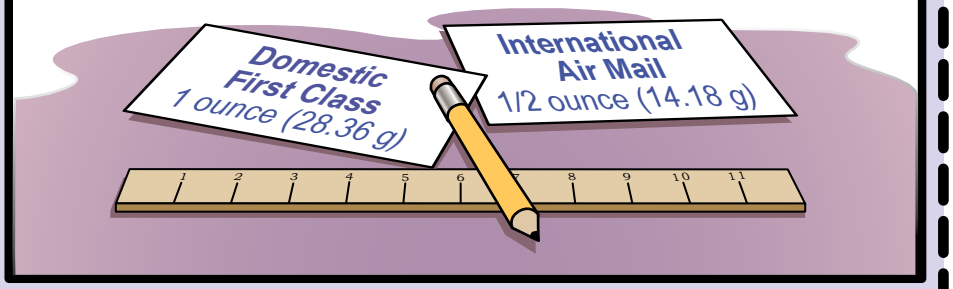
1. Label two envelopes like this:

Domestic
First Class
1 ounce (28.36 g)

International
Air Mail
1/2 ounce (14.18 g)

2. Fill them with just enough paper to equal each weight limit. Seal them closed.

3. Given only these envelopes plus a pencil, ruler, and perhaps a pinch of clay, invent a simple method that allows you to estimate postage any time you want to mail a letter.



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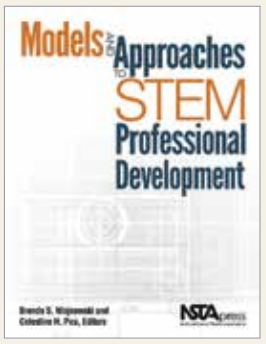


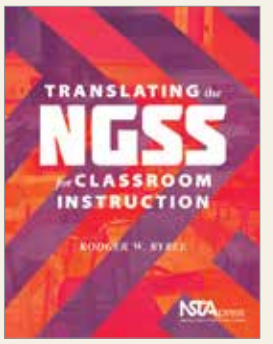
Models and Approaches to STEM Professional Development

Grades K–12

This ambitious book is the perfect source of inspiration to help you kick-start your professional development program this school year. The book's core highlights critical aspects of several successful programs and provides forward-looking insights into the needed professional development surrounding the *NGSS*.

The book's emphasis is on developing highly effective teachers who are expected to improve student achievement in STEM education. *Models and Approaches* is a vital resource for state, district, and school leaders as well as classroom teachers.

Member Price: $27.96 | **Nonmember Price: $34.95**



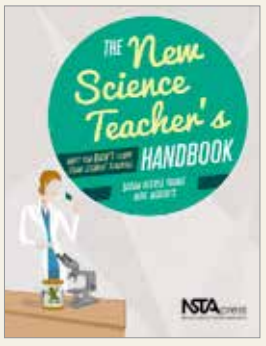
Translating the *NGSS* for Classroom Instruction

Grades K–12

With the release of the *Next Generation Science Standards* (*NGSS*), you need a resource to help you answer pressing questions about how the standards fit with your curriculum, instruction, and assessments. Author Rodger W. Bybee provides essential guidance for everyone from teachers to school administrators to district and state science coordinators.

As practical as it is timely, this book includes an introduction to the *NGSS*; examples of the standards translated to classroom instruction in elementary, middle, and high school; and assistance in adapting current units of instruction to align with the standards.

Member Price: $26.36 | **Nonmember Price: $32.95**



The New Science Teacher's Handbook

What You Didn't Learn From Student Teaching

Grades K–12

By reading *The New Science Teacher's Handbook*, you will learn 12 specific steps that will help you on your way to becoming a skilled classroom teacher. Chapters include lessons learned by the authors, solutions you can choose from to fit your concerns and school environment, and resources on how to create a successful classroom. "Whether you are on your way to becoming a science teacher or a teacher in your early years," the authors write, "we feel confident the ideas presented here will help you become the teacher you've always wanted to be."

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Even More Picture-Perfect Science Lessons

Using Children's Books to Guide Inquiry, K–5

With the debut of the first *Picture-Perfect Science* book more than 10 years ago, authors Emily Morgan and Karen Ansberry demonstrated their expertise at helping teachers engage children in reading and science through picture books. Their new book includes 15 all-new teacher-friendly lessons that deliver strong standards-based science content with connections to both *A Framework for K–12 Science Education* and the *Common Core State Standards, English Language Arts*, and a kid-magnet formula that will get your students engrossed in science while they improve their reading skills.

Member Price: $30.36 | **Nonmember Price: $37.95**

* Cannot be combined with any other offer. Expires 2/28/14.

To place an order or download a free chapter, visit

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National Science Teachers Association

NSTA PRESS: *Including Students With Disabilities in Advanced Science Classes*

Assistive Technology and Your Classroom

Editor's Note

NSTA Press publishes high-quality resources for science educators. This series features just a few of the books recently released. The following excerpt is from Including Students With Disabilities in Advanced Science Classes *by Lori A. Howard and Elizabeth A. Potts, edited for publication here. To download the full text of this chapter, go to* http://bit.ly/1krZXtp. *NSTA Press publications are available online through the NSTA Science Store at* www.nsta.org/store.

Specialized AT

Some students with disabilities need very specialized assistive technology (AT) to perform in a classroom.

For example, you may have a student whose physical disability affects his or her ability to speak. This student may communicate via a speech synthesizer, which has a keyboard or other device that types out words that are then "read" by a computer and spoken aloud using a computer-generated "voice." You may be familiar with Stephen Hawking, the physicist who uses a wheelchair and a speech synthesizer to communicate.

Something to keep in mind is that people with disabilities who communicate through electronic devices are often thought to be less able than their peers. This bias can create even more difficulties for your students with disabilities, as the process of communication through these devices can be time consuming. So while it may take time for them to express their thoughts and ideas, they are just as capable as their nondisabled peers. Obviously, in the case of Stephen Hawking, no one would question his scientific ability despite the slowness of his communication.

Students who are blind or have vision impairments may also have unique AT needs. Much of how we teach science is visual. This can limit how you teach science to the student with vision impairments. We must rely on auditory, tactile, and olfactory cues to help students grasp the concepts. The use of computers that can read text aloud or describe verbally what is happening on a video becomes very important. Your school may have (or have access to) a specialist for students who are blind or have vision impairments; please contact this specialist, as he or she may have suggestions on both AT and materials that can be used in your science class. Please see Figure 6.3 for a few resources that may assist you when working with a student with a vision impairment in your advanced classroom.

Students who are deaf or hearing impaired also have specialized AT needs. For example, they may wear hearing aids or have cochlear implants. Yes, hearing aids and cochlear implants are also AT. Teachers should be aware that hearing aids need batteries, and students should have an extra supply with them. Occasionally batteries will run low, making it difficult for a student to hear. You might want to ask the speech-language clinician or instructional technologist if there is a school supply of extra batteries for these situations when the student does not have a battery replacement. On rare occasions, students may actually turn off their hearing aids or cochlear implant because too much auditory input can be tiring or overwhelming. Most students in an advanced class will not want to miss important auditory information, but please be aware of fatigue in students who are deaf or have hearing impairments.

With some students, you may be asked to use an FM radio system. You will wear a small microphone, and your voice will be amplified so the student can hear you better. These systems are easy to use, but make sure the microphone is turned off when you do not want the student to hear a private conversation (such as when you are chatting between classes with another teacher). Please feel free to ask the educational audiologist, speech-language clinician, or instructional technologist if you have any questions.

There are various types of specialized AT, including Braille-to-speech, speech-to-text, text-to-speech, and other applications. Most important is your willingness to work with students who have these specialized needs. While it may be a little intimidating at first, with practice you can become familiar with the different functions of these applications. Your students will appreciate your willingness to try to learn a new technology. In many situations, students are more fluent with the new technologies and can help us make adjustments. In some cases, it may be helpful to ask the student with a disability using AT to show you how to troubleshoot a device or application. ●

FIGURE 6.3. RESOURCES FOR SCIENCE AND STUDENTS WHO ARE BLIND OR VISUALLY IMPAIRED

- Perkins School for the Blind, Resources for Science Education: *www.perkins.org/resources/scout/education/science-education*
- National Center for Blind Youth in Science: *www.blindscience.org*
- Institute for Broadening Participation, Innovations in STEM Education for Blind Undergraduates Using Digital Pen-Based Audio/Tactile Graphics: *www.pathwaystoscience.org/programhub.asp?sort=RDE-SmithKettlewell-DigitalPen*

All of these resources have links to AT for the blind or visually impaired and lists of where to purchase specific materials (e.g., tactile or auditory materials) used in science classes.

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- How to develop informal science education partnerships that support student success; and
- Indicators/metrics associated with building successful STEM programs.

Saturday

Closing Session with Student Panel Discussion

For updates, more information, and to register:

www.nsta.org/2014stem

NSTA National Science Teachers Association

(All dates are deadlines unless otherwise specified.)

February 20—Educators of grades 8–12, don't miss **Engineering Design Challenge: Thermal Protection System, a free NSTA Web Seminar** that demonstrates how to incorporate *Next Generation Science Standards (NGSS)* into your curriculum. In addition, you will learn about NASA research on a promising new thermal protection system called the Hypersonic Inflatable Aerodynamic Decelerator. The session runs at 6:30–8 p.m. Eastern Time. This web seminar will be repeated on April 17. For more information or to register, visit *http://bit.ly/Eo1MU.*

February 24—The search for life on Mars can be guided by an understanding of Earth's extremophiles (organisms living in extreme environments). Learn more about NASA's Mars exploration goals and extremophiles during **Properties of Living Things: Searching for Fingerprints of Life on Mars, a free NSTA Web Seminar**. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

February 26—Find out how to take engineering out of this world with **Engineering Design Challenge: Spacecraft Structures, a free NSTA Web Seminar.** Participants will receive an overview of the design challenge and information about materials. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 4—How does space travel affect an astronaut's physiology, and what can be done to prevent it? High school teachers can explore how NASA mitigates these effects during **Skeletal System: Human Physiology in Space, a free NSTA Web Seminar.** The session includes an overview of two student activities and strategies for guiding students in creating and testing models while addressing the *NGSS.* The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 6—Explore force and motion concepts during **Engineering Design/Forces and Motion: The Great Boomerang Challenge, a free NSTA Web Seminar**. Learn how to incorporate a free simulation illustrating the airflow around an airfoil and an interactive computer program that determines the airflow around various shapes of airfoils and calculates the lift of the airfoils into the activity. The session runs at 6:30–8 p.m. ET. This session will be repeated on May 1. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 12—Educators of grades 4–6 can learn how air traffic controllers use mathematical reasoning and distance, rate, and time concepts to keep airplanes safely spaced during **Distance-Rate -Time Problems: Smart Skies, a free NSTA Web Seminar**. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 18—Design challenges engage students through hands-on activities with real-world applications. Find out how to use water safety in space to hook students into learning about engineering design, Earth systems, and Earth and human activity during **Engineering Design Challenge: Water Filtration, a free NSTA Web Seminar**. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 20—Find out how you can challenge your students to discover what Mars' ice is made of during **Electromagnetic Spectrum: Remote Sensing Ices on Mars, a free NSTA Web Seminar.** The activity, which addresses the *NGSS,* allows students to use data collected by the Mars Odyssey spacecraft to investigate the composition and distribution of ices on the red planet. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 26—Learn how to combine *Common Core State Standards* for mathematics and science concepts during **Geometry: Space Math Problems—Solar Storms, a free NSTA Web Seminar.** The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

March 31—Educators of students in grades 6–8, don't miss this chance to learn more about student rocketry while making connections to the *NGSS* during **Center of Mass and Center of Pressure: Engineering a Stable Rocket, a free NSTA Web Seminar.** The session runs at 7:30–9 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

April 1—Bring science and math together with a dash of space science to pique your students' interest with **a free NSTA Web Seminar, Percentage and Volume: Space Food and Nutrition—How Much Is Waste?** Participants will learn how students can use ratios to compare the mass and volume of packaged food before and after repackaging for spaceflight and determine the usable and waste portions. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.*

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April 9—Educators can learn how to incorporate concepts from the *Common Core State Standards, Mathematics*, and the *NGSS* into their curricula during **Heat, Temperature, and Energy: MESSENGER—Cooling With Sunshades, a free NSTA Web Seminar.** The session includes an overview of the student activity, information on required materials, and ideas for modifying the activity to teach the engineering design process. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU*.

April 15—How are bones affected by living in space? Find out during **Human Body: Space Adaptations, a free NSTA Web Seminar.** Teachers of grades 4–8 will learn about how space affects astronauts and how this research can lead to a better understanding of Earth-based conditions, such as osteoporosis. Lessons included in the session address *NGSS* and incorporate science, technology, and mathematics. The session runs at 6:30–8 p.m. ET. For more information or to register, visit *http://bit.ly/Eo1MU.* ●

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Detecting What Lies Beneath

Ruins overrun by forests may seem like an exotic setting for an adventure story, but researchers have found evidence of early American farms on land reclaimed by trees and other vegetation.

In New England, over the span of centuries, farmers transformed forests into fields, and then many of those fields were left to return to the forest when rural populations migrated to urban areas as industrialization spread during the late 19th century. Science Now from the American Association for the Advancement of Science reports that a study by geographers Katharine Johnson and William Ouimet of the University of Connecticut, Storrs, to be published by the *Journal of Archaeological Science* in March, shows lidar can be used to detect artifacts of these farms without disturbing the regrown forests. Scientists speculated that lidar surveys could be used to discover more information about an area's history and how human activity affected a particular landscape.

According to Science Now, Johnson says studying vegetation dynamics near the sites could create a living history of the ecosystem, explaining how much earth was moved by farmers or how humans impacted river systems in the past to guide land conservation in the future. Read the article online at *http://bit.ly/1ePcWyt*. ●

Quotable

Knowing is not understanding. There is a great difference between knowing and understanding: You can know a lot about something and not really understand it.

—Charles F. Kettering, U.S. scientist and engineer (1876–1958)