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NSTA Reports
National Science Teachers Association

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Adding More STEM to the School Day

Schools seeking to enhance students' learning of science, technology, engineering, and math (STEM) are adopting in-school STEM enrichment programs that reach student populations in need of additional learning opportunities, connect students with scientists, and/or provide more challenging curriculum. One such program, Science from Scientists (SfS; *www.sciencefromscientists.org*), was established in 2002 "to help teachers with challenges in presenting science content," says Erika Ebbel Angle, SfS founder and executive director. "Some teachers may have taken only one science course, or [find that] students need more science for test preparation," she observes. "Teachers have told us that the only way to reach all of their students is through an in-school program."

SfS offers an In-School Module-Based STEM enrichment program that brings two scientists to grades 4–8 classrooms every other week during the school year "to work with teachers and bring content [that supports] the *NGSS* [*Next Generation Science Standards*] and MCAS [Massachusetts Comprehensive Assessment System]," explains Angle. Teachers can choose from more than 85 hands-on STEM lessons, and the scientists "bring the necessary materials with them."

The program aims "to inspire students and improve both attitudes and aptitudes," she notes. The scientists conduct "pre- and post-assessments every other week" to chart students' progress, she relates.

ARTURO MARTINEZ

Middle school students dissect a frog as part of a hands-on lesson from Science from Scientists, an in-school enrichment program in Massachusetts and California.

"The program succeeds because teachers see us as a great resource to bolster their curriculum and let students interact with scientists as role models," Angle contends. While SfS "isn't gender-specific," it exposes boys and girls to female role models, she notes.

SfS has been adopted by 46 schools in Massachusetts and California, and "many districts seek us out," she notes. Assessments have shown that "SfS raises standardized test scores by an average of 25% in our partner schools," she reports.

SfS is provided free to public schools during the first two years. (Private schools must pay for the entire program.) During year three, public schools start bearing the program's costs. SfS "can help schools get grants and offers fundraising ideas," says Angle. The goal for year four is "to have the program be self-funded in districts where we have relationships," she explains, but SfS can help with funding if a district isn't able to cover all the costs. "If we have classroom teachers who want us, we are committed," she maintains.

An Import From Israel

"Twelve years ago, we were looking for out-of-the-box-type science improvement programs for Jewish day schools in the United States," recalls Judy

See Enrichment, pg 5

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National Science Teachers Association

COMMENTARY: **June Teisan**

Creating Learning Opportunities Around Threatened Fragile Wonders

By June Teisan

June Teisan

Students of every age thrive on wonder. Experiences outside the everyday can fuel dreams, foster exploration, ignite imagination, spark creativity, and inspire action.

In my years as a middle school science teacher, I found awe and wonder to be the best motivators for my students, building inside each learner a desire to know more and do more. I incorporated topics that offered a threefold educational power combination: intensive study of robust science, opportunities for authentic student action, and that vital flash point—wonder! Identifying exciting overarching study themes can be a challenge, so allow me to share one *wonder*-ful topic that will engage student-scientists of all ages: Coral Reefs.

Coral reefs are one of the most awe-inspiring ecosystems on our planet, and these underwater *wonder*lands offer myriad opportunities for students to explore cutting-edge science research and participate in vital stewardship efforts to protect these fragile treasures.

According to the Coral Reef Conservation Program of the National Oceanic and Atmospheric Administration (NOAA),

- A coral reef is one of the most diverse ecosystems on the planet; the variety of species living on a coral reef is greater than in any other shallow-water marine ecosystem. Deep-sea coral communities are thought to support the greatest biodiversity in the deep ocean.
- Reefs offer coastal protection, preventing erosion of nearby shorelines and buffering coastal wetlands, ports, and harbors from damaging wave action.
- Coral reefs have immense economic value; though dollar figures are only one measure of their worth, estimates of the net benefits of global reefs approach $30 billion annually via tourism, fisheries, coastal protection, and more.
- Coral reefs provide habitat and nursery space for a wide range of fish that are important food sources worldwide: In fact, reef fish provide the primary protein source for nearly a billion people living along the world's coasts.
- The search for medicines and useful compounds from natural environments—*bioprospecting*—is unveiling new discoveries in coral reef ecosystems. From toxins exuded by reef inhabitants to the limestone exoskeletons of the corals themselves, important new medicines are under development as painkillers, bone graft material, nutritional supplements, and treatments for cancer, arthritis, asthma, ulcers, heart disease, and other conditions.

Unfortunately, coral reefs are being damaged by a range of forces. Harmful fishing practices destroy reef structure and upset the biotic balance of the ecosystem. Sedimentation from vegetation clearing and construction can blanket and shadow reefs. Chemicals and excessive fertilizer runoff from land can lead to coral disease and bleaching. Tourism-related damage from divers, harvesting of coral for souvenir sales, and removing species from the reef for aquarium sales all impact reef health. Increasing temperatures on the sea surface and ocean acidification also stress corals, leading to bleaching events and coral death. The Coral Reef Conservation Program has committed to addressing the top three global threats to ecosystems—climate change impacts, negative impacts from fishing, and impacts from land-based sources of pollution—and science students of all ages can and should join in the investigation and stewardship efforts.

Despite what is known, more research is constantly being conducted, creating opportunities for real-world learning. Science educators at any grade level can find multiple entry points in their curriculum for coral reef study: Elementary students may compare adaptations in marine versus land-based organisms; cross-curricular middle school collaborations might prepare students for mock community debates addressing pollution threats to these biodiversity hotspots; art classes could build reefs from marine debris or other recycled materials; engineering design teams might create underwater remote-sensing devices; high school ecology classes could access NOAA data on ocean temperatures to investigate the impact of warming water on the symbiotic relationship between corals and the algae they host; a college chemistry unit might explore the impacts of ocean acidification on coral calcification rates. Educational resources focused on coral reefs, such as those at *http://coralreef.noaa.gov, www.education.noaa.gov,* and *http://datainthecclassroom.noaa.gov*, can assist educators in incorporating reef science into the curriculum, setting inquisitive student-scientists firmly in the center of global efforts to protect coral reef habitats and steward their economic and social resources.

So harness the power of awe and wonder in your classroom: Investigate coral reefs and prepare our students, and our planet, for a more resilient future.

June Teisan is a National Board Certified teacher who brought science to life for her middle school students in the metro-Detroit area for 27 years. She received multiple science teaching awards as a classroom teacher, including the 2008 Michigan Teacher of the Year, the 2005 Presidential Award for Excellence in Science Teaching, and NSTA's 2012 Middle School STEM Educator of the Year award. She was selected as an Albert Einstein Distinguished Educator Fellow in 2014. Currently she is working in NOAA's Office of Education as an Education Outreach and Program Specialist, committed to supporting educators with rich, innovative resources and professional development. ●

NSTA Reports

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NSTA National Science Teachers Association

Enrichment, from pg 1

Lebovits, vice president and director of the Center for Initiatives in Jewish Education (CIJE; *www.thecije.org*). CIJE connected with the Israel Center for Excellence through Education to bring the Excellence 2000 (E2K) program to Jewish schools in the United States. Aimed at highly motivated math and science students, the program also has been adopted by several U.S. public schools and implemented in 77 schools nationwide, she reports.

E2K's 24 modules involve "teaching totally hands-on, cultivating personal excellence, fostering creativity, and learning how to learn," and appeal to "students who...like to tinker," she contends. Each module starts with a story and a problem to solve, then students begin to experiment. "The kids come up with the formula on their own... They can take the answer and apply it to other situations," she observes.

Carmel Academy in Greenwich, Connecticut, uses E2K with gifted sixth and seventh graders. Grades 6–8 science teacher and E2K coach Rhonda Ginsberg says the program "is a chance for students to do pure science" and design their own experiments. Last year, students designed and tested insulation for a polar bear's cave, for example.

Often E2K students "bring back what they've learned to the regular science class," and Ginsberg says she has "moved some of the E2K material into the regular science class."

E2K students compete in national and international competitions and have won 10 awards, which "has created excitement around science," she relates. They compete online with students from 25 other schools in a competition held in Israel. "The scientists in Israel were blown away at how fast my kids answered the questions," she reports.

Not all gifted students are admitted to E2K. Ginsberg evaluates fifth-grade candidates, meeting with their science and math teachers to determine their "thinking ability," she explains. Her biggest challenge is "how to say no to a kid who isn't yet there analytically and to [his or her] parents. It's tough."

Kindergarten Enrichment

When the Batavia, Illinois, Public Schools downsized kindergarten classes from full-day to half-day, some parents complained. Seeking a solution, the district contacted the Batavia Park District, which supervises the area's parks and recreation facilities and activities. The Batavia Park District designed an enrichment program, now in its fourth year, to extend the school day to six-and-a-half hours for kindergarteners whose parents were willing to pay for it. "About one-third of [area] kindergarteners are enrolled in our program," says Sarah Schneider, kindergarten enrichment teacher for the Batavia Park District.

The program runs in each of the school district's six elementary schools, with its own classroom and teacher. "In half-day kindergarten, the kids are only able to do core literacy and math; there's not a lot of time for science and social studies," Schneider observes. "We have a solid science program to get kids interested in science early on.

"We have a Delta Education [science] curriculum consisting of six different lessons: oceans, trees, insects and spiders, weather, body and senses, and health and nutrition...[S]ome of us also study the rainforest, arctic animals, space, pumpkins, and basic chemical mixtures," she explains. "[We chose the curriculum] because we didn't want to teach the same topics taught by the [school district's teachers] in preschool," she relates.

"Our kids are very well prepared for first grade because they're in school for a full day and getting extra content," she reports. "We don't worry about [test] scores; we just make sure students are engaged, growing, and getting something positive out of it." Without the testing, "we're able to hold smaller classes with more creative projects."

Schneider notes there is a trend in some districts to return to all-day kindergarten, which would mean the end of the enrichment program. She believes this could be a real loss for students because district teachers "won't have the flexibility that we do." ●

Teaching STEM Through Astronomy's Lens

Astronomy programs can provide many advantages to science, technology, engineering, and math (STEM) teachers and students. "Astronomy is a 'gateway' subject among the sciences," asserts Project ASTRO Coordinator Brian Kruse. "It can help teachers encourage more students to take STEM courses and consider careers in STEM."

Project ASTRO (see the website *http://bit.ly/1SQoFDg*), a national program from San Francisco's Astronomical Society of the Pacific (ASP), partners professional and amateur astronomers with educators. Astronomers visit partner classrooms at least four times during the school year to conduct hands-on activities. "Astronomers have to make a commitment to come to classrooms four times; [this isn't] a one-time only [interaction]. We also do follow-up workshops to help support the teachers," explains ASP Director of Education Greg Schultz.

"We're also now focusing on incorporating science and engineering practices and crosscutting concepts, content relating to what teachers are currently teaching," Kruse relates. "Even [in states not adopting] the *Next Generation Science Standards,* students need to engage with disciplinary core ideas so they can meet performance expectations in the Earth and space sciences."

"We've gone beyond just getting teachers to do hands-on activities and engage students in active learning," says ASP Executive Director Linda Shore. "We now have activities for teaching students how to use models to test hypotheses…The emphasis now is on 'What do scientists and engineers do?'" She adds, "It's important to have a real astronomer there who engages with these practices…It's important for kids to see astronomers are a diverse group [so they] see themselves represented."

With *A Framework for K–12 Science Education* in mind, Project ASTRO is redeveloping activities in *The Universe at Your Fingertips* (*UAYF*), its signature publication for educators, and adding more multimedia, Shore reports. The ASP manages "the NASA Night Sky Network [of more than] 450 amateur astronomy clubs [nationwide] that do educational outreach for the public and in schools. We plan to create videos that show these amateur clubs how to use new *UAYF* activities to help science teachers engage students in real astronomy," she explains.

REDIT TK

Middle and high school students can explore the universe using telescopes worldwide as part of Skynet Junior Scholars, a National Science Foundation-funded program.

The program is also exploring ways to support rural and underserved areas not located near Project ASTRO sites, which are "typically in areas with a lot of astronomers or where planetariums are," Kruse notes. Project ASTRO can reach teachers in these communities via webinars, and amateur astronomers, astronomy graduate students, or retired professional astronomers also can partner with classrooms, he maintains.

Astronomy in Chile

While touring U.S. astronomy observatories in Chile, Tim Spuck says he realized he "didn't know how much the United States has invested in astronomy [there]." After that visit, Spuck—who serves as STEM Education Development Officer for Associated Universities, Inc., in Washington, D.C.,—collaborated with others to create the Astronomy in Chile Educator Ambassadors Program (ACEAP; *http://bit.ly/1n1b13B*). ACEAP provides "opportunities for educators to learn firsthand and experience [Chilean astronomy] facilities and help their audiences understand how astronomy is practiced today, the U.S. investment in astronomy in Chile, and the diverse career opportunities at these observatories," says Spuck.

Supported by the National Science Foundation (NSF), ACEAP brings K–16 formal and informal astronomy educators, amateur astronomers, and planetarium staff to U.S. astronomy facilities in Chile and trains them in communicating STEM concepts. "I'm a strong advocate for breaking down barriers between formal and informal educators and creating opportunities for them to interact," Spuck asserts.

"By 2022, it's estimated that 70% of the world's ground-based telescopes will be in Chile," he observes. "There's a growing need for astronomy professionals who can speak Spanish."

Astronomy has become an interdisciplinary science, says Spuck, because "to build telescopes, you need to have incredible engineers and software programmers" to design them to "operate in extreme conditions."

After the trip, "each ambassador has to conduct seven outreach activities," explains Spuck. Last year's ambassadors have conducted planetarium shows, visited schools, written articles and blog posts, and communicated with astronomers via social media. During a summer camp, one informal educator had students build a small telescope, "and he created an activity about the telescopes in Chile," Spuck recalls.

"The world's greatest astronomical research centers are inspiring. They inspire people to want to learn, one of the greatest gifts we can give [one another]," he maintains.

Young Scholars of the Sky

Middle and high school students can explore the universe using telescopes worldwide as part of Skynet Junior Scholars (SJS; see the website at *https://skynetjuniorscholars.org*), an NSF-funded program for youth in out-of-school programs focused on STEM learning. Vivian Hoette, director of special projects at the University of Chicago's Yerkes Observatory in Williams Bay, Wisconsin, and Sue Ann Heatherly, education program director at the National Radio Astronomy Observatory in Green Bank, West Virginia, founded SJS because "we value kids having authentic experiences in astronomy, such as analyzing data and doing image processing…We want kids to feel like scientists," Hoette contends.

"We put our 41-inch telescope on Skynet (an online program that allows users to interface with telescopes around the world). We could then put in observing requests" from youth programs, she explains.

The SJS web portal connects students with science mentors who can answer their questions, activities, and resources such as an online notebook, a discussion forum, and a gallery where students can post photos. "The kids all have code names, and Sue Ann and I review the notebooks to ensure [online] safety," Hoette relates.

Students can join SJS after their program leaders complete an SJS professional development workshop. They learn how to do investigations with Skynet telescopes, lead hands-on activities with children, and help them make the most of their SJS experience. "We hold face-to-face workshops at Yerkes and Green Bank," Hoette notes, while the ASP offers online workshops. Afterward, educators "have a new network of colleagues, another support system of people interested in science and teaching," she contends.

With SJS membership, "you can learn astronomy with the kids, have access to the telescopes and do your own experiments," she asserts. "Everything is free of charge because we're NSF-funded."●


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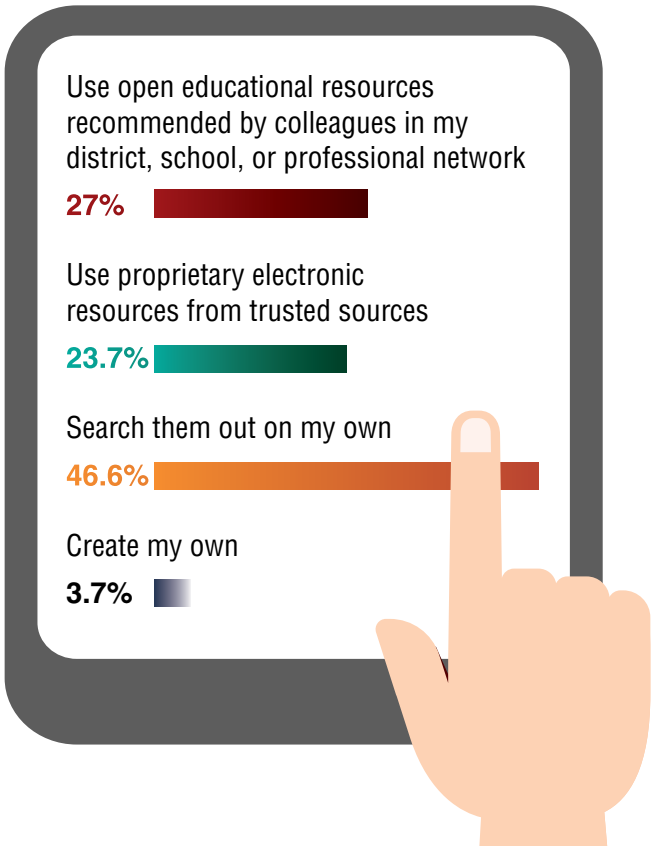
Educators Weigh In: Print vs. Digital

Are bound texts relics of the past being replaced by electronic resources, or are they still essential tools? *NSTA Reports* recently asked science educators whether they preferred digital or print resources. While many reported using electronic resources, 52% said the availability of technology limits their use.

Of educators using electronic resources with their students, 91% reported using videos; 76%, lab simulations; 55%, electronic books; 45%, games. (Respondents were asked to select all options that applied to their practice.) In addition, educators reported using electronic quizzes, online articles, and animations. A majority (64%) preferred a blend of traditional bound texts and electronic resources when participating in professional learning experiences; only 13% preferred using traditional bound texts alone.

Most respondents (46.6%) prefer to find credible electronic resources for themselves, while 27% rely on open educational resources recommended by colleagues and 22.7% turn to proprietary electronic resources from trusted sources. Only 3.7% said they create their own electronic resources.

If you use electronic resources with your students, what is your preferred way to identify credible sources for these resources?



Here's what science educators are saying about the use of traditional and electronic resources:

Let's just say I've never had a textbook refuse to load, crash, or not save responses.—*Educator, Middle School, Alabama*

It can be difficult to get students oriented and being able to learn how to log in and complete assignments. Some platforms cannot utilize some animations and videos due to the type of software used. As a teacher, I have minimal time to learn new apps or software programs...I do resent being told to use a particular software without having any sort of training time provided and being expected to learn the ins and outs of a program on my own time.—*Educator, High School, Missouri*

It is hard for students to save and highlight information on a web page. Research shows that actually reading on a page helps with some types of recall.—*Educator, High School, Iowa*

If the lesson would be boring with a textbook, it'll almost always be boring with an e-textbook. I like to use technology when I feel it can bring something new, especially when students can be creating with technology instead of just consuming.—*Educator, Elementary, Ohio*

Not all students work at the same pace. Not all students have reliable internet at home. So having some printed copies for kids to take home is important.—*Educator, High School, North Carolina*

Text is more reliable; even if slightly outdated, it goes through more rigorous editing than someone's gener-

alized PowerPoint.—*Educator, Middle School, Illinois*

Positive overall, but electronic sources can't replace textbook navigation and literacy skills.—*Educator, High School, Arkansas*

The digital [textbooks] purchased by our district are very poor and very time consuming to use. The students actually love having traditional books because they are so tired of all the online work they must do every day.—*Educator, Middle School, Utah*

The technology (or lack of) in our district has been a constant issue. Until there is a more reliable way for e-sources to be presented, there will still be a need for "dinosaur" written texts. —*Educator, High School, Massachusetts*

One concern, however, is that kids today are supposed to be so tech-savvy, yet I find that kids are not readily able to locate good sources online, use word processing programs with ease, type with any level of speed, or navigate the web quickly.—*Educator, Middle School, Missouri*

Mixed. It can take longer to find good electronic resources than it would take to create my own. It is also important to make sure students learn your intended outcome. Sometimes they get caught up in the technology of the activity and miss [the] point.—*Educator, Middle School, Oregon*

As I don't have a smartphone, my ability to participate fully in [professional development] activities is usually limited. I would prefer that options would encompass laptops as well as smartphones.—*Administrator, High School, North Carolina*

[It's the s]ame as any other resource: Works for some students, not for others. It is a challenge to keep students on task.—*Educator, High School, Virginia*

As long as you choose carefully, [electronic sources] provide more engaging and effective lesson materials. Textbooks are hopelessly out of date and insufficient in developing conceptual ideas, especially in chemistry and physics.—*Educator, Middle School, High School, California and Michigan*

Colleagues and students alike prefer paper to see the "overall/big picture," [and] then use electronic resources to complete assignments/activities. —*Educator, Elementary School, Texas* ●

Quotable

Science literacy is the artery through which the solutions of tomorrow's problems flow.

—Neil deGrasse Tyson, U.S. astrophysicist and science communicator

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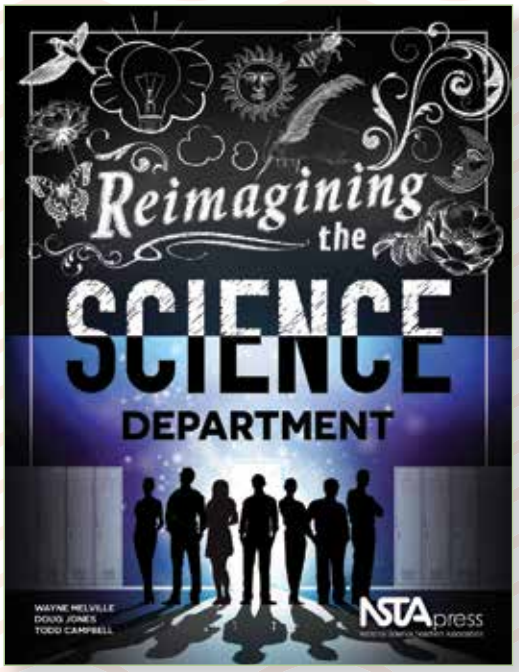

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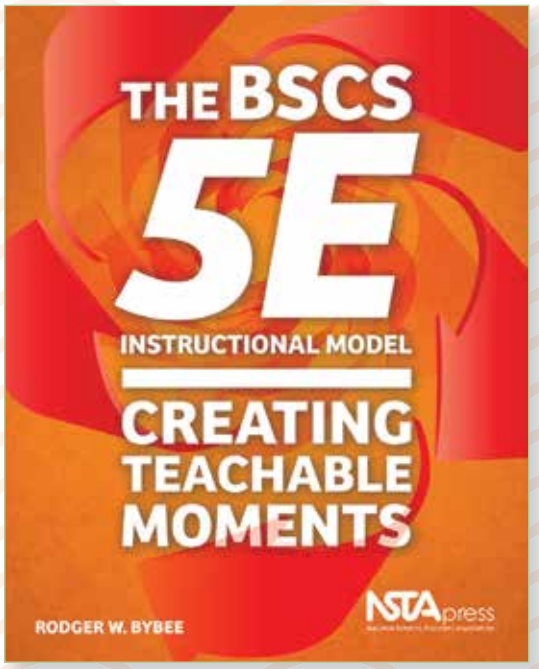

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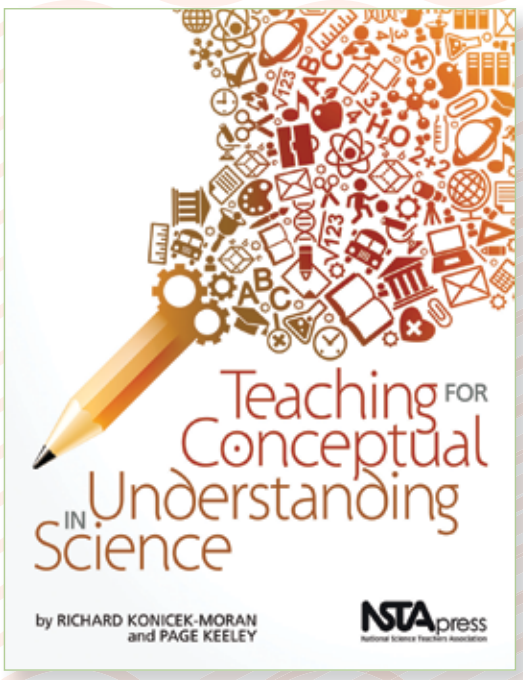

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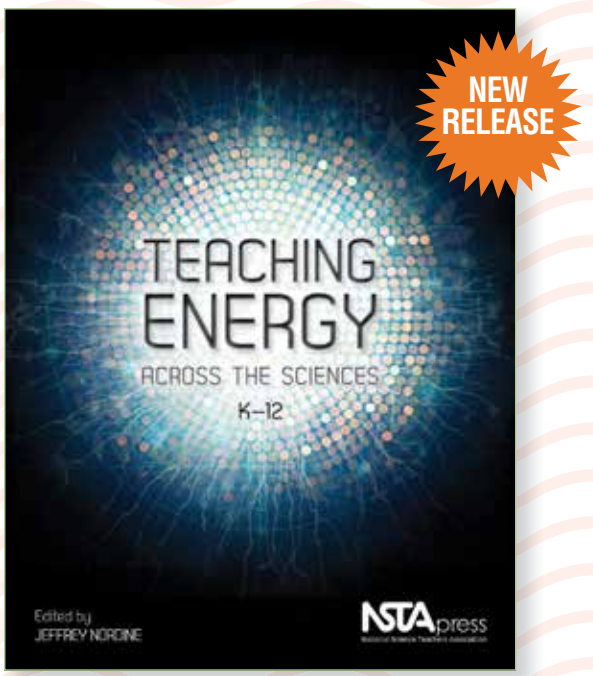

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National Science Teachers Association

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Community Science Workshop (CSW) Network. CSW provides opportunities for students in underserved communities in California to tinker, make, and explore their world through science. At *http://bit.ly/1mwEbaG,* K–12 students nationwide can do the same using CSW's collection of demonstrations, experiments, and "make-and-take" projects. Search the database by project type; science, technology, engineering, and mathematics (STEM) content; *Next Generation Science Standards* (*NGSS*) alignment; or time involved for the project. Selected experiences include demonstrations such as Cardboard Box Camera Obscura and Edible Cell Model; experiments such as Combusting Candles and CD Greenhouse; and build-your-own projects such as Canjo, Wind Tube, Circuit Game, and Cartesian Divers.

Climate Generation (CG). CG offers energy and climate change resources for grades 3–12, including downloadable curriculum guides, online curriculum, and supplemental resources. The curriculum guides successively increase students' knowledge of climate change issues from elementary through high school levels. For example, *Our Changing Climate* (grades 3–6) begins with a study of global climate change processes and presents communication strategies to help students share their knowledge; the version for secondary students (grades 6–12) presents global climate change processes along with the importance of the Arctic to global climate, the potential effects of global warming in the Arctic, and what could/should be done in response. Other CG curriculum guides address the causes of global temperature change (*Next Generation Climate,* grades 6–8) and global climate solutions (*Citizen Climate,* grades 9–12). All guides feature lesson plans, worksheets, connected blogs, and additional resources. See *http://bit.ly/1RhC5a4.*


DAK06

My American Farm. This online game platform for K–5 students offers games and classroom resources on STEM topics. The games support core content instruction, and several science games explore energy and agricultural issues. For example, students learn where food, fuel, and fiber come from in Fact or Fairytale (grades K–2) and delve into energy in Power Up (grades 3–5). The classroom resources include standards-based lesson plans, activity sheets, eComics, and videos addressing energy and agriculture topics. Lesson titles include Shapes in Agriculture and Window Wheatgrass (grades K–2) and The Science of Seeds and Hands, Horses, and High Tech Machines (grades 3–5). Visit *www.myamericanfarm.com.*

Nancy's Brain Talks. Massachusetts Institute of Technology (MIT) neuroscience researcher Nancy Kanwisher presents more than a dozen short video lectures on the human mind and brain. The lectures address topics in broad categories such as How Can You Study the Human Mind and Brain; Face Perception; fMRI: Imaging of the Human Brain at Work; and What Kinds of Minds and Brains Do We Have? Watch the lectures in order within each category, or jump around to suit your interest. The lectures don't require science background and are targeted for the general public, particularly motivated high school students. Consult *http://nancysbraintalks.mit.edu.*

Become a Teacher Liaison! Are you a space aficionado who wants to generate interest in space in your classroom? Join the Space Foundation's Teacher Liaison Facebook group! You'll have access to master teachers who use space in their classrooms to inspire their students. Visit *http://on.fb.me/1VxXXi8* (log in to Facebook first).

Seeds for K–4. Plant the seed of botanical interest with young students with this sample lesson from the National Gardening Association's investigative science curriculum for grades K–4, *Botany on Your Plate: Investigating the Plants We Eat.* In Seeds, students dissect and compare bean and almond seeds, observe the tiny plant embryos surrounded by food for the baby plant, and test the seeds for the presence of natural oil. They then create a Venn diagram to organize their seed observations. Access the lesson at *http://bit.ly/1MO21UE.*

sciphile.org. Developed by Guy Blaylock, associate professor of physics at the University of Massachusetts Amherst, this website offers a searchable library of demonstrations, experiments, activities, and lessons on STEM topics to help educators of all levels spice up tra-

See Freebies, pg G2

Freebies, from pg G1

ditional lectures and in-class materials. Featured lessons include Measuring the Density of a Penny, Slow Motion Magnets, and Upside-Down Water. While the lessons have "flexible" age ranges (e.g., 8 to 99), the content seems most appropriate for use in middle and high school classrooms. Refer to *http://sciphile.org.*

Investigating Evidence. This newly redesigned curriculum from the Cornell Lab of Ornithology's BirdSleuth program can help you bring science inquiry to life in your classroom. Targeted for students in grades 4–12, and supporting the *Common Core* and *NGSS,* the curriculum helps teachers guide students through the processes of making observations, crafting and testing hypotheses, collecting and graphing data, drawing meaningful conclusions, and sharing their work through citizen science and student publications. Visit *www.birdsleuth.org/investigation.*

DIRK

Keep Wild Animals Wild. The International Fund for Animal Welfare's (IFAW) new Animal Action Education program, Keep Wild Animals Wild, addresses three instructional levels (grades K–2, 3–5, and 6–8) and meets learning objectives in life science, language arts, geography, and economics. The program's lessons, videos, and activities explore what makes wild animals wild; why wildlife trade threatens animals, ecosystems, and people; and how to keep wild animals wild. Each set of instructional resources includes a teaching guide with assessments, lesson plans with student worksheets, student magazines, classroom videos, a wall poster, and more. Refer to *http://g.ifaw.org/1kU3tze.*

Discovery Education's Virtual Field Trips. Take K–12 students to some of the world's most iconic locations for rich and immersive learning experiences—no permission slips required! Tour the National Archives, see how an egg farm works, explore NASA's Goddard Space Flight Center, or hear from the President of the United States. Visit *http://bit.ly/1OtPoUn* to preview featured virtual field trips, or peruse the collection of archived field trips by subject (e.g., science and engineering, social studies, literacy, math), grade level (K–5, 6–8, 9–12), or theme (e.g., "Earth and Space Science," "Plants and Animals," "Careers," "Technology").

BioMusic in the Classroom. Expanding the study of sound beyond human experiences to other animals' uses of sounds encompasses the interdisciplinary work of scientists in the emerging field of BioMusic. In BioMusic, scientists study the sounds created by living organisms with particular emphasis on patterns, pitch, and rhythm, as well as the use of sound for both aesthetics and communication. At *www.wildmusic.org,* K–12 educators can access a teacher's guide and other resources to explore this new field in the classroom. To begin, students can take a virtual tour of a traveling museum exhibition, Wild Music, which examines the biological origins of music. The exploration continues with various activities from the teacher's guide, as students learn to listen to "silence" (grades K–12), create a sound map (grades 5–8), represent sounds with our senses (grades K–12), and reflect on Wild Music (grades 7–12).

ARPINGSTONE

Citizen Science Opportunity: Collective Search Behavior by Ants on Earth. Last year, eight groups of ants flew to the International Space Station, boosted by a rocket and the curiosity of Stanford University biologist Deborah M. Gordon, who studies collective behavior. Results from that mission, recently published in the open-access journal *Frontiers in Ecology and Evolution,* showed that the collective search behavior of ants in microgravity had some interesting twists. To follow up on the findings, Gordon is inviting high school students to collaborate in further research, this time studying the collective search behavior of ants on Earth.

A lesson plan to guide students through this citizen science project is available online at *http://stanford.io/1E4shFW.* Through the project, students ask scientific questions, collect and analyze data, and develop explanations about ant colonies and how ants work together. Students then enter their data on the project website and compare it with others on different ant species worldwide.

Project Search. If you want to incorporate more Project-Based Learning (PBL) into your classroom, check out the database of PBL projects from The Buck Institute for Education in California. Known as Project Search, the database presents curated PBL projects for elementary, middle, and high school levels gathered from online project libraries nationwide. The interdisciplinary projects address various subjects and are meant to inspire your ideas or be adapted to fit the needs of your classroom. A broad topic search of "All sources/Science/" turned up more than 200 projects; teachers can further refine the search by grade level and other parameters. See *http://bie.org/project_search.*

Using Digital Notebooks. Want to go paperless in your middle level classroom and use digital notebooks? Read educator Nick Mitchell's blog at *http://scientificteacher.com* for ideas for transforming your classroom into a digital one. Mitchell discusses using digital notebooks in his classroom, including basic information on why digital notebooks are useful and how to set them up. He also shares digital notebook documents from sixth-grade science units on scientific inquiry, ecology, chemistry, and geology.

OpenStax College Textbooks. Three new textbooks—for courses in college algebra, chemistry, and trigonometry—have been added to Rice University's OpenStax College collection of open educational resources (OER). The resources are available for web viewing and as EPUB and PDF files. OpenStax includes textbooks for biology, physics, anatomy and physiology, and other subjects. In addition to saving students money, OER allow instructors to customize course content by rearranging, modifying, or enhancing sections. Learn more at *http://bit.ly/1kFj3O9,* and access Open Stax at *www.openstaxcollege.org/books.*

Gamify Your Curriculum. The Mac Lab provides resources and video tutorials to help high school teachers "gamify their curriculum." Using the Game On plug-in application from WordPress, high school teachers can set up assignments as multi-stage missions or quests in which students can work at their own pace in a game-oriented learning environment. The environment includes opportunities for students to earn points, badges, and even gold, which can then be spent or exchanged in a teacher-designed classroom economy. The app also provides tools for teachers to monitor student progress, allowing teachers to move students ahead or revisit content as necessary. Learn more and get started at *http://maclab.guhsd.net/game-on.*

Gross Science. Increase your trivia knowledge with interesting and bizarre stories from the slimy, smelly, creepy world of science! Produced by WGBH for PBS Digital Studios, the web series inspires all ages—especially middle level students and those with a scatological bent—to enjoy science, see it as a story, and ask lots of questions about the world. Each approximately three-minute episode tackles an unusual question or topic, such as Why don't these cicadas have buttocks? What can you learn from ancient feces? Could kangaroo flatulence curb global warming? How far do sneezes and vomit travel? View episodes and subscribe to the series at *http://bit.ly/1OzJMmY.*●

News Bits

- **Texas, Minnesota, and Connecticut students who don't play sports but enjoy robotics can rejoice: These states have launched statewide robotics programs as part of a FIRST (For Inspiration and Recognition of Science and Technology) pilot program to make robotics an official extracurricular sport nationwide.**

"Robotics is a sport for the 21st century," says FIRST President Donald E. Bossi. "The skills students can learn, including teamwork, collaboration, and problem solving, are the same as those learned in other sports, but unlike most sports, robotics provides all students—no matter their background or physical ability—the opportunity to become a STEM [science, technology, engineering, and math] professional. That's why FIRST believes all states should recognize the hard work of students, coaches, and mentors with statewide support."

These states' "recognition of robotics means millions of students will now have access to robotics, and an opportunity to learn STEM skills in a hands-on way," says Ray Almgren, vice president of National Instruments, who helps sponsor the program. The Texas pilot program allows FIRST teams to be recognized as official sports teams, which provides the structure of an extracurricular sports program, the support of administrators and teachers, and the opportunity for participants to receive a varsity letter. Read more at *http://bit.ly/1QYFKLG*.

- **An Ohio teacher and her students have added a new twist to water-quality testing. They created H2yOu, a conservation website that shows how bodies of water worldwide are connected and allows people to share their personal stories about water.**

H2yOu aims "to inspire people to care for and conserve our shared global resource of water," says Laura Schetter, who teaches at Wildwood Environmental Academy in Toledo. On H2yOu's interactive map, students and other users can share stories about where they get their water from, why it's important to them, and what they're doing to conserve it. At *www.h2you.co,* stories appear in narrative form, or as pieces of artwork, poetry, or songs.

The project has received stories from around the world. Read more online at *http://bit.ly/1Px2TDj*.

- **A digital game from the Natural History Museum of Utah allows middle school students to explore its paleontology archives online.**

Students playing Research Quest use critical-thinking skills and investigations to solve dinosaur fossil mysteries. The game resulted from a two-year collaboration among the museum, the University of Utah, and seven of the state's Title I middle schools.

In one research quest, students study bones from the Cleveland Lloyd Dinosaur Quarry—at which the densest collection of dinosaur bones in history was found—to develop a hypothesis about which species of dinosaur they belong to. In another, they develop a hypothesis about why these dinosaurs died where and when they did.

But the game is about more than just the dinosaurs, says Madlyn Runburg, the museum's director of education initiatives. The game teaches students skills such as problem solving, analysis, and synthesis, she contends.

"Through our testing, observations, and interviewing of students, we've found that Research Quest was effective in improving students' critical-thinking skills," says Runburg. Learn more at these websites: *http://bit.ly/1NVPpMZ* and *http://bit.ly/1OkZ03A*. Access a beta version of the game at the website *http://bit.ly/1ZopPeb*. ●

What's New

FROM U.S. GOVERNMENT SOURCES

National Park Service (NPS)

Everglades Mountains and Valleys

Everglades National Park is home to diverse and dynamic habitats. Small changes in elevation influence the difference between dry and wet habitats. Explore the Everglades' "mountains" and "valleys" from a fresh perspective with expert guides along the way. This kid-friendly video series features seven main habitats within the park, including sawgrass prairie, slough, mangroves, cypress, and Florida Bay.

In each approximately 10-minute video, students explore the habitat with the help of a park ranger, who shares his or her knowledge of the environment and the habitat's unique features. Lesson plans supporting the *Next Generation Science Standards* (*NGSS*) are included for grades K–9. Access the materials at *http://1.usa.gov/1PbBTVt.*

Bureau of Land Management (BLM)

Solar-Generated Electricity

Does the need for carbon-free renewable energy outweigh the potential risks to wildlife habitats, cultural and historical resources, and recreation areas? Middle school teachers can explore this question with their students through *Solar-Generated Electricity,* the latest teaching guide in the BLM's Classroom Investigation Series. The unit describes how solar facilities on public lands work, examines the tradeoffs in detail, and illuminates the factors that affect decisions about where to build solar electricity plants. Each activity includes learning objectives and teacher preparation steps, background information, lesson procedures, adaptations to consider, assessment, and student handouts. Download the unit at *http://on.doi.gov/1P4ZBHk.*

U.S. Department of Agriculture (USDA)

How Our Gardens Grow

Produced by the Idaho State Department of Education, Child Nutrition Programs, this booklet features 10 School Garden Grant sites that offer examples of ways to successfully implement and sustain a school garden program. The booklet begins with an overview of the research showing the benefits of school gardens and the ways school gardens can be incorporated into learning and the school environment. It presents general advice related to funding, starting, and maintaining a school garden. Finally, the book spotlights 10 innovative garden programs in Idaho, with specifics for each garden shown, including size, foods grown, ways the garden is incorporated into learning at the school, how the garden is maintained during the year and over the summer, and contact information.

An appendix includes supplemental documents such as Vegetable Planting and Harvest Tips, A Letter Approving School Garden Use, and seasonal planting guides for fruits, vegetables, and herbs. See *http://1.usa.gov/1LOrO58.*

National Oceanic and Atmospheric Administration (NOAA)

OceanAGE Careers

NOAA's Ocean Careers to Inspire Another Generation of Explorers (Ocean AGE Careers) program invites students to learn about the talented people who explore our ocean planet. From underwater pilots to research scientists, these marine explorers provide students with firsthand knowledge of careers through live interviews, profiles, and mission logs. The site presents more than 30 ocean science–related professions and a profile of an individual in that field today. The profiles describe what the scientists are doing now and the steps they took to get there. Additional resources offer more information about the diverse career paths available. Consult *http://1.usa.gov/1kGr99b.*

National Science Foundation (NSF)

When Nature Strikes

This new video series from NSF's Directorate for Geosciences, The Weather Channel, and NBC Learn explores the science of natural disasters and the research being done to avert their human and economic toll. The 10-part series, *When Nature Strikes: Science of Natural Hazards,* spotlights some of the fundamental NSF–funded scientific research that helps improve predictability and risk assessment that will reduce impacts from catastrophic events. Each episode is approximately six minutes long and covers a single topic: On the Front Lines (i.e., understanding Earth's natural processes), Earthquakes, Volcanoes, Hurricanes, Flash Floods, Landslides, Tornadoes, Space Weather, Wildfires, and Tsunamis. Watch the videos at *http://1.usa.gov/22HKGsc.*

National Aeronautics and Space Administration (NASA)

The S'COOL Project

NASA has a citizen science project for K–12 students: S'COOL (Students' Cloud Observations On-Line). The S'COOL Project involves students worldwide in real science through making and reporting ground truth observations of clouds. By doing so, they are assisting NASA scientists in validating NASA's CERES (Clouds and the Earth's Radiant Energy System) satellite instruments.

Teachers first register their school's address and latitude and longitude on the S'COOL project website (which has an interactive map to help you determine this). Once registered, participants can get a satellite flyover schedule for their latitude and longitude, and the cloud observation reporting can begin. The website has informational tabs to guide you through the processes of observing and reporting your actual data, as well as supplemental resources and activities to increase your knowledge of clouds and weather. See *http://go.nasa.gov/1UrJweh.*

Mars Survival Kit

Take a classroom journey to Mars with this collection of educational lessons and activities for K–12 students. The kit provides a brief description of the educational activity and information about how the activities and lessons support the *NGSS.* Titles include Surviving and Thriving on Mars (grades K–5); Mars for Kids and Red Planet: Read, Write, Explore! (grades 3–5); Imagine Mars: Survival Kit Edition (grades 3–8); and Make Your Own Mars Rover, Gaining Traction on Mars, and Is Life on Mars Possible and Could Humans Establish Settlements There? (grades 6–12). Visit *http://go.nasa.gov/1NnZ0Rg.*

Engineering in K–12 Classrooms

Want to incorporate real-world engineering into your science curriculum? This instructor guide from the education team at NASA's Jet Propulsion Laboratory (JPL) may help. The guide has videos and supporting text illustrating how real-world engineering at NASA can be applied to the *NGSS.* Each video shows an example of how JPL applies the standard, offers a lesson plan or activity, and suggests ways to make the standard relevant. Access the guide and watch an introductory video at *http://go.nasa.gov/1S0r8va.*

U.S. Environmental Protection Agency (EPA)

It's My Environment Blog

EPA summer intern Maddie Dwyer shares her tips for going green at school, like conserving energy and getting involved in campus projects. Other suggestions include practical ideas such

as using recyclable containers to reduce waste and turning off the water when brushing your teeth. The tips were written with college dorm life in mind, but they're also useful for younger students. Read the post on EPA's It's My Environment blog at *http://1.usa.gov/1SvHHyB.*

Recycle City

Want students to understand the link between climate and the environment? Check out Recycle City, an interactive website for elementary and middle level students. The site includes an interactive map, activities, and a game exploring ways homes and businesses can recycle, reuse, or reduce waste.

The site also offers ideas for using Recycle City in the classroom. Teachers can use it as a basis for a group scavenger hunt, for example: Teams of students can browse the site looking for items like something made from recycled tires, an electric car, a use for old bricks, a way to reuse coffee grounds, and so on. This activity often sparks interesting discussions among students, particularly about the items they have difficulty finding. Visit *http://1.usa.gov/1Oh3Knn.*

U.S. Geological Survey (USGS)

Coastal Marine Geology Resources

The USGS Coastal and Marine Geology Program's education web page has resources for all levels (K–college) that demonstrate the many ways science supports the country. Sign up for newsletters to learn the latest news in the field, or peruse the multimedia resources, such as image galleries, animations, videos, and podcasts, which can be used to enhance classroom teaching and student understanding. Students can see a computer-generated animation of what a tsunami looks like, for example, or study coastal change by comparing before and after hurricane photograph pairs. Other noteworthy resources include links to programs like Ask a Geologist, and a tool to generate a customized Mercator projection map of a particular location. Refer to *http://on.doi.gov/1RzatgQ.*

Kids.gov

Science Page for Teachers

At *http://1.usa.gov/1ZgC8Jr,* K–8 teachers will find educational resources culled from government websites and programs, including activities, lesson plans, and worksheets on topics like physics, chemistry, space, and animals. Teachers also can watch video answers to questions Kids.gov asks NASA.

National Institutes of Health (NIH)

Biology, Chemistry, Environmental Health Apps

NIH's National Library of Medicine has developed three interactive iOS apps for high school biology and chemistry and middle and high school environmental health. The apps address DNA base pairing (Base Chase), the Bohr model of the atom (Bohr Thru), and environmental conservation (Run4Green).

In Base Chase, students learn the bases of DNA as they complete unique DNA strands for various animals, with help from DeeNA, a cartoon mascot. In Bohr Thru, users collect and organize protons, neutrons, and electrons to form the Bohr Model and the first 18 elements on the periodic table, learning facts about chemical elements and their structures along the way. Chemistry teachers can use the game in brief in-class sessions to enhance students' understanding of the periodic table.

In Run4Green, middle and high school players learn and reinforce their understanding of topics such as greenhouse gas reduction, renewable energies, and green product purchases as they collect coins and perform environmentally friendly tasks.

Find all three games at the iTunes store at *http://apple.co/1OJHMbQ.* ●

In Your Pocket

Editor's Note

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

February 25–29

CAP Award for Excellence in Teaching High School/CEGEP Physics

This Canadian Association of Physicists (CAP) award recognizes an innovative physics teacher who demonstrates a strong understanding of the subject matter and the ability to motivate and engage students. Nominees should have experience developing innovative teaching methods, participating in physics-related extracurricular activities, and mentoring physics students or new physics teachers.

One award is given in each of five regions in Canada: British Columbia/Yukon, Prairies/Northwest Territories, Ontario, Quebec/Nunavut, and Atlantic Canada. Nominees must be Canadian residents and have been teaching physics at a Canadian high school or CEGEP for at least five years. Awardees receive two free years as a CAP teacher affiliate and a grant that can be used for professional development or purchase of computer software, equipment, or books for classroom use. One honoree will also participate in a week-long training program at a Canadian research institution in Summer 2016.

Apply by **February 25;** see *http://bit.ly/1VnNpC2.*

American Electric Power Teacher Vision Grants

These grants go to preK–12 teachers who live or teach in areas served by American Electric Power (AEP) in Arkansas, Indiana, Kentucky, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, and West Virginia. Grants of $100 to $500 are available for projects with an academic focus that improve student achievement; those with an emphasis on science, math, technology, electrical safety, energy efficiency, or the balanced study of energy and the environment are preferred.

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. Apply by **February 26** at *http://bit.ly/TCM6nl.*

Duke Energy Foundation Grants

The foundation provides grants to support science, technology, engineering, and math (STEM) and early childhood literacy in communities where the company operates: in Florida, Indiana, Kentucky, North Carolina, Ohio, and South Carolina. Grants are available for nonprofit programs that build STEM knowledge and critical reading skills in schools, prepare STEM teachers, and provide students with out-of-school STEM opportunities. Grants range from a few hundred dollars to $10,000. Apply online by **February 29** at *http://bit.ly/18Y6mTF.*

Monsanto Fund Grants

To encourage the growth of farming communities nationwide—as well as support the communities in which Monsanto employees live and work—the Monsanto Fund invests in education programs across rural America. Grants are available for K–12 schools, libraries, science centers, and academic enrichment programs. Proposed projects might include science and technology fairs, family science nights, robotics programs, and school gardens.

Grants of up to $20,000 are available. Apply by **February 29.** Applicants must request an invitation code prior to applying at *http://bit.ly/TrUVgr.*

ISTE Outstanding Young Educator Award

The International Society for Technology in Education (ISTE) presents this award to a teacher who is age 35 or younger as of July 15 and uses technology in the classroom in creative and innovative ways. The honoree will receive a complimentary registration to the ISTE Conference and Expo, up to $1,000 in travel expenses, a $1,500 cash prize, and a one-year ISTE membership. Nominate yourself or a colleague with a curriculum vitae (CV), letter of support, and one- to two-minute video by **February 29** at *http://bit.ly/1BoX2Wv.*

ISTE's Kay L. Bitter Vision Award

This award honors Kay L. Bitter, an early childhood educator for more than 20 years who used cutting-edge technology with her students. The award recognizes a preK–2 teacher who uses technology with students in exciting and innovative ways. The honoree will receive a complimentary registration to the ISTE Conference and Expo, up to $1,000 in travel expenses, and a one-year ISTE membership. Nominate yourself or a colleague with a CV, letter of support, and lesson plan by **February 29;** see *http://bit.ly/1BoXIeF.*

March 1–15

Association of American Educators Classroom Grants

These grants of up to $500 fund a variety of classroom projects and materials, including books, software, calculators, audiovisual equipment, and lab supplies. Full-time educators who have not received a scholarship or grant from the Association of American Educators (AAE) in the last 18 months are eligible, though AAE members receive additional consideration. Teachers in Arkansas, Colorado, Idaho, Kansas, Oregon, and Washington compete for state-specific funds and complete a separate application. Apply by **March 1;** consult *http://bit.ly/LC3Evc.*

Charlotte Martin Foundation Grant

The foundation awards grants in two focus areas: increasing opportunities for minority youth and conserving biodiversity in a changing climate. Grants support programs in Alaska, Idaho, Montana, Oregon, and Washington that provide educational, stewardship, cultural, or athletic opportunities for students ages 6–18. Grants of up to $25,000 are available; preference is given to smaller organizations, particularly in rural areas, that have less access to financial and community resources. Apply by **March 1** at *www.charlottemartin.org.*

Edward E. Ford Foundation Grants

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

All grants require a matching component. Most are for $50,000 or less, with a match of at least one-to-one. The head of school must have served for at least two years before making a request, and must phone the foundation's office directly to be placed on an agenda before the school may apply. Submit proposals by **March 1;** consult *http://bit.ly/18RkVre.*

Arthur Holly Compton Award in Education

This award, sponsored by the American Nuclear Society (ANS) to honor physics Nobel Prize winner Arthur Holly Compton, recognizes outstanding contributions to nuclear science and engineering education. The winner will receive $2,000 and an additional $2,000 for his or her academic institution. Nominees need not be ANS members nor work primarily in education. Submit nominations by **March 1;** consult *http://bit.ly/1QXVq1I.*

Bradley Stoughton Award for Young Teachers

To honor former ASM International president Bradley Stoughton, the organization presents this award to a young materials science, materials engineering, design, or processing teacher who educates and inspires students. Nominees must be age 35

or younger by May 15 and be ASM International members. The awardee receives $3,000 and a certificate. ASM members or alumni and faculty groups can submit nominations by **March 1** at *http://bit.ly/1fXOyJL*.

The Leavey Awards

These awards—sponsored by the Freedoms Foundation and the Thomas and Dorothy Leavey Foundation—recognize elementary, junior high, high school, and college educators who teach students about entrepreneurship and the free enterprise system. One award of $15,000 and up to 20 awards of $7,500 are available.

Recipients must be U.S. citizens or permanent residents who are employed full-time at an accredited American school (grades K–12), college, or university. Applications with innovative projects that develop deep appreciation for and understanding of the private enterprise system are preferred. The program, course, or project must be currently operating or initiated during the 2015–2016 academic year.

Nominations must be postmarked by **March 1;** consult *http://bit.ly/1JqovjK*.

DNA Day Essay Contest

This year's contest, sponsored by the American Society of Human Genetics, asks high school students to consider whether they should defer predictive testing for adult-onset conditions until adulthood because of the impact the results could have on their formative years. Students choose a genetic test, explain how it works and how definitive its results are, then defend their position. Essays should include at least one citation and provide substantive, well-reasoned arguments that demonstrate an understanding of the genetic concepts involved.

The first-place winner receives $1,000 and a $1,000 genetics-materials grant for his or her teacher. Second-place winners get $600; third-place, $400; and 10 honorable mentions, $100 each.

Teachers or administrators may submit up to six student essays from up to three classes after verifying that they are original work. Essays are due by **March 11.** Visit *http://bit.ly/1JdGh9V*.

Captain Planet Foundation EcoTech Grants

The foundation awards these grants to schools and nonprofit organizations that engage students in inquiry-based STEM projects that feature innovation, biomimicry, or new uses for technology to address environmental problems in their communities. Seventeen grants of $2,500 are available. Submit applications by **March 15** at *http://bit.ly/1PxkETb*.

March 31–April 1

EJK Mini-Grants

The Ezra Jack Keats Foundation, named for the children's book author and illustrator, provides these $500 grants to public schools and libraries with creative, innovative programs that support or extend the *Common Core*. Projects should foster creative expression, collaboration, and interaction with a diverse community and be informed by Keats' books, life, and vision.

Public schools, public libraries, and public preschool programs such as Head Start in the United States and its territories, including Puerto Rico and Guam, are eligible. Apply by **March 31** at *http://bit.ly/1ZzqINI*.

Bright House Networks Classroom Innovators Grants

These grants provide funds for innovative educators with classroom needs in communities Bright House serves in Alabama, California, Florida, Indiana, and Michigan. Proposed projects should help move students toward a brighter future in creative ways. Grants of between $250 and $500 are available to K–12 teachers at public or private schools. Apply by **March 31** at *http://bit.ly/1OqL5EQ*.

Advancing Student Achievement Grant

The Actuarial Foundation provides these grants to support new programs for students in grades 4–12 that bridge the gap between math in the classroom and math in the real world. Programs should impact at least one grade level and require student participation throughout the school year.

Five schools will receive grants of up to $10,000 for one year; public or private schools in the United States are eligible. Apply by **March 31;** see *http://bit.ly/1KkO0i4*.

NFIB Entrepreneurship Educator Award

This National Federation of Independent Business (NFIB) award is for educators who teach entrepreneurship in an inspiring way. Applicants submit a two-minute video that answers this question: What best practices have you used to teach entrepreneurship, and what has been the outcome? The winning video will be shown at the NFIB Young Entrepreneur of the Year Award Luncheon in Washington, D.C., and the awardee will receive a $1,000 grant for educational resources.

Educators who teach entrepreneurship in grades 1–12 are eligible. Submit your video by **March 31.** Visit *http://bit.ly/1jtBBOH*.

ACS-Hach High School Chemistry Grant

The American Chemical Society (ACS) provides grants of up to $1,500 to high school chemistry teachers wishing to enhance the learning in their classrooms, foster student development, and spark interest in the field. Funds can be used for lab equipment and supplies, instructional materials, professional development, field studies, or science outreach events. Apply by **April 1;** see *http://bit.ly/1PuXJb9*.

ACS-Hach Second Career Teacher Scholarship

The ACS awards this scholarship to working chemists who want to pursue a master's degree in education or certification as a chemistry or science teacher. Awardees receive up to $6,000 for full-time study; up to $3,000 for part-time study. Funds can be used for tuition, books, room and board, and other education-related expenses and may be renewed for up to three years.

Applicants must have a bachelor's degree or higher in chemistry or a chemistry-related field, at least one year of work experience in a chemistry-related profession, be accepted into a master's or teacher-certification program, and be a U.S. citizen or permanent resident. Apply by **April 1** at *http://bit.ly/1SkRg3f*. ●

Summer Programs

Editor's Note

Visit www.nsta.org/calendar to learn about other summer professional development opportunities.

Fermilab Teacher Research Associates Program. This eight-week program gives science, math, technology, and computer science teachers the opportunity to do professional research over the summer. Teachers are paired with jobs and mentors that best match their particular skills and interests; they might, for example, help the mentor or a team assemble a piece of equipment, build part of a detector, or work independently on a software task. The goal for teachers is to experience cutting-edge science and technology research that can be transferred to their classroom.

Teachers of grades 7–12 at public, private, or parochial schools may attend. Teachers must have full-time appointments the years before and after the research experience and must be U.S. citizens with medical insurance. Participants receive a $700 weekly stipend.

Apply by **February 20.** Program dates vary by mentor; for details, see *http://1.usa.gov/1JdZOXy.*

DANIEL SCHWEN

BirdSleuth Educator Retreat. Cornell Lab of Ornithology's BirdSleuth program aims to build science skills and inspire young people to connect to local habitats, explore biodiversity, and engage in citizen science. The program's four-day retreat for educators, taking place July 13–16 in Ithaca, New York, provides support for teachers wishing to accomplish these goals. Participants will practice bird identification and learn more about bird biology, interact with world-renowned ornithologists, learn how to use BirdSleuth activities and curricula in their classrooms, and engage and brainstorm with other bird-loving educators from around the country. Attendees also receive curriculum kits and a pair of high-quality binoculars to use in their classrooms.

Classroom teachers, after-school leaders, and environmental educators of students in grades 3–8 are encouraged to attend. Two continuing education credits from Cornell University are available. Register by **March 1** online at *http://bit.ly/1DDK75y.*

Monterey Bay Aquarium Project-Based Science Teacher Institute. The Monterey Bay Aquarium invites teachers of grades 6–8 to learn about project-based science and how to use it to teach conservation issues that connect to their students' lives and environments. From July 31 to August 5, participants will go behind the scenes at the aquarium, meet with scientists and experts, and learn how to incorporate project-based science that meets the *Next Generation Science Standards* (*NGSS*) and the *Common Core.*

Teacher teams are eligible; interdisciplinary ones are encouraged. Participants must attend the summer session and three Saturday sessions over the course of the school year, implement a project and related technology with their students, and participate in an online learning community throughout the year. Room and board are provided, and a $50 daily stipend is available upon completing the institute; continuing education credits from California State University (CSU), Monterey Bay, are available. Register by **March 8** at *http://bit.ly/1YM8b3M.*

Monterey Bay Aquarium Connecting With Marine Science Teacher Institute. This institute, also sponsored by the Monterey Bay Aquarium, invites teachers of grades 9–12 to explore the role humans have played in the stability and change in the bay. During July 5–10, participants will do field investigations and learn about climate change science, plastic pollution, sustainable seafood, and the physics, chemistry, and biology of the kelp forest. Teams of teachers are eligible, and interdisciplinary teams are encouraged.

Participants must attend all sessions and use the curriculum presented and related technology with their students. Room and board are provided, and a $50 daily stipend is available upon completion of the institute; CSU Monterey Bay units may be earned. Register by **March 8** at *http://bit.ly/1Oj0XO3.*

EinsteinPlus Summer Workshop. This one-week intensive workshop for Canadian and international teachers focuses on modern physics and includes quantum physics, special relativity, and cosmology. Participants will learn about the latest developments in physics from expert researchers, enjoy lab tours, and interact with likeminded individuals from around the world. Session topics include

- innovative teaching strategies suitable for all areas of physics;
- quantum physics: wave-particle duality and the electron double-slit experiment;
- Geographic Positioning Systems (GPS) and relativity;
- dark matter as an application of uniform circular motion; and
- measuring Planck's constant using a simple electronic circuit.

EinsteinPlus will take place July 6–12 at the Perimeter Institute in Ontario, Canada. Apply by **March 31;** refer to *http://bit.ly/1ffTrkS.*

Physics of Atomic Nuclei (PAN). 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.

PAN is open to all science teachers, though high school physics or chemistry teachers tend to find it most useful; student participants must have completed at least one year of high school. The MSU program for teachers takes place July 24–29; students can attend the MSU program July 31–August 5 or the ND program June 26–July 1. Apply by **April 4;** see *http://bit.ly/WbSAVk.*

Centers for Disease Control (CDC) and Prevention Science Ambassador Workshop. This free workshop is for middle and high school science and math teachers. Participants will work with CDC scientists to develop innovative public health–based lesson plans that meet the *NGSS.* The workshop takes place July 18–22 at CDC headquarters in Atlanta.

Apply by **April 15.** Learn more at *http://1.usa.gov/176f3jD.*

2016 LiftOff Summer Institute. This institute for science teachers takes place June 26–July 1 at NASA's Johnson Space Center in Houston and is sponsored by the NASA Texas Space Grant Consortium. The workshop provides hands-on, inquiry-based science, technology, engineering, and math activities as well as opportunities to work with NASA scientists and engineers and conduct field investigations on this year's space science theme: "Exploration: Past, Present, and Future." Teachers of grades 4–12 with one year of teaching experience, a willingness to share information with others, and U.S. citizenship are eligible. The program is free for Texas teachers. Apply online by **April 15** at *www.tsgc.utexas.edu/liftoff.* ●

The NSTA Learning Center

High quality interactive content for K–12 science teachers

Earn graduate credits and advanced degrees

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Gain knowledge exclusive to your area of instruction

American Museum of Natural History

Seminars on science, six-week online graduate courses in the life, Earth, and physical sciences, incorporate the museum's resources plus interaction with scientists and educators. CEUs and graduate credits.

Montana State University - Bozeman

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.

University of Maryland

Designed for science teachers, the Master of Chemical and Life Sciences is a 30-credit, online, interdisciplinary master's degree offering concentrations in biology and chemistry.

Wildlife Conservation Society

Free Teacher Webinar & Student Webcast Series. Learn real-world science through WCS research and experts. Receive training to introduce core science concepts to your students. Connect your students with science experts through interactive, TV-style webcast programs. Monthly webinars and webcasts begin September 2015. Visit *wcs.org/teacherpd* for more information.

NSTA Virtual Conferences

A day-long series of live web sessions delivered via an interactive distance-learning tool. Each conference features content and/or pedagogy from experts in a particular topic. Participants can log on from anywhere with an internet connection and interact with presenters and educators from across the country.

http://learningcenter.nsta.org/onlinecourses

National Science Teachers Association

MS. MENTOR, **Advice Column**

Teacher-Leaders; Planned, Purposeful Activities

My principal tells me I have "leadership potential." I've been teaching Earth science for 11 years. I like my students, and I feel confident with the curriculum. I don't want to leave the classroom, but a little voice keeps whispering that she may be right. Should I try something new?

—B., New York

What a vote of confidence from your principal! She must see something in you that can and should be shared with others. I can understand your hesitation to move to an administrative position, just as you have developed a repertoire of teaching strategies and a good rapport with students. But after 11 years, you might be ready for new and challenging opportunities, in or out of the classroom.

I would listen to your little voice and look into your state's requirements to earn credentials as a supervisor, principal, or curriculum specialist. In an administrative position, your insights and experience would make you a valuable resource for the science faculty. Working with a principal or curriculum director who understands the *Next Generation Science Standards* (*NGSS*) and the unique demands of science instruction would be a dream come true for many teachers.

Even if you work toward the credentials, it doesn't mean you have to become a principal or central office administrator. The coursework, reflective processes, and internship can give you a big-picture look at schools as part of a system and how science education fits into school-wide issues and initiatives. Having administrative credentials can open the door to other opportunities, too.

On the other hand, if you're not ready for more coursework, perhaps becoming a "teacher-leader" would be a better option.

This includes a variety of roles within the school or district: an advocate for science on school committees and task forces, department chairperson, instructional coach, mentor for new or struggling teachers, advisory board member, grantwriter, team leader, or project director. You could get involved with curriculum development, conduct action research, pilot new technologies, or attend/present at school board meetings. These opportunities for teacher-leadership would not require leaving the classroom.

Professional development is another arena for teacher-leaders. You could offer workshops for teachers in your district or others. Or check with a regional service agency or informal science organization to see if they need workshop presenters or advisors. Consider sharing your experiences and expertise by writing articles for NSTA journals or presenting at conferences, too.

Networking is an important part of being a teacher-leader, and social media provides many ways to work with and learn from our colleagues (for example, participating in NSTA's discussion forums and e-mail lists, or in Twitter chats).

As a potential teacher-leader or administrator, don't underestimate the value of your contributions. I'm sure you have the skills and knowledge, as well as a passion for science, which will enable you to be a valuable resource not only to your students, but also to your school and to the profession. And it sounds like you already have a mentor for the process.

My fifth-grade students get excited about hands-on activities, but sometimes they use an activity as a reason to socialize or joke around. Sometimes the class appears chaotic. I'm looking for ideas on what I can do to ensure students are learning during this time.

—F., Arizona

As you have observed, most students enjoy working together on investigations, projects, and activities. This excitement can get out of control, which leads to safety issues as well as students not meeting the learning goals for the activity…and perhaps the chaos that you mentioned.

Part of the issue could be addressed by classroom routines and planning, but a more fundamental thought is whether students understand the purpose of these activities and how they relate to learning.

If your students' previous science experiences were based on worksheets or teacher-led demonstrations, they might view "fun" activities as a special event or reward for doing the worksheets, rather than an integral and essential part of learning. They also might need guidance on working cooperatively and safely.

Students should be aware of how an activity contributes to the learning goals or performance expectations. Take a few minutes to introduce or describe the activity in that context. Students will be more engaged if they have a personal ownership in the activity.

If activities are an integral part of instruction, they should not be a reward for good behavior or taken away for unrelated poor behaviors. Some teachers have a no homework-no lab policy, but unless the homework was a preparation for the lab, I would not recommend this.

Doing an activity without any kind of follow-up or reflection may also contribute to students' attitudes. My

students seemed to take the activities more seriously when a "product" was required: a lab report, notebook entry, summary, photographs or video, drawing, data chart, graph, or exit slip.

To use class time efficiently and safely, it's essential that you and the students have routines and procedures in place. Here are some from NSTA's e-mail lists and discussion forums:

- Reduce the drama of choosing partners by assigning students to groups. Designate a space for each team to work on activities.
- To minimize students roaming around, one of the roles in cooperative groups could be that of "coordinator" whose job is to get the materials for the activity.
- Monitor the time. Students need time to not only clean up, but also to pack up their thinking. Don't dismiss the class until the room is cleaned up and the materials are accounted for.
- Never leave the room or use this time for your own paperwork. Mingle with the groups and monitor student behavior. Talk with each group, note student skills on a checklist, or ask students to describe what they're doing and learning.
- Have a zero tolerance for unsafe behaviors. If student behaviors get out of control or become unsafe, stop the activity.

Planning and organization are also important. In your mind, go through the activity and focus on what the students should be doing to accomplish the task in an orderly and timely fashion. Can the activity be completed in one class period, or will students need to continue at another time? What is in place for students who finish ahead of time? What accommodations might be necessary for special-needs students? Review any safety issues that may arise.

Have a labeled box or tray for each lab group to make it easier to organize the materials. Have these ready ahead of time for the coordinators to pick up. Include an index card in each box with an "inventory" so that at the end of the period, students know what is to be returned. Save the cards to use the next time you do the lesson. Even though you'll discuss any safety issues before the activity, you could put a summary on the card as a reminder.

As you mingle and monitor, you may find yourself spending more time near the groups who need your attention. Use an agreed-upon signal for quiet if the noise becomes distracting or chaotic. You'll eventually learn to distinguish between off-task noise and the sounds of excited learning—the best sound ever! ●

To maintain anonymity when requested, some letters to Ms. Mentor are signed with a pseudonym. We regret any coincidental resemblance to other educators when a pseudonym is used. Check out more of Ms. Mentor's advice on diverse topics or ask a question at www.nsta.org/msmentor.

Professional Learning to Take Center Stage in Nashville

NSTA's 2016 National Conference on Science Education, Science: Empowering Performance, will open on March 31 in downtown Nashville, Tennessee. In keeping with Music City's legacy, many conference sessions are grouped on entertainment-themed strands to help attendees focus their professional learning experience: Setting the Stage: Scientific Literacy; Building the Band: Involving Community Stakeholders; Harmonizing Concepts: Integrating Instruction; and Stringing It All Together: Three-Dimensional Learning.

Tyraine "Grand Hank" Ragsdale promises an electrifying keynote session on March 31. A former research chemist and co-founder of *The Science of Philadelphia* and *Science Lab of Grand Hank* television series in collaboration with The School District of Philadelphia's PSTV Network, Ragsdale advocates using "event-based instruction" and incorporating hip-hop music and kinesthetic learning into science, technology, engineering, and mathematics (STEM) education to inspire and motivate students. The 2016 national conference will also feature the first in a series of lectures sponsored by the Arthur C. Clarke Institute for Space Education. Jeff Goldstein, director of the National Center for Earth and Space Science Education, will present the inaugural lecture, sharing his Thoughts on Science Education, Science, and Personal Beliefs. Additional featured speakers are educator-favorite

NSTA 2016 National Conference keynote speaker Tyraine "Grand Hank" Ragsdale will discuss how he uses hip-hop music and kinesthetic learning as part of his "event-based" approach to engaging students in education.

Bill Nye (If the Dinosaurs Had a Space Program) on March 30, before the conference officially opens; Jean Kaneko of The Exploratory in Culver City, California (The Tinker.Make.Innovate. Program); Linda Kah (Curiosity's Adventures in Gale Crater, Mars); and many more.

The conference also includes a featured panel discussion. National Conference Chair Becky Ashe explains that when the conference committee was deciding on the featured speaker for the Building the Band strand, it quickly became clear that they "really needed a way to bring a group of partners together to share their perspectives and examples of how they've partnered with educators in unusual ways," she says. The panel will discuss what "partnerships" look like from local, state, and national perspectives. "We hope people take away an idea of what are questions potential partners want educators to answer in a proposal, to understand what it is that [partners] are looking for. As educators, we can't always predict what they want from partnership," Ashe contends.

Attendees may notice something missing from this year's program: Informal Science Day. The one-day event has been replaced by a series of Science in the Community Forums. "We think 'Science in the Community' creates a clearer image of the role informal science education plays as a link from schools to their communities," says NSTA Informal Science Director Dennis Schatz. Noting that many educators had erroneously believed the one-day event was specifically for informal educators, the Informal Science Committee wanted to make the informal science sessions more accessible to all attendees by scheduling the Science in the Community Forums over three days. With titles like Learning Through Failure, Schatz says, "the forums will be interactive in nature, with lots of hands-on opportunities."

Focused Development

For attendees who prefer a structured experience, six Professional Learning Institutes (PLIs) precede the conference, offering day-long, in-depth explorations of topics ranging from science and literacy to three-dimensional learning on March 30. Participants then can attend designated "pathway" sessions during the conference to further delve into the subjects. PLI attendees must be registered for the national conference. The institutes are

- Supporting Conceptual Understanding in Science by Linking Assessment, Instruction, and Learning;
- Integrating Science and Literacy With Picture Books;
- Enriching Your Science Instruction With Three-Dimensional Teaching and Learning;
- GreenSTEM: Applying the Engineering Design Process to Community-Based Projects;
- Argument-Driven Inquiry: Transforming Laboratory Experiences So Students Can Use Core Ideas, Crosscutting Concepts, and Science Practices to Make Sense of Natural Phenomena; and
- Developing Science Literacy–Designed Instruction to Support College and Career Readiness

NSTA offers discounted registration to members. For more information or to register for the 2016 National Conference on Science Education, visit *www.nsta.org/nashville.* ●

BLICK ON FLICKS

Inside Out

By Jacob Clark Blickenstaff

With the Academy Awards ceremony being held at the end of this month, I turned my attention to a leading contender in the Animated Feature category that has even been on some reviewers' lists for a Best Picture nomination. *Inside Out* was the first Pixar film of 2015. (*The Good Dinosaur* was also released last year, though it did not do as well with reviewers or at the box office.)

Featuring the voices of several well-known actors and comedians, including Mindy Kaling, Amy Poehler, Lewis Black, and Bill Hader, *Inside Out* imagines the consciousness of 11-year-old Riley as a control room populated by characters representing her feelings. Riley and her family move from Minnesota to San Francisco so her father can work with a tech startup. This transition—on top of simply being 11—puts Riley's emotions on edge. She has moved away from her home and her friends on her ice hockey team to a strange city where even the pizza is unfamiliar.

The narrative moves back and forth between the external reality in San Francisco and the landscape of Riley's mind, where her five basic emotions (Joy, Sadness, Anger, Fear, and Disgust) process her experiences into memories. Each memory is stored in a glass ball, about the size of a bowling ball, and each day's memories are sent from headquarters to long-term memory when Riley sleeps. Memories are also encoded with a single color, based on the primary emotion associated with that memory. Yellow=Joy, blue=Sadness, red=Anger, purple=Fear, and green=Disgust.

Riley's dominant emotion is Joy, perhaps because it was the first emotion she felt as an infant. We occasionally see the control rooms inside other characters, and the dominant emotions differ. Riley's mom's is Sadness, and her dad's is Anger, though generally the adults show more cooperation among the emotions than in Riley's mind.

Really important events become "core memories," which create Riley's "Islands of Personality." At the start of the film, the islands are Friendship, Family, Hockey, and Goofball, which means that essentially all of her core memories fit into one of those four categories. Joy works hard to keep the other emotions from taking control of headquarters or creating any core memories. She is especially careful to keep Sadness out of Riley's core memories, though Fear, Anger, and Disgust all do get some core memories.

You might guess that with all the turmoil in Riley's external world, Joy is unable to keep the other emotions in check for long. A struggle in headquarters leads to the loss of some core memories, and the Islands of Personality begin to fall apart. The majority of the film is about Joy and Sadness traveling through Riley's inner world, visiting her long-term memory,

imagination, abstract thoughts, and her subconscious. Along the way, they meet Riley's imaginary friend, Bing Bong, and a variety of minor workers who sort and delete memories.

It might seem overly childish to represent a human mind and consciousness as colored glass balls, pneumatic tubes, and amusement park–like islands. Actually, the human brain is so complex, and cognition so difficult to understand, that even scientists use metaphors to simplify descriptions of the workings of the brain. The metaphors in *Inside Out* may be particularly appealing to kids, but they are not far different from the representations adults use for the same phenomena.

A common late 20th-century metaphor describes the brain as a computer with central processing, short-term storage, and long-term memory. Neurons are the hardware, and the connections between them the software of a computer-like brain. This is a useful way to imagine the brain, but may not be any more "true" than phrenology (the late 19th-century idea that bumps on the skull indicated which parts of the brain were most active). The representation that old memories are deleted to make room for new ones fits into the computer-like model of the brain, but no evidence exists that real human brains ever run out of storage space. Forgetting seems to be more about letting a memory fade by no longer recalling it, not because new memories are taking its place.

I particularly like how the filmmakers depict abstract thought. When Joy, Sadness, and Bing Bong enter the region of abstract thought, their bodies become more and more abstract themselves. First they lose detail, then they become two-dimensional, then just a single color, and finally just colored lines. This represents a continuum from the particular (the character of Joy in all of her dimensions and colors) to the abstract, in which she is represented by just a yellow line.

Scientists often use abstract symbols to represent complex objects or concepts. F for force, Q for heat, and K for potassium are all examples of scientific abstractions. Abstract thinking is a powerful tool, but students are not intuitively good at connecting abstractions to what they represent. This scene could help teachers show kids what is meant by an abstraction, and to explicitly ponder their own thinking.

The journey through the landscape of Riley's mind teaches Joy that suppressing other feelings, most particularly Sadness, is not helpful or healthy. With core memories missing and Islands of Personality deteriorating, Riley becomes depressed. Only when Joy (and therefore Riley) understands that memories can be emotionally complex—including both joy and sadness, for example—does Riley's personality return, and new Islands are created.

Supporting students' development of emotional resilience and encouraging them to learn metacognition (thinking about one's own thinking) has increasingly become part of classroom teachers' work, particularly in the elementary and middle grades. *Inside Out* could help teachers start a conversation about feelings with younger students. At the secondary level, teachers could make connections to the science of understanding emotion and cognition, branches of medicine and psychology that could be particularly interesting to students who would like to combine an interest in science with a helping profession.

Note: Inside Out *is rated PG for mild thematic elements and some action.*

Jacob Clark Blickenstaff is the program director for Washington State Leadership and Assistance for Science Education Reform at the Pacific Science Center in Seattle. Read more Blick at http://bit.ly/amBgvm, *or e-mail him at* jclarkblickenstaff@pacsci.org.

NSTA PRESS: *Earth Science Success, 2nd Edition: 55 Tablet-Ready, Notebook-Based Lessons*

Weather Instrument Project

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 Earth Science Success, Second Edition: 55 Tablet-Ready, Notebook-Based Lessons, *by Catherine Oates-Bockenstedt and Michael Oates, edited for publication here. To download the full text of this chapter, go to* http://bit.ly/1OMq6Tf. NSTA Press *publications are available online through the NSTA Science Store at* www.nsta.org/store.

This is an at-home project. It will follow the curriculum for our study of meteorology in Earth science. Students will begin this project by selecting one of the following weather instruments listed below. (Three of the instruments provide less challenge, and therefore result in a slightly lower grade.) This project is to be done individually, without partners.

Instrument Choices

1. Anemometer
2. Barometer
3. Hygrometer
4. Precipitation gauge (The highest grade possible is "B," 85%.)
5. Thermometer
6. Wind vane (The highest grade possible is "B," 85%.)
7. Sling psychrometer
8. Weather stone (The highest grade possible is "C," 75%.) See Figure 6.16.

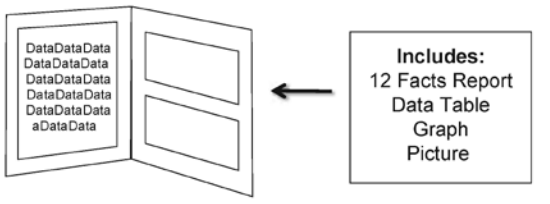
Student Tasks

1. You will build (not purchase) a particular weather instrument.
2. You will conduct research on that instrument, in order to complete a "12 Facts" report.
3. You will use the instrument you built to record measurements of current weather conditions for five consecutive days.
4. You will display one data table and one graph of your results.
5. You will share the weather instrument you built, along with a picture you took of it while it was operating.

FIGURE 6.16.
SAMPLE WEATHER STONE

Science Rocks' Weather Stone	
Stone is wet: Rain	Stone is dry: Not raining
Shadow on ground: Sunny	White on top: Snowing
Can't see stone: Foggy	Stone is moving: Windy
Stone is jumping up and down: Earthquake	Stone is gone: Tornado

FIGURE 6.17.
STANDALONE FOLDER



Required Research

Students may use internet search engines or library resources to first research the following information. Students will use this research to complete the "12 Facts" report.

1. Find what the weather instrument is used to measure (define its purpose).
2. Determine how the weather instrument is engineered (describe the mechanics of how it works).
3. Research how to build your own version of that weather instrument, so you can build it.
4. Research a scientist from history who invented, or is known for first using, this particular weather instrument.
5. On the due date, the project will be presented to classmates during a gallery tour with both the instrument and the stand-alone folder opened for display.

Data Collection

After designing and constructing the instrument, you will use it to record the measurements for current weather conditions. Students must take measurements at least three different times per day for five consecutive days. Data must be collected that can be recorded on both a data table and a graph. This data should include verification for accuracy by checking and comparing with actual data (use internet sites, television and radio broadcasts, classroom weather stations, weather station websites, and newspapers).

The instrument and a stand-alone folder (all information must fit onto a file folder, which is opened for review in Figure 6.17) showing research results will be due. At least one data table of results, one graph of results, and one picture of your weather instrument must be included in your folder.

On the gallery tour for project presentation day, students will complete their Weather Instrument "I Learned…" worksheet to show individual accountability, and they will write one encouraging statement on each Weather Instrument Affirmations form while they travel around the classroom.

'12 Facts' Report

Complete each of the following sentence starters, using your research, in a document. Display this document, along with your data table, graph, and picture, in the stand-alone folder.

1. The weather instrument that I chose to construct is…
2. Its purpose is…
3. The materials used to construct the instrument are…
4. The mechanics of the real-world weather instrument work by…
5. Three facts about the inventor's life story (family, education, birthplace, etc.) include...
6. The original inventor's weather instrument is different from mine in the following way:…
7. The year that this weather instrument was invented is…
8. The invention makes our lives easier, safer, or healthier in the following way:…
9. The data I collected includes all of the following:…
10. The graph of my data shows…
11. If I were to do this project over again, I would…
12. If I could modify the construction of my weather instrument, I would…

NGSS Alignment

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the problem's criteria and constraints. ●

(All dates are deadlines unless otherwise specified.)

March 3—K–12 educators will explore the origins of Earth's water and learn about water cycle basics, water management, NASA's efforts to improve understanding of the water cycle, and more during **Global Precipitation Measurement Mission: Water Cycle, a free NSTA Web Seminar**. The session will run from 6:30 to 8 p.m. Eastern Time (ET). Participants receive a certificate of participation and 100 Learning Center activity points after completing the post-program evaluation. An archive and presentation slides will be available following the program. For more information on NSTA Web Seminars or to register, visit *http://bit.ly/1Iwpg4w.*

March 31—The **64th NSTA National Conference on Science Education** opens in Nashville, Tennessee. The conference runs through April 3. Join science education colleagues from across the country as they participate in more than a thousand sessions, workshops, and other activities to gain insight into the latest trends in science education. Participants can follow four strands—Setting the Stage: Scientific Literacy; Building the Band: Involving Community Stakeholders; Harmonizing Concepts: Integrating Instruction; and Stringing It All Together: Three-Dimensional Learning—to focus their professional development experience or attend sessions targeted to particular needs. For more information or to register, visit *www.nsta.org/nashville*.

April 13—What is the role of a watershed, and how can you identify a healthy one? Learn how to answer these questions and more, and discover some hands-on investigations to conduct with your students during **Global Precipitation Measurement Mission: Watersheds, a free NSTA Web Seminar**. The session will run from 6:30 to 8 p.m. ET. Participants receive a certificate of participation and 100 Learning Center activity points after completing the post-program evaluation. An archive and presentation slides will be available when the program concludes. For more information on NSTA Web Seminars or to register, visit *http://bit.ly/1Iwpg4w.*

April 15—**Session proposals** for the **2017 NSTA National Conference on Science Education** are now due. The conference will be held March 30–April 2, 2017, in Los Angeles, California. For more information or to submit your session proposal, go to *http://bit.ly/1wI4iQg.*

May 5—Explore the types of weather, how weather is monitored by satellites, and opportunities to have your students participate in weather data collection during **Global Precipitation Measurement Mission: Weather, a free NSTA Web Seminar**. The session will run from 6:30 to 8 p.m. ET. Participants receive a certificate of participation and 100 Learning Center activity points after completing the post-program evaluation. An archive and presentation slides will be available after the program ends. For more information on NSTA Web Seminars or to register, visit *http://bit.ly/1Iwpg4w.* ●

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Material Research Advances

In January, material scientists reported developments that could change how electronics are made and used: a new metallic glue and a polymer that can "remember" shapes.

Scientists at Northeastern University in Boston, Massachusetts, have developed a metallic glue that could make a difference in how products such as computers are made. The researchers coated metallic nanorods with indium and galium to create the glue, which has electric and thermal conductive properties. Because the glue sets at room temperature, it could be used to replace "hot" processes like soldering in the manufacture of temperature-sensitive electronic components.

In China, researchers demonstrated the elasticity and plasticity of a new polymer through origami. The material could fold between multiple shapes depending on whether the material's elastic or plastic properties were triggered by temperature changes. The research reported the material could change shape hundreds of times without significant fatigue.

Read more in "Metallic Glue for Ambient Environments Making Strides," in *Advanced Materials & Processes* at *http://bit.ly/1RL5U59*. "Shape Memory Polymer Network With Thermally Distinct Elasticity and Plasticity" was published in *Science Advances* (*http://bit.ly/1WeXrGb*). ●