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DREAM BIG: ENGINEERING OUR WORLD

NSTA Reports

National Science Teachers Association

MIGUEL VASQUEZ

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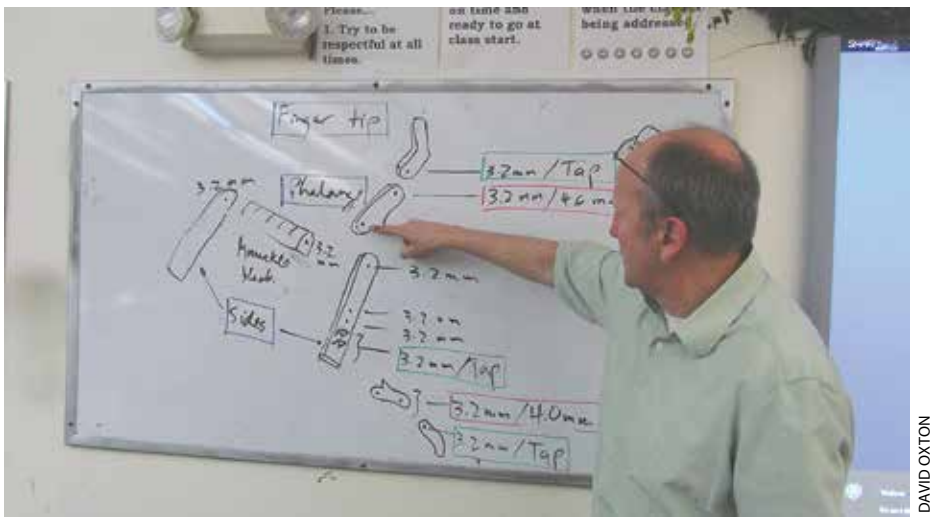
Giving a Hand to STEM

Rich Lehrer, innovation coordinator at the Brookwood School in Manchester, Massachusetts, wanted his eighth graders to work on real-life science, technology, engineering, and math (STEM) projects that help solve community problems. So in 2013, when he saw a video about South African carpenter Richard Van As and American mechanical special effects artist Ivan Owen creating a 3D-printed prosthetic hand to replace the fingers Van As lost in an accident, Lehrer says he was "blown away by [the opportunity] to create a prosthetic hand for Max," his son, who was born with symbrachydactyly, a condition that causes short or missing fingers. "It was an opportunity to involve my students in an authentic project-based learning (PBL) and design project," he maintains.

With advice from Van As, who, with Owen, posted the design for their Robohand online, Lehrer worked with 12 students over seven months in a weekly half-hour club to build the hand.

In Houston, Texas, Nghia Le, physical science teacher at Booker T. Washington High School, says he was interested in 3D printing because "I wanted to have my engineering students do rapid prototyping." He discovered e-NABLE, a worldwide nonprofit community of volunteers who create free 3D-printed hands and arms for those in need. e-NABLE offers open-source designs on its website (see *http://enablingthefuture.org*) and matches persons needing the prosthetics with schools and organizations that can do the 3D printing.



DAVID OXTON

At Brookwood School in Manchester, Massachusetts, Rich Lehrer, the school's innovation coordinator, discusses the phalanges of prosthetic hands.

In his classes, Le explains, "We focus on problem solving. Engineering [involves looking] at different problems, [seeing] how to apply innovative tools to everyday life and problems. Get[ting] students to apply what they know to solve a complex problem." He says he wanted his students to help someone nearby so they could meet with the person.

"I let students choose projects, projects near us," he adds. Through e-NABLE, Le and his students connected with six-year-old Gracie Henderson, who was born missing part of her left arm and hand. He and his students decided to create a prosthetic hand for her. "We weren't sure we could do it, but we wanted to try," he relates. "Problems are part of what we deal with, making sure students learn from their mistakes. [This project was] a perfect way for this to happen."

Facing Challenges, Achieving Success

Lehrer's first hurdle was acquiring supplies. "We had three groups: one to find a 3D printer, one to find the metal hardware, and one to find thermoplastic, which gets soft when heated and can wrap around the arm and provide a form for holding everything together," he explains.

"We connected with the Governor's Academy in Byfield, Massachusetts, [to print] the parts. Our maintenance department helped with the metal components," says Lehrer. A hand surgeon from Boston Children's Hospital connected them with pediatric orthotic products supplier Boston Brace, which donated hundreds of dollars' worth of thermoplastic material. But "figuring it out without a curriculum was hard.

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NSTA Member Poll: The Impact of Daily Work PG 8

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NSTA National Science Teachers Association

COMMENTARY: **Jodi Peterson**

Let's Help Every Student Succeed With STEM

By Jodi Peterson

Jodi Peterson

NSTA, in collaboration with 100kin10 and other key STEM leaders, has developed a new campaign—Every Student Succeeds With STEM—designed to ensure that science, technology, engineering, and mathematics (STEM) subjects and teachers of science and combined STEM subjects are a focus of the new federal education law at the state and local levels.

The campaign provides members of the STEM community with information, tools, and resources to help them take action and supports their engagement with education leaders, policymakers, parents, STEM professionals, and others to ensure that STEM is a priority in state plans submitted to the U.S. Department of Education, required under the Every Student Succeeds Act (ESSA). ESSA—enacted in late 2015 to replace the No Child Left Behind Act (NCLB)—emphasizes ensuring a well-rounded education and guaranteeing equity, two critical issues to STEM learning. ESSA allows states the flexibility to set new policy and funding priorities. All states are now developing new plans (including new accountability measures) that they will submit to the U.S. Department of Education, detailing how they will implement ESSA. States must submit plans for approval on either April 3 or September 18. These plans will affect science and combined STEM education in your state for years.

STEM learning opportunities and support for STEM teachers are mentioned specifically throughout ESSA. Making STEM a priority in every state under ESSA is important because

- STEM education helps ensure students develop the critical-thinking and problem-solving skills they need to succeed in school, work, and life.
- High-quality STEM education is essential to a well-rounded education for all students.
- STEM is a way of thinking and learning as much as it is a set of subjects. It helps engage students in school and learn important life skills, such as creativity, perseverance, and experimentation.
- Increasingly, STEM skills are needed across the workforce, and high-quality STEM education helps students gain the skills they need to be successful in life, no matter what career they choose.
- The majority of jobs in today's economy now require the knowledge, training, and skills gained through STEM. Employers are seeking workers with STEM skills. STEM-related fields are the fastest-growing job sectors in our economy.
- No matter a student's background or where he or she lives, all students should have access to high-quality STEM learning in and out of school.

You and teachers in your school and district can impact your state's plan by promoting STEM. The Every Student Succeeds With STEM website (found at *www.successwithstem.org*) features a wealth of information educators, parents, and community members can use to help make STEM a priority in their state, including details on the new law; updated information on states' progress on their ESSA plans, with links to the plans and implementation milestones; specific STEM programs in ESSA; messages about why STEM matters; suggestions for how to participate in the stakeholder engagement process; and toolkits with tips for crafting e-mails and making phone calls to state leaders and your state team encouraging them to prioritize STEM learning.

Social media is one way to reach out to legislators, as well as the larger community. If you're on Twitter, consider following the campaign (@Success_STEM) and including the hashtag #SuccessWithSTEM on posts related to ESSA and STEM. Every Student Succeeds With STEM also suggests adding related hashtags such as #STEM, #STEMed, and #ESSA. It's important to engage with people: If you receive responses to your posts, let them know you've read them! Answer questions, direct them to additional resources (including the Success With STEM website), and retweet or share their posts.

For more resources, visit the NSTA blog's Legislative Update archive (*https://goo.gl/qN3NZn*) to read our legislative updates and action alerts. Read the Summer 2016 *NSTA Reports* article, "What the ESSA Means for STEM Education," for more about ESSA specifically (available online at *https://goo.gl/tTclti*).

As states develop new plans under ESSA, all members of the STEM community have an important role to play to keep great STEM teaching and great STEM learning a top priority for students and ensure that Every Student Succeeds With STEM. ●

Jodi Peterson is NSTA's assistant executive director, communications and legislative affairs.

NSTA Reports

National Science Teachers Association
1840 Wilson Boulevard
Arlington, Virginia 22201-3092
703-243-7100
nstareports@nsta.org

Lynn Petrinjak ..... *Managing Editor*
Debra Shapiro ..... *Associate Editor*
Will Thomas, Jr. ..... *Art Director*
Production Staff ..... Jack Parker
Catherine Lorrain
Kenneth Roberts .. *Asst. Exec. Dir. for Periodicals*
David Beacom ..... *Publisher*
David L. Evans ..... *Executive Director*
Advertising
Jason Sheldrake ..... *Director*
jsheldrake@nsta.org
703-312-9273

Prosthetic Hands, From page 1

We looked at a lot of devices online," he admits.

As a father, Lehrer faced the challenge of "doing the project with Max, considering his safety. So many things could have gone wrong" if the device had not been made well, he allows. He also had to consider his students' safety. "We're an independent school, so we followed departmental safety procedures. Heating the thermoplastic was a major issue, so we used tongs, hot plates, goggles, gloves, [and other safety equipment]."

Le obtained about $1,200 to purchase a 3D printer through a sponsorship by KBR Inc., a Houston engineering firm. "They support education and had an interest in our school's program," he notes. "[But we] went through two or three printers during the project," with a second one donated through Donors Choose.org and a third "sold to us at a discount by a retail store," he recalls.

"When the printer goes down, you have to send it to the shop," which often involves waiting "six to nine months for the repair. We decided to learn how to fix a printer. We could fix 80% of the problems," Le reports.

Another challenge with the printer is that "some parts of the hand…come out differently from what you expect," he observes. And Le's team had to start over after they created the first hand. "We first made a three-finger hand for Gracie, but she wanted five fingers," he explains.

The project took about a year and a half. "We had a change of teams three times because students graduated. The last team took six months to complete the hand," Le says.

Lehrer was excited when Max was able to use the finished hand, noting, "[I]t launched Brookwood and me into the world of authentic uses of 3D printing." It also led to him becoming K–12 education coordinator for the e-NABLE Educators' Exchange and the Enable Community Foundation, for which he wrote an official curriculum.

Lehrer says the prosthetic hands students are now creating are "95% 3D-printed (our first device was only 30% 3D-printed), and almost all parts can be 3D-printed in 16 to 20 hours… The 3D-printed upper limb prosthetics field has moved very quickly."

The project "had a lot of impact on my students," Le concludes. "They [developed] a personal relationship with Gracie, [which I believe is] important when training engineers and scientists …to help someone. Compassion is important." His students are now trying to make a prosthetic foot for a duck.

One major factor in the success of Brookwood's program has been that Max has been a student there for two years, Lehrer contends. "To do a good job of designing [prosthetics], you have to know the [user]…Most hand devices are designed and built by [persons without upper limb differences] who may not know what it's like [for the users]."

As children grow, they outgrow devices, and many prosthetic hand users benefit from additional adaptors for various activities, he notes. "A sixth grader designed the clip that holds a drumstick so Max can play the drums. Other student-designed clips help him use a baseball bat and a scooter."

Brookwood now has "kids building hands in fifth and eighth grade,…students designing activity-specific clips for adaptors for…Max's hand, and has pioneered this very cool activity [in which] kids 'hack' the existing e-NABLE files to create cool little grabbers," Lehrer reports. And to broaden the authentic design work students are doing, he has created a "problem bank" of "problems around the school and community that students can solve" using 3D printing, he relates. For example, students are working with senior citizens to create devices to help them.

These projects "are as rich, if not more rich, than making a 3D-printed hand…Real-life problems that need solving are the best use of the machines" because they help students develop problem-solving, 3D modeling, and technological skills, he contends.

Learning About Inventions

As part of an engineering unit, Sue Gore's fifth graders at Liberty Intermediate School in Chesterton, Indiana, build prosthetic hands. "There's a section on biotechnology in our textbook that covers prosthetics of all kinds. I teach the design process for science and do a Rube Goldberg/simple machines project with my students, then lead them into biotechnology," she relates. She and three colleagues who teach science and math decided to have students create prosthetic hands when they teach the biotechnology section.

The students use a variety of everyday materials, such as plastic fasteners, string, and cardboard, to create the hands. "The hand has to have a hinged wrist and jointed fingers and has to be anatomically correct," says Gore. "It has to be acceptable to a human being; [with] no 'claws.'"

Last year, students built their hands at home with parents or other adults. This year, students made them in the school's new makerspace, paid for by a grant from the Duneland Education Foundation, which provides funds to enhance educational experiences for K–12 students in the community. "The students worked in teams to make their hands in the new makerspace," Gore explains. In addition, "we knew that the students would be doing the hands-on work versus the parents doing most of it."

The finished hands varied in size. "Some were…too large to hold a ball, a marker, or a cup," which was required, Gore observes. "We critiqued [the hands] as engineers, so they would learn from their prototype….

"My students understand that you may redesign and tweak [a device] many times before it's ready for the market," she points out. "It's important for students to collaborate and go through the whole cycle of the design process."

After attending a U.S. Patent and Trademark Office (USPTO) conference for educators, Gore now teaches students about "getting their work protected. I…require them to do a diagram [of their prosthetic], just as engineers do when they submit inventions to [the USPTO]," she reports.

The unit ends with students "using the Human to Human Interface"—a device that connects one person to another with wires and uses probes—"to see how one's brain can control another's hand," says Gore. "This was a great follow-up to the prosthetic hand presentations. The students were amazed that one could control [the] bodily movements of another [using] wires."

She also emphasizes the human side of prosthetics. "We look at videos of the Special Olympics…[to see how] flexible materials are needed so an athlete can continue to compete. [We also consider the circumstances of] the Boston Marathoners and the difference you can make" in people's lives with prosthetics. ●

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Musically Engaging Students in Science

From fractions to electrical conductivity, music offers a path to increase student engagement and improve learning in science and math.

At Canton Country Day School in Canton, Ohio, Brian Bortz, preK–5 science and fifth-grade math teacher, worked with music teacher Heather Cooper to create a fractions unit with hands-on opportunities to explore the science of sound.

"We had kids measure Boomwhackers® [tuned plastic percussion tubes]. After they found the ratio of sizes of different Boomwhackers [that corresponded with specific notes], they cut giant straws to the same ratios [to make pan flutes]," Bortz explains. "We talked about how sound forms, vibrations… about how sound changes when [the tubes were] capped versus uncapped. We took a field trip to a local church with two pipe organs and talked about how they worked. [Students saw] how the size of the pipes relates to their notes and pitch. A huge pipe equals lower sound. Small pipes have much higher sounds. We discussed how materials they are made from—wood and metal—affect sound as well.

"This was our first year doing this. They seemed to really enjoy the unit. The math piece was an excellent tie-in with fractions," Bortz declares. "The trip was the culmination of everything we had talked about. They asked good questions. We also set aside some times when we were teaching together [in the science lab and the music room], so kids got the connections between the two subject areas…I had students design [tension] experiments [using rubber bands] on their own [to explore] how different variables effect pitch."

Although no formal assessment of student learning occurred, Bortz and Cooper were able to monitor students' understanding informally by how well their experiments and the pan flutes they constructed worked.

"The questions they asked on the field trip showed their understanding as well," Bortz notes. Saying he will "definitely" repeat the unit, Bortz adds, "The practical application of fractions was really valuable. The integration of math, science, and music is really important. We did a lot of planning and discussion, trying things out on our own beforehand."

At Madison Camelview Elementary School in Phoenix, Arizona, Jessie McKinley, K–4 general music instructor, tries to coordinate his unit on the different groups of instruments with the third-grade teachers' unit on the science of sound and a field trip to Phoenix's Musical Instrument Museum.

Noting the classroom teachers use Full Option Science System (FOSS) kits, McKinley says the coordinated lessons allow students to "learn concepts better when there is application in the music room. I have couple [of] instruments they can use, put their hands on, [feel the vibration going through the instrument]: They can see how rubbing strings [and changing finger placement] make higher or lower sounds." The classroom teachers have told him that students had a better understanding of the concepts after seeing them in action in the music room.

"I felt like having students learn how music works and understand the deeper science of sound has made them not only more interested in music and sound, but [also] made them want to

learn more and understand the concepts a bit easier," notes Camelview third-grade teacher Brianne Pearson. "It was helpful going to the Musical Instrument Museum, where they could take what they learned in the classroom and really go deeper with it."

Symphony in School

In 2012, The Phoenix Symphony launched the Mind Over Music (MOM) pilot to introduce arts as supportive of curriculum at schools that don't have an arts curriculum.

"When I came on board the symphony, it was obvious the symphony needed to align our needs with the needs of the community we serve," acknowledges Jim Ward, president and CEO of The Phoenix Symphony. As part of that realignment, the symphony set goals that include helping educate "the next generation of the creative workforce" in Arizona. "In education, we want to address the great need the workforce has for STEM [science, technology, engineering, and mathematics] and STEAM [science, technology, engineering, art, and mathematics] education," he explains.

William T. Machan School joined MOM last year. "We were already, as a school, thinking about STEM," declares Principal Julie Frost. "We knew we wanted to add art, make it a STEAM school. As a Title I school, our students and parents do not have much opportunity to see [a symphony]…It's a win-win for us. All the lessons are directly tied to things we are already doing on campus."

Machan School is now in its second year of participating in MOM. "We started with a limited number of classrooms last year, and it's all K–4 this year," Frost states. "We had really good growth last year in our science scores through bringing on programs like MOM."

Violist Mark Dix has been part of MOM since the launch. He has worked with teachers to incorporate music into lessons ranging from the science of sound to circuits and conductivity. "When you bring a professional musician into the classroom, there's a lot more 'electricity' in the room," Dix observes, apologizing for the pun.

In a lesson he presented with Machan fifth-grade teacher Joel Gámez, students role-played different types of circuits as they moved around the room. As long as they moved along a path that completed a circuit, Dix played his viola. If a circuit wasn't completed, he stopped. He would also adjust his tempo to reflect when a path included a conductive or resistant material by speeding up or slowing down, respectively.

Gámez, who teaches English language arts, math, science, and social studies, says the MOM lessons "helped communicate whatever was the objective for that day." He adds student engagement and scores on in-class assessments have increased in the two years he has worked with MOM musicians.

"From a teachers' point of view, this is an opportunity to learn way more about music. Working with people [from outside the school] opened up new horizons for me," Gámez asserts. "For students, it shows them how academic areas overlap and there can be more than one way to solve a problem…It opens up their horizons, too. Not all of them may become musicians, but I tell them if they stay with something long enough, [and] practice, they will become quite proficient."

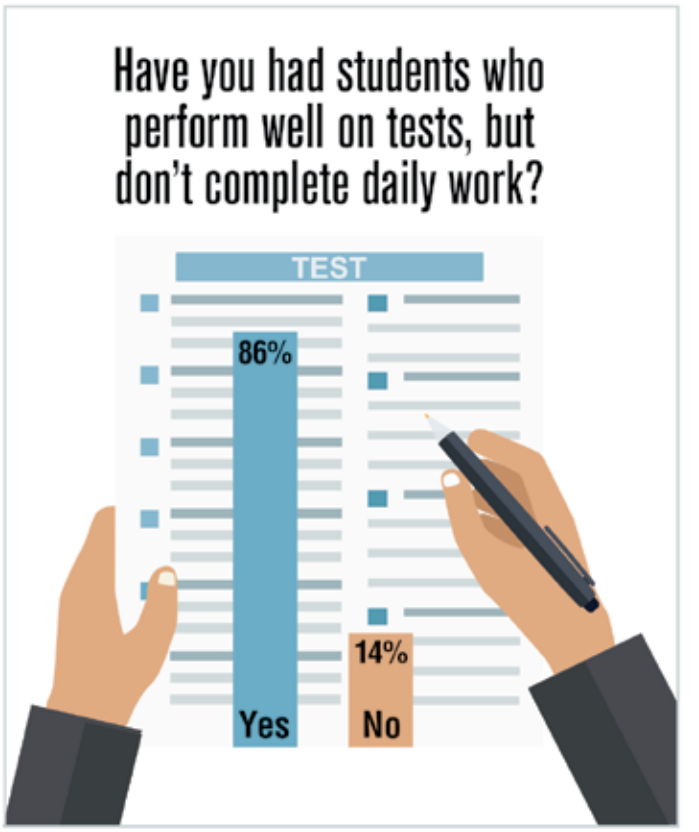
With six schools participating in MOM this year and plans to expand the program to 20 schools next year, Ward hopes the program will eventually reach beyond Arizona. "We're now working to package the curriculum to help other symphonies and schools across the country" replicate MOM, he says. "Next year, we will be testing our ability to deliver the package to another school and orchestra [and have them run the program]…Once we work the kinks out of that, it will be available nationally."●

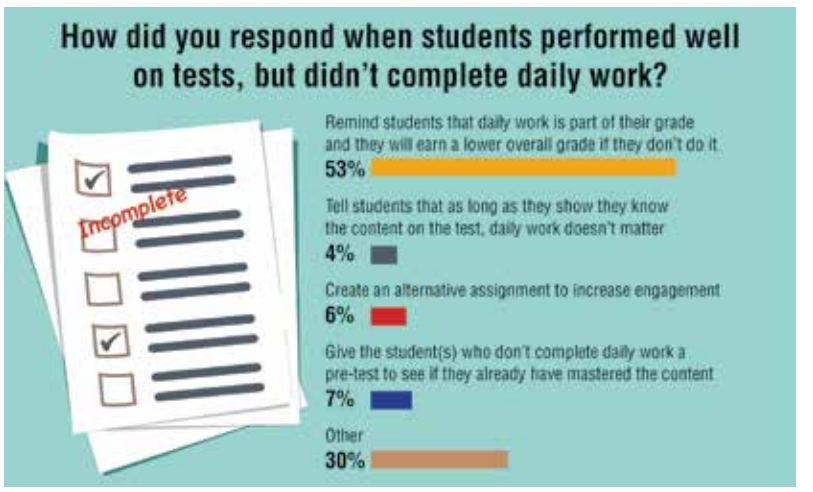
The Impact of Daily Work

NSTA Reports recently asked science educators whether they include daily work when calculating students' overall grades. Eighty-six percent of participants in the informal survey said they do include daily work—whether completed in class or at home. The same number reported having had students who would perform well on tests, but didn't complete daily work.

When students perform well on tests, but don't complete daily work, 53% said they remind students that daily work is part of their grade, and they will earn a lower overall grade if they don't do it; only 7% reported giving pre-tests to assess content mastery to students who don't complete daily work, and 4% told students that as long as they demonstrate content knowledge on the test, daily work doesn't matter. Thirty percent said they employed other strategies, such as assigning detention, making exceptions for students who otherwise maintain an "A" average, notifying parents, and disqualifying those students from retaking tests.

Most (92%) said their principals share their views on daily work and its inclusion in students' overall grades.





Here's what science educators are saying about students' test performance and daily work:

There's not enough time during class for application, and it makes a positive difference.—*Educator, Middle School, Institution of Higher Learning, New York*

All daily work starts as class work and is usually too long to be completed [by] the bell, so students have homework to complete. The questions are exposure to exam questions and push them further for in-class discussions. It's crucial for students to complete part of their learning independently.—*Educator, High School, New York*

We are teaching more than content. —*Educator, High School, Minnesota*

Engagement daily helps to solidify concepts.—*Educator, High School, Virginia*

Daily work improves mental stamina and vocabulary fluency. It also provides something tests don't provide: real-world application and context. But smart kids who are good readers will score well on tests, and I won't say anything negative about that to students.—*Educator, High School, Texas*

When students have already mastered the concept, daily work can be an extension. Through differentiation, you can provide daily work to meet the students' needs.—*Educator, Middle School, Georgia*

Daily work increases students' test performance and helps in both literacy and writing skills, as well as self-discipline.—*Educator, High School, New Jersey*

Not just for students, that's also a feedback to teachers [on] *how* well/[poorly] they learn and so teachers [can] adjust their pedagogy!—*Educator, Middle School, High School, Institution of Higher Learning, Hong Kong*

Most of my students report that doing the daily work does help them to understand the lessons and with the test.—*Educator, Middle School, Virginia*

Our gradebook is under near total control by administration and district. [I assign] [d]aily required [homework] that is included in [the] gradebook. 70% tests, 20% quizzes, 10% [homework] in gradebook [is] mandated across [the] district. Addressing the question, practice is very important for most students.—*Educator, Middle School, Washington*

Practice and working through material is *important* for being prepared for the deeper-thinking kinds of [questions] on the test.—*Educator, Middle School, Washington*

Daily work shows progression toward the goal of mastery. It shows the students' day-to-day participation and progress. In almost every case, the daily work grade saves a child from a lower grade based on test scores. Our tests are mostly straight from the county office, and the daily grades show me how the kids are doing on a consistent basis. I do understand that mastery is the goal, and a student who doesn't "get it" until the test, but does "get it" for the test should not be penalized for his or her more gradual progress, but in my experience and how my classroom is structured, those "on the way grades" are important. I offer chances to redo daily work after conferencing and re-teaching...I do not think it's fair for a child's grade to be based solely on test scores. It's like if a child doesn't do well on state testing but does well the rest of the year, it's a crime for the child to be penalized because of that one poor performance.—*Educator, Elementary, Georgia*

Daily work is important because the skills in my subject require practice. Daily work builds skills, experience, and confidence.—*Educator, High School, Utah*

I think it's about class culture. You need to create an environment that makes kids feel curious and want to learn. "Daily work" is better termed "daily learning" or "daily activities." —*Educator, Middle School, Maine*

If a student already knows the material, why should [he or she] have to do busy work? Make it purposeful and challenging to promote thinking

and learning.—*Educator, Middle School, Nevada*

For some students, it is the main way that they gain the practice they need to develop the skills they need to be successful on assessments. Other students need these opportunities to get [to] be able to come to the classroom [with] the same background knowledge (in a flipped classroom) as all the other students in the class. —*Educator, Middle School, Illinois*

Daily work is repetition and practice. —*Educator, High School, West Virginia*

Assignments are an important component for learning. While insufficient, they certainly contribute to higher learning outcomes.—*Educator, Institution of Higher Learning, Alabama*

Daily work is supposed to help students master content.—*Educator, High School, Missouri*

Daily work usually serves as a jumping-off point for the day's lesson, so if they are not completing it, I feel [it] is because they do not know it and really should be paying attention and participating in the day's lesson. Less frequently it is the students [who are] unprepared for class or unmotivated, in which case they are also not performing well on tests and are a whole different animal that must be dealt with, including remediation.—*Educator, Middle School, Pennsylvania*

Daily work is like formative assessment. It helps the students gain important depth of knowledge and skills, and lets the teacher know who needs more help getting there.—*Educator, Elementary, Ohio*

Ultimately we want students to master all three dimensions of [the *Next Generation Science Standards*]. We can assess this by observing their Practices during class as well as use of [Crosscutting Concepts] and knowledge of [Disciplinary] Core Ideas. We can also use various assessments like evaluating models and written assessments. —*Educator, Middle School, California*

[Daily work is] [v]ery important and helps test performance.—*Educator, Elementary, District of Columbia*

With the exception of a few high-level students, most are not successful in mastering topics without the daily practice work.—*Educator, Middle School, Washington* ●

Quotable

Learning never exhausts the mind.

—Leonardo da Vinci, Italian artist and inventor (1452–1519)

Young Chemists Make and Sell Cosmetics

As part of Csilla Koppany's project-based learning unit called What's on Your Bathroom Shelf, her eighth-grade physical science students at Imperial Middle School in La Habra, California, used chemistry to make cosmetics, then sold them at a "cosmetics convention." "Students can identify with real-world applications of chemistry like cosmetics—particularly middle school students, who are all about appearances and looking and smelling good," says Koppany.

To create this unit, Koppany spoke with staff chemists from local cosmetic companies and researched laws related to cosmetics. "I wanted to make it authentic so students could do tests such as boiling point, pH, and acidity. I looked at formulations that could be replicated in class," she maintains. She decided fragrances and body care products, such as soaps, lotions, and lip balm, would work best.

Koppany's students created vegan, organic products to ensure safety and ease of testing. She also had parents sign permission slips and disclose whether their children had any allergies.

To obtain supplies, "I used social media to get [funding], and…friends working in [fashion and beauty companies]" donated supplies like essential oils, she relates. Koppany says she first had students "bring in their favorite products, examine the ingredients, and see what they like." Students then formed teams of "cosmetic companies" to research and develop products.

Nearly all products failed initial tests. Koppany required students to test their products on themselves; some students came to class with "greasy-looking hair" after a first shampoo test, she recalls. About three rounds of testing were required to ensure products could be sold.

Students "really enjoyed the marketing part: packaging their products…, educating the community about recyclable items and the environment, repurposing the containers," she contends. Students created product brochures and ad campaigns in their English classes; some students created product websites and videos.

"We collaborated with the math teachers because I wanted students to understand profit and loss. They did a budget…and earned math credit for it," she relates. She also had teams sign contracts stating that every team member would receive the same amount of money from sales.

At the convention, cosmetic company scientists judged the products. "They asked real chemistry questions…It was an opportunity for my students to be critiqued by experts," Koppany points out.

Some teams' products sold out at the convention. "My students made quite a bit of money," she reports.

'Try, Fail, Try Again'

Wicked Soap Company was "student-inspired," says Matt Martin, 10th-grade chemistry teacher at High Tech High Media Arts School in San Diego, California. In 2014, a student suggested making soap with sodium hydroxide (lye), and "we tried it as a class…The first time was kind of a disaster, but we used the iterative engineering design process and compared ingredients and techniques to see what worked," he relates. Eventually, they developed the right formula, and in 2015, with Martin's encouragement, launched Wicked Soap Company.

Because lye is caustic, Martin says his "front-end instruction is about lye and lab safety, [using] gloves, goggles, the eyewash station, the fume hood. Then they figure out how to make soap. I want them to explore; try, fail, and try again. It's all about the engineering design process; that's what will prepare them for the future."

He covers "the major chemistry topics: chemical reactions, neutralization, the pH scale, acids and bases, and thermochemistry—the heat capacity of essential oils versus the lye solution," he reports. Students with allergies complete an alternative assignment away from the lab.

Martin launched the business with funding from Real World Scholars (RWS; *www.realworldscholars.org*), a nonprofit that supports teachers integrating instruction with a real-world

MIGUEL VASQUEZ

Csilla Koppany's eighth-grade physical science students at Imperial Middle School in La Habra, California, made cosmetics using chemistry, then sold them at a "cosmetics convention."

business. "Now we make enough to cover our costs and reinvest in the business," as well as to annually provide a scholarship to students and donate funds and soap to charities, he reports.

Wicked Soap Company "is a background project that runs continuously as we do different projects throughout the year," he notes. Besides his regular classroom duties, "there are hundreds of supplies to order and restock, and I'm online weekends and evenings, selling with my students," he explains. But "it's absolutely worth it…There's been the most student engagement I've ever seen in 15 years of teaching."

Lori McLain, former engineering and technology teacher at Oasis Middle School in Cape Coral, Florida, heard about Wicked Soap Company and met RWS staff last year at an Alliance for Excellent Education conference at High Tech High in San Diego. With RWS funding, McLain and her seventh and eighth graders founded Iguana Essentials, a bath and body products business. "My engineering curriculum is very project-based and student-driven," she observes. "I covered density, solutions and solvents, heating temperatures, proportions. I tried to make connections with other disciplines so that my kids could apply their knowledge in a real-world situation."

McLain says she dealt with safety issues and allergic reactions by "using a base [for the products] that was already [Food and Drug Administration]–approved…My students all wore vinyl or latex-free gloves, hairnets, and safety goggles, and they had to sign a safety contract." RWS also required students and parents to sign similar documents.

"My students collected a lot of data [from other students and adults] about the products. They were continuously doing research," she notes.

Students learned about the manufacturing process and quality control. They chose a Chief Executive Officer (CEO) for each quarter, and Team Leads to report to CEOs. "If any of them got behind, they showed up after school to work," she relates.

McLain ordered the supplies. "It was hard to keep up with the orders because [my students] were so efficient," she maintains. But when six students "wasted 23 pounds of materials and only produced six [unusable] bath bombs," they "were fired…It was a huge lesson for all of the kids in the company and helped each of them better understand the [risks involved in] owning a business," she recalls.

Most of the teams were successful. "We sold more than $200 an hour during our first event," she reports. "My students were good [salespeople]…But most of all, they had fun!" ●

PULL-OUT SECTION

SCIENCE TEACHERS' GRAB BAG

Inside this Convenient Pull-Out Section you will find: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News Bits page G3


What's New page G4


In Your Pocket page G6


Summer Programs page G8

Freebies for Science Teachers

Science Notebook Corner. **K12** With video-based instruction, examples of student notebooks, and ready-to-use materials, this toolkit from the California Academy of Sciences presents everything educators need to know about using science notebooks with K–12 students. Topics address Setting Up Your Science Notebook, Strategies for Investigation (e.g., using notebooks in hands-on science explorations), Strategies for Notetaking (e.g., concept maps, active reading strategies, brainstorming tips, and other ideas to support students as they make meaning from science explorations), and Strategies for Reflection (e.g., ideas for using notebooks to help students recognize their own learning). The videos and notebook examples were created in upper-elementary classrooms, but the strategies and activities presented can be adapted for use with any level. Visit *https://goo.gl/n79WA9*.

Find Grant Funding for Free! **K12** Demystify the process of grantseeking with a short e-book written by Connecticut-based educator and researcher Ashley Pereira. The book presents practical information for K–12 educators and others seeking funding for their school or educational nonprofit organization, addressing topics such as What is a grant? Who gives grants? How do I identify appropriate donors? How do I find available grants? What are the next steps?

Each chapter includes links and breaks down the process into easy-to-follow, customizable steps. Download the book at *https://goo.gl/LMQ4qK*.


AMCAJA

Discover Ag Careers Kit. **M** Appropriate for use in both formal and informal education settings, the curriculum for grades 6–8 walks students through careers in the agricultural industry in nine focus areas: Agribusiness Systems, Agricultural Education, Animals Systems, Biotechnology Systems, Environmental Service Systems, Food Products and Processing Systems, Natural Resource Systems, Plant Systems, and Power, Structural, and Technical Systems. Each focus area has standards-based lesson plans and follow-up activities to introduce students to multiple career options within that field. Refer to *https://goo.gl/xc8VIh*.

STEM Ecosystems Initiative. **K12** This national effort is dedicated to improving science, technology, engineering, and math (STEM) education through cross-sector collaborations among schools/teachers, out-of-school time programs, museums, science centers, higher education, professional associations, the private sector, community-based organizations, and youth and families. As STEM Ecosystems evolve, students can connect what they learn in and out of school with real-world learning opportunities, potentially leading to STEM-related careers and opportunities. Learn more about the initiative, and access a blog, research reports, videos, newsletters, and other related materials—including the necessary steps for (and benefits of) starting a STEM Learning Ecosystem in your community—at *https://goo.gl/Rp1vjd*.

***JOIDES Resolution* E-Books.** **E** Help elementary students (grades 1–5) learn how scientists study the ocean floor with two interactive e-books from JOIDESResolution.org. Colorfully illustrated and written in rhyming verse, *Where Wild Microbes Grow* explores the world beneath the seafloor and the microscopic creatures found there that may help us find life on other planets. Similarly written and illustrated, *Uncovering Earth's Secrets: Science and Adventure on the* JOIDES Resolution describes the process of ocean drilling and what scientists can learn about volcanoes, earthquakes, and the extinction of the dinosaurs from examining core samples. The books are available in PDF format or as iBooks in iTunes; the iBook versions include interactive features, such as text, images, and pop-up videos. Access the books and accompanying lesson plans at *https://goo.gl/3R1cPb*.

Science and Technology Research News. **HE** On this website, you'll find science news and updates from leading research universities, government labs, and innovative companies worldwide. The site is designed to help college students and faculty in STEM fields stay up-to-date on new developments in their area of study. Browse the content by area of interest—Academia, Cool Science, Electronics, Energy, Environment, Government, Human Health, Industry, Institutes, Materials, and Transportation—or click on the site's rolling headlines to access trending information in various fields. See *https://goo.gl/rxsjID*.

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Freebies, From pg G1

Siemens STEM Day. K12 Boost K–12 STEM curriculum and energize classroom instruction with the activities and resources on *https://goo.gl/Cuxc20*. Developed by the Siemens Foundation and Discovery Education, the site presents more than 130 low-cost, high-engagement STEM activities targeted primarily for elementary and middle levels. Evaluate the effectiveness of different parachute designs in Geronimo, or find the best method to clean up a simulated oil spill in Oil Spill Cleanup (elementary). Create a weather station in How's the Weather? or produce different chemical reactions with yeast in It's a Gas (middle level). Test artificial urine samples for the presence of glucose and protein to determine if a patient has kidney disease or diabetes in Urinalysis (high school).

Other resources on the site include Five-Minute Refreshers, which review commonly taught science topics in K–8 classrooms, and the Possibility Grant Sweepstakes, which offers a $10,000 prize to advance STEM at your school (deadline **April 28**).

NASA

Martians of Tomorrow. E M Targeted for grades 5–8, the Challenger Center's Martians of Tomorrow STEM Awareness Campaign aims to inspire the next generation of Mars exploration and involve students in a simulated space-themed mission, Expedition Mars. Take a quiz to find out what role—communications, navigation, biology, robotics, geology, life support, medical, rover, or weather—students are best suited for on an expedition team, then access appropriate lessons and activities for each interest. For example, members of the geology, robotics, and rover teams explore the challenges of using rovers on Mars in Rover Races, while members of the weather team explore similarities and differences between the planets' weather in Earth vs. Mars. Find additional activities and learn more at *https://goo.gl/z2MhMc*.

Boeing Activities. K12 Looking for classroom activities with a STEM focus? Boeing engineers and partners (e.g., PBS Learning Media, Teaching Channel, Curiosity Machine, and others) have developed lesson plans, documentaries, and hands-on activities that break down complicated concepts into easy-to-understand content for K–12 audiences. Sample activities include challenges to engineer an airfoil, find alternative energy sources, and design their own satellite. The resources address a range of topics from the history of aviation to engineering design, but all aim to help students learn to think critically, collaborate, and communicate effectively. Consult *https://goo.gl/wRgmZm*.

Resources for Educators Using Data. K12 HE Education Development Center's Oceans of Data Institute (ODI) has compiled a collection of resources for K–college educators teaching with data in the classroom. Available at *https://goo.gl/Vf9Dqn*, the annotated list includes ODI-created content as well as content produced by other science organizations and associations. Notable resources include ODI's Ocean Tracks learning modules (versioned for high school and for college levels), which simplify the processes of accessing and analyzing data so students can focus on making meaning from the data, and the Common Online Data Analysis Platform (CODAP), for grades 6–12, which can be used with various data types and curricula and teaches students how to visualize and interpret data and make evidence-based claims from it.

Blue Apprentice Elementary Science Game. E M Designed for students ages 6–12 (grades 1–6), this intergalactic, story-driven game follows the adventures of young scientist Thalo and his alien friend Grit as they explore alien worlds and apply science learning to solve problems throughout the galaxy on their quest to release the galaxy from the evil reign of King Dullard. The game's content supports the *Next Generation Science Standards* and encourages mastery of elementary science concepts in several disciplines (e.g., physical sciences, Earth and space science, life science, engineering and technology), making it a useful tool for classroom science centers or independent learning stations. Visit *https://goo.gl/xBFywP* to play the game and learn more.

HANNES GROBE

Chemical Laboratory Safety Guides. E H HE The American Chemical Society has published new guidelines for chemical laboratory safety in high schools and in colleges and universities. The documents—Guidelines for Chemical Laboratory Safety in Secondary Schools and Guidelines for Chemical Laboratory Safety in Academic Institutions—are organized around four principles of laboratory safety: Recognize the hazard, Assess the risk of the hazard, Minimize the risk of the hazard, and Prepare for emergencies (RAMP). Of particular interest are student learning outcome statements, which clearly identify the chemical safety knowledge, skills, attitudes, and competencies students are expected to acquire as they progress through their education. Access both documents at *https://goo.gl/JQIZ0M*. (Safety in the Elementary Science Classroom also appears on the page.)

Cricket Media. P E M Looking for ways to foster elementary and middle level students' science curiosity and stock the classroom library with kid-friendly, interesting nonfiction reading material? At *https://goo.gl/h8gXla*, you can read sample issues of the science-based magazines from Cricket Media. *Click* (ages 3–6) introduces young students to science, art, nature, and environmental issues; the sample issue explores the theme "Desert Discoveries." *Ask* (ages 6–9) focuses on the arts and sciences; the sample issue, themed "Meet Your Brain," features articles, cartoons, games, and contests exploring why we get headaches, how our memory works, and more. *Muse* (ages 9–14) presents science and art content along with offbeat jokes and humor; the sample issue, themed "Thinking Different," features teens discussing autism and Shari Tishman, a "thinking researcher" whose work explores how humans can become better thinkers.

Astronomy@OpenStax. HE An introductory astronomy textbook for the college level is available on OpenStax, a nonprofit publishing project at Rice University that provides free electronic versions of open-source textbooks to students and instructors. The textbook presents astronomy basics and current topics such as the results from the New Horizons exploration of Pluto, the classification of exoplanets from Kepler, and the discovery of gravitational waves. Math boxes throughout the book highlight the quantitative aspects of each topic, and each chapter includes collaborative group activities, links to web resources, biographies of astronomers, and interdisciplinary connections.

Click on the orange "Share and Explore" button to go to an Open Educational Resources Hub, where the authors and adopters are sharing course materials and resources. The Hub already has a list of free short videos on the web to accompany each chapter, a guide to free lab exercises for introductory astronomy, a sample syllabus, and more.

Because the textbook is open source, it can easily be updated electronically; professors can use the book as is, or create their own electronic version of it, selecting the sections they teach and adding course-specific curriculum materials. See the website *https://goo.gl/pUQmJP*.●

News Bits

- **How can university instructors facilitate active learning in science, technology, engineering, and math (STEM) courses with hundreds of undergraduates? In a new University of Virginia (UVA) program, professors can hire undergraduate learning assistants to help with small-group work.** **HE**

Undergraduates who already have taken the courses will qualify. Learning assistants will use guided inquiry with students, but not provide answers. The program is part of a two-year grant from the Association of American Universities.

"Th[is] funding will allow us to implement a teaching practice proven by research to be effective in STEM education," says Michael Palmer, director of UVA's Center for Teaching Excellence. Other universities using this approach have shown gains for both the students in the course and the learning assistants, he adds. Fewer students drop the classes with learning assistants, and the learning assistants can reinforce their own knowledge while working with their peers.

Read more at *http://goo.gl/353JgK*.

- **If Ohio Governor John Kasich's new budget proposal is approved, Ohio teachers might have to do an "externship" to renew their teaching licenses.** **K12**

His proposal would require teachers to "complete an on-site work experience with a local business or chamber of commerce" starting in September 2018. The experience would count toward teachers' continuing education credits, which are required for renewal every five years.

According to Ryan Burgess, director of Ohio's Office of Workforce Transformation, the proposal stems from a workforce board the governor convened last year to help the state better prepare its citizens for the job market. Ohio business owners complain that workers lack the skills needed for the workplace, Burgess says, and many students think they have to go elsewhere to find work. "They simply don't know good jobs exist [here]," Burgess told the *Dayton Business Journal*. "This is one way to better understand."

But the Ohio Education Association disagrees. "Teachers are always eager to grow professionally, and we agree it is important to find ways to incorporate job skills in and information about careers in the classroom," Becky Higgins, the union's president, told Cleveland.com. "However, working in an outside business is unnecessary, and we oppose this as a condition of being licensed to teach."

Under the proposal, the Ohio Board of Education would set the parameters, local professional development communities would decide which jobs are appropriate for which teachers, and local chambers would connect teachers with local businesses. Read more at *http://goo.gl/6bkYje*.

- **Stanford University researchers have developed a nanostraw so tiny that it can be used to sample cells without damaging them.** **A**

The nanostraw is 600 times smaller than a strand of hair and allows users to penetrate a single cell's outer membrane—without rupturing it—to extract material. Nicholas Melosh, an associate professor of materials science and engineering at Stanford, says he hopes the new nanostraw can help scientists better understand cell development, leading to improved treatments for diseases like cancer.

Visit *http://goo.gl/3PsmFx* to learn more. ●

What's New

FROM U.S. GOVERNMENT SOURCES

U.S. Food and Drug Administration (FDA)

Nutrition Fact Label Resources K12

The FDA's Center for Food Safety and Applied Nutrition (CFSAN) has interactives, fact sheets, multimedia materials, and other educational resources in both English and Spanish to help K–12 educators and others understand Nutrition Fact labels and use them to make healthier food choices. Explore a clickable interactive about the Nutrition Facts label, play virtual games to practice label reading and develop skills for making healthy snack choices in the real world, and access printable fact sheets on Gluten and Food Labeling, Sodium, and other topics.

In addition, the CFSAN's Education Resource Library contains more resources available in both English and Spanish. Visit *https://goo.gl/AB5A9b.*

National Aeronautics and Space Administration (NASA)

GLOBE Observer App A

To contribute to NASA's studies of our home planet, all you need is a smartphone, access to the outdoors, and the Global Learning and Observations to Benefit the Environment (GLOBE) Observer app. Using the app—which is available for both iOS and Android platforms—students of all ages can become citizen scientists participating in the GLOBE program. By submitting regular observations, students are helping scientists track changes in clouds, water, and plants and other life in support of climate research. Scientists use the submitted data from citizen scientists to verify NASA satellite data.

The app includes tutorials on how to collect data as well as additional information on observation techniques, clouds, and more. Read a press release and access the app at *https://goo.gl/I1WLlQ.*

Easy Ways to Find NASA's Education Materials P K12

Are you looking for NASA resources to incorporate into your curriculum? Check out the recently updated digital flier, "Easy Ways to Get NASA Education Materials," to access links to NASA resources and databases in a single location. Use NASA's Educational Resource Search Tool to find lesson plans, posters, educator guides, and other materials to boost your science, technology, engineering, and math (STEM) curriculum, or browse NASA educational content organized alphabetically by target user (e.g., teacher/student), resource (lessons, guides, posters), or grade level.

Teachers can also find links to NASA Education's multimedia resources and social media channels, as well as links to NASA Opportunities (webinars, competitions, and more). Refer to *https://goo.gl/JuylA8* and *https://goo.gl/biEHWI.*

GOES-R Weather Satellite E M

The GOES-16 (Geostationary Operational Environmental Satellite), launched in 2016, is the first weather satellite in the GOES-R series from NASA and National Oceanic and Atmospheric Administration (NOAA). Orbiting 22,000 miles above Earth, GOES-16 can see amazing details of weather on Earth and will be useful for identifying hurricane, tornado, and flood warnings. At *http://scijinks.gov/goes-r,* teachers can access videos, posters, comics, games, and information to help elementary and middle level audiences learn more about the weather satellite and what it can do.

U.S. Geological Survey (USGS)

Rock n' On Shakey Ground M

Targeted for students in grades 6–8, this activity from the USGS Earthquake Hazards Program provides a brief overview of what earthquakes are, what causes them and where they occur, why the Earth shakes, and how earthquakes are recorded, measured, and located. The material includes vocabulary, diagrams, and a few simple activities. Refer to *https://goo.gl/xeRny3.*

Who Dunit? and the Law of Superposition M

Another middle level activity from the USGS Earthquake Hazards Program helps students understand the Law of Superposition (older layers of the Earth on bottom) and lets students use their skills to solve a geological mystery. Consult *https://goo.gl/0OyGiV.*

National Oceanic and Atmospheric Administration (NOAA)

Just Jelly H

In this lesson from NOAA's Expedition Education Module, The Hidden Ocean 2016: Chukchi Borderlands, high school students compare and contrast the feeding strategies of at least three different types of gelatinous zooplankton; explain why gelatinous zooplankton may function at several trophic levels within a marine food web; and given data on the vertical distribution of temperature in a water column, make inferences about potential influences on the distribution of planktonic species in the water column. Found at *https://goo.gl/08Mvw4,* the lesson plan includes keywords, background information, learning procedures, assessments, extensions, links to other relevant lessons from NOAA's Ocean Exploration Program, connections to learning standards and ocean literacy principles, and student worksheets.

National Severe Storms Laboratory's Learning Resources for Students E M

The National Severe Storms Laboratory (NSSL) has resources, activities, games, and links to teach elementary and middle level students about staying safe in severe weather such as tornadoes, hurricanes, floods, lightning, and winter storms. In addition to Owlie Skywarn coloring sheets, teachers can find Weather Friend trading cards, instructions for How to Make a Weather Satellite, and a safety tips worksheet to help students Prepare for a Storm. Find these resources and more at *https://goo.gl/9qCLJn.*

Exploring National Marine Sanctuaries M

Introduce middle level students (grades 6–8) to the national marine sanctuaries in the Pacific and Atlantic oceans and off the coast of American Samoa. The sanctuaries include breeding and feeding grounds of whales, sea lions, sharks, and sea turtles; significant coral reefs and kelp forest habitats; and the remains of the *U.S.S. Monitor,* a Civil War ship that sank off the coast of North Carolina.

In studying the biodiversity, ecology, and cultural legacy of these marine sanctuaries, students can begin to understand the interdependence of living things on our planet and its importance. Find the lesson plan, student worksheets, and a sanctuary system map at the website *https://goo.gl/QSwhr7.*

U.S. Department of Energy (DOE)

The Harnessed Atom M

This middle school STEM curriculum extension focuses on nuclear science and energy. Teachers will find accurate, unbiased, and current information on the roles that energy and nuclear science play in our lives. The curriculum includes essential principles and fundamental concepts of energy science. This teacher's kit was developed with input from classroom teachers nationwide in pilot test reviews and workshops, as well as

technical reviews from scientists and experts at universities, professional societies, and national laboratories.

The kit features lesson plans, experiments, and interactive games and provides information on careers in nuclear science, energy research, and production. At *https://goo.gl/2Ra9KK,* teachers will find a student edition, a teacher's guide with lesson plans, standards, instructor notes, interactive games, classroom activities, laboratory experiments, and outside resource suggestions.

Powering a Classroom With Solar Energy E

In this video, fourth graders in Durham, North Carolina, discover the benefits of clean energy. Aaron Sebens, a teacher at Central Park School for Children, taught his fourth graders about solar and other energy sources. The students then decided to make their classroom solar-powered. The video depicts the students' journey from idea to reality, concluding with a celebration during which Sebens and his students officially "flip-the-switch" on their solar-powered classroom. Find out how the class raised more than $5,000 for the project by viewing the video at *https://goo.gl/yl2bux.*

Energy Talks: Lowering Energy Usage in Schools H

In this YouTube video, a DOE project officer speaks to high school students about efforts to lower the energy usage of their school buildings. Watch the video at *https://goo.gl/vTtUwI.*

The DOE's EnergyTalks presentations provide in-depth explanations of programs by energy specialists. Check out other videos in the series at *https://goo.gl/e5AkVS.*

Get Current Coloring and Activity Books P K12

The *Get Current* coloring book (see *https://goo.gl/WYXGtV*) engages preschool and kindergarten children with energy. The coloring book introduces renewable energy sources and takes the student through solar, wind, water, hydropower, bioenergy, and geothermal before demonstrating ways to improve energy efficiency, like plug-in electric vehicles. The activity book (see *https://goo.gl/1qGKMi*) is for middle level and high school students and includes crosswords, word games, math puzzles, and more challenging ways to help students, learn, understand, and internalize the principles of energy literacy, energy efficiency, and renewable energy.

U.S. Environmental Protection Agency (EPA)

Science Fair Fun: Designing Environmental Science Projects M

This online booklet for students in grades 6–8 is a step-by-step guide to designing a successful and meaningful science fair project that focuses on the 3Rs of waste management: reduce, reuse, and recycle. The booklet guides readers through a project from start to finish and includes helpful checklists such as What the Judges Look For and What Makes a Good Science Fair Project? With this resource, students' science fair projects can send a clear message showing how the 3Rs lead to resource conservation. Consult *https://goo.gl/qUpEhz.*

Biomagnification Role Play E M

Written for grades 4–8, this role-play activity from EPA helps students understand how polluted waters affect the food chain and how fish become contaminated—and thus unsafe to eat—as pollutants (e.g., chemicals such as polychlorinated biphenyls or PCBs) accumulate up the food chain. In the role play, the classroom is New Bedford Harbor, and students are the animals that live there. Students model the food chain, consuming increasing numbers of PCBs with each organism eaten. Access the lesson, which includes procedures and questions to assess understanding, at the website *https://goo.gl/maj14g.* ●

P: PreK E: Elementary M: Middle H: High HE: Higher Ed A: All K12: K–12

In Your Pocket

Editor's Note

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

April 30

Frontier Communications Cybersecurity Grant K12 HE

This $1,000 grant goes to one teacher who can explain, via essay or video, what he or she has learned about cybersecurity and how he or she applies this in the classroom. Teachers write a 300- to 500-word essay or create a one- to two-minute video explaining how they're learning about and using cybersecurity to help protect their students. The awardee will receive a Visa Reward Card to be used for tech equipment or supplies for his or her classroom.

Apply by **April 30.** K–12 teachers and professors at two- and four-year universities can do so online at *http://goo.gl/F0vYnY.*

SeaWorld Environmental Excellence Awards A

These awards recognize students, teachers, researchers, and other individuals working at the grassroots level to protect and preserve the environment. The organization funds work in four major areas: conservation education, species research, habitat protection, and animal rescue and rehabilitation.

Apply by **April 30.** For more information, consult *http://goo.gl/kIgY7q.*

The Lawrence Foundation Grants P K12

The foundation provides grants to organizations that support education, the environment, human services, and other causes. Public schools, nonprofit organizations, and libraries may apply. Both program and operating grants are available. The average grant amount ranges from $1,000 to $5,000.

Apply by **April 30.** Refer to *https://goo.gl/tizV0U.*

Voya Unsung Heroes Grants K12

Each year, Voya Financial selects 100 educators with innovative project ideas to receive $2,000 toward their classroom projects. Projects should be creative and positively influence students. At least one grant is awarded in each of the 50 states. The top three winners will receive additional prizes of $25,000 (first place), $10,000 (second place), and $5,000 (third place).

Full-time teachers, paraprofessionals, principals, or classified staff at accredited K–12 schools are eligible. Apply by **April 30** at *http://goo.gl/0RXngP.*

May 1–15

The Leavey Awards K12 HE

Sponsored by the Freedoms Foundation and the Thomas and Dorothy Leavey Foundation, these awards 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 2016–2017 academic year.

Nominations must be postmarked by **May 1;** consult *https://goo.gl/BK1Po0.*

Dreyfus Foundation Educational Grants K12

The Max and Victoria Dreyfus Foundation provides grants of between $1,000 and $20,000 to community-based nonprofit programs in the United States. Schools; museums; educational and skills training programs; environmental and wildlife protection activities; cultural and performing arts programs; and programs for youth, seniors, and the handicapped may apply. Proof of 501(c) (3) status is required.

Applications must be postmarked by **May 10.** Refer to *https://goo.gl/5XKKmo.*

Kinder Morgan Foundation Education Grants K12

The foundation provides grants of between $1,000 and $5,000 to education programs for K–12 youth in communities where Kinder Morgan operates in the United States and Canada. Public and private schools and nonprofit organizations with academic programs, including tutoring, and arts education programs are eligible.

Apply by **May 10.** To learn more and find out which communities are eligible, see *http://goo.gl/SEblfF.*

Award for Excellence in Polymer Education by High School and Middle School Teachers M H

Presented by the University of Wisconsin-Stevens Point's POLYED, this award recognizes excellence in polymer education at the middle and high school levels. The honoree receives $1,000 and an all-expenses-paid trip to the NSTA National Conference on Science Education, where he or she will interact with a Polymer Ambassador. Apply by **May 15** at *http://goo.gl/e8Zy2j.*

May 18–June 1

Dollar General Literacy Foundation Youth Literacy Grants P K12

These grants go to schools, public libraries, and nonprofit organizations that help students who are reading below grade level or have trouble reading. Grants of up to $4,000 can be used to start or expand a literacy program, or purchase new technology, equipment, books, materials, or software to support literacy programs or initiatives. Apply by **May 18** at *http://goo.gl/qIofdG.*

ASM's Living in a Material World Grants K12

The ASM Materials Education Foundation provides these grants to help K–12 teachers bring the world of materials science into their classrooms. Funds should help teachers raise awareness of the field and the role of materials scientists in society.

Twenty $500 grants are available. Applicants can contact local ASM members to help them develop innovative projects. Apply by **May 25;** see *http://goo.gl/J4So2e.*

SPIE Education Outreach Grants K12 HE

SPIE, the international society for optics and photonics, provides these grants for optics- and photonics-related education outreach projects. Schools, youth clubs, universities, science centers, optics centers, industry associations, and optical societies are eligible for grants of up to $5,000. Projects are judged by their potential to impact students and increase optics and photonics awareness. Apply by **May 31;** consult *http://goo.gl/g0S4WU.*

Pathways Within Roads to Reading Initiative P K12

This initiative provides new books for circulation and story time in underserved communities. Public and private schools and their libraries, after-school programs, nonprofit organizations, community centers, daycare centers, and licensed in-home daycare facilities are eligible; preference is given to those that provide remedial reading instruction and have been operating for at least six months.

Visit *http://goo.gl/SSfv9l* for details. E-mail applications by **June 1** to *bookdonations@pwirtr.org.*

Professor Chan Two-Year College Award for the Engaged Teaching of Biology HE

This National Association of Biology Teachers (NABT) award goes to a two-year college faculty member

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who has successfully developed and demonstrated an innovative, hands-on approach to teaching biology and has shared his or her commitment with the wider community. The awardee receives $500 worth of Vernier equipment, a complimentary one-year NABT membership, and $500 for travel to the NABT Professional Development Conference, at which he or she will receive a plaque.

Nominate yourself or a colleague by **June 1** at *http://goo.gl/QEvuIn*.

Entomological Society of America's President's Prizes K12

These awards go to primary and secondary teachers who use insects as educational tools. One grades K–6 and one grades 7–12 teacher will each receive $400 for his or her school to purchase the materials needed to expand the use of insects in the curriculum. Each awardee will also receive $400 to present a paper or poster on his or her use of insects in the classroom at a peer professional venue of their choosing, and free registration and $800 in travel expenses to help them attend the society's Annual Meeting, at which the honorees present a lesson.

Nominate yourself or a colleague for these awards by **June 1.** For more details, visit *http://goo.gl/PPL9nn*.

Apply Year-Round

Bridgestone Educational Grants P K12

Educational grants from the Bridgestone Americas Trust Fund are given on a national basis, with emphasis on areas of company operations. The Trust Fund focuses on organizations with missions supporting education, the environment and conservation, and children's programs. The average amount grantees receive is between $1,000 and $25,000.

The grants cover these program areas: Science/Environmental; Science, Technology, Engineering, and Math (STEM); Math; Reading; Social Studies; After-School; Arts; General Education; At-Risk/Character; and Facilities Maintenance. Learn more and apply at *https://goo.gl/zaBi8p*.

VWR Foundation Grants K12 HE

The foundation provides grants to schools supporting grades K–12 for STEM programs that go beyond the textbook (not funded through government or tuition dollars), scholarships for students attending science-related camps, or grant programs to provide training for science teachers. Dollars can be applied to support the purchase of supplies and equipment or for scholarships to cover the cost of the programs for students. At the college/university level, dollars can be applied to science-related programs including scholarships, equipment, and products. In addition, science-related institutions (e.g., science museums) can apply for grants that help further science education.

Applications submitted to the VWR Foundation will be reviewed on a quarterly basis. Learn more at *https://goo.gl/btFg9i*.

The Awesome Foundation Grant A

This foundation funds projects that bring communities together. Awesome ideas "spark an instant of joy and delight and inspire a long-term hope for a more awesome future." Some chapters also routinely contact applicants for interviews before awarding the fellowships. Anyone can apply, and grants of $1,000 are distributed monthly.

Submissions are reviewed monthly. See *https://goo.gl/9N5KIL*. ●

P: PreK E: Elementary M: Middle H: High HE: Higher Ed A: All K12: K–12

Summer Programs

Editor's Note

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

Shelburne Farms: Project Seasons for Young Learners P

This workshop for early childhood educators takes place July 11–14 at Shelburne Farms in Vermont. Participants will explore ways to enhance their curriculum with sustainability in mind and help students make connections between the natural and agricultural worlds.

Scholarships and graduate credits are available. Submit a scholarship application by **April 29** before registering online (by **July 8**) at *http://goo.gl/BbskG2*.

Bermuda Institute of Ocean Sciences Educator Workshop M H

During this six-day workshop, offered by the Bermuda Institute of Ocean Sciences (BIOS), 12 teachers, curriculum specialists, administrators, and informal educators will learn how to plan and execute field study courses for their students at BIOS. Participants will explore coral reefs, use glider technology for ocean study, and visit Whalebone Bay, Cooper's Island, and Fort St. Catherine, among other attractions, to learn how to incorporate them in educational experiences for their students. The workshop will be held during June 26–July 1.

Preservice and inservice middle and high school educators may apply. Register by **May 1.** (Tuition must be fully paid by June 2.) Refer to *http://goo.gl/yBMMA0*.

Innovation Inspired by Nature E M H

The Center for Learning With Nature offers teacher-training workshops on its curriculum for upper-elementary, middle level, and high school teachers. This one-week online course will be offered this summer and will provide participants with example activities, free online resources, and approaches for using bio-inspiration to meet the *Next Generation Science Standards* (*NGSS*) in science, technology, engineering, and mathematics (STEM) classes. For more information, visit *http://goo.gl/5Q6Eyu* or e-mail Sam Stier at *samstier@gmail.com*. Register by **May 20.**

Introduction to Aquaponics Teacher Workshops E M

This workshop introduces K–8 teachers to aquaponics, the cultivation of plants and aquatic animals in a recirculating environment. Workshops will take place over two-and-a-half days at the Herring Gut Learning Center in Port Clyde, Maine. Teachers will use the facility's small-scale greenhouse and hatchery to learn how to integrate aquaponics in the classroom through hands-on lessons and experiments. Teachers also receive curriculum materials, continuing education credits, and an aquaponics kit, which includes a tank, filter, pumps, planting materials, and a manual, to take back to their classrooms.

Two sessions are available: June 27–29 and July 11–13. Register by **May 31** at *http://goo.gl/jfwTz0*.

STEM Think Tank and Conference K12

The Center for STEM Education for Girls will host this event during July 12–14 at the Harpeth Hall School in Nashville, Tennessee. The conference aims to promote new connections and conversations about STEM among K–12 teachers, university faculty and staff, informal educators, and industry members. Those who teach or work with girls and young women in a STEM field are encouraged to attend. Register online by **May 31** at *http://goo.gl/wE6aVo*.

Life Lab: The Growing Classroom Workshop E M

In this two-day, intensive garden-based learning experience in Santa Cruz, California, K–6 teachers will learn how to incorporate gardens into their lesson plans using the *Growing Classroom* activity guide. The guide and accompanying workshop provide participants with hands-on activities that promote ecological literacy and healthy eating, while supporting the *NGSS*. Participants may earn graduate education credit.

The workshop takes place June 19–20. Register online at *http://goo.gl/sY9CaH*.

BioTeach Summer Institute H HE

This five-day residential institute, taking place July 10–14 at the University of Massachusetts at Amherst, focuses on biotechnology and molecular biology techniques and lab activities. Participants will take part in biotechnology labs, visualize molecular biology with models, identify plasmids, test genetically modified organism (GMO) foods using polymerase chain reaction (PCR), and create and identify recombinant microorganisms.

Participants should have a strong background in cell and molecular biology and modern molecular biology techniques. They will receive a $75 daily stipend and up to 67.5 professional development points (PDPs). Graduate credits are also available for a fee. Space is limited. Apply online at *http://goo.gl/CQbw6p*.

Penn State Renewable Energy Teacher Summer Workshop M H

From July 10 to 14, teachers will learn about cutting-edge bioenergy research and how to incorporate it in their classrooms. Throughout the week, teachers will talk and meet with experts and participate in inquiry-based activities at Pennsylvania State University's University Park campus. They will return to their classrooms in the fall with content, knowledge, and activities related to topics like biofuels, bioproducts, and sustainability.

Participants receive housing, meals, travel expenses, classroom materials, and a $300 stipend. Middle level and high school teachers may apply. For videos and more information about the workshop, visit *http://goo.gl/cMhBXc*. Call Matt Johnson at 814-863-6607 or e-mail *mjohnson@psu.edu* if you have questions.

The daVinci Project: Residential Summer Workshops at UConn E M H

This week-long series of hands-on workshops aims to help math, science, and technology teachers of grades 5–12 expose their students to engineering. During July 10–14, teachers will reside on the University of Connecticut campus in Storrs and focus on one of six specialization areas in engineering. They will then develop curricula and exercises to explore how we use chemistry, physics, biology, and math to solve challenging real-world problems. They will be able to use this material in their classrooms.

Fellowships are available. For more details, contact Kevin J. McLaughlin at *kjm@engr.uconn.edu,* or visit *http://goo.gl/S200fB*.

Chemistry Collaborations, Workshops, and Community of Scholars HE

Faculty at universities and colleges can attend the annual National Science Foundation–sponsored Chemistry Collaborations, Workshops, and Community of Scholars (cCWCS) workshops. cCWCS workshops provide a background and modern perspective on topics in the chemical sciences, as well as methods to introduce them into the college curriculum. Attendance at the workshops is free; accommodations, meals, and tuition are provided. (Attendees are responsible for funding their transportation to and from the workshops.)

Workshops will be held at colleges and universities across the United States throughout the summer. For more information, refer to the website *https://goo.gl/VmzCJJ*. ●

P: PreK E: Elementary M: Middle H: High HE: Higher Ed A: All K12: K–12

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NSTA PRESS: *Be a Winner! A Science Teacher's Guide to Writing Successful Grant Proposals*

Grant Proposal Components

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 Be a Winner! A Science Teacher's Guide to Writing Successful Grant Proposals, *by Patty McGinnis and Kitchka Petrova, edited for publication here. To download the full text of this chapter, go to* https://goo.gl/rFv64Z. *NSTA Press publications are available online through the NSTA Science Store at* www.nsta.org/store.

Project Description (Methods)

Teachers of science are well versed in writing the project description section, which is also often called the methods section, as it is the equivalent to the instructional part of a lesson plan. This is where you tell the funder about the strategies and activities you will use to address the identified area of need. This is your opportunity to show that you know what you are doing! You will need to write clearly and concisely, taking care to avoid terms and educational jargon that a non-educator would not understand. As you write, try to connect the passion you have for your project to student learning.

Your methods section is a great place to show how you will engage your students in science and engineering practices such as planning and carrying out investigations, analyzing and interpreting data, and engaging in scientific argumentation using evidence. Deciding on which actions you and your students will undertake as part of the project can be challenging. One benefit of being a science teacher is that there are nearly limitless investigations, projects, and community service opportunities in which to engage your students. This can be overwhelming, which is why it is important to narrow your scope and focus on your objectives. To prepare this section to best represent your project, start with re-reading your proposal's objectives. Identify learning experiences that you feel will best meet the objectives, making sure that all of them are tied directly to the identified need.

As you write your methods section, you may be tempted to add a lot of experiences or inquiries, but try to be concise and focus on the most important activities. You may also find yourself tempted to include experiences that are not age-appropriate for the involved students, but it is recommended that you carefully align the activities to the abilities of the particular classroom and students. Aiming too high in your expectations may result in mismatched pedagogy and student learning. Finally, list all the events related to achieving your objectives or goals in sequential order; they should fit together in a way that clearly supports student learning.

Although your objectives will be educationally beneficial and designed to increase student learning, it is important to note that the educational benefit does not have to be restricted to cognitive growth. You can also include methods that will address the affective domain. If your proposal involves improving science, technology, engineering, and math (STEM) experiences for minorities and girls, it would be appropriate to include goals that encompass factors such as motivation. Likewise, an environmental science project that immerses students in their community may promote interest in STEM careers or heighten awareness of environmental issues.

You can provide a rationale for all of the learning experiences in the project description section by explaining how your proposed methods meet learning objectives or other goals better than traditional methods do. Similar to the other grant components, discuss how these experiences will affect student learning, deepen conceptual understanding, and help solve a community problem. Think about how guest speakers, field trips, and special schoolwide events that you may plan can enhance your students' learning experiences and community or parent-student-school relations.

Features of a Good Project Description Section

Exhibits Strong Connections to Student Learning

When applying for a grant from any organization, it will be critical for you to link student learning to the funder's mission. Regardless of which grant you pursue, all activities need to be age-appropriate. If you are describing an activity in which you will be using equipment, focus on a particular learning experience and the inquiries that students will carry out rather than simply listing what students can do with the equipment. Some grants may require you to link student learning to a specific set of standards, and others may not. Keep this in mind if you are applying for a state or federal government grant because in that case, you may be required to connect your methods to standards.

Incorporates Science and Engineering Practices

When planning the methods you will use to meet objectives, it can be helpful to differentiate between doing an "activity" and "inquiry." Typically with an activity, the results are known ahead of time. Think of the verification labs that you may have had your students conduct in the past. Although many activities are excellent and are designed to allow students to master conceptual information, the best way to engage your students in the *Next Generation Science Standards* science and engineering practices is by developing inquiries: innovative, meaningful experiences grounded in real-world data collection or exploration. Many organizations that fund classroom grants do so for the purpose of getting students excited about science and thus tend to be impressed with those proposals based on solid science, where students are acting as scientists and addressing real-world problems using scientific ways of investigation and thinking.

Includes Partnerships

Don't be intimidated by this suggestion: Although including a community partner can be beneficial to your grant proposal, it is not mandatory. That said, partnerships can add depth and dimension to a proposal, so it is a good idea to make an effort to include experiences that involve collaboration with universities, colleges, state agencies, and local businesses. Partnerships can include mentoring opportunities within your school and your school district if other teachers and students from different grades or schools become involved in the project. Partnerships don't have to be restricted to your geographical area; you can try connecting with scientists and organizations through Twitter, Skype, or Scientists Twibes. You may also want to consider connecting with other classrooms via Edmodo, Schoology, or another online learning management system so that students can share any results with other students.

Involves an Authentic Audience

Consider having your students create a presentation, video, or paper summarizing what they have learned through participation in the project if it is funded. You will find that the students will be motivated to do a great job by the possibility of presenting their findings to an authentic audience. The element of educating others is one that is valuable and inspiring.

Important Points to Remember

- Select age-appropriate activities;
- Limit the scope of your activities;
- Incorporate student-driven inquiries rather than "activities"; and
- Connect your passion for the project to your work as a science educator.●

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

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A 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

BLICK ON FLICKS

Dream Big to Share the Creativity and Compassion of Engineers

By Jacob Clark Blickenstaff

For students interested in science, technology, engineering, and mathematics (STEM) careers, but worried that those careers might not directly improve lives, *Dream Big: Engineering Our World* can help allay those fears. This 45-minute IMAX documentary examines how engineers chose their careers and how engineering projects large and small change the lives of people they serve. From building footbridges in developing countries to creating medical devices, engineers can change reality in a way that few other professions can.

While efforts to diversify the STEM workforce are not new, recent news articles about the experiences of female engineers in major tech companies demonstrate that work is still needed in this area. The creators of *Dream Big* have chosen to highlight several female engineers from diverse backgrounds and the work they do. First, Menzer Pehlivan, a civil engineer who survived an earthquake in her native Turkey, describes how that experience made her change her career goal from becoming an actor to becoming an engineer. She now designs earthquake-resistant buildings in the Seattle area and works with kids to interest them in engineering. The film depicts a neat transition from a classroom "shake table" on which kids test their designs to a full-scale shake table on which an actual three-story demonstration building is tested.

Next we meet Avery Bang, a bridge designer who volunteers in Haiti and Central America, building footbridges in remote communities. The film shows several stages of the construction of a suspension bridge over a swift river that local residents had to wade through to get to school and a medical clinic. Drowning was a real risk and a not-infrequent occurrence. (Though the film doesn't delve into the decision, it would be a good extension question to ask why the designers chose a suspension bridge for this application.)

All the engineers profiled in the film discuss how important creativity and imagination are in designing good solutions to engineering challenges. Caring for others and making the world safer also comes up repeatedly in the film, and I think this message is important when teachers discuss STEM careers.

High school students could be inspired by two stories of underdog academic teams featured in *Dream Big*. First, a team of high school students from Houston, Mississippi, entered the World Solar Car Challenge and competed against groups from world-famous universities. Though they didn't win the race, they did set a record for the greatest distance covered by a high school team in the Solar Car Challenge. More importantly, team members learned how to work together and how to overcome seemingly impossible challenges, and a great deal about solar power technology.

The other high school team may be familiar to readers because they were featured in the book *Spare Parts*, which was then made into a film of the same name in 2015 that starred George Lopez and Marisa Tomei. In 2004, students from Carl Hayden High School in Phoenix, Arizona, entered an underwater robotics competition at University of California, Santa Barbara. The team included students who were undocumented immigrants, and they spent less than $1,000 on their robot. Despite those obstacles, they built a robot that beat teams from MIT and Stanford. Another graduate of Carl Hayden, Angelica Hernandez, is featured in the film. She is shown working with current students in the robotics program. After graduating from Arizona State University, she is pursuing an engineering career in the Phoenix area.

The film's accompanying website (*www.dreambigfilm.com/education*) is a good resource for educators. It has numerous videos with more information about the featured engineers, including one about Angelica Hernandez presented in Spanish. The site includes a number of engineering design challenges to download and try with students, as well as 10 full lessons designed for a range of grade bands in the educator guide.

Teachers seeking a way to show the breadth of STEM possibilities or inspire their students for design challenges should look for showings of *Dream Big* in their areas, and they can make good use of the online resources available to support the film even if their students can't see the film in a theater. ●

Jacob Clark Blickenstaff is Director of K–12 Engagement at the Pacific Science Center in Seattle. Read more Blick at http://goo.gl/6CeBzq, *or e-mail him at* jclarkblickenstaff@pacsci.org.

MS. MENTOR, **Advice Column**

Scaffolding Science Skills, Science Education 'Trifecta,' Mentoring—A Team Effort

Some of my students have little experience in lab investigations. My colleague suggested I "scaffold" my instruction to help them develop lab skills. What does that look like?

—C., Virginia

"Scaffolding" refers to guiding strategies designed to help students develop greater understanding of concepts and skills to become more independent learners.

Recall when you were learning to ride a bicycle. Someone first walked with you, holding onto the seat as you pedaled. Your instructor probably gave you advice and encouragement, then let go for a few seconds until you wobbled. Eventually you were ready to go on your own, though your instructor kept a watchful eye on you for a while.

One strategy to scaffold your students' skill learning is with an *I do>we do>you do* progression:

- focused demonstrations of the skills, connecting them to what students already know;
- guided practice in a variety of contexts with teacher monitoring and feedback; then
- opportunities for students to choose and use the skills independently.

I observed an Earth science teacher scaffolding with a "think-aloud" as she demonstrated how to create graphs from a data table. She reminded herself of the graph's purpose and the steps of the process, asked herself questions as she worked, and deliberately made some mistakes (correcting them in real time). The students could "peek" inside her mind as she worked. When she paused, students offered suggestions. In the second part of the lesson, students worked in groups to make graphs as she offered suggestions and feedback.

I'm looking for creative ways for students to share what they know, other than written reports or essays.

—K., Michigan

The creative process in science involves novel ways of thinking, problem solving, and communicating. When students are given the opportunity, encouragement, and support, their creativity can be astounding.

I found reworking information and/or experiences into another format can be an outlet for student design and creativity:

- An infographic on a science topic to display in the school or on a website;
- A video or photo gallery documenting an activity;
- Posters on a topic such as lab safety;
- A "how-to" manual or video for an app or probe to be used as a tutorial for other students;
- A video or presentation describing a concept to another audience; and
- Models or drawings.

Designing and creating an informational product (such as a booklet, presentation, podcast, or video) for younger students on a science topic was a favorite of my high school students. An elementary teacher volunteered to

review their work and discussed what was appropriate for elementary students. The younger students gave feedback and shared what they learned. My students demonstrated their knowledge of the topic by explaining it to someone else. We had a trifecta: design process, useful product, and assessment.

NSTA's K–12 journals have many ideas for activities and projects, but projects shouldn't be for teachers' eyes only. When students display or share their work in the classroom, with students in other grade levels, or with the community through a web page or live presentations, having an authentic audience adds another dimension.

Our most experienced science teacher is retiring. The other five science teachers are early in their teaching careers. What are your thoughts on asking an experienced non-science teacher to mentor the new hire?

—K., Virginia

When I started as a teacher, we did not have a formal mentor program. I struggled with an especially challenging group of students until a veteran English teacher took me under her wing and helped me.

Years later, I was asked to mentor a new Spanish teacher. My knowledge of Spanish is minimal, but the principal noted many issues faced by new teachers transcend subjects. All teachers face classroom management, relationships with students, dealing with parents, and navigating paperwork. Though our subjects were different, my mentee and I worked well together.

Perhaps the retiring teacher would be willing to be "on call" to answer questions or provide advice. The district safety officer can help with questions related to safe practices and inventories. Encourage your team of young science teachers to share ideas and experiences.

The on-site mentor can help the new teacher with school culture and local issues and requirements. Remind your new teacher that he/she has hundreds of potential online science mentors in the NSTA e-mail lists and discussion forums. ●

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

Quotable

Children are like wet cement. Whatever falls on them makes an impression.

—Haim Ginott, Israeli-American teacher, child psychologist and psychotherapist, and author (1922–1973)

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—NSTA Press reader Amy S.

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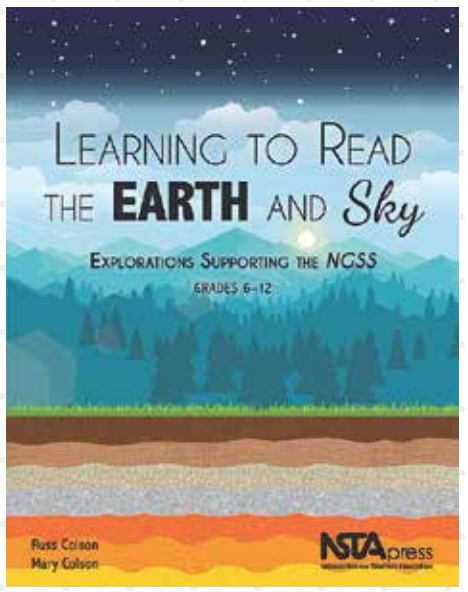

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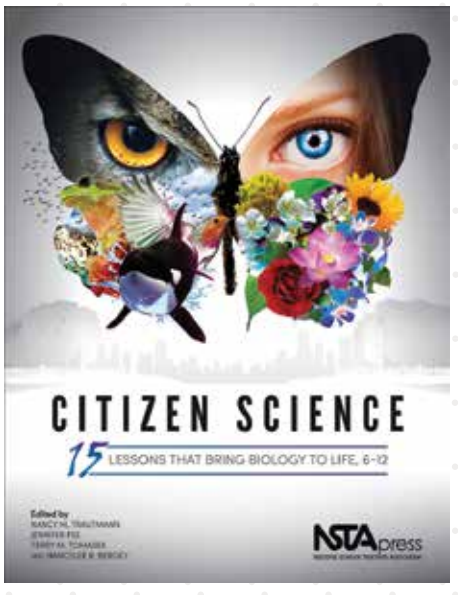

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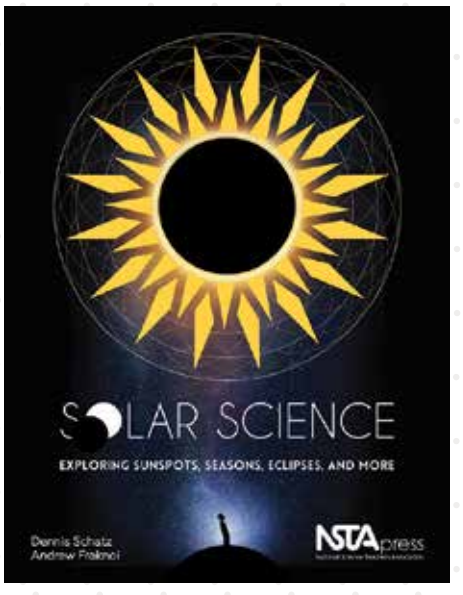

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NSTA National Science Teachers Association

(All dates are deadlines unless otherwise specified.)

April 15—Proposals for **sessions at the 2018 NSTA Atlanta National Conference on Science Education** are due now. The national conference will be held March 15–18, 2018. For more information on submitting a session proposal, visit *https://goo.gl/eTVbJK*.

May 1—Submit your manuscript today to help ***Science and Children*** (*S&C*), NSTA's peer-reviewed journal for elementary science education, explore how educators are **"Using the 5E in Alignment With the *Next Generation Science Standards*"** in its December issue. General-interest manuscripts may be submitted at any time. Read the call for papers at *https://goo.gl/UXBmlh*.

May 1—Forensic science can do more than solve crimes: It can engage your students! Share your best activities and practices for teaching **"Forensics: Solving Mysteries Through Science"** with your fellow high school teachers in the November issue of *The Science Teacher* (*TST*), NSTA's peer-reviewed high school–level journal. In addition, the journal accepts articles unrelated to a theme at any time. For more information on writing for *TST,* issue themes, and more, go to *https://goo.gl/u6JTM6*. For help with preparing a manuscript, see an annotated sample manuscript at *https://goo.gl/EwzlLG*.

May 1—Submit your best **modeling** methods to show cause and effect, address misconceptions, and more in a manuscript to ***Science Scope,*** NSTA's peer-reviewed journal for middle level science teachers, today for consideration for the December issue. General-interest manuscripts, commentaries, and column submissions may be submitted at any time. Read the call for papers and access submission guidelines at *https://goo.gl/l6bNbz*.

May 10—Are you wondering **How Do I Promote Student Discourse?** This **free NSTA Web Seminar**, part of a series on implementing three-dimensional science standards, will examine how to encourage meaningful student discussion about phenomena and their observations. The session will be held at 6:30–8 p.m. Eastern Time (ET). New users should log in 15 minutes before the scheduled start time for an introduction to NSTA Web Seminars. All participants will receive a certificate of participation and 100 Learning Center activity points for attending and completing the post-program evaluation. An archive and presentation slides will be available at the end of the program. For more information or to register, go to *https://goo.gl/DK4wMs*.

May 12—Register today for the **Sixth Annual STEM Forum & Expo**, hosted by NSTA, to be held July 12–14 at the Gaylord Palms Resort & Convention Center in Kissimmee, Florida. The forum will feature strands targeting early childhood and lower-elementary educators; upper-elementary, middle level, and high school educators; and administrators. The event will also feature a strand devoted to exploring successful partnerships among community, business/industry, and education members that enhanced STEM education for preK–16 learners. Earlybird registration for NSTA members costs just $180. For more information or to register, go to *https://goo.gl/dTLN6j*.

June 1—Share how you are **"Meeting the Needs of *All* Students With Physical Disabilities"** with your fellow elementary educators by submitting a manuscript today for the January 2018 issue of *S&C*. General-interest manuscripts may be submitted at any time. Read the call for papers at *https://goo.gl/UXBmlh*.

June 1—Good **"Assessment Strategies"** are essential to effective instruction. ***Science Scope***'s January 2018 issue will feature educators' best assessment strategies—if you submit a manuscript today! General-interest manuscripts, commentaries, and column submissions may be submitted at any time. Read the call for papers and access submission guidelines at *https://goo.gl/l6bNbz*.

June 1—How are you **"Using New Tools to Support Science Learning in a Connected World"?** *TST* is accepting manuscripts for the December issue that explore the use of social media, online simulations, virtual learning communities, and cloud computing, as well as ways to improve critical thinking, digital and media literacy, and more. In addition, the journal accepts articles unrelated to a theme at any time. For more information on writing for *TST,* issue themes, and more, go to *https://goo.gl/u6JTM6*. For help preparing a manuscript, see an annotated sample manuscript at *https://goo.gl/EwzlLG*.

July 12—Does each lesson build upon the prior one when you teach a unit? Explore how a coherent storyline can improve students' learning and learn how to create your own during **How Do I Develop a Storyline for a Unit?** This **free NSTA Web Seminar**, part of a series on implementing three-dimensional science standards, will be held at 6:30–8p.m. ET. New users should log in 15 minutes before the scheduled start time for an introduction to NSTA Web Seminars. All participants will receive a certificate of participation and 100 Learning Center activity points for attending and completing the post-program evaluation. An archive and presentation slides will be available at the end of the program. For more information or to register, go to *https://goo.gl/bKCJ9l*. ●

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Keep Up With the NSTA Conference Every Day

Whether you're attending the NSTA National Conference on Science Education in Los Angeles, March 30–April 2, or just want to keep abreast of the latest science education trends being discussed, check out the *NSTA Conference Daily* online at *https://goo.gl/7HgdyF.*

The *NSTA Conference Daily* highlights featured speakers and special events, such as share-a-thons, each day, as well as special giveaways, raffles, and exhibitor events. The *Daily* also links to videos, blogs, and more from NSTA attendees and staff.

NSTA conference attendees will receive *NSTA Conference Daily* in their e-mail. Non-attendees can register on the *Conference Daily* page to receive it. ●

Quotable

Mistakes are lessons inside out.

—Matshona Dhilwayo, Canadian entrepreneur and author