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COVID-19: Fortifying Your Personal Finances 8

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National Science Teaching Association



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Tips for Modeling, Time-Saving, Integrating STEM 14

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Teaching in the Coronavirus Era

Editor's Note: In this article, we examine how the COVID-19 pandemic is changing the way science education is taught, how teachers are working with parents, and how one creative science teacher helped bring much-needed supplies to first responders.

The COVID-19 pandemic “[has] everyone becoming new learners,... and learning in these circumstances is hard,” contends 2019–2020 NSTA President Elect Elizabeth Allan, a biology professor and coordinator of the Secondary Science Education program at the University of Central Oklahoma in Edmond, Oklahoma. The pandemic has had “a powerful impact on the future, on how to run classrooms,” for classroom veterans, preservice teachers, and higher education faculty, she observes.

Preservice teachers “in an education program are found along a spectrum of experiences and knowledge, often [related to] what year they are in. For those just beginning in their program, their understanding of schools and teaching is often limited to their own experiences. Because these experiences are so deeply embedded, they are expressed in their view of classrooms and teachers,” Allan relates. “During a time of significant disruption, these new preservice teachers are given the chance to see pedagogical challenges in a way that others that came before did not.”

She continues, “For the first time, in real time, social and economic inequities are played out as [preservice teachers] observe from the virtual classroom. Their world views and deeply held beliefs are challenged by the reality they find students and

teachers living day to day. In fact, they may find themselves experiencing learning and equity challenges that in a normal world, were mitigated by having internet at schools, libraries, [and other typical locations]. Even food insecurity is enhanced for preservice teachers (ramen noodles still being the go-to for college students), just as it is for some of their students. They are truly seeing into their students’ worlds.

“For preservice teachers who are now student teaching, it is a chance to really step back and think about learning in a fundamentally different way under circumstances [in which] learning, real student learning, is visible. No longer can their students blend in so as to not be noticed. Other distractions in classrooms are not there. No one is interrupting over the intercom, and no one has to raise their hand to go to the bathroom. Papers aren’t passed back, disruptions can be muted, and now there are just students,” Allan relates. In addition, these preservice teachers “are also taking courses of their own online and adjusting to that as well.

“Working with preservice teachers in this period of disruption means listening and supporting, but it’s also



Students in Denise Webb's STEM classes at Coal Mountain Elementary School in Cumming, Georgia, do distance learning projects such as designing a marble maze. During the pandemic, students often are working with their parents.

a time to challenge them to reflect critically about what they are experiencing,” Allan maintains. “They have the opportunity to see students as embedded within culture and society. Seeing [pre]K–12 students, and critically considering how that affects student learning, may be the very best thing we can do to prepare them to teach in whatever schools look like when they step out as teachers.”

For teachers accustomed to being in the classroom, “doing science

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COMMENTARY: Ashley Pereira

Make Every Lesson a STEM Career Lesson

By Ashley Pereira



Ashley Pereira

Think back to when you were 12 years old: What did you want to be when you grew up?

I have loved horses my entire life, and grew up riding them. I dreamed of becoming a horse trainer, doing what I loved and getting paid! In high school, I worked as an assistant horse trainer, thinking I was on track for my future career.

Then my boss was severely injured in a riding accident. Not only was I jobless for at least six months, but I also realized I no longer wanted a career in horse training. I had already missed most college application deadlines, as I had not considered other options. Now what?

Each year countless students graduate from high school (and sadly,

even college) and ask themselves this same question. At a time when more science, technology, engineering, and mathematics (STEM) jobs are available than available workers (Bureau of Labor Statistics 2019), this simply should not be the case. The solution is STEM career awareness and exploration, starting early on.

Doctor, lawyer, veterinarian, nurse—so many of us default to careers that may not be the best fit, simply because they are the only careers of which we are aware. I had no idea what my career options were. I know now I was not the only teenager who felt that way!

According to a 2019 Gallup poll, *Not Just a Job: New Evidence on the Quality of Work in the United States*, only 40% of employed Americans are in “good jobs,” meaning they expressed high satisfaction across 10 important job characteristics (flexibility, pay, and so on). Researchers found that while most workers in good and mediocre jobs rated their overall quality of life as “high,” most of those in bad jobs did not. In short, the quality of your job closely relates to the quality of your life.

Many factors likely underlie this stark reality, but it makes sense. How do you know if you like something

if you’ve never done it? If students don’t actually do career-related work until college (when they are spending thousands of dollars and years of hard work to “do” it), we are setting our future workforce up for disappointment instead of positioning them to leverage the tremendous opportunities in STEM fields. To combat this, career exposure must start very young. For example, I work as a civil engineer to build block towers with my four-year-old every week! Raising awareness of STEM careers need not be fancy. Every educator teaching STEM can easily turn virtually any lesson into a STEM career lesson with three simple steps:

Identify the content you will be teaching.

Find one STEM career that connects to that content. Studying the water cycle? Hydrologist! Plate tectonics? Seismologist!

Deliver the lesson through the lens of the STEM career. When you start, focus on simply naming the career that relates to your content: “Today we will be working as entomologists to examine the mystery of peppered moths in England!” In this example, the teacher would use the word *entomologist* as much as possible during the lesson, raising awareness of the career and underscoring connections between the career and the content.

The purpose is not to make every student desire a particular career; it is to raise awareness of the vast array of existing STEM careers. In the example, students now know what an entomologist is and have been engaged in practices mirroring the work of real entomologists (finding patterns and analyzing data from a case study on peppered moths in England). Spark-

ing interest in an entomology career would be a tremendous win, but it is not the actual goal.

The point of this approach is to increase relevance, which every good teacher knows also increases engagement. By naming a STEM career within every lesson, we automatically increase relevance because a connection has been made to the real world. Delivering content through the lens of a STEM career connects your content to a career that exists in real life. In 90 minutes or less, students learn about a new career, understand the basics of what that person does (because your lesson is linked to practices used in the real world), and grasp the point of the content because it has been connected to a profession in real life. In short, we have engaged students in STEM career exploration without adding extra work—just a new lens!

For students to truly gain “the skills to enter careers of their choice” as outlined in the *Next Generation Science Standards*, we must expose kids to STEM careers and have them engage in the practices of real STEM professionals early on. If every lesson was a STEM career lesson, imagine the thousands of careers you would be exposed to over your educational career! Try the STEM career lens to expose your students to many different careers, help them determine their interests and abilities, and connect them with career possibilities. ●

Ashley Pereira is a former middle and high school science teacher. She owns Career In STEM®, a provider of STEM career exploration resources, and she helps students prepare for STEM careers and turns schools into STEM pipelines. E-mail her at ashley@careerinstem.com.



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Coronavirus, from pg 1

online is more challenging [because] some sciences require equipment [not commonly found] at home, especially for high school students,” Allan notes. Teachers may have “small children at home, or may have relatives who [have been exposed to COVID-19], are ill, or at high risk... They may have technology issues [such as] sharing computers with their kids, scheduling time [for using them],...or they may not have internet access or other [technology-related] resources.” Often preservice teachers and high school and college students can be a help to experienced teachers who suddenly must master Slack, Zoom, and other new programs, she points out.

Not being able to be there for students and having to teach them online has affected many teachers. “We don’t prepare any teacher for this, except in some [fortunate] school systems that require at least one online class,” Allan asserts. And in some districts, not all students have access to technology. “Inequity in families must be amelio-

rated before this could be a standard,” she contends.

One silver lining to the pandemic, says Allan, is that “people get to see into classrooms in ways they didn’t before, and parents are involved. [Teachers] are making [science teaching] visible to the public. We will have the chance to look back at this window opening to show what teachers do to help students learn.”

STEM (science, technology, engineering, math) involves “phenomena and wondering,” notes Allan. She suggests teachers “get students actively involved in phenomena” they can explore during their daily experiences. “Pick a big idea that students can explore, and give them a choice of high-tech and low-tech activities” so all students can be engaged, she urges. “Learning doesn’t have to occur only online. Students can go outside and make videos [of phenomena].”

Resources like NSTA’s Daily Dos can “engage students, parents, and siblings in high-quality science content,” she observes. (See page 6 for a list of

resources, including the Daily Dos, for teaching science and STEM remotely.)

With education companies and associations like NSTA providing resources teachers can use during this challenging time, Allan is confident that learning will continue. “Teachers have always risen to the challenge; this is one more example of that,” she concludes.

Working With Parents

“I am fortunate that I am in a district that already had strong online learning in place. Parents and students were trained in how to use online learning for inclement weather days. However, this is still a challenge and learning curve with this extended time at home,” says Denise Webb, Discovery Lab Teacher at Coal Mountain Elementary School in Cumming, Georgia.

“I am a STEM and specials teacher and see all the students in our K–5 school,” Webb continues. “I found that I had to work with parents on how to ask questions [to help] their children be successful with their science and

engineering activities. It is important for both teachers and parents to understand that reading science is not science, that is the ELA [English language arts] part of the curriculum. Science is action: investigating, questioning, observing, sometimes getting messy!”

Webb says she had to give parents “quick training in science talk,” for example. “I try to give them simple question stems, like ‘Why do you think that...?’ or ‘What more can you tell me...?’” She contends that parents “have gotten away from having conversations with students [because] students are looking at their devices. We have to build that back in. Listening is important: ‘This is what I hear you saying...’”

She finds that parents have to learn how to ask questions and allow wait time for students to answer them, and they must learn to ask open-ended questions, such as “What evidence do you have?” “I give parents the words to say, but [encourage] them not to give students the answers,” she explains.

See Coronavirus, pg 7



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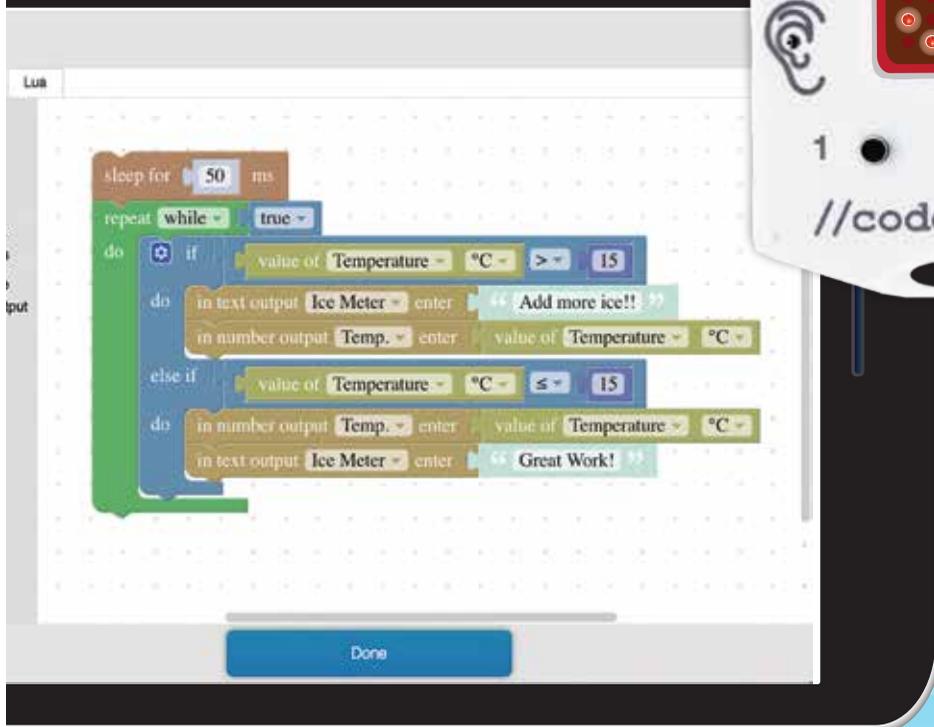
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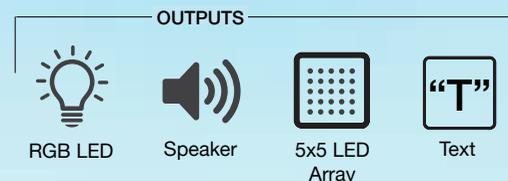
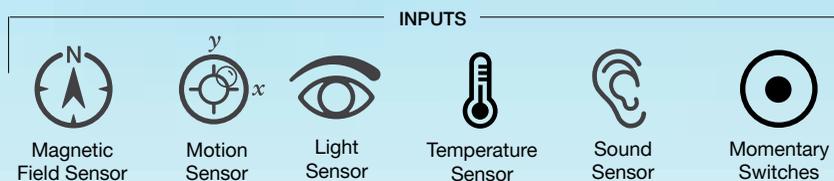
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Resources for Teaching Science, STEM Remotely

In the wake of the COVID-19 pandemic, schools and districts nationwide are turning to remote learning. Here are some key resources that teachers and parents will find helpful in teaching science and STEM.

NSTA Daily Do

Teachers and families across the country are facing a new reality of providing opportunities for students to do science through distance and home learning. The Daily Do, available at www.nsta.org/dailydo, is one of the ways NSTA is supporting teachers and families with this endeavor.

Each weekday, NSTA will share a sensemaking task teachers and families can use to engage their students in authentic, relevant science learning. Each Daily Do has a collection of resources (most free) that you can use at home or in your classroom.

NSTA Teacher Tip Tuesday

This new online series at <https://bit.ly/2XZwpME> allows teachers of science to learn, share, and grow together through informal discussion on important topics in science and STEM education.

NSTA Web Seminars

Continue your professional learning online with these free offerings from NSTA. Register at <http://bit.ly/2RGhr8N>.

NSTA Press Sample Chapters

NSTA Press publishes science activities for teachers of kindergarten through college on a wide range of topics. At <https://bit.ly/3by24ZB>, we've posted sample chapters and activities from our books for free download so you can look inside.

NSTA Collection Resources

This list of resources compiled by NSTA will assist teachers with the challenge of teaching remotely. The external resources in this collection have been shared by educators, but have not been reviewed by NSTA. You will find dozens of resources at <https://bit.ly/34WKM67> from groups such as BSCS Science Learning, the International Society for Technology in Education (ISTE), Try Engineering, the Smithsonian, and the National AfterSchool Association.

NSTA Exhibitor Resources

Dozens of free online resources from NSTA's valued exhibitors—such as Amplify, Arbor Scientific, Carolina Biological Supply Company, Fisher Science Education, and Flinn Scientific—can help teachers and others deal with the challenges presented by the COVID-19 pandemic. Visit <https://bit.ly/2zklbbj>.

STEM Teaching Tools

These resources for immediate support during school closures provide an overview of how to best support home-based science learning and include documents (in nine languages) geared toward family members and students. Learning menus offer suggestions for different home-based phenomena to investigate.

A second section will enrich longer-term home-based science learning opportunities and feature different activity types that focus on local phenomena, science notebooks, and family science talks. Refer to <https://bit.ly/2KpR44E>.

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Coronavirus, from pg 4

In addition, “I tell them they don’t have to have all the answers; just focus on discovery. It takes the anxiety off parents,” she maintains, but admits that “trying to do this in bite-sized chunks with parents is challenging.”

Webb chooses STEM activities that families can do together. “Families are excited to do STEM together. This is the positive side: It’s a platform for families to have these talks. Parents are hungry for it,” she observes.

She finds that open-ended activities like engineering design challenges are easier for parents to do and “hook the whole family. I give them a choice [of challenges. They can] make a marble maze using what they have at home; they can use straws and LEGOs.” Or they can create a Rube Goldberg machine, “a complicated device to do a simple task, like getting a cup into a sink. Lots of families sent me videos of this. I could hear from cheers in the videos that the whole family was engaged,” she recalls.

Webb has made short videos and shared them with students. “I made one on the bees at my house. It shows students that science is everywhere, not just in the classroom,” she asserts. She also encourages students to “grow things using what they have at home, such as growing new plants from the bottom of [a head of] lettuce or a celery stalk, or planting some dried beans in baggies with a wet paper towel and hanging them in a window.”

All of this wouldn’t have been possible for Webb and her colleagues without her principal’s support, she maintains. “Our principal [gave] us permission to be creative to help students meet Georgia standards. It has encouraged teachers to integrate engaging science activities into their lessons.”

Integrating NGSS

Vanessa Logan Wentzloff, physics teacher at Avondale High School in Auburn Hills, Michigan, is teaching remotely and integrating *Next Generation Science Standards* (NGSS) science and engineering practices (SEPs). In a post from her blog, @outoftheboxstem, she offers some suggestions for doing this.

“Data interpretation is one of the easiest NGSS SEPs to practice right now.

Students are seeing data everywhere and need to practice interpret[ing] it to be scientifically literate citizens,” she writes. “If students perform a lab... [they] can continue by creating data tables, graphs, [and] analyzing and identifying sources of error. If kids are watching a lab that you are performing, they can take down data during the lab, or you can give them the data afterwards.”

She continues, “If you want to focus on data interpretation in your subject area, find an authentic and current data set for students to look at. Think about current COVID19 data sets, environmental studies, and current research that is still being published. Data sets are more than graphs and data tables; they are also images and diagrams.”

Regarding engaging in argument from evidence, Wentzloff writes, “CERs, Claim Evidence Reasoning, are one of the cornerstones of NGSS... All kids can do CERs by looking at a phenomenon, a data set, or experiment. This is a more authentic assessment, rather than a test or quiz, which is extremely stressful for students during this time. Have kids look at a new phenomenon or data set and make a conclusion. For data, they can also practice using equations.

“Practice CER skills by giving a claim and hav[ing] students identify evidence. Skip the reasoning for now, and focus on evidence. Work on your kids looking at CERs for current information, given a question for their claim. For instance, does social distancing work to prevent the spread of COVID-19? I recommend giving them sources so they can interpret [it] themselves. This is a great chance to collaborate with your English teachers, who also use CERs.”

To read more of Wentzloff’s suggestions, visit <https://bit.ly/3aF6ZqE>.

3-D Printing for the Front Lines

“I am printing 400 face shield headbands, 400 surgical mask band adjusters, and 50 N95 Facsimile face masks, and I have other contacts sewing cloth masks with pockets for HEPA [High Efficiency Particulate Air] filters to be inserted. I am working with a printing group here on O’ahu to ‘mass produce’ PPE [personal protective

equipment] for health care providers. I am currently working with staff at [the Queen’s Medical Center West O’ahu], and my spouse is working to provide 25 cloth masks to Kaiser [Permanente Moanalua Medical Center],” reports NSTA District XVI Director Richard Jones, associate professor of science education at University of Hawai’i (UH)–West O’ahu.

“My lab is being run through [two of] my VETS Program (Veterans Empowered Through STEM) interns, [undergraduates] who are coming in two days a week to keep the printers working. I also have my son, a materials engineer in Colorado, working via virtual network to modify designs as needed,” explains Jones, who is VETS’ program director. Chantal Dewall, VETS Program assistant director, is also working on the project.

In 2018, UH–West O’ahu received a \$638,100 grant from the U.S. Office of Naval Research to create a program for veterans interested in STEM careers and education. With the funds, Jones created VETS, and added 3-D printers to the VETS Lab. Of the lab’s approximately 14 printers, 10 are ac-

tively printing the face masks and two different kinds of headbands.

“Keeping the printers running is a full-time job,” Jones maintains. His VETS interns excel at troubleshooting any problems that arise with hardware and software, which is the focus of their internship. They also are taking classes online, he adds.

The project also supports NGSS science and engineering practices “because we have had to [create a prototype] and modify the design, Jones contends.

It’s easy for Jones, Dewall, and the two interns to practice social distancing. “The lab space is big; there are six-foot buffer zones around the printers and desks... We [also] have a staggered schedule for everyone. We’re really careful to not be on top of one another,” he explains.

“We have the ability within STEM to help out, and that’s what we’re doing,” Jones asserts. Teachers interested in helping health care workers “might be able to take home a [3-D] printer from their school. Even a small printer can help,” he suggests. ●

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MONEY 101

COVID-19: Fortifying Your Personal Finances During the Pandemic

We're all in uncharted territory with a pandemic that has wreaked havoc across the globe on both the public health and economic fronts. Schools across the nation are closed, and many educators are on stressful double duty: teaching from home and juggling their personal-life responsibilities, like parenting. And with job losses at Great Depression levels, workers like educators also have financial security weighing heavy on their minds.

When the economy was initially shut down (except for essential services), job loss impacts were concentrated in the restaurant, retail, and travel industries. The second wave of layoffs and furloughs now is hitting additional commercial sectors, as well as government and academia. Already some jurisdictions have laid off or furloughed public sector employees due to a dramatic drop in tax receipts. The pain could come to education because state and local budgets that fund public schools have been decimated. Meanwhile private schools, colleges, and universities are worried about fall enrollment and the impacts on their budgets.

Public school districts typically deal with budget shortfalls by declaring hiring freezes, canceling vendor contracts, or adopting efficiency measures. But labor costs comprise 80% of K-12 costs. If the budget gaps are significant, experts predict that public school districts may ultimately have to cut personnel (see the following website: <https://brook.gs/2z3DHEM>). For higher education, announced furloughs haven't yet eliminated faculty, but reductions in pay and benefits could be coming. (See <https://bit.ly/3euyeHr>.)

Given this outlook, educators can act now to fortify their personal finances to prepare for any potential impacts



ISTOCKPHOTO

“...[E]ducators can act now to fortify their personal finances to prepare for any potential impacts to their household income...”

to their household income—whether from cuts to teacher income or from a partner's employment situation.

Create a bare-bones budget. Previous columns have covered the importance of developing a detailed household budget to understand precisely in what budget categories you are spending. If you haven't created a budget, do it now. The next step is to assess what expenditures are essential (housing, car payments, utilities), what aren't (clothing, streaming services, travel), and items for which you can reduce spending (mobile phone, food). If you carry debt, research what options are available for potentially deferring

payments, as many banks and credit card issuers are offering relief. (Learn more at <https://cnb.cx/3et7uaj>.) This could help reduce monthly obligations. Ultimately, the goal is to determine the exact amount you need each month so you can plan accordingly for any income cuts.

Start or augment your rainy day fund. Most Americans have less than \$400 saved for an emergency. This becomes increasingly problematic for anyone facing a salary cut, furlough, or job loss. One step to take now is to trim all non-essentials and start using that money to potentially cover essential expenditures. The sooner you start,

the more you'll have saved. And if you ultimately don't need that savings, consider reserving that money for another rainy day.

Look at your financial big picture. In addition to your income, you may have other assets, such as your home or retirement savings. In some cases, it may make sense to look at refinancing a home mortgage. Refinancing a mortgage means exchanging an existing loan for a new one at a lower interest rate, and rates now are historically low. This could reduce monthly payments, which could be helpful if your income decreases. A word of caution: Closing costs apply to a refinance, so it's important to do the math to ensure a refinance is worthwhile. Also keep in mind that it's getting harder to refinance during the economic crisis. (Read more at <https://cnb.cx/3eoG9pL>.)

When it comes to retirement savings, experts agree that tapping into this nest egg should be an absolute last resort. The Coronavirus Aid, Relief, and Economic Security (CARES) Act allows for penalty-free withdrawals of up to \$100,000 from certain individual retirement accounts or borrowing up to \$100,000 or 100% of the vested balance. But if you take out a loan and can't repay it, you'll be hit with a 10% early withdrawal fee. You'll also be double-taxed on the money you pay back.

If you withdraw retirement savings, the impact could be worse. You'll have to pay taxes on any withdrawn funds. While these tax payments can be stretched out over three years, this could create an ongoing financial burden. In addition, the retirement savings you use will no longer grow to help finance retirement.

Understand available financial assistance. Hopefully, your job (and your

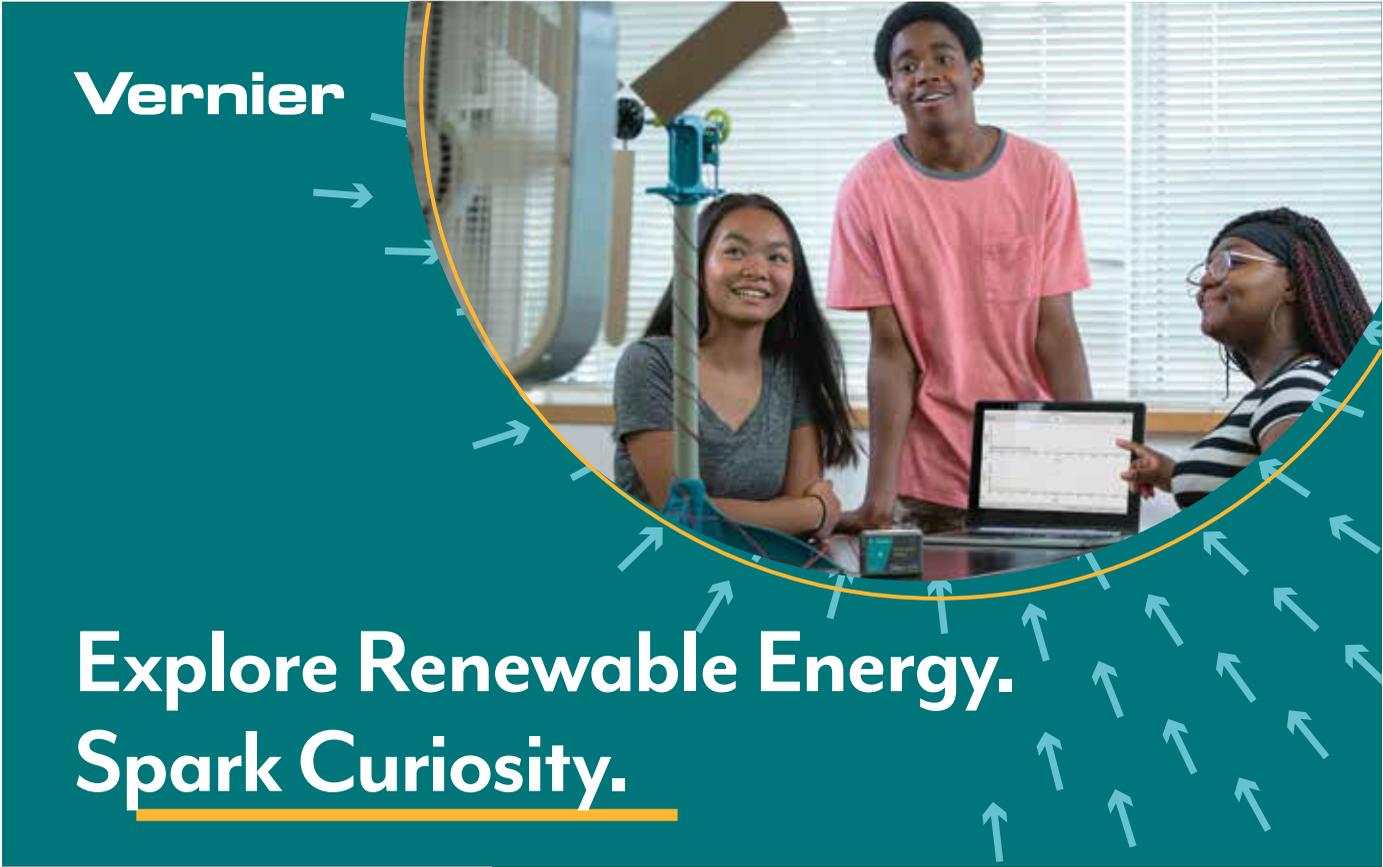
partner's) will remain safe. But it's prudent to hope for the best and prepare for the worst: a job loss. You may already have received government stimulus check worth up to \$1,200 per person and \$500 per dependent child. If you are working, consider depositing this money in your rainy day savings account should anyone in your household experience a job loss. And Congress may provide additional stimulus payments, which could further bolster your savings.

It's important to understand unemployment benefits that are available in the event of a job loss. The CARES Act provides an extra \$600 per week to workers receiving unemployment during the COVID-19 pandemic. The law also extends unemployment eligibility by up to 13 weeks, and it expands who qualifies for unemployment.

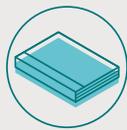
To get ahead of the curve, visit your state's unemployment website now to understand the unemployment process. These agencies and their websites currently are inundated, so it's a good idea to do the research now. Some states require workers to apply on specific days to avoid overwhelming the system, and states typically require submission of personal information like your Social Security number and past employers. Once an application is submitted, the state agency sends a notice explaining if you qualify, how much you can expect in benefits, and for how long you can receive benefits—and this varies by state. (Learn more at <https://wapo.st/3aelRvH>.)

Times are tough. But investing time now to plan for a worst-case employment scenario likely will help lessen any financial blows. Wishing you good health and job safety. ●

Kelly Kenneally has 25 years of public policy experience including serving in the White House. She has worked for more than 10 years with nonprofit organizations to help improve Americans' financial security.

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NSTA partners with professional development providers that offer the following online learning opportunities on a continuing basis. These institutions offer short courses as well as degree-granting programs to assist the teacher of science.



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PULL-OUT SECTION

SCIENCE TEACHERS' GRAB BAG



Inside this Convenient Pull-Out Section you will find:

Freebies for Science Teachers

2020 STEM for All Video Showcase. K12 HE This virtual interactive event taking place May 5–12 will feature more than 170 short videos from federally funded projects aimed at improving science, technology, engineering, mathematics (STEM), and computer science in formal and informal environments. They span the range of innovations in elementary school to graduate education. Many address broadening participation and increasing access to high-quality STEM experiences in formal and informal environments. Anytime during the showcase, visitors to <http://stemforall2020.videohall.com> can

- View videos of interest by grade level, keyword, or state;
- Engage in online conversations with the presenters;
- Suggest how their own work, expertise, and experience might connect with that of the presenters;
- Provide questions, comments, and feedback;
- Share the site with their collegial and social media networks; and
- Vote for their favorite videos through Facebook, Twitter, or e-mail ballot.

Rocky Mountain Wolf Quest. H This project-based learning experience for grades 9–12 developed through Captain Planet Foundation's Project Hero program offers a high-interest, Colorado-relevant learning experience suitable for remote classrooms involving virtual discussions and collaboration. In the project, students explore this question: Should wolves be reintroduced into Colorado? Through web-guided activities, students consider diverse citizen perspectives and compare scientific evidence about wolves to commonly held perceptions. The Quest helps students learn to evaluate scientific evidence to determine which perceptions are facts and which are myths, and helps them understand the importance of science in public discourse and policy decisions.

To access the quest and accompanying instructional materials—including standards information, instructional storyline, and Educator Notes—visit <https://bit.ly/2XWclek>. (Note: Teachers must sign up for a free account to access the quest's supplementary instructional materials.)



CHRISTIAN MEHLFUHRER, USER: CHMEHL

CRISPR Teaching Resources. H HE Bio-Rad Explorer launched a new resource page at <http://bio-rad.com/teachcrispr> for instructors and students. Designed for high school and undergraduate levels, the page

presents information about CRISPR science, technology, and applications along with videos and links to open-access articles. Educators can also connect to Bio-Rad Explorer's YouTube channel, which offers more than a dozen videos explaining CRISPR technology and how it works.

CADRE (Community for Advancing Discovery Research in Education) Resources for Online Learning. K12 Visit <https://bit.ly/2VJMOCk> for a collection of virtual learning tips, tools, and activities for teachers and students, developed by National Science Foundation–funded education researchers. The collection contains resources for every grade level and can be filtered by grade level, content area, resource type, and learner. For example, a search of “middle level/science/activity/teacher” produced links to Learning Toolbox, a set of free materials addressing the coronavirus from the Exploratorium in San Francisco; Research Quest, a series of science investigations to improve students' critical-thinking skills; and WISE: Web-based Inquiry Science Environment, a research-based science curriculum and program that incorporates interactive scientific models alongside hands-on activities, personalized guidance, and embedded assessments.

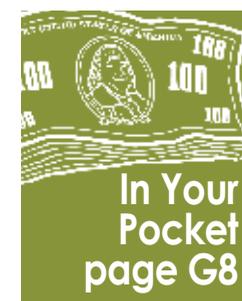
4-H STEM Lab. K12 Looking for ways to excite K–12 students about STEM learning? Try the hands-on activities developed collaboratively by HughesNet and 4-H in the 4-H STEM Lab! The Lab contains STEM activities for students to do at home with commonly available household items. For example, in Water Pollution Cleanup (grades 1–7), students learn about water pollutants, then discover through experimentation the challenges of removing pollutants from water. In Liquid Layers (grades four and up), students learn about density as they create a rainbow in a jar using various household liquids. In Crazy Kites (grades 3–8), students develop engineering design skills as they build a kite of their own. Similarly, in Building Bridges (grades 6–12), students learn about the engineering design process and the mechanics of building bridges while designing their own bridge. All of the Lab's activities are designed to foster student curiosity, develop



Freebies page G1



What's New page G5



In Your Pocket page G8

See Freebies, pg G2

Freebies, from pg G1

critical-thinking skills, and spark STEM learning. Consult <https://bit.ly/3cfDqNj>.



ERIC FISCHER

ASLA Online. **K12** With digital books for young readers and design and building activities to spark curiosity about careers in landscape architecture, the American Society of Landscape Artists (ASLA) has resources to keep K–12 teachers and students engaged in a virtual learning environment. Introduce the building blocks of landscape architecture with the activity book *Discover Landscape Architecture* (grades K–6), or inspire students with hands-on activities such as Build a Green Roof (grades K–6), Designing a Reading Garden (grades 6–8), and Create a Rain Garden or Bioswale (grades 6–12). High school students can explore careers in the field through the link Your Path to Landscape Architecture, which presents text and other resources answering questions such as these: Is landscape architecture right for me? What does a landscape architect do? How do I learn more? Find these and other online resources at <https://bit.ly/2Kbpyrj>.

The Endangered Species Conservation Site. **A** The site's background information, resources, and action ideas encourage everyone—including students and educators of all ages and levels—to learn more about threatened and endangered animals and how to help protect them. The For Teachers page offers activity ideas and talking points that can easily be adapted to today's virtual learning environments. For example, students of any age could have an online discussion regarding the overuse of plastic and share ideas on how to reduce the use of items such as straws and cups. In addition, the Resources page has supplementary materials relating to threatened and

endangered animals. For example, educators can access links to webcams showcasing endangered or threatened species in their natural habitats, as well as podcasts, videos, posters, publications, and more on conservation themes. See www.esconservsite.org.

Flinn At-Home Science. **M H** Flinn Scientific has online labs and activities to keep middle and high students engaged in active science learning while studying at home. The labs review basic science topics such as chemical reactions, acid-base chemistry, chemical bonding, properties of materials, solutions, titrations, and kinetics and equilibria and include instructional support materials for teachers (teacher guide, student guide, PowerPoint presentation). In addition, more than 50 simple science activities can spark students' curiosity and science interest. For example, students can Make a DNA Model with beads, pipe cleaners, and tape; create artistic patterns in Chromatography Challenge; or explore surface tension and cohesion in Soap-Motor Boat. Find more at <https://bit.ly/2VapcYi>.

WGBH Distance Learning Center. **P K12** Quickly access trusted digital resources for preK–12 remote learning at <https://bit.ly/2K7aUBB>, which features a selection of self-paced, self-contained computer-based interactive lessons and activities from PBS LearningMedia and partners. Organized by grade level (preK, K–2, 3–5, 6–8, and 9–12), the resources cover a range of commonly taught subjects, including science. The resources were chosen for their ease of use in varied household settings by minimizing the need for logging in, hands-on guidance, or group work. Select a grade level and subject of interest, then browse links and the annotated descriptions summarizing What Students Do and the Length required for each activity. Resource highlights include Shadow Play, a computer simulation (preK); *Peep Observes the Moon*, an interactive storybook (grades K–2); Linking Vegetation Growth to Rainfall, a map comparison activity (grades 3–5); Meaning of Matter, an interactive lesson (grades 6–8); and

Choosing Earth's Climate Future, an interactive lesson (grades 9–12).

QUBES Hub Teaching Quantitative Biology Online. **HE** For open education resources for college biology instructors teaching online, check <https://bit.ly/2KcJ1rD>. The resources can be used to teach quantitative skills in a variety of biological contexts and require minimal adaptation. Select the Resources tab to browse available online modules from QUBES partners, including BIOMAAP, Data Nuggets, Earth Lab, and Genome Solver. Resource Walk-Throughs, another tab on the page, offers short, author-led “tours” of various teaching modules that have been modified for remote learning. Teachers can join the community to contribute their own content materials for teaching online and participate in discussions on the topic.



MUNSEY FUND, 1927

Purdue Physics E-Learning Resources. **M H** Middle and high school educators can access physics resources and activities from Purdue University to use in their online instruction. One resource, Superheroes of Science, is a weekly podcast series featuring interviews with scientists. Each approximately 30-minute episode discusses a different science topic (e.g., seismic waves, weather forecasting, bacteria and viruses) and includes a guided worksheet to help focus student learning. Another resource of interest is the collection of hands-on activities from the Purdue Physics Inside Out program. Presented in PDF format, these lessons explore basics physics concepts, and several can be completed at home (e.g., Moment of Inertia, Nut Energy, Water Glass Optics). Visit <https://bit.ly/2XAUFEQ>.

Science Take-Out. **M H HE** This educational content company produces innovative hands-on science activity kits for individuals or small groups of students. Designed for high school audiences, but adaptable for middle to junior college levels, the kits require no special laboratory equipment and can be used in any educational setting. At <https://bit.ly/34ywmcb>, teachers can access files and photos associated with kits exploring topics such as A Medical Mystery of Epidemic Proportions, Pollution Investigation, and Disease Detectives. The materials provide everything needed for students to complete the kit activities virtually, including photos of experiment results.

Education Companies Offering Free Subscriptions Due to School Closings. **K12** The world's sudden shift to digital learning has left educators at all levels racing to create high-quality curriculum for virtual teaching and learning environments. An annotated list from AmazingEducationalResources.com can make this process easier. The website presents an alphabetical listing of educational companies providing free subscriptions and other materials to teachers due to school closures. Links and brief information about each resource (e.g., company name, subject area, targeted age group, and description) are included. Science-themed companies featured include Amplify Science, EduCode Academy, Esri, Flinn Scientific, Google Edu, and Mad Science. Companies (and educators) wishing to add a free resource to the list can do so by completing an online form at <https://bit.ly/2RXkMC4>.

NSTA Daily Do. **P K12** The Daily Do (see <https://bit.ly/2Yd0rge>) is one of the ways NSTA is supporting teachers and families who are doing science through distance and home learning. Each weekday, NSTA will share a sensemaking task teachers and families can use to engage their students in authentic, relevant science learning. Each Daily Do has a collection of resources (most free) that you can use at home or in your classroom.

See Freebies, pg G4

SAVE THE DATES

2020

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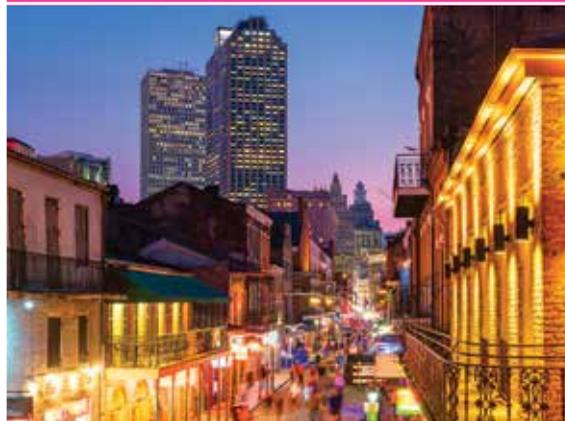
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On-Ramps for All Learners
Intersections and Interchanges:
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#NSTA20



Freebies, from pg G2

PRI Learn and Teach at Home. A

The Paleontological Research Institution (PRI) has a web page with online resources to help teachers and students of all ages and levels and lifelong learners discover more about our remarkable Earth and its past and present life. The resources—videos, virtual field trips, activities, teacher guides, online exhibits, blogs, and other materials—are organized by audience (e.g., Families and Children, K–12 Teachers and Students, Faculty and College, and Everyone) and subject (e.g., Fossils and Paleontology, Climate and Energy, and Nature and Outdoors). Visit <https://bit.ly/2V5mCTv> to take a behind-the-scenes tour of PRI specimen collections; view an online exhibit, Bees! Diversity, Evolution, and Conservation; access a Virtual Collection of Fossils; and try activities like Climate in a Tree Stump and Build a Wind-Powered Machine.

Pandemics: How They Start. E

Targeted for elementary learners, this special edition of *Cricket* magazine presents age-appropriate, straightforward content to alleviate fears and inform students and families about germs, pandemics, and healthy precautions. In addition to explanatory articles such as “What’s a Germ?,” “Seasonal Flu vs. Pandemic Flu,” and “Ouch!,” the 36-page issue contains articles highlighting epidemics in history (e.g., “Epic Epidemics”), a primer on proper handwashing technique (e.g., “Got Germs?”), fictional stories on the topic (e.g., “The Holding-On Night”), and a quiz that reminds students of best practices to limit the spread of germs (e.g., Stop the Spread!). Access the issue at <https://bit.ly/2V6Enlf>.

All About Outbreaks. A TEDED has compiled a list of resources for all ages that answer questions to increase understanding of topics related to the COVID-19 outbreak. Explanation videos include these: *How Pandemics Spread*; *How Do Viruses Jump From Animals to Humans*; *How Vaccines Work*; *How Does Your Immune System Work*; *Cell vs. Virus: A Battle for Health*; *Learning From Smallpox*; *How to Eradicate a Disease*; and *The Surprising Reason You*

Feel Awful When You’re Sick. Watch the videos at <https://bit.ly/34wm5NH>.



NASA AND THE HUBBLE HERITAGE TEAM (STSCI/AURA)

STEM@ Home. K12 Access online STEM learning resources for grades K–12 from the Idaho STEM Action Center through STEM@Home. This resource was conceived during the COVID-19 pandemic, but the agency plans to continue offering content once the crisis abates. From three-dimensional lessons to printable worksheets and games, nature activities, art integration, LEGO building, basic genetics, access to 360-degree views of the surface of Mars, and more, the portal can help students bridge the learning gap. Teachers and parents can find activities, experiments, articles, curriculum, and YouTube videos by age, grade, or subject area. Visitors can also submit resources for possible inclusion. The agency will highlight activities daily on Facebook and Twitter, so follow #STEMatHOME in newsfeeds. Refer to <https://bit.ly/2V7hvCl>.

The Partnership in Education. K12

This program at Duquesne University shares its own educational resources for grades K–12, including apps, video games, television programs, movies, digital planetarium shows, interactive museum exhibits, and vetted teaching materials/curriculum. The Partnership in Education focuses on STEM education and health literacy, using technologies and creative media platforms to bring science to life by working with artists and animators, game developers, educators, medical doctors, and researchers from institutions around the world. These tested science education tools were designed for integration into the classroom, museum, or living room. See <https://bit.ly/2yVmRrD>.

FunScienceDemos: Coronavirus.

E M FunScienceDemos, created by

a Temple University professor and Central Bucks School District (Pennsylvania) teacher, offers YouTube videos that address science topics for elementary and middle level learners. The YouTube channel offers life science, physical science, and Earth and space science videos, exhibiting teacher-tested simulations and engineering ideas. In this video, Naomi explains more about how viruses infect healthy cells, providing information to help students keep themselves and their families calm and healthy. Free teaching resources accompany the lesson. Visit <https://bit.ly/3ekCSYw>.

Museum At Home. E The Children’s Museum of Indianapolis puts its spin on virtual tours for elementary students. Videos are designed for the whole family. Multiple Playlists include Facebook Live With Museum Experts; DIY Science; Storytime; Museum in Minutes; Warm Up With Our Coaches; Curate Your Own Collection; and a Morning Greeting From Rex. A Museum Coloring Book offers printables, and Classroom Connections include standards-based lessons written by educators. Visit <https://bit.ly/2V6ptvG>.



ENERGY.GOV

Navigating Nuclear: Energizing Our World. M H Take a virtual field trip journey to the Idaho National Laboratory (INL), a nuclear research facility. Middle level and high school students can step inside a nuclear reactor, explore unexpected careers in nuclear science, and learn about advances in nuclear capabilities. Students will meet people who work at INL, such as nuclear scientists, engineers, and glassblowers; they can also learn the role nuclear science plays in creating clean energy and nuclear reactors and powering Mars rovers. Companion educator guides are available. Resources are offered through a partnership between Discovery

Education and the American Nuclear Society. See <https://bit.ly/2RAOLzM>.

Two What’s and a Wow! E M Wow in the World, the kid-friendly podcast created by TinkerCast, has added a daily game show for all ages. Curious kids and their parents can expect to hear new full-length episodes of Wow in the World every Monday and the interactive, science-based game show Two Whats and a Wow! every Tuesday through Friday on National Public Radio. In a signature “cartoon-for-the-ear” production style, the game show features family-friendly humor and real science facts. Hosts Mindy Thomas and Guy Raz present three weird, interesting, or “wow” statements, and players at home are challenged to identify the true “wow” fact from the science fallacies. At the end, players are encouraged to return the next day to discover which was the real “wow” and are left with an at-home STEAM (STEM plus arts) challenge inspired by the daily topic. Access <https://bit.ly/34VxIhc>.

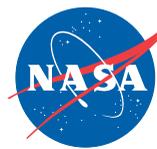
Biodiversity Data App. A Missouri-based nonprofit Friends of the Rainforest recently introduced the Centre for Environmental Rights Biodiversity App, which enables users of all ages to gather and share biodiversity data and discoveries about specific plants and animal species observed when walking on rainforest trails. Developed with assistance from Natural Solutions Costa Rica’s Jeff Norris and GIS Librarian Amy Work of the University of California, San Diego, the new tool is a geographic information system (GIS) application adapted from Esri’s Survey123 platform. The app records the observation’s primary classification and date; the rainforest station and trail; time and weather conditions; and more. Users can also attach photographs or sound files if captured.

The app is particularly useful because data is collected via a field application that works on mobile devices even when the internet or cell service is unavailable. To learn more about the app and access news articles and other resources to bring rainforest education to K–12 classrooms, visit the website www.friendsoftherainforest.org. ●



What's New

FROM U.S. GOVERNMENT SOURCES



National Aeronautics and Space Administration (NASA)

Cryosphere Resources @My NASA Data **EMH**

Study the cryosphere—Earth's ice-covered regions including sea ice, lake ice, river ice, snow cover, glaciers, ice caps, ice sheets, and frozen ground—with resources from NASA's My NASA Data program. Resources for students in grades 3–12 include lesson plans, mini lessons, visualizations of NASA Earth data, and connections to Global Learning and Observations to Benefit the Environment (GLOBE) protocol to present a comprehensive examination

of the topic and its role in the global climate system. Of particular interest is Sea Ice and the Earth System Story Map (grades 7–12), a multimedia, standards-supported resource that guides students through data-based explorations of essential climate questions such as these: How does sea ice melt influence the Arctic ecosystem? How do changing air temperatures affect observed trends in sea ice extent? How does sea ice melt change ocean circulation patterns? See the website <https://go.nasa.gov/2XnVX5X>.

Climate Games **M**

Engage middle level learners in climate studies with games from NASA's Climate Kids website. The games explore

topics such as coral bleaching, greenhouse gases, clean energy, weather, natural disasters, and Earth systems. For example, Power Up challenges players to capture clean energy from the wind and the Sun to produce enough electricity to run a town. Missions to Planet Earth, an online card game, introduces NASA weather satellites (Aura, Aqua, CloudSat, ICESat, and Terra) and missions, helping students understand how the data collected from each satellite are being used to monitor Earth's climate. Slider: The Art of Weather presents facts and information about space and Earth weather alongside digital tile puzzles of NASA space and weather phenomena. See the following website: <https://go.nasa.gov/3bbanu4>.

NASA @ Home **K12**

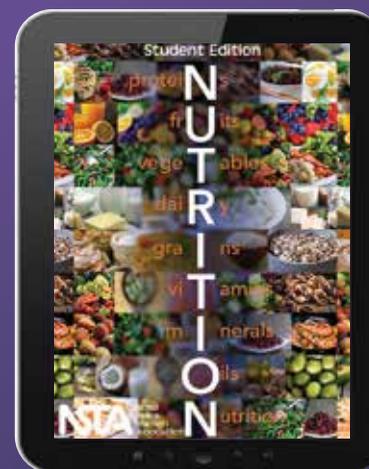
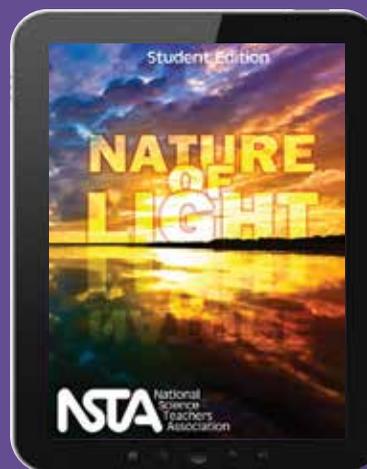
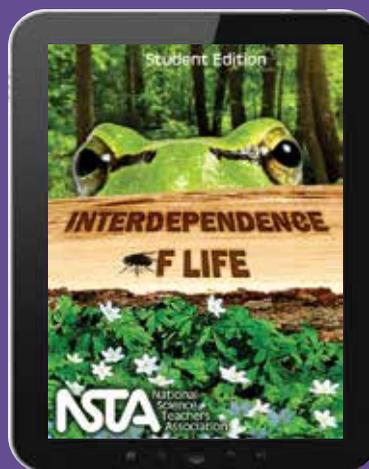
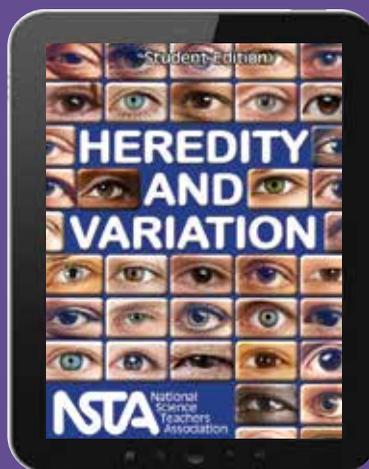
NASA @ Home provides links and easy access to NASA's collection of K–12 resources for science learning in virtual environments. The resources are organized by topic (e.g., General, Astronomy and Planetary Exploration, Earth Science, and Human Space Flight) and include an assortment of lesson plans, videos, websites, projects, and other educational materials produced through NASA programs. One notable resource, Learning Space With NASA, presents videos and project ideas such as the Make a Paper Mars Helicopter video tutorial (grades K–8) and the Code a Mars Helicopter game

See What's New, pg G6

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Grade Level 6–12



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What's New, from pg G5

(grades 3–8). Refer to the following website: <https://go.nasa.gov/2VksqaM>.

Climate Change Online Lab M

You can use this middle level activity from NASA's Global Precipitation Measurement Mission to enhance your virtual learning curriculum in Earth science. In the activity, students use resources from NASA's Climate Change website to research key indicators of Earth's climate health, such as CO₂ concentrations, global surface temperature, arctic sea ice, land ice, sea level, and forest cover. Students record information about each vital sign on a Student Capture Sheet, then create presentations to share their findings. An accompanying Teacher Guide, Pre- and Post-Activity Assessment, and climate indicator PowerPoint presentation, are available. Visit the following website: <https://go.nasa.gov/2UYuKoV>.

NASA Media Library K12 HE

NASA's Media Library has more than 140,000 space-related images, videos, and sound files useful for K-college educators and space fans of all ages. In addition to impressive images of space environs, the collection offers images of astronauts, rocket launches, NASA events, and other astronomical happenings. Teachers can use the copyright-free material for educational or informational purposes, including in photo collections, textbooks, public exhibits, computer simulations, and web pages. A bonus for photography enthusiasts: The images include accessible Exchangeable Image File Format (EXIF) data, which provide specific details about each image's date, time, camera setting, location, and more. See the website <https://images.nasa.gov>.

National Institutes of Health (NIH)**Pathways: Circadian Rhythms M H**

NIH's National Institute of General Medical Science and Scholastic have teamed up to produce *Pathways*, a series of curriculum modules about basic science and its importance to health and research careers. Designed for grades 6–12, the series' latest unit explores Circadian Rhythms. The dig-

ital module at <https://bit.ly/34twXvA> contains a student magazine, teachers guide, vocabulary list, and an online interactive, The Science of Sleep. The materials address topics such as how the brain's "master clock" and other body "clocks" drive circadian rhythms; the average teen's circadian cycle; noteworthy developments in science research on circadian rhythms; and how blue light from electronic devices affects our internal clocks. Print copies of the student magazine and teachers guide are also available.

Library of Congress (LOC) Roller Coaster Design in History**E M H**

Using LOC historical images, students can analyze the engineering design of the Flip-Flap Railway roller coaster—the first looping roller coaster in North America—and apply what they learn to their own design. The activity can be used from elementary to high school levels and includes questions to analyze the historical photographs and a link to a gallery of roller coaster images. Consult <https://bit.ly/3c7GNpq>.

Illuminating Primary Sources With Electric Lights E M

It's not easy for elementary and middle level students to grasp the enormous impact of the development of electricity in history, but two activities from the Teaching With the LOC blog make the concept tangible. In *Illuminating Primary Sources With Electric Lights*, students examine a drawing of a candlelit scene, then simulate the experience by working in a darkened classroom using a flashlight pointed upright (to represent a candle) as the room's primary light source. The simulation helps students understand why candlelight illumination was limited (e.g., it doesn't reach beyond a small circle) and why the development of interior and exterior electric lights was important, as electric lights made it possible to extend the length of the day beyond daylight hours.

A follow-up activity, Paper Circuits and Primary Sources, extends students' understandings about electricity and U.S. history. Students use cardboard, conductive copper tape, LEDs, and a coin-cell watch battery to design a pa-

per circuit that illuminates a historical photograph featuring electric lights. Visit <https://bit.ly/2Ruwm7O>.

Kites and Alexander Graham Bell M

Alexander Graham Bell meticulously documented his experiments through correspondence and journals. Studying these documents can lead to insights into Bell's processes and approaches to recording his work, as well as deeper understanding of particular experiments or inventions, including aerial locomotion and kites. An activity for middle level students from Teaching With the LOC has students examine Bell's journals, then recreate their own version of his aerial kites based on the scientific descriptions from his journal. Students can sketch their designs on paper or create them from recyclables and craft materials. Further explorations can include testing and modifying kite designs. As students complete the activity, they record scientific descriptions of how their kites work based on the examples in Bell's journal. See <https://bit.ly/3erA1gy>.

**U.S. Department of Energy (DOE)****ORISE STEM Interactives K12**

The DOE's Oak Ridge Institute for Science and Education (ORISE) has two engaging interactives to boost students' interest and content knowledge in science, technology, engineering, and math (STEM). The Tremont Experience, a virtual reality (VR) tour of ORISE's Great Smoky Mountains Institute at Tremont (GSMIT) in Tennessee, is appropriate for all ages. Students can explore various locations at GSMIT, including forests, fields, a stream, and a natural overlook. The self-guided, narrated adventure can be viewed on computers or tablets or experienced immersively using mobile devices and VR headsets.

Orbie's Space Walk, for grades K–2, combines foundational coding understandings (e.g., using directional arrows) with standards-based content review. In the game, "Orbie" the robot is stranded in space. To help Orbie get enough energy to return home,

students must correctly code (using directional arrows) the robot's path to the finish line by correctly answering questions in one of four categories (numbers, life science, Earth science, and engineering) and acquiring "energy spheres" along the way. Learn more about ORISE and access the games at <https://bit.ly/2wBGZyl>.

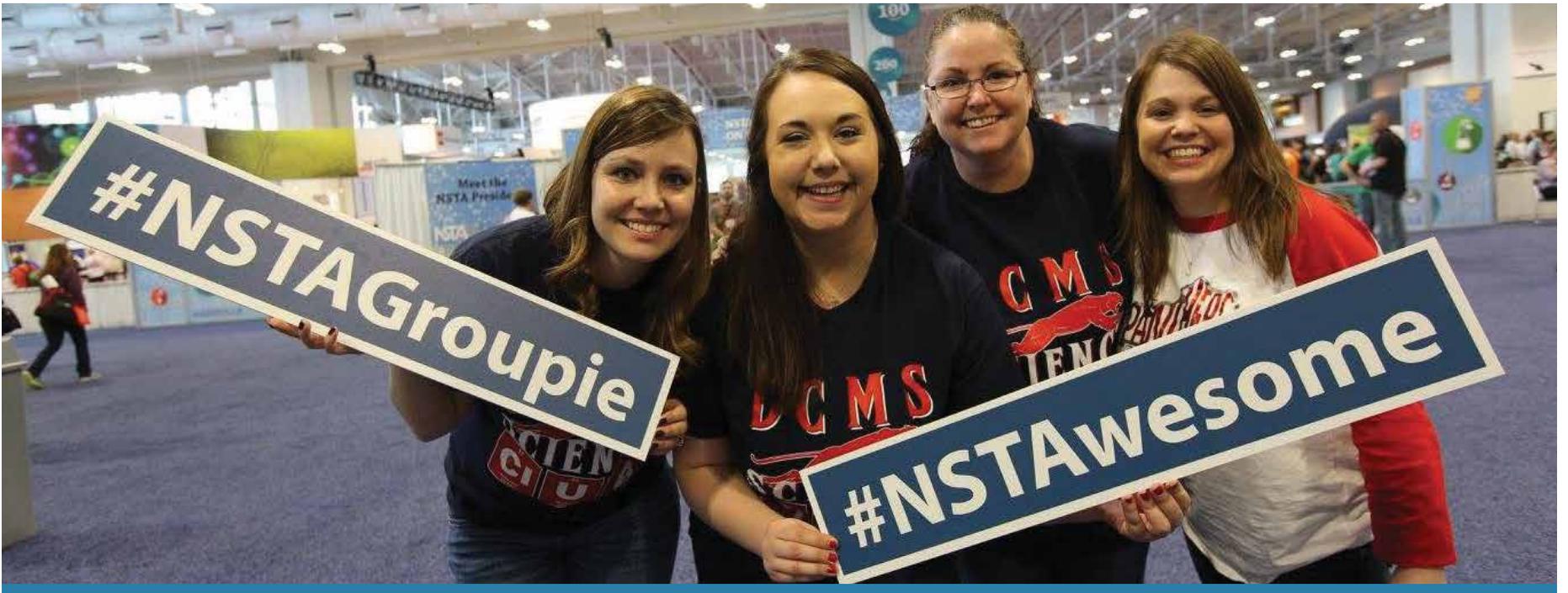
STEM at Home K12

Energy.gov's STEM at Home website (<https://bit.ly/3a5UaVN>) features ideas for K–12 remote science learning. Designed to engage families in STEM outside of the classroom, the site's energy-related resources—games, videos, virtual field trips, career profiles, project ideas, podcasts, and more—can also help teachers enhance their virtual science lessons. For example, elementary educators can access the daily download from Idaho National Laboratory's collection of STEM Lesson Plans for Remote Learning, featuring hands-on activities such as Build a Paper Roller Coaster and Coding with Cups. Middle level educators can engage students with experiment videos from the Jefferson Lab's Frostbite Theater. High school teachers can encourage students to consider STEM careers with websites like Women @ Energy: STEM Rising or podcasts like Direct Current, which highlights cutting-edge research and innovations in energy.

U.S. Department of Homeland Security (DHS) Tornado Safety Resources A

Ready.gov, the DHS's official website, has education resources to help teachers and students prepare for natural disasters, including tornadoes. Available at www.ready.gov/tornadoes, the resources include tips, links, and fact sheets with practical advice for staying safe before, during, and after tornadoes in any location, whether a school or home setting. The materials emphasize key ideas such as signing up for alerts, having a designated safety plan, and knowing safety tips. In addition, Ready.gov has tornado protection documents (in PDF format) for school administrators and other stakeholders, such as How to Protect Your Property or Business from High Winds and Selecting Safe Refuge Areas in Buildings. ●

NSTA School Partner Program



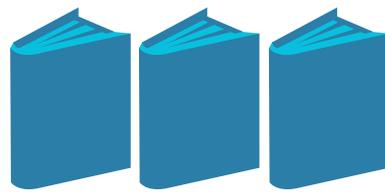
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In Your Pocket

Editor's Note

Visit <https://bit.ly/2ZIRIp5> to learn about more grants, awards, fellowships, and competitions.

May 21–31

Dollar General Literacy Foundation Youth Literacy Grants **K12**

These grants support new or existing literacy programs for students who have trouble reading or are reading below grade level. Grants of up to \$4,000 can be used to start or expand such programs or purchase new technology, equipment, books, materials, or software. Schools, public libraries, and nonprofit organizations are eligible. Apply by **May 21** at <https://bit.ly/2V63PaQ>.

Zayed Future Energy Prize, Global High Schools Category **H**

These prizes go to schools with plans to implement sustainability measures in their schools or communities. One prize of up to \$100,000 is awarded in each of six regions: the Americas, Europe and Central Asia, Middle East and North Africa, Sub-Saharan Africa, South Asia, and East Asia and Pacific. Apply by **May 21**; visit <https://bit.ly/2VD1B42>.

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 and raise awareness of the role that materials play in society. Twenty grants of \$500 are available. Applicants can contact local ASM members to help them develop innovative projects. Apply by **May 25**; see <https://bit.ly/2V3UyzW>.

NSHSS Educational Conference Registration Grants **H**

To help teachers and counselors attend educational conferences that enhance their professional development, National Society of High School Honors (NSHSS) provides \$500 grants to be used to help defray costs of conference

registration, travel, and accommodations. Any high school teacher or counselor currently employed at a public or private high school in the United States or internationally may apply. The application deadline is **May 31**; visit <https://bit.ly/2XEfjnp>.

June 1–30

Pets in the Classroom Teacher Grant Program **P E M H**

These grants are for preK–9 teachers who have a classroom pet or want to introduce one. Funds can be used to buy small pets, pet food, pet environments, or pet supplies. Eight types of grants are available, including \$50 sustaining grants to support current class pets and \$75 and \$125 rebate grants for the purchase of new ones. Public and private school teachers are eligible. Apply by **June 1** at www.petsintheclassroom.org.

Safer Brand School Garden Grant **K12**

This grant is awarded to one K–12 school with plans to create or maintain a fruit, berry, vegetable, flower, or hydroponic garden. The garden should serve as a teaching tool that brings students together to work toward the common goal of better health. Submit a 50- to 300-word essay explaining how your school would use the \$500 grant and photographs of your garden space by **June 14**. See <http://bit.ly/2OHKGXH>.

NAGT Outstanding Teaching Assistant Awards **HE**

This National Association of Geoscience Teachers (NAGT) award honors 30 outstanding teaching assistants (TAs) in the field. Winners receive a one-year NAGT membership, which includes a subscription to the *Journal of Geoscience Education* and *In the Trenches* quarterly magazine.

Both graduate and undergraduate TAs in geoscience education are eli-

gible. Department chairs or faculty members who coordinate TAs can submit nominations by **June 15**. Contact <https://bit.ly/3a6I7HM>.

Breakthrough Junior Challenge **M H**

For this competition, students ages 13–18 create an original video that brings a big idea in physics, life sciences, math, or the science of the COVID-19 pandemic to life. Videos should be no more than three minutes long and inspire creative thinking about these subjects. Winners receive a \$250,000 college scholarship, a \$50,000 prize for their teachers, and a \$100,000 Breakthrough Science Lab for their schools at a live, televised ceremony in November.

Students must complete a short questionnaire and submit their videos by **June 25**. Refer to <https://bit.ly/2XFZU61>.

WGU Loves Teachers Scholarships **HE**

These \$2,500 scholarships go to prospective or current teachers who want to earn a degree from Western Governors University (WGU) to get their teaching certificate, improve their skill set, or move into administration. Recipients must first be accepted as WGU students and can apply the funds to bachelor's or master's degrees, post-baccalaureate teacher-prep, and endorsement-prep programs. Apply by **June 30** at <https://bit.ly/3eji10K>.

ASM's Kishor M. Kulkarni Distinguished High School Teacher Award **H**

ASM International presents this award to one high school science teacher who has made a significant and sustained impact on precollege students. The honoree receives a \$2,000 cash grant and up to \$500 in travel funds to attend the ASM Awards Dinner.

Suggested candidates include past recipients of ASM Foundation K–12

Teacher Grants and the ASM Materials Camp Teachers Camp program. ASM members can nominate full- or part-time teachers for this award by **June 30** at <https://bit.ly/3aZutHP>.

Looking Ahead

Mitsubishi Electric America Foundation's Grants for Youth With Disabilities **A**

These funds are for innovative projects that help youth with disabilities develop leadership and employment skills—particularly in science, technology, engineering, arts, and math fields. Grants range from \$10,000 to \$75,000, for one to three years. Preference is given to projects involving Mitsubishi Electric employee volunteers or their communities (see <http://bit.ly/2WpUGrh> for a list of locations). Take the eligibility quiz to submit a proposal by **October 15**.

Apply Year-Round

Brown Rudnick Charitable Foundation's Community Grant Program **A**

The program aims to

- Encourage those involved broadly with the Brown Rudnick Center for the Public Interest to actively consider the educational needs in the communities of Boston, Massachusetts; Hartford, Connecticut; New York City, New York; Providence, Rhode Island; Washington, D.C.; and London, England.
- Recognize, encourage, and collaborate with the front-line workers within the educational system who often don't have a voice in funding decisions; and
- Provide funding for small, concrete projects or needs that will make an improvement in inner-city education within a year of the grant award.

The foundation will consider grant applications monthly and award grants totaling not more than \$2,000 in any one month. See <http://bit.ly/2wCySOd>. ●

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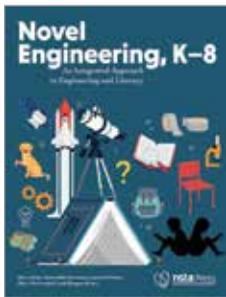
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NSTA PRESS: *Novel Engineering, K-8: An Integrated Approach to Engineering and Literacy*

An Overview of Novel Engineering in the Classroom

By Elissa Milto, Merredith Portsmore, Mary McCormick, Jessica Watkins, and Morgan Hynes

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 *Novel Engineering, K-8: An Integrated Approach to Engineering and Literacy*, by Carla C. Johnson, Janet B. Walton, and Erin Peters-Burton, edited for publication here. To download this excerpt, go to <https://bit.ly/2Vyq7AX>. NSTA Press publications are available online through the NSTA Science Store at www.nsta.org/store.

The best way to begin this book is to sketch out what *Novel Engineering* can look like in a classroom. We've seen the book *Wonder* by R. J. Palacio used in several fifth-grade classrooms and are going to present a composite of these classrooms. Although there is variety among the classrooms and students, there are many similarities. *Wonder* is the story of Auggie, a fifth-grade boy who was born with a severe facial difference and is entering school for the first time. The book begins from his perspective and then switches to include the perspectives of the other characters. The teachers have several learning goals for students that include having students think intensely about the characters and the overarching themes of acceptance and friendship. This requires students to think about multiple characters' perspectives and make inferences about their thoughts and feelings. As the teachers read the book, they pause to give students time to discuss the problems that arose and to discuss, as engineers, how they might solve those problems.

As groups are engaged in discussion, the teacher walks around the room and listens to the discussions. One group wants to address the discomfort that the main character, Auggie, feels while eating in the school cafeteria.

Due to his facial structure, Auggie is very messy when he eats and feels embarrassed. As two students, Samuel and Mateo, begin to consider solutions to this problem, it becomes evident that they are drawing on details of the story and making spontaneous inferences, all in service of understanding the design context. For example, they describe how they think Auggie feels, cite specific passages in the text, and infer the reason for those feelings—all of which help them empathize with Auggie about how it might feel to be bullied. They also generate a map of the cafeteria based on setting descriptions, consider the social landscape of an elementary school, and come up with a list of foods that may be easier for him to eat in public.

The following is an excerpt of a conversation between the two students. The conversations throughout this book are numbered so that if teachers are discussing them in groups, they can use the numbers to refer to students' statements.

1. Samuel: He doesn't like to eat with everyone.
2. Mateo: He could just not eat in the cafeteria, maybe in a classroom with a teacher?
3. Samuel: No, he is in school to be with the other kids. We need to make something so he can eat in the cafeteria. What can we...
4. Mateo: He'll be afraid people will look at him.
5. Samuel: We can make something that will let him eat and make it less messy.
6. Mateo: Okay. How can it be less messy so the food doesn't fall out? Maybe something that catches food but blocks his mouth?
7. Samuel: It can be like a fork but hides his mouth.

The following day, the group begins building a device that will help Auggie eat with less mess. As in most *Novel Engineering* classrooms, the students

are provided with a list of available teacher-supplied materials when they begin to plan, which typically includes a variety of cheap and recyclable materials such as tape, paper clips, cardboard, string, and cloth.

Samuel and Mateo propose to test their device using a range of foods, such as a yogurt, apples, and cheese. As they test their device, they are reminded by the teacher to record their findings in an engineering journal so they can share findings with the class and make changes, if needed, the following day. While sharing their findings with their classmates, the students describe their design choices and rationale, the way they tested their design, and how they intend to improve it. Samuel and Mateo want it to look as much like a traditional fork as possible so Auggie will not feel self-conscious. With that in mind, they include a small guard that helps keep food in his mouth.

In many *Novel Engineering* units, a writing assignment is included as part of a final culminating activity. In Samuel and Mateo's class, students have been instructed to write a journal entry as Auggie, describing how the engineering solution helped him overcome the problem. The pair of boys write about how Auggie felt less fear during lunchtime and is now able to talk to a friend at the lunch table. The students make projections about how their device would help Auggie gain confidence, which in turn would affect his life. In this example, Samuel and Mateo organically worked through an engineering design process (EDP) without being required to follow the process as a checklist; rather, they were allowed to move naturally through the steps. (We will discuss the EDP used in *Novel Engineering* in the next two chapters.)

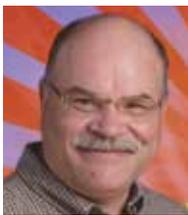
After their first *Novel Engineering* experience, teachers often say that their students exceeded their expectations. In the previous example, Samuel and Mateo thought deeply about how

Auggie might feel in different situations, such as eating in a school cafeteria or meeting new people. They also made inferences from the text and used their knowledge of the characters to project how different scenarios might play out. The teacher spoke with students as they worked, which provided a strong understanding of what their ideas were around the text, their design choices, and their construction of the final design.

In addition to meeting ELA goals, students worked collaboratively with partners or group members, communicating their ideas and supporting one another in the process. Most surprising to teachers, however, is the way their students act like young engineers. When engaged with the *Wonder* unit, students think critically about their designs, present evidence to support their design decisions, test their ideas, evaluate those ideas, and then iterate to improve their designs.

This example mirrors the experiences of hundreds of teachers with whom we have worked. Teachers consistently indicate that the integration of engineering and literacy is synergistic and powerful. Stories provide complex settings (engineering design contexts) and characters (clients) with real problems and needs, and the students' desire to help those characters by designing functional engineering solutions motivates a deeper reading and understanding of the texts. Most important, students become excited about what they are reading, writing, designing, and building! This excitement in turn helps them make strides in both engineering and literacy, as well as in their abilities to work together, think creatively and analytically, and communicate their ideas.

Novel Engineering provides a structure for students to do engineering while simultaneously working in the content areas. ●



ASK A MENTOR, Advice Column

Tips for Modeling, Time-Saving, Integrating STEM

by Gabe Kraljevic

I recently came across an activity [in which] a spinal cord was represented using candy. I can only imagine how excited the students must feel while completing this project, but I am wondering if it truly led to a better understanding of the material for the students?

—F., North Dakota

You asked the most important question when evaluating lesson ideas: Will this activity lead to a better understanding for your students?

If you just wanted students to understand the layout of the spine and spinal cord, then perhaps arranging candy in a pattern that mimics this anatomy might work. But if you needed them to have a better understanding of how the form and function of the spine work together, then I believe that colored clays or other durable

and inedible material would be more appropriate. It would give the students more flexibility to make the models more lifelike and allow you to display or handle them for longer periods of time without worrying about decay or hungry critters (or your students).

Another way to approach this model-building is to have students brainstorm conceptual models. How could you represent the spinal cord by its purpose? If students understand the idea that nerves send signals to transfer information and control an organism's body, they may decide to represent a spinal cord using bundles of wires, for example.

While I was known for giving students treats, I didn't use candy or other foods for hands-on activities, primarily because students will eat some, raising many concerns. Are



PHOTO BY JOHN-MARK SMITH on UNSPLASH

their hands, the containers, and all work surfaces hygienic? What would students do with morsels that fell on the floor? Should alternatives be provided to students who can't eat these treats due to allergies, health issues, and other conditions, so they don't miss out?

Save the candy for treats. Use something else for models.

I would like to find some time-efficient way to have students share their learning or their observations with me (individually) without [my] having to take in two classes of science notebooks.

—J., Ohio

School should not be a place where young people go to watch old people work.

—Cris Tovani

You are not required to correct and grade everything a student does. Giving formative feedback is necessary, but you can reduce the workload while not diminishing students' learning.

Assign written work on exactly what you want students to learn. Whether you ask them to make observations, draw conclusions, or reflect on their learning, you will get what you

need without having to read entire notebooks.

Mark notebooks only periodically. Students can even self-assess their work using a rubric that you supply. My teaching was revolutionized many years ago by an online rubric maker (<http://rubistar.4teachers.org>), which allowed me to better manage notebook assessments, among other activities.

Peer assessment is an excellent learning strategy that also reduces your workload. Analyzing and discussing their classmates' work can be a powerful learning experience for students. Consider incorporating peer feedback into almost everything your students are doing. This can be done in pairs or in groups, but you will need to spend some time teaching them how to do these assessments. Small colored slips with guiding questions are very useful and can be attached to reviewed pages. These colored papers are easy to thumb to in a notebook for quick checks.

I want to know if there are ways to incorporate [science, technology, engineering, and mathematics (STEM)] into more or all subjects? How would a teacher begin to integrate English or social studies with STEM?

—M., Arkansas

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CAROLINA

Children don't come to school with brains divided by subjects: We compartmentalize the subjects for administrative reasons. To help students become well-rounded, I strongly believe that we should teach all subjects in an integrated manner. STEM attempts to bring together similar subjects that should rely on one another; however, we can't even begin to teach these subjects without communication, also known as language arts. When you add social context, societal issues, ethics, and geography to STEM lessons, you have incorporated social studies. And don't forget about the arts!

You may want to consider these concrete ideas:

Foster written communication by incorporating reports and journaling activities in place of fill-in-the-blank worksheets. Reinforce verbal communication through discussion groups in which students can use new terminology, brainstorm ideas, and share conclu-



PHOTO BY ALEXIS BROWN on UNSPLASH

sions about data they collected. Teach students the dos and don'ts of slideshow presentations and have them present research projects, lab results, pictorial essays, and other work to the class.

Students can overlay data on maps, plan and discuss environmentally friendly development, and debate issues and ethics related to science and technology (e.g., where to place wind turbines, the use of pesticides or genetic manipulation, terraforming other planets, and so on) to incorporate social studies.

Throughout all of this you can encourage creativity by integrating art, design, music, and movement as methods of demonstrating understanding.

Hope this helps! ●

Check out more advice on diverse topics or ask a question of Gabe Kraljevic and Sharon Delesbore from *Ask a Mentor* at <https://bit.ly/35LMFS1>, or e-mail mentor@nsta.org.



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BLICK ON FLICKS



Onward: Pixar's Tribute to Dungeons and Dragons

By Jacob Clark Blickenstaff

It has been a while since audiences have seen a new Pixar film that was not part of a series or a sequel. *Onward* (2020), which is available to watch online now, introduces viewers to a world where magic is present, but old fashioned. No humans exist in the *Onward* universe; it is populated with pixies, elves, dragons, centaurs, and unicorns instead. In the distant past, magic held sway, but once electricity was discovered and made to light a light bulb, folks began to switch to technological solutions.

Onward's collection of creatures and their abilities reminded me of

playing *Dungeons and Dragons*, which was no accident: A prominent thanks to the publishers of D&D appears in the credits.

The story centers on two young elves, Ian Lightfoot (voiced by Tom Holland) and his older brother Barley (voiced by Chris Pratt). Their father, Wilden, died before Ian was born and when Barley was just a few years old, so they have been raised by their mother, Laurel (who is voiced by Julia Louis-Dreyfus). When Ian comes of age at 16, he inherits a staff, a jewel, and a spell left behind by his father. The spell will allow Wilden Lightfoot

to return from the dead for just one day, and casting the spell will consume the jewel.

Of course Ian and Barley try out the spell, but something goes wrong, and only half of their father is restored when the jewel is consumed. Unfortunately, it is the bottom half, basically from his feet to his belt. To bring the rest of their father back, they will need another magical "phoenix stone," and they will have to get it in 24 hours. What follows is their quest to find the phoenix stone and recast the spell before time runs out. Along the way, they meet pixies on motorcycles and

a manticore tavern owner, and ride on an unconventional boat down a subterranean river.

Through all the adventure in a movie based in magic, it might seem a stretch to find science connections, but I did spot some fun physical science connections that middle and high school teachers could use.

In one scene in *Onward's* trailer, Ian attempts a spell to make a gas can larger (thereby creating more gas for Barley's van). The spell goes wrong, and Ian shrinks Barley to just a few inches tall. Barley's voice becomes very high-pitched and squeaky when

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this happens, and that is exactly what physics says should happen.

We make sound with our voices by pushing air through the voice box, or larynx. The larynx includes the vocal cords and the cartilage that moves the vocal cords as we breath and speak. The vibrations of the vocal cords are amplified by the shape of the throat and nasal passages. When Barley becomes tiny, his larynx and nasal passages get smaller, which causes his voice to get higher. The smaller space amplifies shorter wavelengths of sound (which are the higher-pitched sounds).

Some students might think that this is what happens when someone inhales helium, but it isn't. Helium in the larynx changes which frequencies are amplified because sound travels faster in helium than in air. Breathing a gas that has a lower speed of sound

would lower the voice. (*Please note: It is not a good idea for an adult to inhale helium, and never allow students to breathe helium in class.*)

A key plot point near the film's end involves sunset. (I won't reveal the details here, for those who have not yet seen *Onward*.) The scene got me thinking about how long it actually takes for the sun to set; that is, how long it is from the moment the disc of the sun appears to touch the horizon until the sun sets fully below the horizon. In the movie, the full sunset takes about five minutes, but doesn't seem to flow at a constant rate. The actual time varies quite widely with the season and with latitude.

Here is one way to think about it: Recall that the reason the sun appears to set is that the Earth is rotating on its axis, which it does once every 24 hours. A point on the equator travels about

40,000 km in 24 hours, so it is moving at almost 1,700 km/hr. Points north and south of the equator travel in smaller circles, so they are not moving as fast.

As an example, Seattle is about 48 degrees north of the equator, so the circle my house makes each day is only 27,000 km in circumference, which means I'm moving at only about 1,100 km/hr. Since Seattle is not moving as fast as places near the equator, sunsets take longer here than in Bogota, which is just 4 degrees north. Typical sunset time on the equator is just more than 2 minutes, which does not change much through the year. Far from the equator, seasonal variation is large: from 3.5 to 4.5 minutes at 50 degrees north or south.

Of course, within the Arctic circle, there is a period of time with no sunset in the summer, and no sunrise

in the winter. If you or your students care to look very closely at the end of the movie, you will be able to find an inconsistency in how the sunset proceeds, which could mean that magic is not only able to temporarily bring someone back from death, but also alter how quickly or slowly time passes.

While *Onward* is not likely to join classics like *Toy Story* and *The Incredibles* as a Pixar masterpiece, it has some fun moments teachers can use to discuss the physics of sound and planetary geometry.

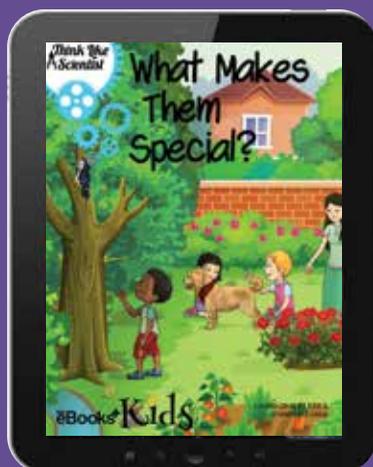
Note: Onward is rated PG for action/peril and some mild thematic elements. ●

Jacob Clark Blickenstaff is an independent science education consultant and learning designer with AVID, based in Seattle, Washington. Read more Blick here: <http://bit.ly/2S2wH2L>, or e-mail him at jlclarkblickenstaff@outlook.com.

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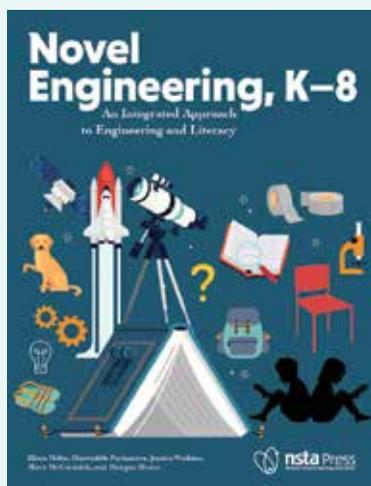
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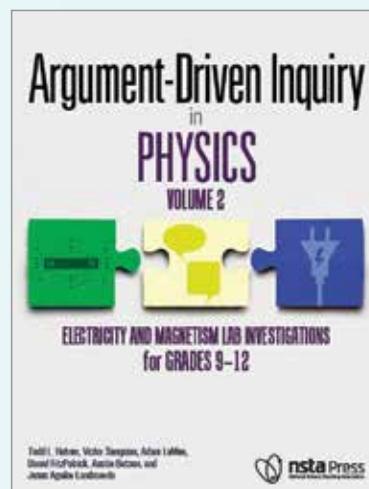
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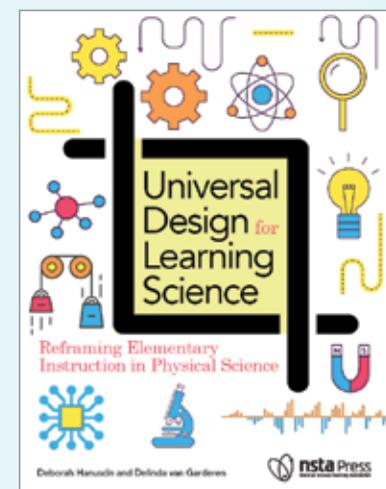
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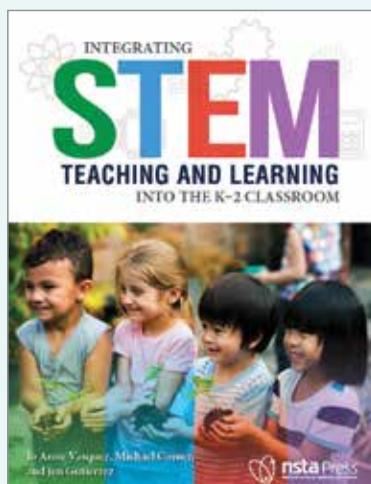
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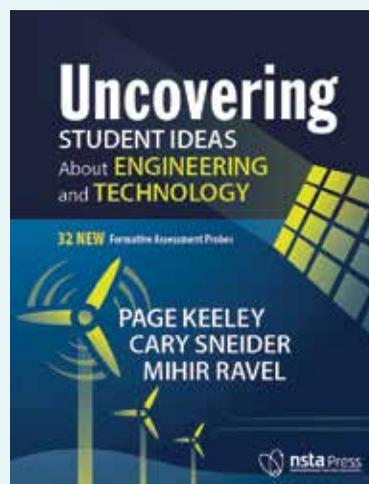
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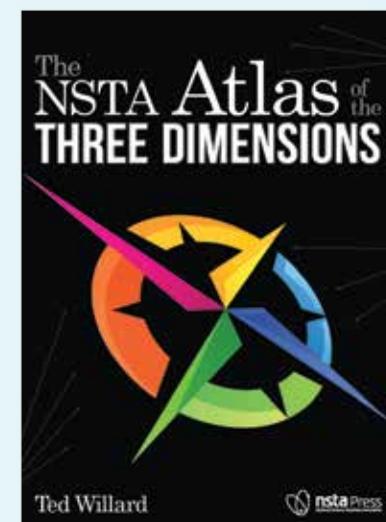
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National Science Teaching Association



(All dates are deadlines unless otherwise specified.)

May 13—It's time to learn about tropical weather systems (hurricanes)! Join a **free NSTA Web Seminar** at 7 p.m. Eastern Time (ET) on the topic **Science Update: Tropical Climatology and Hurricane Hazards—The Seasonality and Geography of Tropical Systems in the Atlantic Basin and an Early Hurricane Season Outlook**. You'll get an overview of the seasonality, timing, and risks associated with tropical weather systems and learn about the meteorological and climatological factors underpinning the challenges of forecasting these unique storms. You'll also examine the human side by hearing about the vulnerabilities society faces from these annual phenomena. American Meteorological Society (AMS) staff will give you a very early prognostication for the 2020 hurricane season, while also noting the limitations of such early outlooks. And they'll contextualize some of these concepts, as they appear in the popular AMS-DataStreme program for K–12 teachers. Learn more and register at <https://bit.ly/2KaACVG>.

June 1—How are preschool and elementary teachers applying **Culturally Responsive Teaching** (CRT) principles in the science classroom? Where does CRT fit into science and engineering teaching and learning? How are teachers providing culturally relevant lessons that set high expectations for success and promote student self-efficacy? Share your knowledge of and experience with CRT by submitting a manuscript on that topic for the March 2021 issue of *Science and Children*, NSTA's peer-reviewed journal for elementary teachers. Check <https://bit.ly/34Fpsli> for more information and advice on creating and submitting your manuscript.

June 1—Attention, science and math teachers: The January 2021 issue of *Science Scope*, NSTA's peer-reviewed

journal for middle level teachers, will feature the theme **"Using Mathematics and Computational Thinking."** Contribute a manuscript that explains how your students use digital tools to analyze large data sets; use mathematical representations to describe or support scientific conclusions and design solutions; create algorithms to solve problems; apply mathematical concepts and processes to scientific and engineering questions and problems; or use mathematics and computational thinking in science activities resulting from collaborations between science and math teachers. Get started at <http://bit.ly/2zOZUUA>.

September 23—**Elementary teachers**, begin your new school year by learning strategies for using picture books to teach elementary science, technology, engineering, and math (STEM). The fall 2020 **Picture-Perfect STEM Online Course**, which starts today at 7 p.m. ET, is part of a program that combines the appeal of children's picture books with standards-based STEM content. This course includes 10 hours of live training using videoconferencing: It's a real-time, interactive learning experience requiring attendance and participation at each session. (The course continues on September 30 and October 7, 14, and 28.) You'll have three 2-hour sessions with the authors, Karen Ansberry and Emily Morgan, and two 2-hour sessions with a trained facilitator to help you become a master at blending the books with your STEM curriculum. Participants will receive one e-book of choice from either *Picture-Perfect Science STEM Lessons K–2* or *Picture-Perfect Science STEM Lessons 3–5*; a digital learning packet containing the first five chapters of *Picture-Perfect Science Lessons*, lessons modeled during the webinars, and relevant articles; and graduate credit (if purchased separately). Learn more and register at <https://bit.ly/3eprkDq>. ●

#ICYMI

In case you missed it, check out a few highlights from NSTA's e-newsletters. Catch up on all the latest e-newsletters at <https://bit.ly/2X5iuEQ>.

"Survey Finds Teachers Support School Closures, Concerned About Students Struggling and Falling Behind"

Eighty-four percent of teachers agree with the decision to close their schools due to the COVID-19 pandemic, but more than half (52%) are worried students will struggle to learn in a virtual environment and fall behind academically, according to new survey results released by the Association of American Educators Foundation. While the survey only had 700 responses, it's one of the first efforts to capture data on how educators are adjusting to the change. Check out the infographic and read Education DIVE's brief and insight on the survey.

—NSTA Express (April 7, 2020; <https://bit.ly/2KegqlQ>)

"Science at Home: Explore Shadows and Light With Tips From Page Keeley"

Science is about making sense of our natural world, something that children naturally do long before they begin school. Parents and teachers can be guides and facilitators in supporting elementary-age children in their wonderings and in helping them develop their ideas about science. Explore with Page Keeley through her blog post how you can use tools from her *Uncovering Student Ideas in Science* series at home or through online learning to help students formulate their ideas and share them as they explore phenomena related to shadows and light.

—NSTA Express (March 31, 2020; <https://bit.ly/2VzQDK7>)

"Teaching, Parenting, and Science Outreach in the #COVID19 Pandemic"

Lab Out Loud's guest this week is Joanne O'Meara, a physics professor from the University of Guelph. To help educators right now, the Guelph physics department is creating videos to answer user-generated science questions. Called *AMASE (Ask Me Anything: Science Edition)*, this video series has been tackling concepts such as the speed of light, rainbows, and Schrodinger's Cat. O'Meara joins the Lab Out Loud podcast to discuss the *AMASE* project and how she (and her daughters) made the first video on the speed of light, and shares her experiences in teaching and parenting during the pandemic.

—NSTA Express (April 15, 2020; <https://bit.ly/2yiopM6>)

"Why STEM Training Boosts Instruction for Every Subject"

STEM is about implementing rigorous instructional strategies that can be applied in any content area. Here are a few actions we have implemented to establish a STEM culture and support effective teaching in every subject.

—STEM Classroom (April 2020; <https://bit.ly/2ypSSaU>)

"Implementing Storylines: A Meaningful, Effective Way to Practice the NGSS"

Jason Crean, Illinois science educator and leader of the NGSS Biology Storylining Working Group, discusses how students engaged in sensemaking through storylines focus on figuring out how the world works, not on learning facts, which increases students' engagement and gives them the contextualized learning they need.

—Next Gen Navigator (March 2020; <https://bit.ly/3bfwkbn>)

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Come Explore the New NSTA.org!

We've got a new website with a brand-new look, full of features and content to meet all of your science education needs. So what's new?

While you will still find the same trusted and quality resources that you've come to expect from us, you'll experience our new streamlined design and navigation, allowing you to *find and customize great NSTA content*—including daily lesson plans, book chapters, and journal articles—to the *specific subject and grade you teach*.

As you personalize the content you need, you'll want to *make NSTA your one-stop shopping destination*. You can also upload your own content, share

and curate resources from your peers, and document all of your professional learning needs. Or go online and network with other teachers, and share experiences, stories, ideas, and more.

And of course, we still have loads of webinars, discussion groups, book studies, professional learning opportunities, conferences, and so much more—all waiting for you at the new NSTA.org!

This past year we've introduced our new name, a new logo, and now, our new website. We are so excited about these changes and look forward to the journey ahead with you.

Check us out, and tell us what you think. ●



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UPCOMING SESSIONS

SUMMER SESSION 1

May 18 – June 28

Registration deadline: May 11

SUMMER SESSION 2

July 6 – August 16

Registration deadline: June 30

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