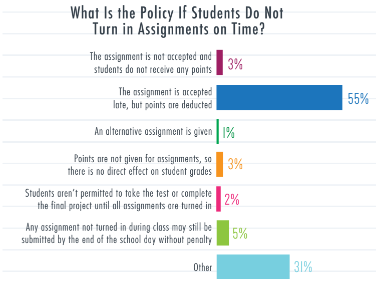

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NASA Grants Rocket Informal Ed Ahead

Grants from NASA's Competitive Program for Science Museums, Planetariums, and NASA Visitor Centers (CP4SMPVC) enable the agency to partner with informal education venues to enhance their space science related–programs and engage teachers and students in NASA's mission. But the CP4SMPVC hasn't awarded new grants since early 2017. Why should science, technology, engineering, and math (STEM) teachers care about this?

Teachers and students partnering with Fairchild Tropical Botanic Garden in Coral Gables, Florida, on the Growing Beyond Earth (GBE) STEM education program care because in the first two years of Fairchild's $1.25 million, four-year CP4SMPVC grant for the program, middle and high school students identified 91 varieties of edible plants suitable for zero-gravity growth in the International Space Station's plant growth facility. GBE students have tested 106 varieties of plants so far as part of the Fairchild Challenge, a Miami-based environmental science competition, according to Amy Padolf, Fairchild's director of education. Padolf and Carl Lewis, Fairchild's director, designed GBE with researchers at NASA's Kennedy Space Center.

According to Padolf, 136 classrooms in Miami-Dade, Broward, and Monroe counties participate, and GBE will expand to "another 15 in Palm Beach County" and be tested at the Franklin Park Conservatory and Botanical Gardens in Columbus, Ohio.

With the grant funding, which began in 2016 and will last until 2020, "we give schools all the equipment necessary to conduct the research, along with rigid research protocols from NASA scientists, and provide training for the teachers," Padolf explains. The schools grow the plants, collect data, and "input it into spreadsheets that are shared with NASA researchers…It's one of the few NASA grant projects that is feeding their research," she points out.

Students are getting real-world experience "working with plant research, statistics, and data collection; writing proposals; and presenting research posters that NASA will review," Padolf relates, "and NASA scientists are communicating with students regularly via Twitter [@GrowBeyondEarth]."

Teachers report that "students have a greater interest in plant science and STEM careers…Kids who have never grown anything are [feeling] empowered," she contends.

ANDREW KEARNS, JOSE MARTI MAST 6–12 ACADEMY

As part of a NASA CP4SMPVC grant to Fairchild Tropical Botanic Garden in Coral Gables, Florida, middle and high school students have identified 91 varieties of edible plants suitable for zero-gravity growth.

Teaching Students About Flight

Teachers and students who visit the Flight aerospace exhibit at EdVenture, an educational museum in Columbia, South Carolina, would care if EdVenture hadn't received its three-year, $893,224 CP4SMPVC grant. The grant provided funds to design and build the exhibit—including a real Boeing 757 cockpit attached to the museum—and

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Sharing Enthusiasm to Increase STEM Interest PG 3

Are you interested in shaping the next generation of K–12 science educators?

Apply to be the next Field Editor of the *Journal of College Science Teaching*.

The National Science Teachers Association is looking for the next Field Editor of the *Journal of College Science Teaching* (*JCST*).

JCST is a peer-reviewed journal published by the National Science Teachers Association. Each issue includes articles, editorials, and columns that emphasize innovations in teaching and learning in the natural sciences at the college and university level. The journal is published bimonthly and reaches a wide audience of readers who are professionals in the field of science education.

The Field Editor has ultimate responsibility for the journal's content. The ideal candidate instructs in the natural sciences or in teacher preparation at the college level, is engaged in educational research, is a strong editor, and is dedicated to improving science education for all.

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3. Oversee all aspects of the manuscript review process, ensuring that those submissions ultimately published reflect the highest levels of professional communication in the field.

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To apply, e-mail a concise vita (no more than two pages) and a letter that specifies related experience and background to the Publisher, David Beacom (dbeacom@nsta.org), by **March 15, 2018**.

For answers to frequently asked questions, visit http://www.nsta.org/jcst/fieldeditorfaq.aspx

COMMENTARY: **Ricky Arnold**

Sharing Enthusiasm to Increase STEM Interest

By Ricky Arnold


NASA

Ricky Arnold

An unexpected thunderstorm during my ninth-grade Earth science class led me to an equally unexpected career in science, technology, engineering, and mathematics (STEM) education, and then to NASA.

It was a pretty typical classroom: alphabetically-paired students working at black lab tables and the teacher managing a multitude of tasks at a large multi-functional table that spanned the front of the room. To the right of the blackboard was the dreaded green erasable weather map on which each student spent a week nervously forecasting the daily weather (each of us hoping for five days of blessed, predictable high pressure). One day, following a forecast assuring absolutely no chance of rain, we moved on to the seemingly less-than-dynamic topic of rock formation.

As my teacher guided us through our rock specimens and gleefully pointed out the feldspar, quartz, and mica indicative of a granitic rock, the sky darkened in the windows just behind my desk. A brilliant flash of lightning was immediately followed by a jarring clap of thunder. Most of us jumped.

Mr. Replane instantly let a beautiful piece of granite fall to the floor and was scavenging some stopwatches from the bowels of a nearby cabinet. Within minutes, he had us calculating the distance of the lightning strikes from the window where we now pressed our faces. The math confirmed what we all suspected: Some of the lightning struck very near the baseball fields right behind our classroom.

I was just a typical teen at the time, completely oblivious to the fact that someone had managed to sneak a combined algebra/physics/meteorology exercise by me because I—like the rest of my class —was too caught up in the excitement to notice. However, the single most excited person in that classroom was without a doubt my teacher. His enthusiasm for learning still motivates me and certainly inspired my time in the classroom. Where else was I going to find a job in which I got paid to learn?

In addition, I was learning alongside some of the most inquisitive and open minds that human beings have to offer—middle schoolers. As a teacher, I strove to capture the spirit of wide-eyed discovery that Mr. Replane shared with me at Samuel Ogle Junior High School. I hope I passed that along to some of the students whom I had the honor to teach.

I know this may sound like a selfish rationale for becoming a STEM teacher, but I also had more strategic reasons for becoming a STEM teacher.

First, STEM is where the jobs are. If I want to give a kid a hand up or push forward, I can offer no better tool than the opportunity to enter a field in which dynamic and well-paying jobs can be found. Additionally, for those wishing to explore this career field further, NASA and many big engineering companies offer exciting internships in which students work side-by-side with scientists, engineers, and researchers on real projects that help us understand the complexities of spaceflight and aviation.

Second, but equally important, the only way we are going to address the very real issues that this planet is collectively facing is with a scientifically literate public. Sadly, this is a very real problem in the country that landed the first humans on the Moon. The only way to address it is through education.

Despite the constraints of curriculum, seemingly endless paperwork, and real hardships many kids face daily, as teachers we have the very unique privilege to share with our students our passion for STEM fields. As I and many of Mr. Replane's other former students can attest, nothing is more contagious than a teacher's enthusiasm for what he/she is doing. This spark, once lit, is the mechanism with which we can help our students develop the critically needed tools required for economic empowerment and enlightened civic involvement. This is why teaching STEM is so critical, and so special.

Meanwhile, I need to return to studying the communication system on the International Space Station, and I still have a lot to learn. Thankfully, learning has been my joy, not a job.

Mr. Replane, if you happen to read this, e-mail your phone number to *Jsc-stemonstation@mail.nasa.gov*, and I'll call you from space to thank you. The STEM career that you and many other teachers inspired me to pursue has taken me to some pretty remarkable places. ●

Ricky Arnold was a middle and high school science and mathematics teacher for 15 years. He joined NASA in 2004 and has conducted research both undersea, underground, and in outer space. He is scheduled to return to the International Space Station in March 2018.

With Arnold's mission and that of astronaut and former teacher Joe Acaba before it, NASA is celebrating a "Year of Education on Station," with an unprecedented number of educational outreach activities and resources available. Visit https://goo.gl/KXnyiB *to learn more about this unique opportunity to stimulate students' interest in STEM subjects.*

NSTA Reports

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create programs that draw on students' interest in flight, space, engineering, and physics. "The exhibit [conveys] the excitement of flight to children to get them interested in science," says EdVenture President and CEO Karen Coltrane.

The funding also enables teachers to bring students to the museum as part of a field study experience in which students do an activity chosen by their teachers and hear about aerospace careers and opportunities in South Carolina. "More and more this has to be funded because schools don't have a budget for field trips, which are memorable for students," Coltrane maintains.

EdVenture is leveraging the grant to gain funds from other sources to provide professional development (PD) for K–8 teachers in using NASA and STEM content and resources. "We recognize that teachers may not be familiar with airplane manufacturing. We knew we could be helpful" in educating teachers about it so they can help students understand why advanced degrees are needed to work in 21st-century factories, Coltrane observes.

"We're starting with the youngest students to give them real-life experiences to prepare them for the workforce," remarks Nikki Williams, EdVenture's executive vice president. "There aren't a lot of varied opportunities for [PD] for teachers of grades 4–8 [in our area]… We want to make sure teachers have opportunities to feel confident in their delivery [of the content]."

Infusing NASA Content

Teachers and students in Maryland's Prince George's County Public Schools (PGCPS) district would care if the Howard B. Owens Science Center in Lanham, Maryland—which is owned and operated by the district—wasn't awarded a CP4SMPVC grant in 2014. The center's NASA Earth, Solar, and Planetary Science Infusion Project received the five-year grant of $409,047 to hold programs for grades 3–8 featuring NASA Sun-Earth connections, comparative planetology, and NASA Space Weather Action Center data.

"We do a lot of PD with teachers [to give them] tools to use NASA resources," says Russell Waugh, an Owens outreach teacher. The grant funding is used to purchase supplies and materials for these workshops. In one workshop, "teachers learn about telescopes and build a small telescope to use in their classrooms…[In another,] we show third-grade teachers how to use NASA data."

"We try to help teachers meet the *Next Generation Science Standards* (*NGSS*) [because] a lot of teachers aren't familiar with them yet. Our curriculum is based on [the *NGSS*]," says Patricia Seaton, the center's planetarium specialist. "Our county curriculum aligns with this grant," she adds.

"The funds mainly go to teachers for their time here," Waugh points out. "We give teachers time out of class to gain additional experiences with science content and related fields, and tools to use with students in hands-on activities."

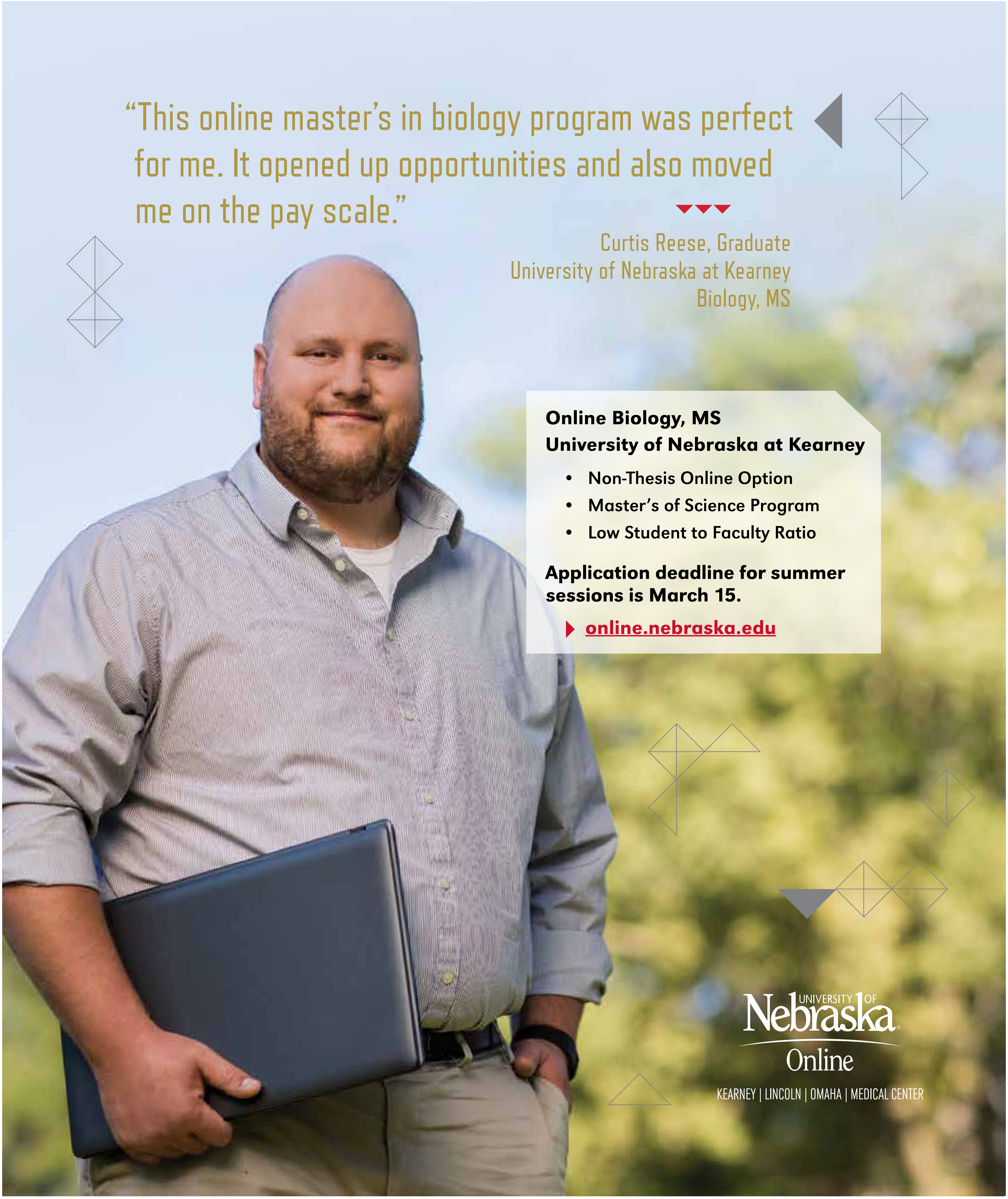
"Teachers get a stipend for participating [in our activities] and free materials," notes Seaton.

"We [also] use the PD to introduce teachers to our programs for students, to generate enthusiasm for teachers to bring their students here," Waugh explains.

"We have a Challenger Center spacecraft simulator mission called Earth Odyssey [that shows students] the advantages of remote sensing…It's as if they're flying in space. The kids are impressed," Waugh relates. Student Challenger missions are regularly enhanced with new NASA content, and the grant funds "have enabled us to keep [the Challenger simulator] updated so we can keep running it," he reports.

"Our aim is to develop a pipeline of students who would get experience with NASA data and missions and have different experiences in each grade [that would inspire them] to pursue STEM studies and careers," Waugh contends.

Without the grant, "we'd be losing the possibility of developing opportunities for students and the public to learn what NASA is doing," Seaton and Waugh maintain. ●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53 Children's Science Trade Books Recognized as 'Outstanding'

In October 2017, a panel named by NSTA and the Children's Book Council assembled to identify recently published outstanding science trade books for children, continuing a 45-year tradition. The 53 books selected can help children improve literacy while learning science, covering subjects ranging from physics to Earth science to biology.

Twenty-two science, technology, engineering, and mathematics (STEM) books also were selected for NSTA's new Best STEM books list. Nine books appear on both lists.

Visit *www.nsta.org/publications/ostb* for more Outstanding Science Trade Books for Students K–12 and the Best STEM Books, as well as the lists from past years.

Outstanding Science Trade Books

ABCs from Space, by Adam Voiland.
About Habitats: Seashores, by Cathryn Sill, illustrations by John Sill.
Animal Journal, by Juan Carlos Alonso.
Bat Count, by Anna Forrester, illustrations by Susan Detwiler.
Bees, by Piotr Socha.
Birds Make Nests, by Michael Garland.
Botanicum, by Kathy Willis, illustrations by Katie Scott.
Can an Aardvark Bark? by Melissa Stewart, illustrations by Steve Jenkins.
Cao Chong Weighs an Elephant, by Songju Ma Daemicke, illustrations by Chistina Wald.
Caroline's Comets, by Emily Arnold McCully.
Catching Air, by Sneed B. Collard III.
Chasing Space, Young Readers' Edition, by Leland Melvin.
Elon Musk and the Quest for a Fantastic Future, Young Readers' Edition, by Ashlee Vance.
The End of the Wild, by Nicole Helget.
Exploring Space, by Martin Jenkins, illustrations by Stephen Biesty.
Feathers and Hair, What Animals Wear, by Jennifer Ward, illustrations by Jing Jing Tsong.
Finding Wonders, by Jeannine Atkins.
Girl Code, by Andrea Gonzalez and Sophie Houser.
The Girl Who Thought in Pictures: The Story of Dr. Temple Grandin, by Julia Finley Mosca, illustrations by Daniel Rieley.
Grand Canyon, by Jason Chin.
The Great Penguin Rescue, by Sandra Markle.
Hawk Mother, by Kara Hagedorn.
HelloFlo: The Guide, Period, by Naama Bloom.
Honey Girl, by Jeanne Walker Harvey, illustrations by Shennen Bersani.
How Animals Build (Lonely Planet Kids), by Moira Butterfield, illustrations by Tim Hutchinson.
How to Be an Elephant, by Katherine Roy.
Isaac the Alchemist, by Mary Losure.
It Starts With a Seed, by Laura Knowles, illustrations by Jennie Webber.
It's a Fungus Among Us, by Carla Billups and Dawn Cusick.
Living Things and Nonliving Things, by Kevin Kurtz.
Margaret and the Moon, by Dean Robbins, illustrations by Lucy Knisley.
Moonlight Crab Count, by Neeti Bathala and Jennifer Keats Curtis, illustrations by Veronica V. Jones.

Mosquitoes Don't Bite Me, by Pendred Noyce.
My Journey to the Stars, by Scott Kelly, illustrations by André Ceolin.
Newton's Rainbow, by Kathryn Lasky, illustrations by Kevin Hawkes.
Out of School and Into Nature, by Suzanne Slade, illustrations by Jessica Lanan.
Over and Under the Pond, by Kate Messner, illustrations by Christopher Silas Neal.
Pup the Sea Otter, by Jonathan London, illustrations by Sean London.
Ribbit, by Jorey Hurley.
Seagrass Dreams, by Kathleen Hanes, illustrations by Chloe Bonfield.
The Secret Life of the Red Fox, by Laurence Pringle, illustrations by Kate Garchinsky.
The Secret Project, by Jonah Winter, illustrations by Jeanette Winter.
Secrets of the Sea, by Kate Baker, illustrations by Eleanor Taylor.
Seven Wonders of the Solar System, by David A. Aguilar
Shark Lady, by Jess Keating, illustrations by Marta Álvarez Miguéns.
The Street Beneath My Feet, by Charlotte Guillain, illustrations by Yuval Zommer.
Super Women, by Laurie Lawlor.
Tall Tall Tree, by Anthony D. Fredericks, illustrations by Chad Wallace.
This Book Stinks! by Sarah Wassner Flynn.
Tide Pool Secrets, by Narelle Oliver.
When Planet Earth Was New, by James Gladstone, illustrations by Katherine Diemert.
When the Sky Breaks, by Simon Winchester.
When the Sun Goes Dark, by Andrew Fraknoi and Dennis Schatz, illustrations by Eric Freeberg.

Best STEM Books

Ada Lace Sees Red, by Emily Calandrelli with Tamson Weston, illustrations by Renée Kurilla.
The Book of Chocolate, by HP Newquist.
Cao Chong Weighs an Elephant, by Songju Ma Daemicke, illustrations by Christina Wald.
Caroline's Comets, by Emily Arnold McCully.
The Doctor with an Eye for Eyes, by Julia Finley Mosca, illustrations by Daniel Rieley.
Elon Musk and the Quest for a Fantastic Future, Young Readers' Edition, by Ashlee Vance.
The End of the Wild, by Nicole Helget.
Find the Dots, by Andy Mansfield.
Finding Wonders, by Jeannine Atkins.
From Here to There, by HP Newquist.
Girl Code, by Andrea Gonzalez and Sophie Houser.
The Girl Who Thought in Pictures: The Story of Dr. Temple Grandin, by Julia Finley Mosca, illustrations by Daniel Rieley.
Hidden Figures, Young Readers' Edition, by Margot Lee Shetterly.
How Could We Harness a Hurricane? by Vicki Cobb.
John Deere, That's Who! by Tracy Nelson Maurer, illustrations by Tim Zeltner.
Maya Lin, by Jeanne Walker Harvey.
The Music of Life, by Elizabeth Rusch, illustrations by Marjorie Priceman.
Newton's Rainbow, by Kathryn Lasky, illustrations by Kevin Hawkes.
Science Comics: Flying Machines, by Alison Wilgus, illustrations by Molly Brooks.
Shark Lady, by Jess Keating, illustrations by Marta Álvarez Miguéns.
Voyager's Greatest Hits: The Epic Trek to Interstellar Space, by Alexandra Siy.
Warcross, by Marie Lu. ●

Teaching Challenges Vary Across Urban, Rural, and Suburban Schools

THINKSTOCK

Teachers of science, technology, engineering, and math (STEM) who have moved from urban schools to suburban and/or rural schools have experienced unique joys and challenges. Cheryl Patty of New Hampshire calls the urban Massachusetts school where she first taught eighth-grade Earth science "the toughest middle school in the city. There were a lot of violence and discipline issues. Undercover police patrolled the hallways."

At that urban school, "teaching the content wasn't the most important [goal]. I wanted my students to love science and want to study it in high school," she maintains. In turn, her students "liked being noticed and felt I cared for them. They felt safe at school with adults who are stable," she recalls.

"I made a difference emotionally, but not academically," Patty concludes. But she adds, "I miss the diversity I had in the city. My current students [in a rural school] are mostly white and haven't been exposed to other cultures."

Maire Schultz taught sixth-grade science in a grades 6–12 inner-city charter school in St. Louis, Missouri. Parental involvement was infrequent in St. Louis, she contends, because "students were bussed in from all over the city," while at her current school in suburban Honolulu, Hawaii, "the parents bring their children to school, and I can talk to them directly." In addition, parents in St. Louis tended to assume "no news is good news" and only expected teachers to call them with problems, but "I did make lots of calls to tell the parents positive news," she recalls.

David Lockett first taught at an urban school in Tennessee. At that school, "there was a lot of community involvement and funding for technology because there were a lot of community-based businesses nearby, and we had access to them. It was easy to get answers to technology-related questions from them and get them involved with the school," he reports. In addition, parental involvement was strong "because many parents lived and worked nearby," he notes.

However, the urban school "had slightly larger class sizes than what I'm used to now," Lockett acknowledges. "Smaller classes allow you to better understand students' needs and pathways."

Margaret Busker-Postlethwait went from a suburban middle school in Maryland to an urban high school in Ohio. "It's been a very challenging ride," she asserts, even though in her area, "inner-city schools pay more and offer better healthcare benefits."

For example, her suburban students "would put their phones away," but at her high school, "students' phones are their life, and they won't put them away," she reports. She has students from low-income families "who have expensive smartphones. They have misplaced priorities, and education is not seen as a path [to a better life]," she contends.

Busker-Postlethwait points out that at her current school, bad behaviors, such as cursing at teachers, have "little repercussions because we have become desensitized, and when we do write them up, nothing happens."

Suburban Surprises

Patty later taught eighth-grade Earth science in a New Hampshire suburb. She says she noticed "a lot of the same attitudes [as the urban students had]. There was a core group of students who were not serious about school. There was no violence, but the core group was so apathetic that I couldn't reach them."

In addition, "the school board was all about money and the budget. A lot of their decisions were money-based, not student-based," she recalls.

Schultz now teaches grades 6–8 science and third-grade technology in a private Catholic school in suburban Honolulu. She says she appreciates "the diversity of subjects [I teach in Hawaii] and how far I can push my students [because] a lot of them have high aptitude [in science]." But in Hawaii, "the student population is very diverse, [and I teach] a lot of English-language learners, which is very challenging," she contends. "Teaching in a private school is not necessarily easier."

Cheryl Turlin of Missouri says she fared better when teaching in an urban district than she did when that district merged with a suburban district. In the urban district, "most administrators had the teacher's back. You were never blindsided [by reprimands]," she explains.

In the suburban district, "the administrators and vice principals thought parents and students always told the truth, and their words were [considered more valid than] the teachers' words," she maintains.

For example, after agreeing to accept a particularly difficult student in her classroom and successfully working with him, Turlin says she was stunned to learn she was "written up" because she bought a necklace from the student after school. "I was [reprimanded] for encouraging him to sell things at school," she explains. "They put a write-up in my file without notifying me in advance, then asked me to provide my side [in a written statement]."

In the urban district, Turlin's school was "an environmental elementary magnet school" that had "amazing parental involvement" because parents appreciated the environmental focus, she contends. After the merger, the suburban district administrators removed some of the environmental areas her school had established, such as a native Missouri grassland restoration area. "We were told, 'This is not going to be an environmental magnet school. We want it to be the same as the other schools without these distractions.'…Some parents hung in there, but a lot of parents gave up and quit," she recalls.

Rural Adaptation

After 12 years at the suburban school, Patty now teaches now teaches grades 5–8 STEM in a small public K–8 school in rural New Hampshire. "There's huge community support for us," she contends, and "the students say, 'Thank you.' They're very enthusiastic about learning and a joy to teach. There might be some mild bickering, but no violence."

In addition, "I am in charge of planning my curriculum. As long as I cover what the district requires, I can teach how I want. When all the hurricanes happened [last] fall, I was able to teach about them right as they happened," she relates.

However, funding is tight at her rural school. "Teaching four grades makes me a scavenger. I pay a lot out of my own pocket," she confesses.

At the suburban school, Patty observes, "we had a good science department, and I had lots of colleagues. At my current school, I'm the only science teacher, which is challenging."

Lockett now teaches at a rural school in Florida. He finds that "being in a rural area allows you to better know and understand your community; it's more intimate," he explains. "When you go from a fast-paced environment to [one that is] slower-paced, you can take more time to understand community projects."

Such a drastic change has implications outside the classroom as well. Gabe Kraljevic, a retired teacher in Winnipeg, Manitoba, who writes NSTA's Ask a Mentor advice column (*https://goo.gl/W98LEC*), lived in a rural area briefly before he became a teacher. "My move to the country became a love-hate relationship, to be honest. I liked the quiet [and] how amazingly close you got to nature, and I really enjoyed meeting the people and learning about farming. I really miss scooping farm-fresh cream from a mason jar into my coffee: nothing better!"

However, Kraljevic continues, "I hated the lack of entertainment, minimal choice[s] for activities, and not having connections to my social group back in the city (pre-internet days). On the bright side, I did do a lot of reading [when I lived in the country]." ●

Quotable

Our progress as a nation can be no swifter than our progress in education. The human mind is our fundamental resource.

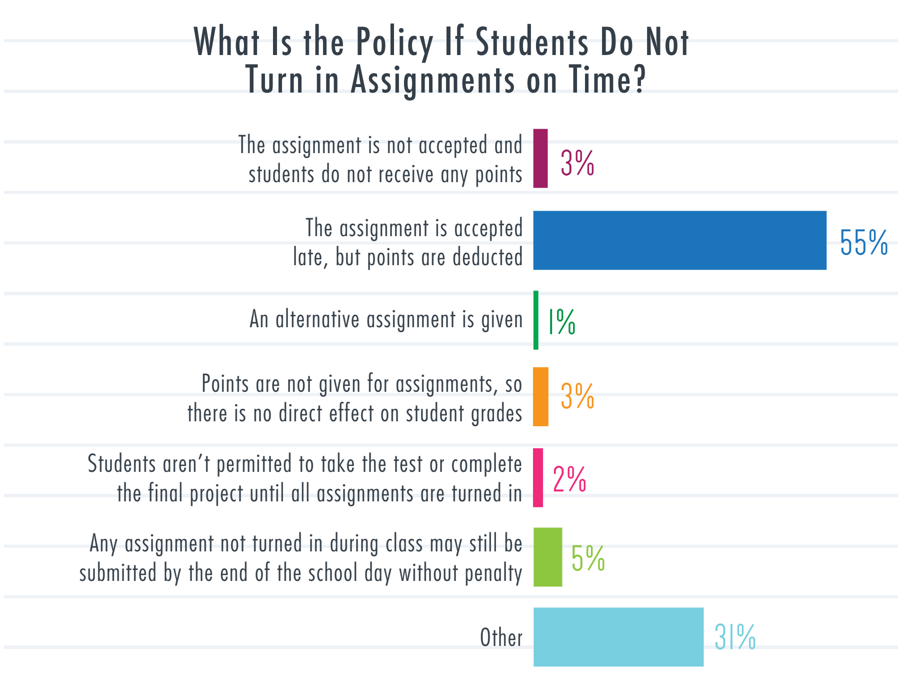
— John F. Kennedy, U.S. president (1917–1963)

Benefits of Allowing Make-Up Work Outweigh Drawbacks

After a recent discussion of make-up work on NSTA's e-mail lists, *NSTA Reports* asked science teachers to share their policies in an informal poll. More than half of respondents (55%) said they accept late assignments but deduct points. Only 3% said they don't accept late work, and another 3% reported that they don't give points for assignments, so student grades aren't directly affected. Thirty-one percent reported having different policies, including accepting late work without penalties until students take the summative test, at the end of the unit, or the end of the marking period.

To help students catch up when they fall behind, 53% of respondents said they post work assignments online or in a folder in the classroom so students know where to find assignments and can complete them as soon as possible. Fifteen percent say they assign students to either before- or after-school interventions to work with a teacher. Nineteen percent reported using a variety of strategies, including holding regular intervention periods for any students wishing to attend.

While 53% said allowing make-up work increased the number of students turning in work late, 80% indicated they thought allowing make-up work benefitted students.



Here's what science teachers are saying about the benefits and drawbacks of allowing students to make up work:

Homework includes guided notes and practice problems that help students understand and prepare for assessments. If they do not do the work (and many won't if there is no credit given), they miss the valuable practice. —*Educator, High School, Massachusetts*

Students are required to own their learning more. The student still is required to complete the formative work, which in turn promotes better understanding of the material. If [students want] to redo a summative assignment, they need to show that all of their formative work has been completed first.—*Educator, High School, Utah*

If the student is late infrequently, then it is not an issue; if the student is always late with work, then there is another issue that needs to be investigated.—*Educator, Middle School, Idaho*

The work we assign is to improve understanding and learning of the material. If we do not have students make up the work, they are not learning the material.—*Educator, High School, Kansas*

If students are missing assignments not because they were ill, but because they chose not to complete them, they have made a choice to get behind. By continually allowing them to "make up" work, you create an environment in which they do things when they feel like it, not on a schedule. This is not preparing them for life.—*Educator, Middle School, Illinois*

In science they can make up the grade, but it's nearly impossible to make up the learning. Some do make up the learning, but most don't.—*Educator, Middle School, California*

Only when the turn-in [occurs] at an appropriate time. The homework was assigned to review and practice, so that is exactly what it is doing. If it's [done] after the evaluation, then it is of little value.—*Educator, High School, Michigan*

[We are] preparing them for college/university and [the] workforce. Allowing procrastination does them no academic favors.—*Educator, Institution of Higher Learning, Arkansas*

Allowing students to turn in work late creates a lack of accountability that follows them as they get older.—*Educator, High School, Tennessee*

I make students complete pre-lab work before they can…do the lab. Not doing pre-lab = zero, but they also must do it to complete the lab itself. The original zero or failing grade goes in the book and cannot be overwritten. If the work isn't completed or done poorly, the student does remediation rather than the lab.—*Educator, High School, Georgia*

The goal should be learning...I think not accepting work late encourages a "just get it done" mentality in all students.—*Educator, Middle School, Maryland*

They are allowed to make a mistake. Allowing make up work helps to foster the idea that all the work is important and that it all needs to be learned for the best student outcomes.—*Educator, Middle School, New Hampshire*

Real life involves deadlines. Teaching time management and the need for a sense of urgency is useful if our students are to be successful.—*Educator, High School, North Carolina*

Varying family circumstances may not allow a student to be "on time." I don't want to penalize the student when control is not yet fully in their hands.—*Educator, Middle School, Oregon*

We don't get to just not turn in progress reports or taxes, or send e-mails, just because we missed the deadline. There are workload and social/professional consequences when that happens, but we still have to do the work. We also shouldn't deduct points because it dilutes the information contained in grades. A grade should reflect content and skill mastery, not behaviors. —*Educator, Middle School, Washington*

I required students to meet with me to explain why the assignment was late and tried to turn that into a learning session before agreeing to accept the late work. Tried to help student figure out how to avoid late work in the future, as it would be problematic outside of school.—*Administrator, Informal Education Setting, California*

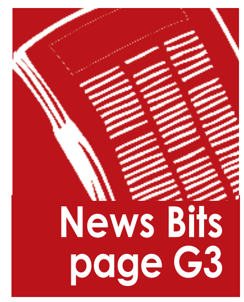
I want them to know and understand the material. Students often have extraneous issues that they may not feel comfortable discussing. Having a policy [in which] late work is accepted, within reason, allows them to not fall under scrutiny and still stay on top of their work with their classmates. —*Educator, High School, Wisconsin*

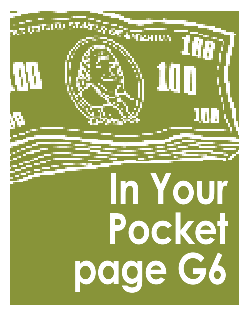
I can't possibly catch every student [missing work] in a timely manner. Getting a zero will kill their grade and make them give up. They always appreciate when I make them come outside of class time to get help finishing things they felt they couldn't do on their own and therefore did not turn in.—*Educator, High School, New Jersey* ●

PULL-OUT SECTION

SCIENCE TEACHERS' GRAB BAG

Inside this Convenient Pull-Out Section you will find:





Freebies for Science Teachers

GasSim. **H** **HE** This modeling and simulation tool can help high school and undergraduate chemistry and physics students develop a deeper understanding of ideal and real gas laws. The app has a database of gas properties for 76 gases, including elements, inorganic compounds, hydrocarbons, and organic compounds. Students can manipulate the temperature, volume, or the number of moles of a selected gas. The simulator then computes the pressure for the selected variable, using three different gas models: the ideal gas model, the van der Waals real gas model, and the Peng-Robinson real gas model.

Results appear in both graphs and tables. The User Guide includes screenshots of results from different simulations, giving students a clear picture of the kind of data available from the app. See *https://goo.gl/ifQHtC*.

An Eye on Optics. **M** This middle level science, technology, engineering, and math (STEM) unit teaches about light, lenses, assistive vision technologies, and the engineering process. In six lessons, students work with materials and make and share observations to learn about optics and the relationship between gelatin shapes and light. Students then apply what they've learned in a final challenge in which they design a set of lenses to correct a hypothetical patient's vision problem (e.g., myopia or hyperopia). Each lesson can be completed in 45–60 minutes, and tips for facilitating the activity, summary and reflection questions, and student worksheets are included. Visit *https://goo.gl/muQT8i*.

Innovation Curriculum. **M** **H** A project learning–based curriculum from the New York Academy of Sciences teaches middle and high school students how to solve challenges facing their communities—and communities worldwide—by applying principles of scientific research and design thinking. Known as the Global STEM Alliance Innovation Process, the process gives students a framework for creative problem-solving and modeling the work of STEM professionals. The curriculum has two formats: The Classroom Model, which can be implemented in 10 weeks and includes both in-class and outside-of-class assignments for students, and the Workshop Model, which presents the content as a one- or two-day intensive learning experience. Teachers can get support from an online community. Consult *https://goo.gl/QWX8Bm*.

PATRICK M. BONAFEDE

My Molecularium. **M** **H** This fast–paced molecule-building game/app helps players better understand the molecular nature of the world. Fun for players of any age but most appropriate for middle and high school chemistry students, the game challenges players to build a variety of molecules including water, vitamin C, caffeine, and adrenalin. To build them, players "launch" atoms at target bond sites to assemble accurate 3D molecular models of increasing complexity and difficulty. The app has three levels and covers 33 essential molecules, allowing students to learn and practice chemistry concepts related to molecular structure, chemical formulas, and other topics. Download the app (available for both iOS and Android devices) at *https://goo.gl/DKtiLq*. Teachers can preview the game at *https://goo.gl/PXQKzo*.

FLEET. **M** **H** The American Society of Naval Engineers produced this STEM video game for middle and high school students. FLEET engages students in the engineering design process through shipbuilding and can be played individually or in classrooms or science clubs. Accompanying curriculum materials at *https://goo.gl/ptWJT9* explore the underlying engineering and scientific processes that help students succeed in the game, including ship stability, speed, and maneuverability. The lessons incorporate a mix of hands-on science experiences, instructional videos, engineering discussion topics, and pilot-testing opportunities using the game as a virtual simulator. Watch a video trailer to learn more at *https://youtu.be/ZS0mlBX3OQs*.

Guide to K–12 STEM Resources for Teachers. **K12** Created by Norwich University Online, this document presents data demonstrating the importance of a STEM education, along with lesson plan ideas, projects, and curriculum supplements. Links to science education associations and other groups (e.g., NASA for Educators, The Concord Consortium) that offer

See Freebies, pg G2

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

Freebies, from pg G1

STEM resources are included. See *https://goo.gl/U1tg6u*.

Boddities for the Classroom. E M H This video series produced by Boston Globe Media's online health, medicine, and science publication STAT uses animation, vintage film footage, and interviews with leading physicians to answer questions about the human body, such as what happens when skin gets sunburned, why our fingers get wrinkly in water, and why stomachs don't digest themselves. Targeted for students in grades 4–9, the short (less than two minutes) videos can spark science discussions or serve as fun extras after a lesson. Some episodes are paired with classroom worksheets offering Quick Questions to consider while viewing, Fast Facts to highlight science information, and a concluding Activity. Visit *https://goo.gl/SVnjBp*.

ESPRESSO ADDICT

Discovering Farmland. H An education initiative from the U.S. Farmers and Ranchers Alliance and Discovery Education offers lessons, digital explorations, and 360 videos (videos made with a camera that records in every direction at the same time, allowing viewers to explore a scene in 360 degrees) for high school students that focus on critical issues impacting the agriculture industry. The lessons support the *Next Generation Science Standards* and explore sustainability, the new science behind farming, and entrepreneurship. Digital explorations, such as Your Shopping Experience, introduce students to the meaning behind food labels as they click through items at a virtual grocery store and learn about terms like genetically modified crops, grass-fed proteins, and USDA Organic certification. The 360 Videos provide glimpses of new developments in agriculture, including automatic feeders, robotic milkers, seed technologies, and Smart Farms. Visit *https://goo.gl/dhwdHQ*.

Tools for Building Data Literacy. K12 HE The Community for Advancing Discovery Research in Education (CADRE) offers tools and resources to help K–college students and teachers develop skills in analyzing and interpreting data. For example, Data Nuggets (grades K–12) are classroom activities designed by scientists and teachers that bring real research data into the classroom and give students practice in identifying hypotheses and predictions, visualizing and interpreting data, making evidence-based claims, and asking their own questions for future research. The Web-based Inquiry Science Environment (WISE) offers interactive units for grades 5–9 that help students learn to interpret, critique, and construct graphs and explore graphs of complex scientific phenomena such as thermodynamics. TI Sensor Tag (grades 9–12) challenges students to use WiFi-linked sensor tags to collect environmental data in the schoolyard, then analyze it using data tables and graphs. Refer to *https://goo.gl/XwJyDG*.

The IP Patch Curriculum and Toolkit. E M H Created by the Intellectual Property Owners Education Foundation in collaboration with the U.S. Patent and Trademark Office and the Girl Scout Council of the Nation's Capital, the Intellectual Property (IP) Patch introduces students to the patent process and invention and encourages them to consider STEM careers. The curriculum materials—Imagination Pioneers (grades 2–3), Investigating Possibilities (grades 4–5), Inventive Products (grades 6–8), and Inspiration Producers (grades 9–10)—include information, activities, and real-world examples that explain what intellectual property is and how to use it to promote and protect your works. An accompanying toolkit offers guidance for youth groups and other organizations interested in hosting events using the IP Patch curriculum, as well as support for teachers introducing IP education in the classroom. Visit *https://goo.gl/tB2Qx3;* click on Appendix to access the curriculum.

Chemical Education Xchange. H HE ChemEd X provides a place for high school and college chemistry teachers to collaborate globally, communicate experiences, and share pedagogical ideas and tips. All content is moderated and includes articles and activities that are peer-reviewed by high school and college-level chemistry teachers, as well as blogs, "picks," videos, and event announcements. Consult *www.chemedx.org*.

TERRY GOSS

Ocean Tracks Curriculum, College Edition. H HE Targeted for undergraduates but also appropriate for high school students, this curriculum from the Education Development Center's Oceans of Data Institute and its partners teaches students how to use the Ocean Tracks map interface to explore authentic scientific data—including environmental and tracking data for elephant seals, Laysan Albatross, white sharks, and tuna. Through learning modules, students develop skills in analyzing data, spotting patterns, and extracting useful information from big datasets. Titles include Fact or Artifact? Interpreting Patterns in Ocean Tracks Data; Faster, Farther, Deeper: Exploring the Physiology of Highly Migratory Ocean Predators; Do You Come Here Often? The Making of Biological Hotspots; Saving Sharks: Proposing a New Marine Protected Area; and What's Up in the Pacific Ocean? Connecting Productivity and Tuna Migration. Visit *http://oceantracks.org/curriculum*.

Color Mixing Demonstration. HE Produced as part of Polyhedron Learning Media's iNSIGHT collection—a supplemental curriculum designed for college-level vision science and experimental psychology lab classes—this app illustrates additive and subtractive color mixing, or the mixing of colored lights and colored pigments. With the app, students can adjust the proportion of the primary colors in a color mixture, as well as plot the position of a given color mixture in a 3D color space. A downloadable Student Guide includes exercises and materials to guide users through the demonstration. A Teachers Guide is also available. Consult *https://goo.gl/hGDVvC*.

Science Biographies for Grades 3–8, an Annotated Bibliography. E M The list—compiled in 2012 as part of the Sense of Wonder: Stories of Nature, Science, and History Conference for Educators, sponsored by the Kennedy Presidential Library and Museum—highlights contemporary and historical persons who have made significant contributions in the fields of science, technology, and environmental protection. Organized by category—Animals, Astronomy and Space Exploration, Botany, Environmental Protection and Climate Change, Invention, Medicine and Genetics, Oceanography, and Paleontology—each annotation includes recommended grade level, publication information, and a brief description of the content. Access *http://goo.gl/esS57N*.

Robotics With Ready. E M Ready, a simple software-building platform, allows teachers and students to create software to program robots, create games and other projects, and develop computational thinking—all without previous coding experience. Visit *http://goo.gl/NjsCPw* to access tutorials, curriculum activities for students in grades 5–7, and an online help forum.

School Garden Wizard. K12 Developed by the U.S. Botanic Garden and Chicago Botanic Garden, the website presents resources and support for new and existing school garden programs in K–12 settings. Teachers will find information to share with administrators on the benefits of school gardening and a how-to template for writing an effective proposal for a school garden program. The site also provides tips for finding funding for a garden program, advice on planting and maintaining a school garden, and lesson plans. See *www.schoolgardenwizard.org*. ●

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

News Bits

- **In Massachusetts, Amherst College's Being Human in STEM (science, technology, engineering, and math) program will offer a course open to non-STEM majors this spring. HE**

Being Human in STEM was developed in 2016 to promote discussion and research on inclusiveness and diversity in STEM fields. Originally designed as a special topics course, the program originated from the Amherst Uprising movement of 2015, a student-led sit-in to raise awareness of and seek action against white supremacy at the college and nationwide. The program seeks to foster a more inclusive, supportive STEM community. "I feel like Being Human in STEM has been one of the most fulfilling classes I have taken at Amherst," says student Ruth Manzanares.

Many of the program's practices have been incorporated into biology and chemistry classes. And after outreach to other institutions, Yale University now offers its version of Being Human in STEM, which examines how gender, race, religion, sexuality, and economic circumstances shape the STEM experience. Read more at *https://goo.gl/pmWAwJ*.

- **Preschool teachers' comfort level with science affects whether they choose to teach it, Michigan State University researchers found. P**

Hope Gerde, associate professor of human development and family studies and the study's lead author, said teachers' comfort level in teaching reading and math was not as significant. About 99% of teachers engaged in literacy activities three to four times a week, and 75% engaged in math activities that often, while only 42% offered science lessons that frequently. The research team interviewed 67 teachers who were all Head Start instructors.

Gerde theorizes that the instructional imbalance occurs partly because of previous and current policy focus on literacy. Though no empirical evidence shows lack of science exposure in preschool affects students' future understanding of it, only 37% of fourth graders scored proficient in science in the National Assessment of Education Progress in 2015. Calling the lack of preschool science instruction "a missed opportunity," Gerde observes, "Science has this fantastic potential to not only promote scientific thinking and problem solving and inquiry-based thought, but [also] to integrate the literacy, the math."

Researchers did find that today's preschool classrooms have more science materials and activities than in 2006, when a similar study was conducted. Researchers are now working with the teachers surveyed to introduce more scientific activities to their students and to convince teachers they don't need to know all the answers to teach science. Read more at *https://goo.gl/An8ymj*.

- **A Colorado school district has replaced parent–teacher conferences with the online portal Infinite Campus. K12**

Commerce City's Adams 14 School District made the change to increase instructional time. The district—in which almost half the students are English language learners and about 85% qualify for subsidized lunches—has struggled academically and is under a state-ordered improvement plan.

In addition to weekly grades, Infinite Campus informs parents about assignments and attendance, and district officials claim the portal's information is more robust. But parents contend the system isn't user friendly and can't replace the insights they receive from teachers. Steven Sheldon, a research scientist and associate education professor at Johns Hopkins University, says portals pose a problem to families without internet access. And because the reports are in English, non-English-speaking parents have complained.

Spokesperson Janelle Asmus says the district has no data about parental attendance at conferences, but teachers reported that parents often failed to attend them. Teachers and union representatives say parents are still requesting conferences before or after school, when teachers aren't being paid. Read more at *https://goo.gl/iq5KPA*. ●

What's New

FROM U.S. GOVERNMENT SOURCES

National Oceanic and Atmospheric Administration (NOAA)

The Tell-Tale Plume H

Explore hydrothermal vents without leaving the classroom with this interdisciplinary chemistry and math activity from NOAA's Ocean Explorer series. The activity for grades 9–12 uses web resources to teach students about hydrothermal vents and how to identify changes to the physical and chemical properties of seawater that are caused by them. Students then apply this new knowledge to analyze oceanographic data to recognize a probable plume from hydrothermal activity.

Visit *https://goo.gl/QV6Qvs* for a lesson plan including background information on hydrothermal vents that teachers can share with students, student handouts (e.g., Hydrothermal Vent Plume Inquiry Guide and Hydrothermal Plume Plotting Sheet), and web resources from NOAA's INSPIRE: Chile Margin 2010 Expedition, which explored previously undiscovered hydrothermal vents near the Chile Triple Junction.

Multimedia Discovery Missions H

These interactive multimedia presentations and learning activities for students in grades 9–12 address topics from Chemosynthesis and Hydrothermal Vent Life and Deep-sea Benthos to Food, Water, and Medicine From the Sea, and include questions for students to answer as they learn. Visit *https://goo.gl/ebLT12* for a description of each presentation.

U.S. Department of Energy (DOE)

Solar Decathlon Energy Resources Picks K12

Check out the K–12 energy education resources recommended by the DOE's Solar Decathlon, a collegiate competition in which student teams design and build full-size, solar-powered houses. Notable resources include the National Energy Education Development (NEED) Project's Energy Infobooks (for grades K–2, 3–5, 6–8, and 9–12), which feature fact sheets describing major energy sources, new technologies, energy conservation, electricity, and other energy topics. Energy House, a classroom activity for grades 4–8, teaches about efficiency, conservation, and economic returns as students use various materials to insulate a cardboard house, then test its efficiency. Exploring Photovoltaics, a unit for grades 9–12, teaches students how solar energy is used to generate electricity. Access these and other energy education materials at *https://goo.gl/WGWRAh*.

STEM Rising K12 HE:

The DOE's new STEM Rising initiative publicizes science, technology, engineering, and math (STEM) happenings. A monthly newsletter (*https://goo.gl/b5PK9j*) and blog (*https://goo.gl/bQoFVk*) highlight DOE-supported STEM programs for all ages, including outreach activities at DOE facilities around the country, K–12 learning resources, student competitions, field trips, internship and research opportunities, and tools for STEM teachers.

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

Centers for Disease Control and Prevention

Ready Wrigley Prepares for Flu Season E

Help K–3 students stay well with *Ready Wrigley Prepares for Flu Season,* an activity book at *https://goo.gl/QQiV1z.* The book features coloring pages and puzzles that remind young students of simple practices to follow to stay healthy, such as washing hands frequently, getting a flu shot, covering coughs and sneezes, and staying away from people who are sick. Share the book in class, or send it home with students for families to complete together.

National Aeronautics and Space Administration (NASA)

Robotic Arm Challenge E M

In this challenge, adaptable for grades K–8, students use a model robotic arm to move items from one location to another. The experience engages students in the engineering design process as they design, build, and operate the arm. The lesson plan at *https://goo.gl/Rf25k9* has background information for teachers; highlights relevant vocabulary terms that can be applied in many engineering design challenges (e.g., rover, payload, cargo platform, end effector); and includes discussion questions, assessment ideas, and links to extension explorations that challenge students to create more sophisticated robotic arms.

Engineering in the Classroom Instructor Guide K12

The *Next Generation Science Standards* (*NGSS*) offer opportunities for teachers to integrate engineering into the science curriculum. This resource shares real-world examples of how the *NGSS* engineering standards are used at NASA's Jet Propulsion Laboratory (JPL) and connects these video vignettes to classroom activities for elementary (grades K–2 and 3–5), middle, and high school levels that apply some of the same principles discussed in the video. For example, middle level students are challenged to determine criteria for measurement as they attempt to keep hot water hot and cold water cold in designing a "Mars Thermos." JPL scientists employ similar engineering processes when designing spacecraft. Learn more and download the resource at *https://goo.gl/2e99eo.*

USA.gov

Exploring Careers in the Government E M

In this lesson for grades 4–6, students work in groups to research careers in the federal government, such as aerospace engineer, archaeologist, Army dentist, wildlife officer, marine biologist, and physical therapist. Students watch a video on an assigned career, then take a quiz about it. Afterward, the groups share, as a class, the jobs they were assigned, the answers to the quiz questions, and why they think that job is important. In addition, students complete a Likes and Dislikes worksheet to learn more about themselves and find possible careers suited to their interests. Access the lesson plan at *https://goo.gl/R7jRsg.*

National Institutes of Health (NIH)

Cell Biology in the News M H

Current events allow teachers to show students "why we care about this topic" and spark science discussions. At *https://goo.gl/b9fec7,* teachers can access a page of cell biology resources appropriate for students in grades 6–12, including a news brief describing a discovery made using a state-of-the-art microscope that enables scientists to see changes inside the nuclei of living cells. Once students' curiosity is piqued, the page offers Fun Facts About DNA and links to additional cell biology resources from the U.S. National Library of Medicine to extend learning.

Know the Science Health Research Initiative M H

NIH's National Center for Complementary and Integrative Health has launched Know the Science, an education initiative designed to clarify and explain scientific topics related to health research. Materials include interactive modules, quizzes, and videos filled with engaging, straightforward content to help consumers "get to know the science." Though the content is intended for adult audiences, many of the resources are appropriate for middle and high school students.

For example, students learning to conduct science research can benefit from the module Nine Questions to Help You Make Sense of Health Research, which presents critical questions to ask when evaluating scientific data or reports: What are the parts of a scientific paper? What were the goals of the study? How large was the study? How do the reported results compare with previous studies?

Another module, The Facts About News Stories, presents valuable information about identifying reliable health science news in the media. Find these resources and more at *https://goo.gl/s4Tymr.*

U.S. Department of Education (ED)

STEM Study Findings H

African American and Hispanic students in Texas complete fewer advanced STEM courses than white students, although they have equal or better access to such classes, according to *Advanced Course Offerings and Completion in Science, Technology, Engineering, and Math in Texas Public High Schools,* a Regional Educational Laboratory Southwest study. This report reflects on possible reasons for this outcome. (See *https://goo.gl/ZSN4mi.*)

The study shows that while Hispanic and African American students do lag behind white students in advanced STEM course completion, it is likely not because of less access to these courses. Instead, findings point to a need for increasing Hispanic and African American student enrollment in those advanced courses and identifying mechanisms other than increasing course offerings to accomplish this. For example, future research might focus on factors that may contribute to lower course completion rates among racial/ethnic minority students, such as less (or less effective) communication with parents, less effort in middle school to spark interest in STEM, or less access to highly qualified teachers.

U.S. Environmental Protection Agency (EPA)

What Happens to Trash? M H

Teach students about recycling, pollution, and the environment with this infographic about Municipal Solid Waste—or trash—in the United States, the benefits of recycling, and action steps to take to reduce the amount of trash thrown away. Most appropriate for middle and high school levels, the infographic features interesting comparisons that can spark science discussion in the classroom. For example, did you know every ton of recycled paper can save the energy equivalent of 322 gallons of gasoline?

The final panel presents simple ideas to implement immediately, in stores and at home, to reduce trash, such as buying only what you need and you know you will use, shopping for products made with recycled materials, composting food scraps and yard waste, and using energy-efficient bulbs and rechargeable batteries at home. Find the infographic at *https://goo.gl/JnYYhr.*

U.S. Fish and Wildlife Service (FWS)

Beginner's Guide to the National Wildlife Refuge System K12

National wildlife refuges provide important habitats for more than 380 threatened or endangered species. Many refuges also conserve designated wilderness and historical and cultural resources. Introduce K–12 students to the National Wildlife Refuge System at *https://goo.gl/cV7Dj1.* Through a series of amazing nature photographs taken in some of the 566 national wildlife refuges across the United States, students learn about the National Wildlife Refuge System and its importance in preserving our country's wildlife heritage—from what the system encompasses and how it was established, to the conservation programs taking place there and the recreational opportunities they provide, such as fishing, hiking, photographing wildlife, and enjoying environmental education programs. ●

In Your Pocket

Editor's Note

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

January 20–31

Lawrence Scadden Teacher of the Year Award K12

This award from Science Education for Students with Disabilities (SESD) recognizes excellence in science teaching of students with disabilities. The honoree will receive $1,000 for travel expenses to attend the NSTA National Conference in Atlanta in March and be recognized at the Science-Abled Breakfast. K–12 science, general education, or special education teachers in public or private schools with at least five years of teaching experience may apply by **January 20.** See *www.sesd.info/scadden.htm.*

Edward C. Roy, Jr. Award for Excellence in K–8 Earth Science Teaching E M

This American Geosciences Institute award goes to one K–8 teacher who is a leader and innovator in Earth science. The honoree receives $2,500, a plaque, and a $1,000 grant to attend the NSTA National Conference in Atlanta. Full-time K–8 teachers in the United States or the United Kingdom who teach Earth science are eligible. Apply by **January 22** at *https://goo.gl/lZ7N8Y.*

Six Star Science Online Professional Development Program M H

The American Physiological Society (APS) offers this program for middle and high school science teachers. For 10 months, online teacher fellows explore Six Star Science, a research-based framework for excellence in science instruction, and develop methods for implementing it in their classrooms. Fellows receive a stipend for participation, and graduate credit is available.

Science teachers in any discipline with at least one year of teaching experience and a current appointment are eligible. Those from minority groups underrepresented in the sciences or who teach in schools with predominantly underrepresented minority students are especially encouraged to apply (deadline **January 31**). Visit *https://goo.gl/sgsEm7.*

Fund for Teachers Grants P K12

Educators can use these grants to support professional development experiences of their own design. Individuals receive up to $5,000, and teams receive up to $10,000 to conduct their own summer projects. PreK–12 teachers, curriculum specialists or heads, special education coordinators, media specialists, and librarians who have at least three years of teaching experience and spend 50% of their time directly teaching students are eligible.

Application instructions vary by state; check eligibility and apply online by **January 31** at *www.fundforteachers.org.*

MAXIMUS Charitable Foundation Grants A

The foundation awards these grants to nonprofit organizations serving disadvantaged populations and underserved communities in three focus areas: youth and children development, community development, and health care. Programs that promote personal growth and serve disadvantaged, low-income youth receive preference. Grants of between $1,000 and $5,000 are available, though larger grants may be awarded to programs with compelling need. Apply by **January 31;** see *https://goo.gl/YEenYF.*

SPIE Education Outreach Grants A

SPIE, the international society for optics and photonics—the science and application of light—provides these grants for optics- and photonics-related education outreach projects. Schools, youth clubs, universities, science centers, optics centers, industry associations, and optical societies are eligible for grants of up to $5,000. Projects are judged by their potential to impact students and increase optics and photonics awareness. Apply by **January 31;** consult *https://goo.gl/hbR8Ls.*

February 1–15

Alan Shepard Technology in Education Award K12

This award—presented by the Astronauts Memorial Foundation, in partnership with NASA and the Space Foundation—recognizes the outstanding contributions of one K–12 educator to technology education. Innovative aerospace or aeronautics programs receive priority. The awardee will receive $1,000, a commemorative trophy, and a trip to the Space Foundation's 34th Space Symposium in Colorado Springs in April.

Candidates can be formal or informal educators. School principals, superintendents, or associate superintendents may nominate eligible candidates. Postmark applications by **February 1;** see *https://goo.gl/m7sFPF.*

American Association of School Librarians Collaborative School Library Award K12

This $2,500 award recognizes partnerships between teachers and school librarians. Those who have jointly created a project, event, or program to further information literacy, independent learning, and social responsibility using the school library may apply. Projects should serve as a model for other collaborative library projects.

School librarians with an American Association of School Librarians membership are eligible. Apply by **February 1;** see *https://goo.gl/OFOHg5.*

American Honda Foundation Grants K12

The American Honda Foundation (AHF) funds youth education programs focused on science, technology, engineering, and math (STEM) and the environment. Grants of between $20,000 and $75,000 are available. Programs should be imaginative, creative, youthful, forward-thinking, scientific, humanistic, or innovative. Public and private K–12 schools, public school districts, and nonprofit organizations that haven't previously received AHF grants can apply by **February 1** at *https://goo.gl/9IckUp.*

Lowe's Toolbox for Education Grant Program K12

These grants help public and charter K–12 schools and parent-teacher groups fund projects, especially those encouraging parental involvement and community building. The program will provide grants of between $2,000 and $5,000 for technology upgrades, tools for STEM programs, and facility renovations and safety improvements.

Schools must register before they can apply (by **February 9**), which can take up to 24 hours to process. The application closes once 1,500 applications have been received. Consult *http://toolboxforeducation.com.*

Air Force Junior ROTC Grant M H

The Air Force Association offers grants of up to $250 to promote aerospace education in classrooms and Junior ROTC units. Grants may be used for aerospace-related items, such as books, materials, or field trips to an aerospace museum, Air Force base, or other aerospace facility. Classrooms and units can apply every other year. Apply by **February 10;** see *https://goo.gl/U3ObjW.*

Bonnie Plants Third-Grade Cabbage Program E

This program provides free cabbage plants to third-grade classrooms nationwide and awards a $1,000 scholarship to one participating student in each state (excluding Alaska and Hawaii). Teachers receive accompanying lesson plans and can register for free cabbage plants at *http://bonniecabbageprogram.com.* (Teachers in the far south should register by **February 15.**)●

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

Summer Programs

Editor's Note

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

NSCF National STEM Scholar Program M

The National Stem Cell Foundation (NSCF) seeks 10 middle school science teachers who are passionate about science, technology, engineering, and math (STEM). They'll spend a week (June 3–9) at Western Kentucky University (WKU) in Bowling Green connecting with national thought leaders in STEM education; working on hands-on, minds-on activities; and developing a Challenge Project for their classrooms. Each teacher will receive a Chromebook and a $2,500 credit for supplies and materials, along with an all-expenses-paid trip to the 2019 NSTA Conference on Science Education, where they'll share their progress on their projects.

All expenses, including meals, travel, and lodging, will be covered, and WKU faculty will mentor participants throughout the year. Apply by **February 1** at *https://goo.gl/xf6yuU.*

National WWII Museum's Teacher Institute M H

Middle and high school teachers with at least three years of experience can participate in this 16-month professional development opportunity sponsored by the National WWII Museum in New Orleans. This year's institute focuses on the U.S. Home Front and its role in securing Allied victories.

In Phase I (July 22–28), participants attend seminars at the museum and gain content, curriculum, and strategies for introducing students to the Home Front's role in the war. In Phase II (the 2018–2019 school year), participants design and lead workshops for teachers using the curriculum resources they received in Phase 1. The museum will help plan and advertise these workshops and give them free copies of the curriculum. In Phase III (July 2019), teachers travel to Pearl Harbor, Hawaii, to spend a week exploring historic WWII sites related to Phase I's key themes.

Participants receive free room and board, a travel stipend, most meals, and all seminar materials needed. Graduate credits are also available.

Media specialists, librarians, curriculum coordinators, and academic coaches who spend at least half their time directly instructing students may attend, as well as teachers of subjects other than social studies who can explain how the program will benefit their teaching. Apply by **February 1** at *https://goo.gl/jd8OQ6.*

McDonald Observatory Workshops K12

McDonald Observatory, located in West Texas, will host five workshops for K–12 teachers. They'll meet astronomers and discuss current research, practice basic astronomy skills, tour the facility's telescopes, and conduct nighttime observations. Workshop topics and dates are

- UTeach Light and Optics (June 11–13), for grades 6–12; preference is given to current and former UTeach students and new teachers;
- Elements of the Cosmos (June 15–17), for grades 6–12;
- Galaxies and the Hobby-Eberly Telescope Dark Energy Experiment (June 19–21), for grades 8–12;
- Giant Magellan Telescope (June 23–25), for grades 6–12; and
- Solar Systems and Beyond (July 17–19), for grades K–8.

Continuing education credits and full scholarships covering everything but transportation are available. Apply by **February 9** at *https://goo.gl/fNxsaJ.*

Fermilab Teacher Research Associates Program M H

Science, math, technology, and computer science teachers spend eight weeks conducting professional research at Fermi National Accelerator Laboratory in Batavia, Illinois. Teachers are paired with jobs and mentors that match their skills and interests; they might, for example, help assemble a piece of equipment, build part of a detector, or work independently on a software task. Participants receive a $700 weekly stipend.

Teachers of grades 7–12 at public, private, or parochial schools may attend. Apply by **February 18.** Program dates vary; see *http://1.usa.gov/1JdZOXy.*

Monterey Bay Aquarium's Splash Zone Teacher Institute P E

PreK–2 teachers will explore the habitats in their own backyards. With colleagues and experts, participants will study patterns of survival in various habitats and ways to inspire conservation efforts among their students. The institute also encourages science discourse in the classroom by connecting science notebooks, language arts, inquiry, and technology.

Participants must attend a summer session (July 23–27) and three follow-up sessions. They must also use the curriculum with their students, participate in the aquarium's online professional development community, and lead an inservice or action project.

Teams of teachers are invited to apply. Daily stipends of $50 are available upon completion of the institute, as are California State University (CSU), Monterey Bay, credit units. Dorm housing and meals are provided. Register by **March 5** at *https://goo.gl/RkCIfn.*

Monterey Bay Aquarium's Project-Based Science Teacher Institute M

During July 29–August 3, teachers of grades 6–8 learn about project-based science and how to use it to teach conservation issues relevant to their students' lives. Participants will meet with aquarium scientists and experts and learn how to incorporate project-based science that meets the *Next Generation Science Standards* (*NGSS*) and *Common Core State Standards.*

Participants must attend the summer session and three follow-up sessions. They must implement a project and related technology with their students and participate in an online learning community

Teacher teams are eligible; interdisciplinary ones are encouraged. A $50 daily stipend, dorm housing and meals, and continuing education credits from CSU Monterey Bay are available. Register by **March 5** at *https://goo.gl/rVCyUQ.*

Monterey Bay Aquarium's Coastal Systems Teacher Institute E

Teachers of grades 3–5 will explore Monterey Bay's ecosystems while focusing on the *NGSS* crosscutting concept of systems. Teachers will conduct field investigations, learn to use science notebooks, and experience how authentic science writing can improve students' science literacy.

Participants must attend the summer session during July 8–13, and three follow-up sessions on September 29, 2018, and February 23 and May 18, 2019. They must also use the curriculum presented with their students, participate in the aquarium's online professional development community, and lead an inservice or action project at their school or district.

Teams of teachers are invited to apply. Daily stipends of $100 are available upon completion of the institute, as are CSU Monterey Bay credits. Register by **March 5** at *https://goo.gl/iCRfjo.*

BIOS Educator Training Workshop M H

During June 25–30 at the Bermuda Institute of Ocean Sciences (BIOS), 12 teachers, curriculum specialists, administrators, and informal educators will learn how to plan and execute field study courses for their students at BIOS. Participants will explore coral reefs and visit Whalebone Bay, Cooper's Island, and other attractions to learn how to incorporate them in educational experiences. Preservice and inservice middle and high school educators may apply.

Field study themes might include "Oceanography and Marine Science," "Gliders," and "Island Ecology and Geology." Register by **May 25** at *https://goo.gl/BXR5Dy.* ●

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

BLICK ON FLICKS

Science and Engineering on the Orient Express

By Jacob Clark Blickenstaff, PhD

Murder on the Orient Express, Agatha Christie's classic mystery novel, has been adapted for film and television several times since its publication in the 1930s. Probably the most well-known film version was released in 1974, starring Albert Finney as Belgian detective Hercule Poirot. Though not as famous as Sherlock Holmes, Poirot is a fictional detective character whom actors like to adapt to their own strengths. Kenneth Branagh, who directed and starred in the latest version, gathered serious acting talent for it, including Johnny Depp, Michelle Pfeiffer, Judi Dench, Penelope Cruz, Willem Dafoe, and Derek Jacobi.

Poirot, who sports a distinctive mustache, describes himself as the world's best detective. Police around the world invite him to help with their most difficult cases. The film opens with Poirot solving a mysterious theft in Jerusalem, thereby preventing a religious conflict. Exhausted from that challenge, he hopes for a quiet train journey to Paris on the luxurious Orient Express.

Poirot gets the last berth on the train when a ticketed passenger doesn't show up. He joins a shady, wealthy American rug merchant, Edward Ratchett (played by Depp); Princess Dragomiroff (Dench); Caroline Hubbard (Pfeiffer); and 10 other interesting characters. Not long into the journey, Ratchett, fearing for his life, asks Poirot for help. Poirot refuses the job, as he will not work for a man he does not trust.

That night, an avalanche derails the train. The next morning, Ratchett is found dead in his berth, with 12 stab wounds in his chest. The lack of appearance of a struggle suggests that Ratchett was unconscious before he was stabbed, and Poirot notes the smell of a sleep aid (barbital) in the coffee that had been delivered to Ratchett the night before.

As typical in murder mysteries, everyone is a suspect, and each character takes a turn as the most likely killer. In case some readers are unfamiliar with the resolution, I won't give any more details away, but if you've seen other versions of the story, you may still be surprised by the conclusion to this film.

The Orient Express was a real set of train routes that ran between Paris and Istanbul/Constantinople from the 1880s through the end of the 20th century. Different companies ran trains on different routes, but the end points were consistent. For the vast majority of the Orient Express' existence, steam locomotives pulled the trains over mountain passes and through long tunnels. It was a significant feat of engineering to get train tracks through such difficult terrain, and we see both bridges and tunnels in the film.

The film's depiction of steam power gives teachers a chance to discuss energy conversion and some of water's striking properties. A steam engine converts the chemical energy of a fuel (typically wood or coal) into the kinetic energy of the train by heating water past its boiling point, and making steam. Expanding steam pushes pistons that drive the wheels.

Water is an amazingly good substance to use for this because it stores a huge amount of energy in the conversion from liquid to gas. It takes a lot of fuel to heat water and make it change phase from liquid to gas (in chemistry, we say that water has a large latent heat of vaporization). That means that when steam reverts to liquid, a lot of energy is released. Every stroke of a steam engine causes some of the steam to change back into liquid water as it gives up its thermal energy to the motion of the piston.

Steam locomotives pulled trains from the early 1800s all the way up to the 1970s, when they were replaced globally by diesel-electric engines. All you need to keep a steam train going is a supply of wood or coal and water for the boiler. (Old westerns often show the water tower next to the railroad tracks, where trains would refill their tanks.) The abundance of wood and coal, the flexibility of fuels, and simplicity of the engine all contributed to its longevity. Trains in the United States switched to diesel fuel a bit earlier than those in other countries because of large desert areas in the southwestern states.

I recently learned about Tufts University's Novel Engineering approach (*www.novelengineering.org*; see also "Engineering Literary Solutions" in *NSTA Reports* at *https://goo.gl/gBpBDm*). The idea is that characters in fiction often have problems that could be approached with an engineering framework. The characters in the story then become the "clients" whom we imagine approach students looking for a solution.

In *Murder on the Orient Express*, for example, the train was derailed far from the nearest town. The train is stuck on a trestle over a large ravine, and about to enter a tunnel. How can the snow be removed, and how can the train be put back on the tracks without heavy equipment such as a bulldozer or crane? Students would have to work within some challenging constraints to propose and test solutions.

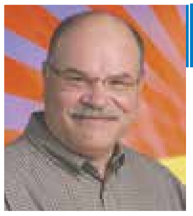
I like this way of linking literacy with engineering design. I also like the expectation that students work together to decide which problems the characters need to have solved, as well as collaborating on the solution. Novel Engineering includes examples across a wide range of grade levels from early elementary through high school.

Poirot suspects Ratchett was drugged with barbital-laced coffee, and we later learn that one of the train's other passengers is addicted to the drug. Barbital is a synthetic drug used as a sleep aid until the 1950s. It was dangerous because users could become habituated to it, and need larger and larger doses to get an effect. It was not uncommon for users to accidentally overdose.

Because of this danger, barbital is more carefully regulated now. Students can draw parallels from this to the current national opioid crisis. Researchers are working to create drugs that can block pain without also causing euphoria or other pleasant feelings, as it is the pleasure that makes the drugs addictive. Check out this National Public Radio article at *https://goo.gl/mwGG4q* for more information on this research.

Teachers can connect class topics like energy conversion, the properties of water, engineering design, and drug addiction to the latest adaptation of *Murder on the Orient Express*. ●

Jacob Clark Blickenstaff is a senior program officer for Washington STEM in Seattle. Read more Blick at http://goo.gl/6CeBzq, *or e-mail him at* Jacob@washingtonstem.org.



ASK A MENTOR, **Advice Column**

Advice on Technology, Assessments, Efficient Grading, and Sub Plans

I have been thinking about getting a thermal imaging camera—specifically, an attachment for a smartphone that allows it to do thermal imaging. If you had one in your classroom, what would you use it for?

– R., Alaska

This is a great idea! Having a hands-on device to explore phenomena beyond our senses is an excellent tool for a science class. When I think of using thermal imaging technology (and I would include infrared thermometers), the following comes to mind:

Convection/Conduction. Set up an ambient temperature aquarium and turn on the heater. Track the convection over time through photos or time-lapse video. Heat or cool different materials and rank them in terms of conduction. Experiment with surface area, fans, colors, and their effects on heating and cooling.

Homeotherms vs. Poikilotherms. Compare the body temperatures of "hot-blooded" and "cold-blooded" animals at different ambient temperatures.

Temperature gradients. Many students don't really grasp what a gradient is. Have them graph temperature vs. distance for a variety of radiant heat sources.

Heat of vaporization. Students will discover that the temperature of boiling water is constant. An infrared thermometer is excellent to use to demonstrate this. Point it at a beaker of boiling water. The glass (measured from the side) will register 400+ °C, while the water (measured from the top) will be at 100°C.

Engineering. Have students design insulated containers that keep a beverage warm for the longest possible time. Thermal images will allow them to assess and modify their creations.

I would like to include a rubric when students are completing various labs and activities in science. Could you share any examples?

– A., Iowa

I have found that checklists, in particular, are good assessment tools during a lab. Your objective is to quickly assess and record student performance while still monitoring the lab as you circulate the room and answer questions.

Most textbooks and lab manuals include generic checklists and rubrics for assessing lab skills and maintaining safety. Streamline the checklist by incorporating it with a class list. I would often copy checklists on colored paper and carry them around on a clipboard. You can align it with curricular goals by listing the specific learning outcomes. A "checklist" doesn't have to be tick boxes: It could be a Likert-type scale or a quick numbering system (as simple as 1-2-3). Incorporate space for comments.

A quick search of NSTA's Learning Center (*http://learningcenter.nsta.org*) pulls up a few sample chapters from two NSTA Press books that might be useful:

- The Nature of Science and Science Inquiry, from *Readings in Science Methods, K–8* (*https://goo.gl/mnEf5T*)
- Using Rubrics to Foster Meaningful Learning, from *Assessment in Science: Practical Experiences and Education Research* (*https://goo.gl/M6R9eb*)

4Teachers (*https://goo.gl/3QHVUa*) offers a pretty good checklist generator with some built-in items that you can select, edit, and augment. (After you select the appropriate grade level under the Science heading, check out the option for Experimental Research.) I would even give students the checklists to self-assess after cleanup.

This same website also has an excellent rubric maker: RubiStar (*https://goo.gl/Kpejt*). This website revolutionized the way I teach because I could generate an assessment rubric for almost any type of assignment: reports, posters, brochures, public service announcements, videos, and more. I would never have considered doing debates in biology if it weren't for this website. As for your specific needs, under the Science heading is a Lab Report item that contains some lab safety assessment options. Group work rubrics can be generated as well.

We are incorporating more writing opportunities in our middle school and high school science classes, both "formal" and "informal" writings. How can one teacher grade more than 180 pieces of writing in a timely fashion with feedback that allows students to learn and grow?

– L., California

I have tried the following strategies when facing a mound of work to grade:

Before

- Take time to prepare students. Share your evaluation scheme beforehand, and show some examples, if possible.
- Rubrics and checklists are key to speed.
- Consider self-evaluations. You may be surprised at their honesty.
- Allow students the time to submit drafts for feedback.

During

- Don't think that you can get through everything in one session. Take breaks.
- To reduce paper, create a pared-down checklist or Likert-type scale with space for comments. Use class lists with columns representing the categories in your rubric.
- Double-check self-evaluations and amend with comments.
- Go through the pile one category at a time. For example, at first, just mark graphics. Take a break, then reverse the pile for the next line in your rubric to avoid always marking the same students first or last.
- Take notes on common mistakes.

After

- Adding up grade points can take a remarkable amount of time. Students can add up points on their own work and return the assignment for recording (with judicious oversight!). I don't recommend students add up classmates' work.
- Review common mistakes with the class.

This is my first year of teaching physics, and I can't think of generic plans for a substitute for this class. Can you suggest some generic/emergency plans that could help me?

– E., Michigan

One of the hardest things is to wake up knowing you can't make it to work and you're now scrambling to provide something for your substitute. Mary Bigelow wrote an excellent blog post (*www.goo.gl/7ctWKe*) on preparing for substitutes. Since your question is specific to physics, I can add a little to her advice.

I advise against generic activities to "just keep students busy." Concentrate on moving your lessons ahead.

Visit the Physics Classroom at *www.physicsclassroom.com* for free downloadable worksheets and online tutorials and quizzes that address almost anything you're teaching in physics (although I find the site a little short on magnetism resources).

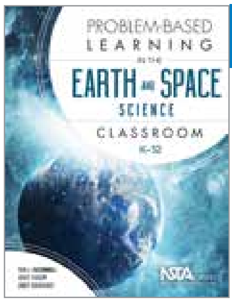
The National Science Digital Library (*www.goo.gl/wXV3hE*) has a searchable library of lessons, activities, simulations, and more.

The National Science Foundation (NSF) has a number of videos on all subjects avaialble on the NSF YouTube Channel (*www.goo.gl/WZPLmF*), Science 360 (*www.goo.gl/hsRAh3*), and multimedia gallery (*www.goo.gl/aqv2pA*).

When the teacher, particularly a substitute, shows videos, the students shouldn't see them as a break from learning. You should always have some form of follow up or active component. An online search for graphic organizers to respond to videos will give you lots to choose from. Keep these on file.

Hope this helps! ●

Check out more advice on diverse topics or ask a question of Gabe Kraljevic from Ask a Mentor at www.nsta.org/mentor *or e-mail* mentor@nsta.org.



Problem-Based Learning in the Earth and Space Science Classroom K–12

Editor's Note

NSTA Press publishes numerous high-quality resources for science educators. This series features just a few of the books recently released. The following excerpt is from Problem-Based Learning in the Earth and Space Science Classroom K–12 *by Tom J. McConnell, Joyce Parker, and Janet Eberhardt, edited for publication here. To download the full text of this chapter, go to* https://goo.gl/KDApCa. *NSTA Press publications are available online through the NSTA Science Store at* www.nsta.org/store.

Moves to Make: Correcting Misconceptions or Nonscientific Solutions

When students are constructing and selecting solutions, they are considering information their class has shared, but they also are influenced by prior knowledge. Sometimes this prior knowledge is not accurate, and it is likely to be durable and difficult to change. These ideas can lead to solutions at the end of the analysis process that are not practical, fail to really solve the problem, create other problems, or omit concepts the teacher has identified as important learning goals.

So what should you do when that happens? Our first suggestion is to assume the role of a classmate by asking questions you know will force the class to think about an important concept or piece of evidence. When skillfully used, these kinds of questions can help students notice the problems with their claims. One of the most effective approaches is to have students compare a problematic claim to information they have listed under the "What do we know?" column of the analysis charts.

One strategy that can be very effective is to ask questions such as "Are there any 'what we know' statements that contradict this solution?" By asking students to compare their researched information with other facts and evidence, you can help them develop Science and Engineering Practice 8: Obtaining, Evaluating, and Communicating Information. This is a critical practice in our world of abundant information. Students will be exposed to many claims and proposals in the news, at work, through advertising, and in legislative bills that need critical analysis against the available evidence. This also helps address at least two of the "Essential Features of Classroom Inquiry" listed in the National Research Council supplement to the *National Science Education Standards* (National Research Council 1996, 2000) by asking students to give priority to evidence as they form and evaluate explanations.

Another approach would be to ask students to list the strengths and weaknesses of each solution. As in the strategy above, this places students in the role of evaluators and requires comparison of solutions to evidence. This also models the type of analysis used in the workplace for problems related to science and engineering, as well as many other contexts. Remember, the phase of the problem–based learning (PBL) process in which students generate solutions highlights both synthesis and critical thinking, so having students engage in these types of thinking is important.

But what if this doesn't do away with a misconception? Or what if the class didn't grasp a key concept that makes a big difference in the problem? Scientifically incorrect ideas can be durable and may get in the way of students' assimilation of new ideas. Some of the peripheral information may draw students' attention as they create solutions. So the teacher needs to be prepared to correct ideas and guide the development of solutions during this final part of the PBL lesson.

When your students aren't applying concepts accurately, you have a chance to explain ideas. There are times when your students need you to be the expert. Although we suggest you be patient with students' own thinking process, you may need to step in and present information that students need. If needed, you can lecture, lead a discussion, show a simulation or an image, or introduce some type of activity to help guide the learning.

Assessing Learning

When implementing a PBL lesson, the teacher/facilitator should respond to the learning needs of his or her students as they emerge. Flexibility is key, but to be flexible, the teacher needs information about what students are thinking. Assessment is an important part of the facilitation process. As you lead a class through PBL problems, you should be planning to assess and to use the information from your assessments to adjust your teaching.

The PBL process as we have described provides for continuous assessment. The process of analysis using the PBL framework allows the teacher to hear and see what students are thinking as they talk about their ideas and record information, questions, and hypotheses under the three columns of the analytical structure. Each comment from a student gives you insight into his or her understanding.

But be aware that what you hear in a group discussion may not reveal what every individual is thinking. In a whole-class discussion, the teacher sees a "group think" picture of what students know. There may be bits of information from a handful of students that seem to make sense when the entire group shares ideas, but you need to know what each student understands. It is helpful to have strategies that let you assess individual students rather than the entire group of students.

The need for individual assessments is even more pronounced if the activity takes more than one class period. As we developed our model in the PBL Project for Teachers, our facilitators found it very helpful to implement informal assessment strategies like exit tickets. These are very brief prompts asked before the end of a class period for which students write a short response. These prompts may focus on one idea the students learned, one idea they found confusing, or one question they have based on what happened in class. You might also ask students or groups to give a written summary of the information they found during their research, their choice of the "best hypothesis so far," or a drawing of the concept they are exploring.

Another form of assessment is the transfer task. *Transfer of knowledge* refers to the ability of students to apply knowledge of the concept in new contexts. For instance, students may know that air masses take on the characteristics of the surface where they develop, but they should also recognize that the extreme low pressure and high winds of a hurricane are more likely to form when an air mass is positioned above very warm ocean water where the moisture can evaporate and be contained in a warming air mass. The importance of transferring knowledge to new situations is supported by Schwartz, Chase, and Bransford (2012), who suggested that a deep understanding of a concept must be accompanied by transfer. To help you perform this type of assessment, the problems in Chapters 5–8 include transfer tasks. The transfer tasks are often used as a summative assessment, but they can also inform the choices the teacher makes about the next activities to include in a unit.

In Chapters 5–8, we also present open-response questions that we have developed and tested for each content strand. There are two types of these questions—general and application—to address the concepts and standards included for the problems in the content strand. We discuss the role of these assessments further in Chapter 4, as well as options for when to use the assessments and how to interpret responses. ●

(All dates are deadlines unless otherwise specified.)

January 16, 2018—Don't miss this deadline to **submit a proposal** for one or more of **NSTA's 2018 Area Conferences** in Reno, Nevada; Charlotte, North Carolina; and the Gaylord National Harbor, Maryland. These conferences take place October 11–13 (Reno), November 15–17 (Gaylord National Harbor), and November 29–December 1 (Charlotte). To submit a proposal, visit *www.nsta.org/conferenceproposals*.

January 31—The Picture-Perfect Science Online Course, which will help elementary teachers combine science and literacy instruction, starts today. This online course features 10 hours of live and/or prerecorded training, including three sessions with Picture-Perfect authors Emily Morgan and Karen Ansberry. Participants will receive either the *Picture-Perfect Science STEM Lessons K–2* e-book or the *Picture-Perfect Science STEM Lessons 3–5* e-book, as well as a digital learning packet containing the first five chapters of *Picture-Perfect Science Lessons*, lessons modeled during the webinars, and relevant articles. Graduate credit is also available. Registration costs $175. Visit *https://goo.gl/yxotDS* to register.

February 1—Submit your manuscript sharing how you teach your middle school students core ideas about the history of Earth—as well as its materials and systems, plate tectonics, and more—for consideration for the September 2018 issue of ***Science Scope,*** NSTA's peer-reviewed journal for middle school science teachers, by today. General-interest manuscripts, commentaries, and column submissions may be submitted at any time. Read the call for papers and access submission guidelines at *https://goo.gl/l6bNbz*.

February 9—Plan ahead for the **2018 NSTA National Conference on Science Education!** Register early to receive the lowest rate. NSTA and Georgia Science Teachers Association members who register by this date pay only $285 for the conference, taking place March 15–18 in Atlanta, Georgia. For more information or to register, visit *www.nsta.org/atlanta*.

March 1—How do you teach middle school students to become reflective thinkers who can understand new information and connect it to different ideas? Share your strategies with your fellow educators by submitting your manuscript for the October 2018 issue of ***Science Scope*** by today. General-interest manuscripts, commentaries, and column submissions may be submitted at any time. Read the call for papers and access submission guidelines at *https://goo.gl/l6bNbz*.

April 1—Share your best strategies for applying Newton's Third Law, constructing investigations into the factors affecting electric and magnetic forces, and more related to **"Motion and Stability: Forces and Interactions"** for the November/December 2018 issue of ***Science Scope*** by today. General-interest manuscripts, commentaries, and column submissions may be submitted at any time. Read the call for papers and access submission guidelines at *https://goo.gl/l6bNbz*.

April 16—Today's the final day to submit a proposal for the **2019 NSTA National Conference in St. Louis** (April 11–14). To submit a proposal, visit *www.nsta.org/conferenceproposals*. ●

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Vote for NSTA's Board and Council

Voting for NSTA's Board and Council opened on December 18, with electronic ballots sent to NSTA members via e-mail. NSTA Board and Council members serve three-year terms, beginning on June 1. The 2018 nominees for president-elect are Dennis Schatz, a senior advisor at the Pacific Science Center in Seattle, Washington, and Jerry Valadez, chief executive officer of the Community Science Workshop Network and adjunct faculty at Fresno State University in Fresno, California.

NSTA members will also elect a Preschool/Elementary Division Director (candidates Judy Boyle and Alex D. Jones), Middle Level Division Director (Ranell Blue and Mary Pat Coburn), Informal Science Division Director (John Loehr and Steven Walvig), and Professional Development Division Director (Jen Gutierrez and Cynthia Willingham).

Six district director positions on the NSTA Council are also up for election. They are

- **District II** (Maine, New Hampshire, and Vermont): Linden Higgins and Anica Miller-Rushing
- **District IV** (New Jersey, New York, and Pennsylvania): Scott Goldthorp and Todd Hoover
- **District VIII** (Kentucky, Virginia, and West Virginia): Laura Casdorph and Russell Kohrs
- **District X** (Indiana, Michigan, and Ohio): Kristen Poindexter and Danae Wirth
- **District XIV** (Arizona, Colorado, and Utah): Wendi Laurence and Josh Stowers
- **District XVI** (American Samoa, California, Guam, Hawaii, and Nevada): Richard Jones and Joel Truesdell

For more information on all the candidates, see the full ballot. If you did not receive an e-mail with a link to the ballot, contact *nominations@nsta.org*. Voting ends on **January 25.**