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Monthly Newspaper of the National Science Teachers Association

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Extraordinary Science Field Trips

Some NSTA members have taken their students on science field trips with unique purposes, activities, and destinations. One teacher, Steven Ruthford, and his 25 Advanced Placement Environmental Science (APES) students from Bellingham, Washington, sailed aboard a research vessel to the San Juan Islands "to help students review major concepts for the AP exam" and "to have the students investigate local and global environmental topics and issues [outdoors]," he explains.

His students "venture[d] into the Puget Sound for various student- and teacher-led lessons," and hiked "around one small island in the San Juan Islands National Monument," he relates. Students then taught the entire class brief lessons they had prepared in advance. "For instance, one group led the class through a plankton collection process and investigation of marine ecosystems. Another group led the class through a northwest conifer forest hike and investigated stages of succession," he notes.

The students benefited by "having the time to study a topic and prepare a lesson for the class prior to the field trip. The student pairs were seen as the experts for their particular topic, both in their lesson and when we encountered a question associated with their topic," says Ruthford. Their learning also was enhanced "by having a full day reviewing major concepts associated with their formative assessment," he contends. "[M]uch of the APES curriculum deals with issues of human impact, and this trip provided insight into local issues associated with our class…[such as] the collapse of our local fishing industry, the decline of our logging industry, and dynamics of our local watershed."

Gary Gittis, science teacher at Downingtown Middle School in Downingtown, Pennsylvania, took 98 seventh graders on a field trip that spanned three states and included whale watching in Plymouth and Cape Cod, Massachusetts.

Heidi McAllister of South Carolina also has led nautical field trips. She and her Hilton Head Island Middle School students have sailed on the *Educational Vessel Discovery* as part of the Carolina Coastal Discovery marine education program. Her students "do a land and sea activity with a touch tank, dissection, and more. They learn about recycling oyster shells as well," she observes. Afterward, students create poems and drawings for a book.

Terri Hebert's field trips also involved aquatic learning. She took her 10th graders from north Louisiana "to the Louisiana Universities Marine Consortium to work in the Gulf of Mexico for one week," where they studied "marine biology, water quality, and sampling techniques," she recalls. They then "returned to north Louisiana and replicated as many of the techniques as possible" at a local lake.

Out-of-State Outings

"I am writing you from a bus [heading] from Downingtown, Pennsylvania, with 98 seventh-grade students and 75% of my grade-level team from Downingtown Middle School, to the Wolf Conservation Center in South Salem, New York," wrote Gary Gittis in May. "From there, we will be heading to Plymouth, Massachusetts, for an evening whale watch. Tomorrow we go to Cape Cod to Monomoy National Wildlife Refuge and a visit with a few thousand gray seals and another whale watch in Provincetown, Massachusetts. [On] Thursday, we visit the New Bedford Whaling Museum and the *USS Nautilus* submarine in New London, Connecticut, before heading home." Accompanying them were 28 parents.

Gittis said the trip was unusual because "most people think I am insane for taking seventh graders on an overnight field trip. I see it as sharing

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my passion for whales, wildlife, and the ocean with children from a large Philadelphia suburb who would not normally do something like this. I do it at a time in their lives when they are still influenced by their teachers, and they are still impressionable."

What students learn is immeasurable, he maintains. "The biology and ecology of the animals, the oceans, the connections between everything in the oceans and on land. They learn to appreciate and respect wildlife. They learn that their actions have an impact on the world...They also learn about the history involved with the area, the industry that sprung from the sad practice of whaling, the influence it had on the region and its importance at the time, and how things have now changed."

Gittis assessed students' learning through journals they kept during the trip and an endangered species project incorporating lessons from the trip.

Laurie Bissonette of Reno, Nevada, has taken high school students to the Scripps Seaside Forum in La Jolla, California, to attend the annual Future of Genomic Medicine Conference. Students chosen for the trip "must have either a year of biology completed or must concurrently be in biology and have a demonstrated aptitude for biology—an understanding of molecular and Mendelian genetics, cell biology, etc.," she notes. "This is a very popular trip, as ambitious biology students have the opportunity to meet some of their science idols and discuss the scientists' work with them. Students hear about cutting-edge research discoveries and techniques, and this inspires them," she contends.

Interdisciplinary Journeys

Judy Reeves and Kayla Booth, science and social studies teachers at Saint Margaret Catholic School in Lake Charles, Louisiana, lead a seventh-grade life science/Louisiana history trip on which "students gain an understanding [of] the economics of Louisiana," they explain. The trip begins in Lake Charles "at McNeese State University Farm, [where] students are given a tour of the fields and animals" and are briefed "on the running of the farm and economics," they relate. Next, students visit The Louisiana Telephone Pioneer Museum in Jennings, to view "equipment, tools, and telephones spanning more than 100 years," and the Louisiana Oil and Gas Park, to see Louisiana's first oil derrick and learn about the alligator industry, say the teachers. The last stop is the Farmers Rice Milling Company in Lake Charles, to help students understand how rice is processed and its by-products recycled or reused so no waste is left behind.

Beth Schoellkopf of Buffalo, New York, combined science and the humanities when she took her middle school students to Boston, Massachusetts, to do fieldwork as part of the Invasion Learning Expedition. "Students learned about invasive species, the invasion of wind and water in terms of erosion, the invasion of tides, the invasion of birds (migration), and the invasion of human impact," she explains. For the humanities portion, "students learned about the invasion of government, religion, [and] ideas [as] they explored Plimoth Plantation (religion); various points along the Freedom Trail, Lexington and Concord (government); and Salem (ideas)."

History also merged with science when Beth Topinka of Millstone Township, New Jersey, took 95 sixth graders to Craig House at Monmouth Battlefield State Park in Freehold, New Jersey. "My students examined this Revolutionary War–era house and barn for evidence of biological, physical, and chemical weathering," she explains. They saw "the effect of ultraviolet-ray exposure...and the impact of water erosion" and "noted the local sedimentary conglomerate rocks used in part of the house's foundation" and "evidence of mold and algae damage inside [window] frames," she recalls. ●

COMMENTARY: **Ann Hammersly**

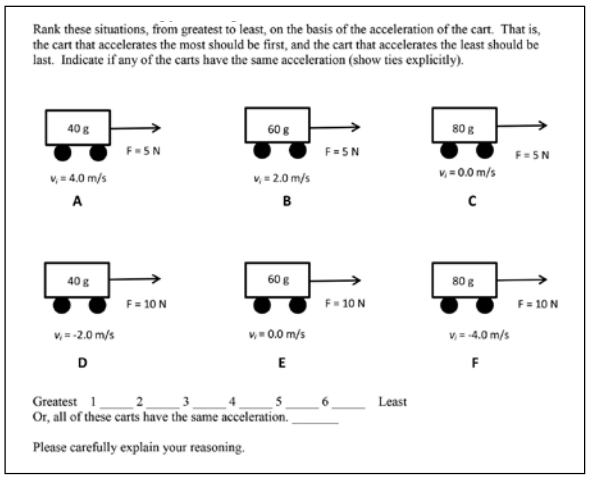
Ranking Tasks as a Next Generation Physics Assessment

By Ann Hammersly

Several years ago I attended an Advanced Technological Education (ATE) Program workshop on Tasks Inspired by Physics Education Research (TIPERs). The ranking task intrigued me. In this kind of problem, students are presented with six to eight situations differing in one or more physical characteristic. Each situation is represented by a simple diagram and numerical data. Students are asked to rank the situations based upon a specific variable, and then *carefully explain their reasoning.*

The example at right shows six carts and their masses and initial velocities. Using that information and the forces acting on each, the students are asked to rank the carts by the acceleration each will experience. Ties should be shown explicitly, either by circling two or more letters that represent ties or by writing the letters on the same dash. The key to the task, though, is the part in which students are asked to explain how they came up with their ranking. Most students need to be coached a bit here: We aren't looking for "I put the largest acceleration first and the smallest last," but rather for an explanation of *how* the acceleration is determined. I require complete sentences in the answers, and students are also encouraged to use equations or numbers as appropriate. The last part of the task simply asks the students to rate their confidence level in their ranking, from guessing to completely sure. I use this primarily to judge a student's metaknowledge; a confident student who is wrong and a guesser who is correct both have some rethinking to do! It is useful in a formative assessment for the students to ask themselves how well they know what they know, but I leave off this part when using a ranking task in a summative assessment.

With the release of the *Framework* and the *Next Generation Science Standards*, I realized ranking tasks are a great way to assess student learning in a Next Generation–friendly manner. A ranking task can be written for just about any disciplinary core idea with a numerical component, and the ranking tasks lend themselves very well to addressing the practices of "using mathematics," "developing explanations," and "arguing from evidence." The particular strength of the ranking task is students must *articulate* their reasoning, not just plug in numbers for a traditional physics problem. That writing (and conversation, if you have students work in pairs or small groups) also addresses some of the essential language arts skills from the Common Core Standards.



In this particular example, I would expect my students to apply Newton's Second Law ($\Sigma F = ma$) to determine the accelerations. Their explanations must include how the force and the mass given allow them to calculate the accelerations, but they also have to explain that the initial velocities given do not affect the acceleration of the carts at all. Including the initial velocities in the task can reveal which students don't have a solid grasp of Newtonian mechanics.

The explanation part of the task can give the teacher a great deal of insight into student thinking and possible misconceptions, typically far more than we'd see with a traditional "plug and chug" problem. Your language arts teachers will also love you for including writing skills in your curriculum in a very authentic way. Students will become much better at articulating their reasoning and at correctly using scientific vocabulary as the year progresses.

In my physics classroom, I use ranking tasks in multiple ways: as formative assessments on a homework assignment, in pairs or small groups during class to get students discussing and writing together, and as a summative assessment on a quiz or end-of-unit test. Well-constructed ranking tasks are very useful in helping a teacher spot student misconceptions and develop classroom activities and discussions that can help students reach that "aha" moment when they understand the discrepancy between their ideas and reality.

It takes some time to develop a good ranking task, but once a task is completed, it can often be used in more than one way. This task, for example, could also be used to have students rank the situations by final velocity or by the momentum change in a given time, or the final kinetic energy when the force acts over a given distance. You can write your own ranking tasks, or find some online , but two good sources are the books *Ranking Task Exercises in Physics* and *E &M TIPERs: Electricity & Magnetism Tasks.* My students don't exactly love solving this type of problem because it requires more of them than traditional problems do, but they do understand that when they write as well as calculate, they ultimately come to understand a concept in a Next Generation kind of way. ●

Ann Hammersly is a physics teacher and science department chair at Chaparral High School in Scottsdale, Arizona.

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Planning and Investing in Safe Science Facilities

By LaMoine L. Motz, PhD; Sandra West Moody, PhD; and James T. Biehle, AIA

Well-designed, standards-based facilities are the foundation for safe and effective science programs. Science spaces in schools are specialty areas that need to be safely and effectively planned and designed. Teaching science anywhere other than in a properly designed lab will not allow students to achieve the goals identified in the Next Generation Science Standards. Other "models" of teaching violate safety research and best practices.

The lack of science facilities is primarily due either to districts and architects not constructing enough science facilities when a school was initially built—because they weren't fully informed or did not understand the core science curriculum—or the curriculum or school population changed. In a conversation with a school architect, Sandra West Moody described the problem of teachers having to "float" due to an inadequate number of science rooms being built initially, even with new construction. In this case, a 2,000–student high school in which four years of science is taught needed 17 labs. The surprised architect said the firm's "template" for a 2,000–student high school included 12 labs. No wonder classes began in a new school with "floating" science teachers! Moreover, too often, and possibly due to public pressure, districts spend millions of dollars on extracurricular facilities, while choosing not to build enough science rooms to support their own graduation requirements and the technical workforce America needs.

The easiest way to determine the correct number of science classroom/laboratories is to calculate the required number of science teachers and then provide the number of standards-based classroom/laboratories. The chart at right from *NSTA Guide to Planning School Science Facilities, Second Edition*, allows one to identify the number of combination classroom/laboratories needed, based upon the number of years of science a school offers. For example, if a middle school has grades 6, 7, and 8 with an enrollment of 600 and science is taught at each grade level, four science classroom/laboratories are needed.

The combination laboratory/classroom design is the only plan NSTA recommends. A laboratory/classroom is a combination design in which the laboratory and the classroom areas are combined into one instructional area. This design is an NSTA standard for several reasons. First, the plan offers the most flexibility for various groupings or the type of science taught in that room. Second, science instruction often involves cooperative or collaborative learning experiences requiring students to move seamlessly back and forth between the classroom and laboratory. Third, when using combination classroom/laboratories, teachers report doing twice as many hands-on activities, enabling students to have concrete experiences with natural phenomena.

Constructing an adequate number of safe, spacious, and well-equipped science lab/classrooms and appropriately located and designed science storage facilities should be seen as an investment in the future. While school boards, administrators, and facilities professionals have clear responsibility for providing safe science facilities, teachers have a parallel responsibility to make good judgments. It is never adequate—and could even increase a teacher's liability—to simply notify a supervisor that an unsafe condition exists.

What does a teacher do when asked to teach a curriculum in an obviously unsuitable facility? This is especially a problem for low-seniority faculty. While there are no perfect solutions, here are a few suggestions:

"Triage" your own instruction, and secure your administrator's written approval for the changes. They may be illegal. For example, in Texas, science courses in grades 6–12 are required to use "hands-on" science activities 40% of the instructional time, so it is illegal to reduce the concrete science learning experiences to less than 40% (19 Texas Administrative Code 2010). Some laboratory experiences *cannot* be conducted without a complete, modern, and properly-equipped lab. A few of them, primarily simulations or simple demonstrations, might be fine in almost any situation. Others can be conducted if supportive administrators provided some equipment and assistance. Here are some of the accommodations some teachers have achieved while they waited for facilities to be remodeled or built:

- Add water and portable Occupational Safety and Health Administration –approved standard eyewash equipment.
- Add chemical splash goggles, and identify a sanitation method such as a sterilization cabinet.
- Purchase microchemistry equipment, and modify the lab instructions.
- Purchase lockable rolling carts. (*Never* use them for stock bottles, but only for very small quantities of decanted chemicals.)
- Purchase a demonstration shield.
- Add a fire extinguisher and blanket.
- Request a few minutes of supervisory help, so you can move chemicals and equipment when students are not frequenting the halls. Advise the principal of the loss of instructional time because you must leave class early.

Expand your knowledge. NSTA offers a range of resources, including policy statements, a safety portal, mentors who will answer questions, and print and electronic resources. Your local fire marshal can provide the citations for fire safety codes such as "occupancy load" for rooms used for science laboratory courses.

Provide school boards, parent committees, administrators, architects, and facilities directors with written copies of safety standards (state and local legal requirements, safety research, and best practices as found in the NSTA position statements).

Don't allow an administrator to "pass the buck." If an accident should occur, everyone—including those who scheduled the classes/labs in inappropriate facilities—shares the liability. Check the liability policy in your state and district. Will the district cover your legal expenses? The *NSTA Guide* has a very comprehensive Facilities Audit (pp. 113–121) that can be used to document hazards with an administrator's signature line.

Gather input from local business and industry regarding the high levels of science and mathematics required for the much–needed highly skilled technical workforce to support the need for longer-term solutions such as renovations or new construction.

Make your school insurer's loss control specialist and fire marshal your new best friends. They are very likely to have the ear of the superintendent and board.

As the science expert, you are the best advocate for the supplies and facilities you need to teach science safely.

Student Enrollment	No. of Lab/Classrooms when 4 yrs. of science is required	No. of Lab/Classrooms when 3 yrs. of science is required	No. of Lab/Classrooms when 2 yrs. of science is required
400	4	3	2
600	5	4	3
800	7	5	4
1000	9	7	5
1200	10	8	5
1400	12	9	6
1600	14	10	7
1800	15	12	8
2000	17	13	9
2200	19	14	10
2400	20	15	10
2600	22	17	11
2800	24	18	12
3000	25	19	13

SANDRA WEST MOODY, DEPT. OF BIOLOGY, TEXAS STATE UNIVERSITY–SAN MARCOS

Number of lab/classrooms required per enrollment (chart developed by Sandra West Moody).

A Strong, Long-Term Commitment

Education is being scrutinized today from many different angles. From budgets, curriculum, assessments, and professional development to safety, schools are under the microscope. Safety for our citizens, including teachers, administrators, and schoolchildren, has our nation's attention. Every aspect of community and educational safety and security are under review, and school districts/schools are researching best practices to safeguard both staff and students.

Laboratory science investigations are essential for the effective teaching of science. School laboratory investigations (labs, projects) are experiences in a classroom laboratory and other spaces that provide students with opportunities to be engaged directly with natural phenomena or with data collected by others using tools, materials, data collection techniques, and models (NRC 2006, p. 3).

NSTA has long advocated for safe and effective science instruction with position statements; four safety books *(Exploring Safely, Inquiring Safely, Investigating Safely,* and *Science Safety in the Community College); Safety in the Elementary Classroom* and *Safety in the Middle School Science Classroom); Science Laboratory Safety Manual; the NSTA Ready-Reference Guide to Safer Science*, a book series by Ken Roy, NSTA science safety compliance consultant, that compiles safety articles that have appeared in NSTA journals; and two editions of the *NSTA Guide to Planning School Science Facilities*, in a focused effort emphasizing facilities are the foundation of safe and effective science instruction. School boards, administrators, architects, facilities directors, business and industry, parents, science coordinators, and science teachers must all be aware of the hazards of inadequate facilities and practices to students and teachers and work together as stakeholders in America's future.

References for this article can be found online at *http://bit.ly/196k4o4.*●

The authors share their reaction to teaching science from carts at http://bit.ly/14pciDy.

Quotable

The art of teaching is the art of assisting discovery.

—Mark Van Doren, U.S. poet (1894–1972)

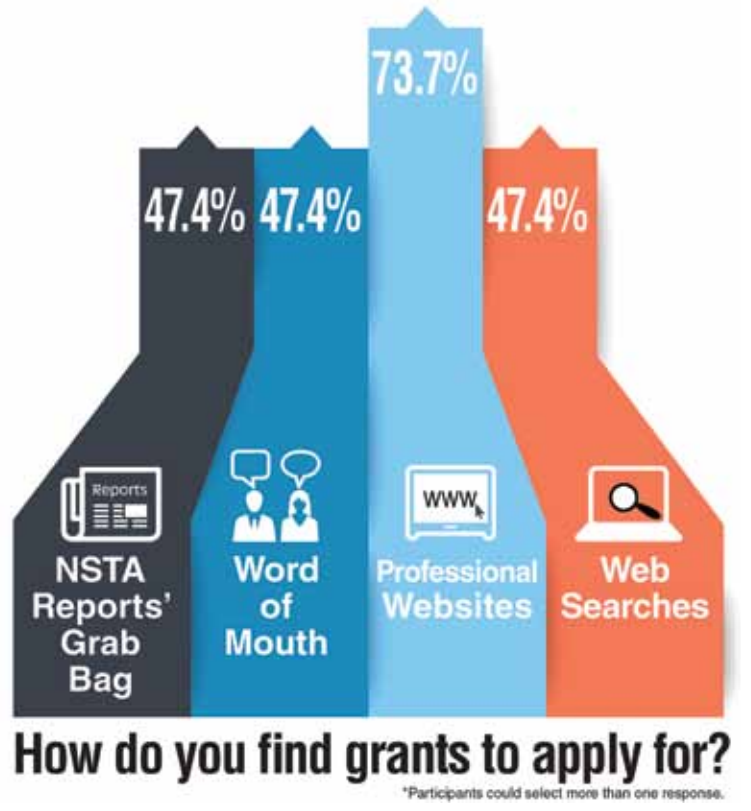
NSTA MEMBER POLL: **What You're Saying**

Grant Writing Receives Little Support

NSTA Reports recently asked science educators to share their grant-writing experiences. Most said finding time to research and prepare grant applications was their biggest hurdle to obtaining this type of funding. Nearly all survey respondents (95%) said they do not receive any professional development on writing grants.

Those who did receive professional development on grant writing said they received it from an informal source or mentor and in person from their school or employer, while others noted they were self-taught. Although 5% of respondents said they never apply for grants, 75% said they applied once a year or more frequently (one-third of those said they applied for grants at least once a quarter). Their success has been mixed, with 42% reporting most applications have been funded, 26% receiving funding for approximately half of their applications, and 31% saying less than half of their applications are funded.

Most educators seeking grants reported applying to local sources (88%), with nearly as many applying to regional (72%) and national (77%) sources. Nonprofit groups (77%) and business or industry (72%) were the sources most frequently applied to, with 16% reporting they applied to online charities such as DonorsChoose.org. Classroom equipment (84%) was the most-sought item. Educators also turned to grants to fund consumable classroom supplies (57%), field trips and other activities (52%), professional development activities (42%), and support for science team competitions (31%). Respondents also noted they sought grant funding to develop a biotechnology program and for special student research and literacy projects. Professional websites were the most common source educators reported consulting for grant opportunities. Forty-seven percent said they found grant opportunities in the Science Teachers' Grab Bag section of this newspaper, via web searches, and by word of mouth. Two educators added they learn of some opportunities via e-mail. (*Editor's Note: Respondents were allowed to select more than one category for these questions.*)



Here's what science educators say deters them from applying for more grant funding:

Obstacles to Grants

[Not] knowing the best way to write a grant proposal that is likely to be funded. —*Educator, High School, West Virginia*

My organization discourages it due to lack of control over the funds. —*Educator, Elementary, Middle School, Connecticut*

Getting approval to apply from [administration].—*Educator, Elementary, Illinois*

I teach in a small rural school. When I am asked how many students this grant would impact, I have a low number—maybe up to 60 students. I teach only about 90 students total, and I am the only high school science teacher in this school. Some of my classes are really small (7–10 students), such as my chemistry or physics class[es]. I would love to get some electronic equipment for physics and chemistry, but most of my budget goes to the classes with more students. It is hard to justify spending [half] my budget for eight kids.—*Educator, High School, Utah*

I take on more work and do not receive any additional salary.—*Administrator, Institution of Higher Learning, California*

Not enough time to write grants with all my other duties.—*Educator, Elementary, Middle School, High School, Institution of Higher Learning, West Virginia*

[Lacking] time to write them. —*Educator, Middle School, Kansas*

Tracking down grants, writing the proposals.—*Educator, Middle School, West Virginia*

Our school district's demographics are not very diverse.—*Educator, High School, Texas*

Not having a major project to fund. —*Educator, High School, New Mexico*

Keeping a schedule of applying for them, so that I do them in a timely manner and am not trying to scramble to get the information needed. —*Educator, High School, Illinois*

Time! It takes time to apply for grants, and I don't always have time to do the paperwork before the deadline. —*Educator, Elementary, Florida*

[Finding] where to find opportunities.—*Educator, High School, Tennessee*

[No] time to write.—*Administrator, High School, Massachusetts*

Lack of knowledge of grants to apply for.—*Educator, High School, Texas*

[Need] knowledge on what is out there. Skillful writing is lacking. —*Educator, Elementary, Institution of Higher Learning, Tennessee* ●

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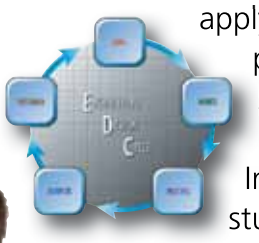

- ***working collaboratively,***
- ***communicating plans and ideas,***
- ***developing explanations,***
- ***finding trends in data,***
- ***building on the work of others,***
- ***collecting, organizing, and analyzing data,***
- ***observing and interpreting,***
- ***using evidence to support claims,***
- ***thinking critically.***

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BRAINSTARTER

CLUE•DOKU

BY PATRICK MERRELL

Every row, every column, and every 3x3 square (marked by the bold lines) must include all of the digits 1 through 9, once each in any order.

		6	9		7	4		
5								7
	7		3		5		1	
	8			9			2	
2								8
	1			5			6	
	4		8		6		7	
8								4
		7	4		3	1		

Highlighted squares of the same color will answer these questions:

- To the nearest minute, how long does it take for light to travel from the Sun to Earth?
- In what year did Copernicus publish his theory that the Sun was at the center of the Solar System (in order from top to bottom and left to right)?
- What is pi's one-billionth (and also sixth) digit?

In this puzzle, instead of using the digits 1–9, use these nine letters:

J U G O F N E W S

F			U		G			J
			S			F		
	S			W				
O				E			J	N
		S	W		U	O		
W	G			F				E
				G			U	
		O			N			
E			J		O			S

Highlighted squares of the same color will answer these questions:

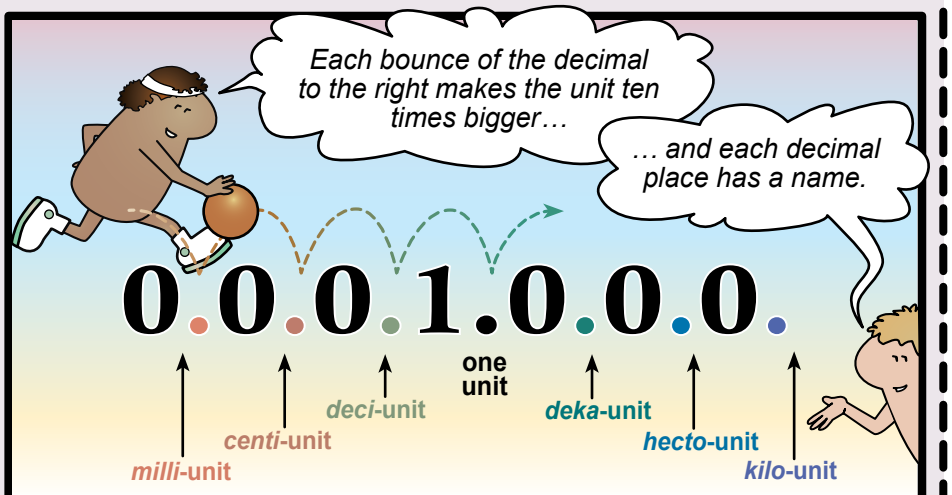
- What is the atomic symbol for the most common element in Earth's crust?
- What type of organism is the largest known organism of any kind on Earth (in order from top to bottom and left to right)?
- What one letter isn't used in any atomic symbol on the periodic table?

Answers on page 19

Try this TOPS IDEA!

decimal bounce

…adapted by TOPS Learning Systems from MEASURING LENGTH #02



OBJECTIVE

To define the decimal equivalents of metric prefixes, and combine them with units of measure.

ANSWERS

1. Each move of the decimal point to the left divides the unit by ten (ten times smaller).

milli-dollar	*0.001 dollar (0.1¢)*
centi-dollar	*0.01 dollar (1¢)*
deci-dollar	*10 cents (10¢)*
one dollar	**1 dollar**
deka-dollar	*10 dollars*
hecto-dollar	*100 dollars*
kilo-dollar	*1,000 dollars*

milli-minute	*0.001 min (0.06 sec)*
centi-minute	*0.01 min (0.6 sec)*
deci-minute	*0.1 min (6 sec)*
one minute	**1 minute**
deka-minute	*10 minutes*
hecto-minute	*100 minutes*
kilo-minute	*1000 minutes*

EVALUATION

A yard is 36 inches long. How long is:

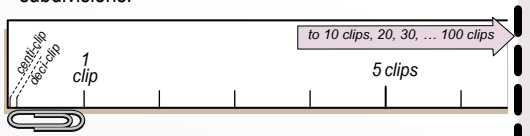
a. 1 centi-yard? *(0.36 inches)*

b. 1 milli-yard? *(0.036 inches)*

c. 1 kilo-yard? *(36,000 inches, or 1,000 yards)*

EXTENSION

Cut adding machine tape to the length of 1 hecto-paperclip (1 hecto-clip). Draw and label the metric subdivisions.



Inquiry: Joe and Gita each mark the first 10 clip lengths on their tapes, then fold to measure additional 10's, up to 100. Why are their finished tapes different lengths? *(Small measuring errors in the length of 10 clips multiply 100 times over.)*

MATERIALS

- Lab: student pencil and paper.
- Extension: about 3.5 meters of adding machine tape, scissors, paper clip.

1. If the decimal point moves one place to the ***left***, how does the size of the unit change?

2. Convert the following units for money and time into metric language by completing these tables:

METRIC MONEY

deci-dollar	*0.1 dollar (10 cents)*
one dollar	**1 dollar**

METRIC TIME

milli-minute	
one minute	**1 minute**
deka-minute	*10 minutes*

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- Gain knowledge exclusive to your area of instruction

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

California University of Pennsylvania

Designed for elementary and middle level teachers, Cal U's online masters degree focuses on teaching inquiry across the STEM disciplines. Each course in the 30-credit program also develops your teacher leadership skills so you can take your career to the next level.

Mississippi State University

Earn a Master of Science degree in geosciences via distance learning through the Teachers in Geosciences program. Curriculum includes courses in geology, meteorology, climatology, oceanography, astronomy, hydrology, and environmental geoscience.

Montana State University - Bozeman

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

University of Maryland

The online Master of Life Sciences degree, specially designed for science teachers, is a 30-credit interdisciplinary program offering concentrations in biology and chemistry.

University of Nebraska

Choose from more than 60 online programs for classroom educators and administrators, including master's degrees in Biology, Entomology, Science for Educators, Science/Math Education and a graduate certificate in Insect Biology for Educators. Individual courses also available.

Wildlife Conservation Society

Online graduate courses provide K–12 educators an opportunity to examine life science through interactive simulations, videos, and presentations from WCS scientists and educators. Get the most up-to-date news from field experts and explore best practices in science education.

NSTA Online Short Courses

Join NSTA's cadre of experts in our five-week moderated courses that incorporate live web seminars, interactive simulations, and classroom-ready student activities. NSTA member discount, graduate credit, and CEU's available.

http://learningcenter.nsta.org/onlinecourses

National Science Teachers Association

PULL-OUT SECTION

SCIENCE TEACHERS' GRAB BAG

Freebies for Science Teachers

Environmental Science Resources. Middle level to high school environmental science teachers can benefit from the education resources at *www.aurumscience.com*. This website offers a diverse collection of activities, PowerPoint presentations, worksheets, and labs covering everything from environmental history and laws to environmental toxins and energy use. Click on Current Events Articles to access a custom database of recent environmental news briefs from reliable sources, including *National Geographic,* BBC News, *The New York Times,* and *Discover Magazine.*

Tectonics. This series of geospatial investigations is designed to supplement existing middle school Earth science curriculum. Students use Web GIS (geographic information systems) to investigate important tectonics concepts. The investigations at *http://bit.ly/10vGDNP* incorporate scientific practices, crosscutting concepts, and core ideas from the National Research Council's *A Framework for K–12 Science Education*. Titles of the investigations include Geohazards and Me: What Geologic Hazards Exist Near Me? How Do We Recognize Plate Boundaries? How Does Thermal Energy Move Around the Earth? Tectonics also contains teacher resources, student resources, and assessments.

SingAboutScience.org. A website and database at *http://bit.ly/11Flwvw* provide access to more than 6,000 songs and 200 lesson plans and quizzes for incorporating music into preK–college science, technology, engineering, and math (STEM) classes. In many cases, the lyrics and a video accompany the song. In addition, teachers can find relevant research supporting the use of science and math songs in education or join online discussion groups exploring the use of science songs in the classroom. These STEM songs also can be used to stimulate critical thinking and combat stereotypes about scientists.

The Concord Consortium's Interactive Pathfinder. The Pathfinder connects K–college educators with vetted, digital activities aligned with the Next Generation Science Standards (NGSS). At *http://bit.ly/158pNY1,* teachers select parameters to search for STEM activities that meet specific instructional needs. For example, selecting Life Science (core ideas); Asking Questions, Defining Problems (practices); and Energy (crosscutting patterns) directs users to a computer-based simulation for elementary students exploring how plants make food. Teachers can also search for activities by subject and grade level.

Free Physics Resources. This website (*www.freesciencestuff.com*) boasts a varied collection of resources for high school physics teachers and students. Educators can access documents, labs, warm-up questions, and a great end-of-course question bank. In addition, the site has video tutorials exploring topics like the Meissner Effect, velocity, kinetic energy, and vector and scalar measurements. A section with physics-themed crossword puzzles could be used as topic review.

BirdSleuth Project. With lesson plans, videos, images, facts about birds, and opportunities to participate in citizen science projects, the Cornell Lab of Ornithology's BirdSleuth website (*www.birdsleuth.org/free-resources*) can hook students of all ages on science through the study of birds. In Get a Bird's-Eye View of Nesting Birds, elementary and middle school students watch footage from live bird cams and learn about nesting behaviors and habitats through accompanying lessons. In Evolution in Paradise, high school students explore evolution concepts through lessons and videos inspired by birds of paradise.

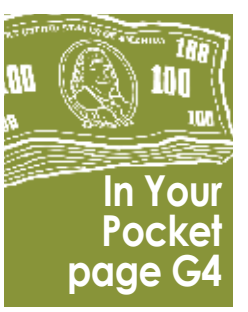
STEM Career Videos. Show middle and high school students how exciting working in STEM fields can be, and challenge the misconceptions that still persist around these subjects with the video resources at *http://bit.ly/14l60aH*. Produced collaboratively by icloud (an online initiative highlighting real-life interviews and videos from STEM professionals in the United Kingdom) and TES (an online network of teachers and education resources developed by teachers for teachers), the videos highlight careers such as snowboard technician, architect, civil engineer, microbiologist, and firefighter.

See Freebies, pg G2

Inside this Convenient Pull-Out Section you will find:

Freebies page G1

What's New page G3



In Your Pocket page G4

Freebies, from pg G1

Lewis Dots App. Introduce high school chemistry students to molecular bonding principles with this app for iPad found at *http://bit.ly/Wx8ePo*. The app enables students to generate and manipulate chemical structures depicted as their Lewis dot diagrams, otherwise known as electron dot structures. Students can save their structures and diagrams as images in Photos App. Click on Lewis Dots Support for teacher information and worksheets about using the app.

Get Caught Engineering. The resources at *www.getcaughtengineering.com* can help elementary teachers and parents connect "classroom learning" with real-life applications in STEM. The site offers lessons, blogs, ideas, and resources for hands-on engineering experiences to excite and challenge students in grades K–6. Teachers will especially appreciate the Engineering Energizers, quick STEM lessons requiring just a few simple materials. "Like" the accompanying Facebook page at *www.facebook.com/GetCaughtEngineering* to receive continual updates on great engineering resources!

Discovery Education STEM Camp. STEM Camp is a series of standards-aligned curricula available to schools, districts, nonprofit organizations, and parents for use in summer camps, after-school learning opportunities, and other educational programs. The content centers on water, urban infrastructure, and energy and includes hands-on and virtual labs, engineering challenges, digital investigations, interactive videos, and career connections designed to inspire primarily middle and high school students in learning about STEM subjects. Learn more at *www.discoveryeducation.com/STEM* (free registration is required).

Nature Detectives. This website aims to spark students' interest in safely exploring forest environments. Targeted to students ages 8–13, and produced by the Woodland Trust wildlife group in the United Kingdom, the site at *www.naturedetectives.org.uk* offers forest-themed resources and activities that can be used in any location. For example, educators can access identification ("spotter") worksheets featuring various birds, fungi, flowers, leaves, autumn seeds, and fruits as well as activity worksheets to guide you through events such as setting up a snail race, making your own barefoot walk, or going on a scent scavenger hunt.

Youreka Science. The brainchild of biomedical science researcher and National Science Foundation fellow Florie Charles, this website (*www.yourekascience.com*) presents easy-to-understand, visual explanations of new medically relevant, biological findings. The videos, ranging in length from 5 to 10 minutes, explain the findings presented in various scientific and medical journals in layperson's terms and are most appropriate for use in high school and college biology classrooms. Videos explicate discoveries related to cancer, genetics, diabetes, obesity, stem cells, and other medical topics.

Goodbye Bulky Textbook, Hello Net Texts. Through the Net Texts website (*www.net-texts.com*), teachers can select high-quality, multimedia open educational resources (OER) from the web, combine them with their own materials, and create customized multimedia courses for students' iPads, Android tablets, and laptops. The website offers tutorials to guide teachers through the process of creating multimedia courses with OER resources and points out several benefits, such as more opportunities for students to interact with the content, financial savings on fewer text purchases, and the ability to easily update course content. ●

What's New

FROM U.S. GOVERNMENT SOURCES

U.S. Environmental Protection Agency (EPA)

EPA School Flag Program Materials

EPA's School Flag Program uses brightly colored flags based on the Air Quality Index to show how clean or polluted the air is. Each day, schools raise a flag that corresponds to the air quality forecast so everyone can know what the air quality will be.

Recently updated program materials at *http://1.usa.gov/17D46nn* guide K–12 teachers through what is best to do for students at each air quality level. *Air Quality and Outdoor Activity Guidance for Schools* addresses questions like these: How long can students stay outside when the air quality is unhealthy? What physical activities can students do inside? What is an asthma action plan? The School Flag Program poster is a colorful reminder of air quality levels that can be displayed in the classroom.

National Oceanic and Atmospheric Administration (NOAA)

Climate Science Activity Book

Discover Your Changing World With NOAA: Ten Activities to Introduce You to the Essential Principles of Climate Science introduces middle and high school students to the principles of climate science and the factors involved in climate change. Students explore climate science concepts as they make a solar cooker, set up a home weather station, construct an electronic temperature sensor, create a unique message about climate change, and play the Are You Climate Literate? board game. Each activity includes detailed instructions and illustrations. Access the book at *http://1.usa.gov/ZilxVk*.

Climate Change Graphs

How do we know the Earth's climate is warming? How do we know humans are the primary cause of the warming? Where can one find more information about climate change and climate monitoring? At *www.ncdc.noaa.gov/indicators,* NOAA's Climatic Data Center's Global Climate Change Indicators web page, high school teachers and students can access evidence via graphs to answer these questions. With informative captions that guide students in interpreting data about climate change indicators such as global and U.S. surface temperatures, sea level, snow cover, glacier volume, and U.S. climate extremes, the graphs are a great tool for Common Core–style activities requiring students to use data to support an argument.

National Institutes of Health (NIH)

College Planning Manual

JUMP START College Planning, a free how-to manual for organizing a precollege conference for science-minded high school students, guides users through the process of planning and hosting a successful event that showcases the interdisciplinary nature of science, technology, engineering, and math (STEM) careers and provides access to the resources students need to navigate pathways to college. The event can help students learn how to apply to college, register for the right college courses, and choose from the many career possibilities in the STEM disciplines. Download the manual at *http://1.usa.gov/13v3omm*.

Healthy Muscles and More

NIH's National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS) has published fact sheets to help kids and teens ages 10–18 keep their bones, joints, muscles, and skin healthy for years to come. The sheets, available at *http://1.usa.gov/11btF7S,* include information, diagrams, basic facts, and glossaries along with practical advice.

For example, the Healthy Muscles fact sheet offers ways to avoid sprains, strains, and other muscle injuries; the Healthy Skin page tells how to properly care for acne, insect bites, and other skin conditions; the Healthy Joints page explains different types of arthritis and the role physical activity plays in keeping joints healthy; and the Healthy Bones page discusses how diet and exercise affect bone strength and includes recipes for bone-strengthening fare like Fruit Smash Smoothie and Trail Mix.

Fish and Wildlife Service (FWS)

Conservation Kids Website

Targeted for students grades K–6, but useful for parents and elementary teachers, too, this website *(http://1.usa.gov/11fCmkn)* features games, articles, quizzes, and activities highlighting some of the world's most unique and at-risk species. Click on Meet the Species to find images and facts about more than 20 at-risk plants and animals, from the Asian Elephant to Venus Flytrap. Simple games, such as Nature Treasure Hunt and Wildlife Car Bingo, encourage kids to consider the environment as they practice their observation skills—and keep them focused while in an outdoor classroom. Wildlife-themed activities like creating animal masks and making "turtle soap" are other fun suggestions to engage students in conservation matters.

National Aeronautics and Space Administration (NASA)

SpaceMath@NASA—New Math Guides

Four new math guides have been released by SpaceMath@NASA:

- *Exploring the Lunar Surface* (grades 3–5). This introduction to the lunar surface features 10 problems involving basic scale and proportion *(http://1.usa.gov/13VQxOC)*.
- *Exploring Planetary Moons* (grades 3–6). This collection of 22 problems includes work with proportional relationships, fractions, and temperature changes *(http://1.usa.gov/ZMCLGb)*.
- *Exploring Stars in the Milky Way* (grades 6–8). These 13 problems focus on basic counting, tallying, and grouping techniques, as well as working with simple proportions *(http://1.usa.gov/12FoP63)*.
- *Exploring the Milky Way* (grades 6–8). This group of 30 problems introduces students to mapping the shapes of the Milky Way and ways to identify different kinds of galaxies in our universe *(http://1.usa.gov/11yXBNg)*.

Each guide is illustrated with NASA images and includes a Unit Overview with teacher background information, Next Generation Standards connections, Common Core Standards (math), video resources, vocabulary, and data sheets.

Scope It Out!

The James Webb Space Telescope (JWST) may look unusual and not much like a telescope, but it has much in common with simple tube-shaped telescopes. NASA's Scope It Out! game, most appropriate for high school students and adult astronomy buffs, uses puzzles to teach players about the basics of common refracting and reflecting telescopes you might have in your backyard. Then the game introduces the JWST and shows how it has the same basic parts as a typical telescope. Finally, the game compares the JWST to the Hubble Space Telescope and shows that while they don't look alike, they have the same essential parts.

Inform your students that they should pay close attention as they play the game because the information presented in each level will help them solve the puzzles in the next round. Scope It Out! is available at *www.jwst.nasa.gov/scope.html*.

In addition, those who want to run the game at an exhibit, museum, observatory, or university can download special files from the site. ●

In Your Pocket

Editor's Note

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

Spencer Foundation's Areas of Inquiry Small Grants

The Spencer Foundation supports research in these areas of inquiry: education and social opportunity; organizational learning; purposes and values of education; and teaching, learning, and instructional resources. Grants of up to $50,000 are available. Applicants for research grants must have a doctorate in an academic discipline or professional field or have equivalent experience in an education research–related profession. The principal investigator must also be affiliated with a college, university, research facility, school district, or cultural institution that is willing to serve as the fiscal agent if a grant is awarded.

Proposals are accepted from the United States and abroad but must be written in English and propose a grant amount in U.S. dollars. Apply online at *http://bit.ly/Xjev1S* by 4 p.m. Central Time on **July 23.**

'From Failure to Promise' Grants

Four grants of $1,000 are awarded to schools, libraries, and community-based organizations to help move students "from failure to promise" in science, literacy, math, or technology. K–12 educators and youth-group leaders with creative ideas for motivating students are eligible. Apply by **July 31;** visit *http://bit.ly/16TtpkK.*

Toshiba America Foundation Science and Math Improvement Grants

Grades 6–12 math and science teachers with innovative project ideas for their classrooms may apply for these grants. Applications requesting less than $5,000 are accepted year-round. Requests of more than $5,000 are due **August 1.** Visit *www.toshiba.com/taf.*

NSTA New Science Teacher Academy

The NSTA New Science Teacher Academy, co-founded by the Amgen Foundation, was created to help promote quality science teaching, enhance teacher confidence and classroom excellence, and improve teacher content knowledge. Teachers in this year-long program receive an NSTA membership; a discipline-specific mentor; access to web-based content development courses and other resources; and funds for accommodations, airfare, food, and registration at the 2014 NSTA Conference on Science Education in Boston, Massachusetts. Middle and high school science teachers in their second through fifth years of teaching are eligible. Apply by **August 1** at *www.nsta.org/academy.*

American Honda Foundation Grants

The American Honda Foundation awards grants of up to $75,000 to youth education programs focused on science, technology, engineering, and math (STEM) and the environment. Programs should be imaginative, creative, youthful, forward thinking, scientific, humanistic, or innovative. Public and private elementary and secondary schools, public school districts, and nonprofit organizations with 501(c)(3) status are eligible. Apply by **August 1** at *http://bit.ly/OnjIiB.*

American Teacher Scholarships

The American College of Education offers four full-tuition scholarships for applicants to its Masters of Education degree programs. Recipients must be currently employed as a teacher in the United States and must meet all requirements for admission to the college.

Educators nominate themselves for these scholarships by posting on the American Teacher Facebook page. Scholarships are awarded by vote. Nominate yourself by **August 1;** see *www.ace.edu/american-teacher-scholarship* for details.

Core Fulbright Scholar Competition

The Core Fulbright Scholar Program sends 800 U.S. faculty and professionals abroad each year. Grants are available in more than 125 countries worldwide. Grantees lecture and conduct research in a range of academic and professional fields. U.S. citizens with a PhD or equivalent professional or terminal degree (including a master's, depending on the field) may apply by **August 1.** Consult *http://bit.ly/aKfy3.*

Teachers Helping Teachers Award

The Literacy Empowerment Foundation gives these awards to elementary teachers who help other educators. Awardees might mentor new teachers, present at professional conferences, create websites with helpful methods or resources, or volunteer for extracurricular activities. Each week, a new winner will be awarded $100 worth of books for his or her classroom, along with a certificate of achievement.

Nominate a colleague online at *www.lefbooks.org/teachers-helping-teachers* by **August 8.**

LUIS MIGUEL BUGALLO SÁNCHEZ

Entomological Foundation's Science Project Contest

This Entomological Foundation contest seeks to identify the top 5 to 10 science project ideas for elementary, middle, and high school students. Projects focused on insects, spiders, or related arthropods are welcome. The best will be both doable and exciting and help students better understand the principles underlying the natural world. The contest is open to Entomological Society of America student members; projects submitted by entomology student clubs and K–12 educators are preferred. Winning entries will receive $100 and appear on the foundation's website. Submit project ideas by **August 31;** see *www.entfdn.org/projectcontest.php.*

America's Home Energy Education Challenge

America's Home Energy Education Challenge (AHEEC), a national student competition, is designed to help families save money by saving energy. Administered by NSTA for the U.S. Department of Energy, AHEEC can inspire student interest in STEM fields, while encouraging students in grades 3–8 to make smarter energy choices and save energy at home. Schools and classes will compete within 11 regions for more than $60,000 in prizes that will be distributed at the regional and national levels of the competition.

Students (including those in homeschool and after-school programs), educators, and school principals may register to participate at *www.HomeEnergyChallenge.org* by **November 15.**

NSTA PRESS: *Inquiring Scientists, Inquiring Readers: Using Nonfiction to Promote Science Literacy*

Measuring Pennies and More Inquiry Unit

Editor's Note

NSTA Press publishes high-quality resources for science educators. This series features just a few of the books recently released. The following excerpt is from Inquiring Scientists, Inquiring Readers: Using Nonfiction to Promote Science Literacy, *by Jessica Fries-Gaither and Terry Shiverdecker, edited for publication here. To download the full text of this chapter, go to* http://bit.ly/13YlnSQ. *NSTA Press publications are available online through the NSTA Science Store at* www.nsta.org/store.

Explore

In the first part of the Explore phase, students compare different measuring tools and select the best ones for making large and small measurements. In the second part, they design and conduct a pendulum investigation that requires careful measurement.

Part I—Measuring Pennies and More

Advance preparation—Gather tools to measure weight, length, time, and volume. The tools for each measurement type should vary in their calibration; for example, instruments for measuring volume should vary from a ¼ tsp. measuring spoon to a 2 c. measuring cup. Be sure to include both customary and metric measuring tools. Include items from comparatively large to very small (e.g., from a grain of rice to a brick for weight) for students to measure. Prepare event cards for use in the time station. Each event card should describe an action the students will measure, such as the time it takes to walk across the room, draw a line on the chalkboard from one end to the other, or write their name 10 times. Before class, set up length, weight, volume, and time stations.

1. After the Measuring Penny assignment is completed, discuss what students found and how they chose to measure the item they selected. Guide students toward recognizing that base units of measurement are divided into smaller and smaller units or are combined into larger and larger units.
2. The next set of guiding questions is designed to lead students toward thinking about the calibration of measuring tools. Before you begin this set of questions, draw on the board an oversized ruler with markings that divide each unit into quarters, or use a document camera and place a ruler on the document camera for the demonstration.
3. Demonstrate that items being measured often do not line up with the marks, making it difficult to get an exact measurement. While you are holding an item that does not line up with the marks, point out that a gap exists between the edge of the object and the marking on the ruler. Discuss with students how they handled similar situations.
4. Read *How Tall, How Short, How Far Away?* Pause to point out how base units are divided into smaller units or combined into larger units. After reading the book, tell students they are going to determine which measuring tools are best for measuring various items.
5. Organize students into cooperative groups of three to four students. Distribute a penny to each group and a Measuring Pennies and More data collection sheet to each student. Review the procedure on the Measuring Pennies and More form. Explain to students that at the time station, they will be selecting event cards rather than items. Each student in the group should have a chance to work with the various measuring tools.
6. Lead a class discussion about the experience after all groups have finished.
   - How did the different measuring tools at each station compare with one another?
   - What did you notice about using different measuring tools to measure the same item or event?
   - Which tools were best for measuring the smallest items at each station? The largest items at each station?
7. Reorganize the students into groups of five. Working in these small groups, students will reinforce what they have learned about measurement by reading *How Do You Measure Length and Distance? How Do You Measure Liquids? How Do You Measure Time?* and *How Do You Measure Weight?* Each group will select and read only one of these books. Students will then use a Seed Discussion strategy to facilitate their small-group discussions.
8. Lead a class discussion in which each group shares what they have learned with the rest of the class. Paired reading, an alternative grouping approach that can be used with the Seed Discussion, is described in column 4. Select the option that best fits your students' needs.

EVENT CARD 1

Measure the amount of time it takes to walk across the room.

A Seed Discussion is a strategy in which students respond in writing to a predetermined set of prompts as they are reading. The students' responses to the prompts serve as "seeds" for the discussion. During the discussion, group members individually share their seeds. The remaining group members comment on a member's seed before the next group member shares. Group members may be assigned roles to help keep the group discussions orderly and productive. In this modified version of a Seed Discussion, one group member will read the assigned book aloud to the remaining members (Messmer 2009).

1. Divide the class into groups of five. Each group will work with a different book. Assign the following roles to the group members:
   - Reader—reads the book aloud to the group;
   - Leader—leads the discussion by calling on group members to share their seeds;
   - Manager—ensures all group members have the necessary materials;
   - Timekeeper—ensures the group stays on track to complete sharing within the allotted time; and
   - Communicator—lets the teacher know when the group is finished and ready to move on.
2. Give each student a Seed Discussion Graphic Organizer. Review and model the procedure. As the groups read and discuss the books, circulate around the room, providing guidance as needed. Monitor group discussions, noting any areas that may need review before moving forward. When the groups have finished, lead a discussion in which each group shares some of their seeds and highlights of the group's discussion. Make the books available for students to read at their discretion.

Paired reading alternative—Organize students into pairs of mixed-ability readers. Pair high-achievement readers with mid-level readers, and pair mid-level readers with low-achievement readers. The pair takes turns reading to each other. The length of the passage to be read can vary from a single sentence to the entire page. Typically the more accomplished reader begins, followed by the second reader. While one student is reading aloud, the other follows along, asking questions and offering support as needed. As they are reading, the pair can add seeds to their Seed Discussion Graphic Organizer. When all pairs have finished their books, lead a discussion in which students share their seeds. ●

NSTA CONFERENCES ON SCIENCE EDUCATION

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- Bridging to the Highly Anticipated Next Generation Science Standards—What's in It for Me?
- Building Bridges Within STEM Education

Charlotte, NC NOVEMBER 7–9

Professional Development Strands

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- Merging Literacy into Science Instruction
- Accelerating the Skills of Digital Learners

Denver, CO DECEMBER 12–14

Professional Development Strands

- PreK–8 Science: A Playground for Literacy and Mathematics
- Engineering the Engineering: Connecting the Why to the How
- Exploring STEM: Inside and Out

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BLICK ON FLICKS

Dinosaurs! In 3D!

By Jacob Clark Blickenstaff, PhD

I saw the film *Jurassic Park* on opening weekend in June 1993. *Jurassic Park 3D* was re-released to celebrate the 20th anniversary of that initial release. While that makes me feel old, I admit I did enjoy seeing the movie on the big screen again. Details I've missed when watching it on a television screen jumped out at me (and not just because of the 3D effects). Biology teachers could use this re-release of *Jurassic Park* to introduce DNA, genetic engineering, and evolution, and all science teachers could initiate a discussion of scientific ethics and practices with some carefully selected scenes.

I expect almost everyone knows the basic plotline of *Jurassic Park* and the novel upon which it is based. Wealthy entrepreneur John Hammond (Richard Attenborough) builds a theme park around living dinosaurs his genetic engineers re-created from DNA preserved in amber. His investors are concerned about safety at the park, and demand a site visit by a team of experts. A lawyer representing the investors brings mathematician Ian Malcolm (Jeff Goldblum), while Hammond selects paleontologist Alan Grant (Sam Neill) and paleobotanist Ellie Sattler (Laura Dern). As happens in sci-fi thrillers, things go terribly wrong, and several people end up as food for the carnivorous dinosaurs. This film spawned two sequels, but neither became the classic that the original is today.

I will leave it to others to note the scientific errors in *Jurassic Park*, and it certainly contains some significant ones. See "Top 10 Biggest Scientific Errors in *Jurassic Park*" (*http://bit.ly/118RBXO*), for example. (Though I say criticizing the filmmakers for not knowing in the 1990s what we know now seems a bit unfair.) I will instead focus on ways teachers can use the movie to generate interest and foster discussion in class.

One of the most memorable (non-scary) moments early in the film is the animated lesson on genetics and cloning. Problems with the science occur here, but it is a reasonable metaphor to describe DNA as an organism's "blueprint," and insects really have been found trapped in amber. No mosquitos have been found as old as the 100-million-year-old ones shown in the movie, and no DNA has been extracted from these ancient insects. Some scientists have proposed cloning a mammoth from DNA found in carcasses frozen in glaciers for tens of thousands of years, but those two time scales are radically different, and the fact that molecules like DNA degrade over time means chances are slim of 100-million-year-old DNA being usable.

Near the beginning of the movie, Grant tells a group visiting a dig site that birds are likely descended from dinosaurs, noting both bird and dinosaur bones hold air sacs and hollows. This idea runs counter to early 20th-century representations of dinosaurs as cold-blooded, slow-moving, giant lizards. Since the film's release in 1993, additional evidence of the relationship between birds and dinosaurs has been found: Some dinosaurs had feathers (not just archaeopteryx), dinosaur trackways indicate flocking behaviors, and the idea that most dinosaurs were warm-blooded is now widely accepted.

Probably every science teacher has heard students ask, "Why do we need to learn this?" Every teacher probably has a favorite answer ready when it comes up. One potential answer teachers may not give very often is "because learning about the world can be a moving experience." I really appreciate that the scientists in *Jurassic Park* are shown as emotional about their work. Grant and Sattler both cry at the sight of the dinosaurs brought to life, which makes them far more human than most scientists in films and on TV. I have written before about the stereotypical representation of scientists as crazed, antisocial, white men. *Jurassic Park* does some work to dispel that misrepresentation. We also see a positive depiction of a female scientist: Sattler is relentless in looking for what sickened a triceratops, even going so far as to reach into a huge pile of dinosaur dung. This is just the sort of commitment to solving a puzzle that scientists need to succeed.

On the other hand, the white-coated technicians in the *Jurassic Park* laboratory display some poor lab techniques. Perhaps one of the first lessons in keeping a lab notebook is to write in ink using a non-erasable pen. If a lab notebook is to be considered a complete report of your work, it is unacceptable to erase any of your notes or data. We see Wu, the lead technician, erasing his pencil notations repeatedly during his conversation with Grant and Sattler. Possibly this is a conscious choice by the filmmakers to show that Hammond hired unscrupulous scientists to work on the park.

One discipline depicted negatively in the film is computer programming. Dennis Nedry (Wayne Knight) might as well have been named "Dennis Nerdy," given his affinity for Jolt Cola, his messy desk, and outdated clothes. The greedy and unscrupulous programmer meets a very sticky end as a result of his bad behavior. Only the work of Hammond's granddaughter shows the value of computer literacy when she brings systems back online.

Finally, Malcolm's line, "…your scientists were so preoccupied with whether or not they could that they didn't stop to think if they should," would be an interesting way to spark a discussion of scientific ethics. What responsibility do scientists have for how their discoveries are used by engineers, doctors, and politicians? I do not claim to have the answer, but I think it is a conversation that more science teachers should have with their students. ●

Note: This film is rated PG-13 for intense science-fiction terror.

Jacob Clark Blickenstaff is an independent education consultant located in Seattle, Washington. Read more Blick at http://bit.ly/amBgvm.

JUDY MCKEE: **Life After Retirement**

Voluntary Engagement

By Judy McKee

One NSTA Retired e-mail list contributor opted to accept her state and school district financial incentives for early retirement to make way for younger, less expensive employees. "But we weren't thinking about you," complained her principal. After calculating what she would earn in excess of her pension if she continued working in the district, it didn't make sense to stay on. The principal encouraged her to remain engaged with students and teachers as a part-time science consultant, a position that would allow her to retire and receive a pension, but continue to work in compliance with applicable state regulations. Several years later, and now in her mid-70s, she is still at it with no plan yet to fully retire.

Though many teachers are quite happy to pursue possibilities beyond the classroom, many are opting to continue in the field after their "official" retirement. The Bureau of Labor Statistics reports nearly a third of Americans between the ages of 65 and 70 still work. Among people ages 75 and older, 7% remain employed. Though many people need the income, others remain in their jobs or continue as volunteers because they are in excellent health and still enjoy working. "There is so much left for me to do" was a common sentiment expressed by several educators attending the Before and After Retirement: Practicalities and Possibilities session at the NSTA National Conference on Science Education in San Antonio, Texas. For veteran teacher Renee O'Leary, that "much to do" includes maintaining her connections with young children, which she finds the most rewarding aspect of her career.

Renee O'Leary

An award-winning teacher, O'Leary taught kindergarten in Delaware public schools for 33 years and spent 17 more years at Caravel Academy in Bear, Delaware. She then decided she had "spent enough time getting paid, so I decided to do it for fun." She currently makes an impact at Holy Angels School in Newark, Delaware, by regularly providing science activities for preK–3 students.

O'Leary holds a doctorate in early childhood science curriculum and design, has authored four books, and has presented at countless state, national, and international conferences. Among numerous other awards, she was chosen Delaware's Teacher of the Year in 1982, and has been inducted into the National Teachers Hall of Fame, the Association for Childhood Education International Hall of Fame, and the Hall of Fame for Delaware Women.

During her childhood, her own teachers would not have predicted these accolades. Born with severe physical problems that made her childhood difficult, she is grateful to her father, who built her confidence and predicted great things for his daughter. She claims, "He was my rock."

O'Leary's concentration on science for young children emphasizes an understanding that "science is in everything," she explains. With this in mind, she created the PASS (Portable,

Affordable, Simple Science) curriculum for grades K–1 and BLAST (Bringing Literacy and Science Together) for grades 2–3. In both, basic science concepts are taught using multisensory, hands-on connections across the curriculum. Parents can participate in the learning process using "take-home" activities that reinforce concepts from class lessons.

Her expertise, time, and materials used at Holy Angels School are donated in memory of her late husband, who encouraged her to return to what had always given her pleasure and satisfaction, when she was ready. Principal Barbara Snively acknowledges the importance of "Dr. Renee's" work, noting, "She provides engaging science activities for our students. Her instructional methods along with her passion for science have motivated the children in the area of [science, technology, engineering, and mathematics] education… It is evident that the students enjoy the subject matter and are gaining much in science skill development. I am in awe of her energy and enthusiasm!"

During the NSTA conference, O'Leary chatted with Angie Hernandez, an attendant in a hotel's hospitality room who is currently pursuing a degree in early childhood education. "I cannot believe how enthusiastic [Ms.] Renee is about teaching," exclaims Hernandez. "She even helped me with ideas for a class assignment while she was enjoying her morning coffee. What a special person."

In addition to her volunteer work, O'Leary has been active in community theater for years, recently performing in *A Funny Thing Happened on the Way to the Forum*; *Hello, Dolly*; and *The Rocky Horror Picture Show*. The theater group, Chapel Street Players, renamed its fundraiser after her as they celebrated 50 years of performances and 50 years of O'Leary appearing in them.

"Age is a number, and mine's unlisted," jokes O'Leary, who has no desire to stop working. And why should she? She continues to make an important impact because as Snively says, "She influences the teachers as well as the students. She [has] a plethora of knowledge…It's all about positivism. She makes the teachers she works with feel empowered. It's a great feeling when you leave her presence or her classroom."

Using a penny and a balloon, Renee O'Leary teaches children about momentum, centrifugal force, and gravity.

For more information on PASS and BLAST, contact O'Leary at 302-530-7482 or by fax at 302-731-1493.

*During the Before and After Retirement/Practicalities and Possibilities conference session, attendees requested that this column include information on senior discounts and other ways those ages 50 and older can benefit from being "older." Check out AARP for information about membership and discounts offered. The Frugal Living website has a comprehensive, alphabetized Senior Discount Directory (*http://bit.ly/6r8ERJ*). And in NSTA's discount plan for retired teachers, membership renewals and registration fees for conferences are reduced.* ●

MS. MENTOR, Advice Column

Test Makeups, Interacting With NSTA Colleagues

I am a student teacher in sixth-grade Earth science. My question is about makeup exams. I have several ideas, but can you suggest other systems or procedures for allowing students to make up exams?

—Dawn, San Jose, California

Student absences are a given. It's frustrating when students miss a class (or two or three) due to illness, field trips, or family situations. It's hard to find time for students to make up assignments, especially tests, labs, and projects.

In your note, you listed your ideas for students to make up a test when they return to school. Two important considerations regarding makeup tests are the format and content. Will you give the same test as a makeup or an alternate version? How will you ensure the alternate version assesses the same objectives as the original test?

Based on my experiences, I have some thoughts and questions:

- Require students to schedule an appointment to make up the exam. I suspect this is a very common strategy. But do your students have study halls or resource time during the day when they can make up work? What about before or after school? If students don't have time during the day, you could ask those needing a makeup to take the test during class time when they return from the absence. If the rest of the class would be distracting, the student could go to another classroom or the library (arrange this with your colleagues beforehand). One drawback is that when the student makes up the test during the school day, he or she then misses what is happening in class.
- Have students take an online test or computer-based test. This option assumes students have access to the technology and you have the appropriate resources to create, administer, and view the results of an online test. Do you typically use an online format, or will you have to create an online version? Where and when will the students complete it? What if other students would prefer this alternative?
- Permit students to do a take-home test. Would this be the same test or an alternate version? Do students taking the test in class have access to their notes, the textbook, the internet, or one another? If not, how will you regulate what happens at home, where these resources may be readily available? What is the time frame for completing it? What about other students who would like this option?
- Substitute a project in place of the exam. If you do this, you'll have to be careful the project reflects the same learning objectives as the traditional test. If your test focuses on recall of factual knowledge or written explanations but the project requires a higher level of thinking, then you're assessing different learning objectives. Decide in advance how much time to allow for the project. Would students who were not absent prefer or benefit more from projects?

A strategy that worked for me was having "transition time" between units of instruction, usually a day or two. During this time, students could make up the test, revise lab reports, retake the test (if that is an option), finish projects, or engage in extension activities.

As a student teacher, you can observe how your mentor/cooperating teacher handles this issue.

I am the only science teacher at my school, and I have no one to ask for help. How can I post a question online to all the members of NSTA? I see there are forums and [e-mail] lists, but I don't know how to participate. For example, right now I'm looking for resources on dissections.

—Chris, Kutztown, Pennsylvania

You may be the only science teacher in your school, but you have thousands of colleagues in NSTA. You'll find NSTA members are eager to help you and share their experiences and resources: We want all students to succeed! In addition to NSTA's blogs, Facebook pages, and Twitter feed (#nsta), you have several ways of tapping into this collective expertise:

NSTA's Community Forums (see *http://learningcenter.nsta.org/discuss*) are threaded discussions on topics submitted by participants. The forums are divided into Science Disciplines (Chemistry, Earth and Space Science, Elementary Science, General Science and Teaching, Life Science, Physical Science, and STEM) and Pedagogy and Research (Evaluation and Assessment, New

Teachers, Next Generation Science Standards, Professional Development, and Research in Science Education). Choose a forum to examine an existing topic, search for a topic or concept, or post a new topic/question. If you view an existing topic, you can choose to post your own reply to the group or send a private message to a responder. You can select the option to be reminded via e-mail if someone responds to your topic. I searched the community using the keyword "dissect" and found several threads about dissection:

- Virtual Dissecting (New Teacher forum)
- Teacher-Guided Dissections vs. Instruction-Sheet Guided Dissections (Life Science forum)
- Which Dissections Are Best? (Life Science forum)
- Dissections (Life Science forum)

Use NSTA's E-Mail List Server (at *www.nsta.org*, under the Member Services tab) to join group e-mail discussions that allow members to exchange information in a peer-to-peer environment. NSTA members can subscribe to any (or all) of the 14 topic areas. Colleagues on the list can share ideas, get information, and ask questions. The lists are active 24/7, so information is readily available whenever you need it. In your case, subscribe to the biology list and ask about activities or lesson plans related to dissections. Include specifics such as the grade level, learning goal, and time frame so your colleagues get a better idea of what you need. I'd suggest setting up a separate e-mail account so your school or personal e-mail accounts don't get overloaded, especially if you subscribe to more than one list.

NSTA's SciLinks (*www.scilinks.org*) does not have a keyword for dissection. Instead, you could search NSTA publications via the Learning Center (*http://learningcenter.nsta.org*). Several articles on dissection have appeared in NSTA journals. I've created a collection in the Learning Center (*http://bit.ly/1bdvg1n*) to get you started. ●

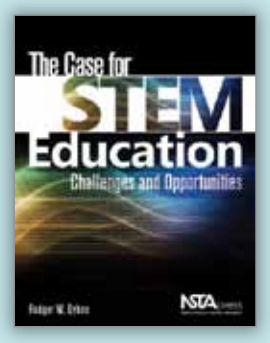
Check out more of Ms. Mentor's advice on diverse topics or ask a question at www.nsta.org/msmentor.

Quotable

People keep saying, "Science doesn't know everything." Well, science knows it doesn't know everything; otherwise, it would stop.

—Dara Ó Briain, Irish standup comedian and television presenter

SUMMER READS



The Case for STEM Education

Challenges and Opportunities

Grades K–12

If you're concerned with science, technology, engineering, and mathematics initiatives, this book is a must-read. Author Rodger Bybee outlines the challenges facing STEM education while offering several ideas you can use to develop action plans for implementing STEM instruction. Teachers, administrators, methods professors, and education leaders at all levels will benefit from this book.

Member Price: $22.36 | Nonmember Price: $27.95

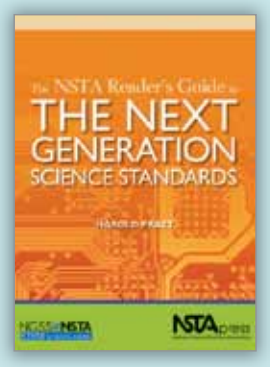
Everyday Science Mysteries

Stories for Inquiry-Based Science Teaching

Grades K–8

Everyone loves a good mystery—and thousands of teachers love the way the *Everyday Science Mysteries* series gets K–8 students engaged in real experimentation about real science content. NSTA's three new releases in this bestselling series each focus on a specific content area—Earth and space science, physical science, or biological science.

Member Price: $20.76 | Nonmember Price: $25.95



The NSTA Reader's Guide to the *Next Generation Science Standards*

The key to unlocking the full potential of the *NGSS* is a deep understanding of the interrelationship of its core ideas, scientific and engineering practices, and crosscutting concepts. This brief and easy-to-use *Reader's Guide* offers anyone with a vested interest in improving the quality of science education the tools they need to absorb the new standards and begin to implement them, effectively, into classroom practices.

Member Price: $8.76 | Nonmember Price: $10.95

To place an order or download a free chapter, visit

www.nsta.org/store

NSTA National Science Teachers Association

(All dates are deadlines unless otherwise specified.)

August 1—Applications for the **NSTA New Science Teacher Academy** are due! The academy provides middle and high school science educators in their second through fifth years of teaching with a year–long professional development (PD) experience, including a NSTA membership, an online mentor, web-based PD activities, an all-expenses-paid trip to NSTA's national conference on science education, and more. For more information about the NSTA New Science Teacher Academy or to apply, visit *www.nsta.org/academy.*

August 1—Sound your horn and share your best ideas for teaching the **"Sounds of Science"** in the February 2014 issue of *Science & Children*, NSTA's peer-reviewed journal for elementary school teachers. Submit your manuscript describing what strategies you use, how you develop understanding of sound, and more. For more information, see the call for papers at *http://bit.ly/agiF5g.*

August 1—Do you have a successful way of "**Using Multiple Modes of Expression to Demonstrate Understanding?"** Describe it in a manuscript on this theme for the January 2014 issue of *Science Scope.* For more information, see the call for papers at *http://bit.ly/hD7eoc.*

September 1—Share your outdoor learning explorations in the March 2014 issue of *Science & Children,* featuring the theme **"Ecosystems: Interactions, Energy, and Dynamics."** The editors are seeking manuscripts detailing learning opportunities, resources, and more. For more information, see the call for papers at *http://bit.ly/agiF5g.*

September 17—Have you considered nominating yourself or a colleague to serve on **NSTA's Board and Council**, but aren't sure about the obligations of the various posts or the process? Join Lois Mayo for a free web seminar discussing the leadership opportunities and how to complete an application. More information is available from the NSTA Learning Center; see *http://bit.ly/Eo1MU.*

October 1—You know how you assess your students, but how do you assess your own learning and performance? Contribute your insight and experience with **"Measuring Your Effectiveness,"** the theme of the April/May 2014 issue of *Science & Children*, just in time to help your colleagues reflect on another school year. The editors are seeking manuscripts explaining how educators analyze programs and support materials, determine professional development needs, evaluate curriculum, and more. For more information, see the call for papers at *http://bit.ly/agiF5g.*

October 1—Interested in applying for the **Shell Science Teaching Award,** and want to make your application as strong as possible? Norma Neely and previous awardees will offer advice and examples from previous award submissions during a free web seminar at 6:30–7:30 p.m. Eastern Time. More information is available from the NSTA Learning Center at *http://bit.ly/Eo1MU.*

October 9—Are you ready to become one of NSTA's leaders? The association is accepting nominations for the **NSTA Board of Directors and Council** for the 2014 election. Applications are being accepted for president-elect, Multicultural/Equity in Science Education director, Preservice Teacher Preparation director, and Research in Science Education director. Applications for district directors are being accepted from District I (Connecticut, Massachusetts, Rhode Island), District VI (North Carolina, South Carolina, Tennessee), District VII (Arkansas, Louisiana, Mississippi), District XII (Illinois, Iowa, Wisconsin), District XIII (New Mexico, Oklahoma, Texas), and District XVIII (Canada). All applications must be submitted electronically to *nominations@nsta.org.* For more information on the NSTA Board and Council, visit *http://bit.ly/dCSvM9.*

October 15—What are the elements of a winning award application? Join Carrie Launius to learn more about the **NSTA Teacher Awards program** and what it takes to be honored with one of these valuable awards during a free web seminar at 6:30–7:30 p.m. Eastern Time. More information is available from the NSTA Learning Center at *http://bit.ly/Eo1MU.*

November 1—How do you access resources outside your school to enhance your students' learning experiences? The Summer 2014 issue of *Science & Children* will feature manuscripts on the theme, "**Resources From Informal Science Centers and Funded Projects**." Share how you identify resources, recruit and train volunteers, partner with informal science centers, and more. For more information, see the call for papers at *http://bit.ly/agiF5g.*

November 8—Applications for the **Shell Science Teaching Award** are due now! The award honors K–12 science teachers who have positively affected their students, schools, and communities through their exemplary science teaching. Find more information and download an application at *http://bit.ly/alRFmJ.*

November 15—It's the last day to register your student teams for the **America's Home Energy Education Challenge**, sponsored by the U.S. Department of Energy. Students in grades 3–8 can participate if they have a Team Advisor. For more information, go to *www.homeenergychallenge.org.*●

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FUNGUS: A giant *Armillaria ostoyae* in Oregon occupies 2,384 acres.

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Quotable

In wisdom gathered over time, I have found that every experience is a form of exploration.

—Ansel Adams, American photographer and environmentalist (1902–1984)

Painted Frog Hops Off Extinction List

An extinct species doesn't always stay that way. Scientists in Israel recently reported the rediscovery of the Hula painted frog. The frog had been declared extinct by the International Union for Conservation of Nature in 1996, the first of 34 amphibian species to be so designated. The frog's rediscovery also led to its reclassification from the *Discoglossus* group of amphibians to *Latonia* based on genetic testing and computed tomography (CT) scans. The Hula painted frog is the only known member of the *Latonia* group in existence; all other members of the group are only known in the fossil record, having died out approximately 15,000 years ago. Although no longer extinct, the frog remains listed as "critically endangered" due to its limited habitat.

National Geographic blogger Ed Yong also reported additional Hula frog specimens have been found since the original article on the study was published in *Nature Communications* on June 4. Read the abstract at *http://bit.ly/18RlkxK*.

MICKEY SAMUNI-BLANK

Hula Painted Frog