MSTA Newsletter

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From the President's Desk:

Continuing on with the Next Generation Science Standards

By Michael Sampson, MSTA President

As my term as president draws to a close, I have spent a great deal of time reflecting on what we have accomplished. Back in April 2012, when I was elected, I determined that the organization would focus on how we could support our membership during their review and implementation of the Next Generation Science Standards (NGSS). The leadership of this organization has dedicated our resources and expertise on writing, reviewing and developing professional development to aid both the state department of education and our membership in beginning to implement these standards.

The MSTA leadership will continue to support the adoption of the NGSS by being vocal advocates at state level meetings and offering excellent professional development opportunities at our state conference and other venues. To emphasize a point from my last article: an organization is only as strong as its members are; the MSTA is no different.

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From The Desk of Your Executive Director

By Robby Cramer, MSTA Executive Director

The number one theme of questions I am asked by MSTA members, our board of directors, and science teachers across Michigan is: What is happening regarding the Next Generation Science Standards (NGSS) and the State of Michigan?

The short answer is that the Michigan Department of Education still recommends that science teachers everywhere in our state continue to work on implementation of the NGSS' Science and Engineering Practices. After discussion at the MSTA board meeting in November, I emailed the MSTA position paper to all eight members of the Michigan State Board of Education. When the NGSS was not a topic on the November agenda, I emailed all members of the State Board of Education (SBE) again, asking when they might begin discussion of the NGSS. The delay in action made it clear that the executive committee needed to think about our next steps. We decided not to have any of our members speak at the November meeting. It was decided that, as Executive Director, I would go to the SBE meeting to watch and listen.

I learned many things that day. In particular, I discovered that providing pieces of information about the NGSS and sharing our stories of what these practices look like in our classrooms would help us inform the Board about how these standards will help Michigan students take their places in the world of tomorrow. I also learned that we needed to have many members of the science education community and science leaders share perspectives as a united front to tell the story of what occurs in our science classrooms every day.

With this in mind, I spoke with science teachers and leaders across the state of Michigan. We asked if anyone would be willing to share their thoughts at the board meeting in December. Paul Drummond, the MSTA Membership chair, spoke, with the permission of his Intermediate School District as an ISD Science consultant, and as a representative of the Square One business group and informal science programs (Ann Arbor Hands on Museum.) He spoke about how these groups support NGSS and would like to see discussions begin to move toward adoption.

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Liz Larwa, the MSTA Elementary Director, spoke about what the NGSS practices look like in her fourth grade classroom. She emphasized connections to the Common Core in both Language Arts and Math. Her vivid descriptions helped board members picture in their minds how these lessons were different than those she taught using science concepts from the GLCES. The expressions on their faces reflected their interest and understanding of her message.

We presented each Board member with a present from MSTA: a large, Honeycrisp apple in a cellophane bag tied with a bright, tri-colored ribbon. I explained that the significance of the present was not the apple, but the ribbon. The three colors of the ribbon represented the three dimensions of the NGSS: Disciplinary Core Ideas, Cross Cutting Concepts, and Science and Engineering Practices. I used Joe Krajcik's rope analogy; as the three strands of rope are braided or twisted together, the strands becomes stronger, more flexible, and their connections more integrated. So it is with science knowledge that incorporates all three dimensions of NGSS. Student thinking and understanding about science becomes deeper and stronger and more flexible as we weave the three dimensions together.

The key to all of this is that they listened. Two days later the Michigan Department of Education invited leaders from the MSTA, the Math and Science Center Network and representatives of many science education stakeholders throughout the state to meet in Lansing at the end of January to talk about science education in Michigan. We will continue to keep you informed as this collaboration unfolds.

You have a chance to gather in Lansing in March to talk and learn about science education. On behalf of the MSTA Board of Directors and the 2014 Conference Committee, I would like to invite you to attend the 61st MSTA Annual State Science Conference! We are excited to be back at the Lansing Center and the Radisson Hotel-Lansing at the Capitol. The theme of our conference is Pure Michigan Science: Bridges to the Next Generation.

The MSTA Conference will begin with a keynote address from Stephen Pruitt. Dr. Pruitt is the Senior Vice President for Content, Research and Development at Achieve. He is an excellent speaker! The title of his presentation is: "Top Ten Reasons Science Education is Changing!" Science education is at a crossroads. This change is a good one and moves "school science" toward real science. His keynote will inform, entertain, and push your thinking about how science education will need to look to prepare all Michigan students for their futures. Look for Liz Larwa's article in this newsletter to find out more about the State conference! I look forward to seeing you!

The Intersection of Standards and Instruction

From Megan Schrauben, Integrated Education Consultant, Curriculum & Instruction, Michigan Department of Education

In the September 2013 issue of the MSTA Newsletter, we briefly introduced the intentional instructional practices that we are emphasizing at the Michigan Department of Education. To review, we looked at the intersection of Standards, Culture, and Instruction as being intentional in your planning for lessons. Where these intersect, we envision a classroom where students are engaged in rigorous tasks that are seamlessly linked with the standards and are culturally relevant. We will investigate the intersection of two of the three areas in this newsletter—standards and instruction—and what this means for the science classroom.

When we are intentionally planning and look to link to our standards for guidance with what we are doing instructionally in the classroom, we end up with curriculum that raises the cognitive demand for our students. This increased rigor promotes the use of skills that we define as being characteristics of career and college ready students. Currently, our Michigan Content Expectations separate the inquiry and process skill standards from the content standards. This presents a slight challenge for us when we are intentionally planning our lessons because it may not always be clear how the content is to relate to the process. In some cases, the process skills are taught as separate ideas to learn apart from the content, which unfortunately leaves these ideas as unrelated in the student's mind. How can we expect students to be users and creators of scientific knowledge if they do not understand how the practices that scientists engage in help them develop new scientific knowledge or solve problems through the application of their knowledge?

Therefore, to be intentional and raise the level of rigor of the tasks in which students are engaged, we need to think about how we can have students practice *using* the content that they are supposed to be learning. This happens by having students engage with the content by using the characteristics of career and college ready students—communication and collaboration, problem solving, technology and tools, and argument and reasoning. For example, scientists communicate and collaborate about their most recent findings/data. This is how they learn, adjust, and further their understandings—why wouldn't students benefit by participating in the same processes?

In the future, it may be clearer about how these characteristics are linked with content if we adopt the Next Generation Science Standards (NGSS). The scientific and engineering practices that are crucial parts of the three dimension boxes showcased in the standards further define the four categories of the characteristics of career and college ready students. In addition, the performance expectations integrate these practices with the content (disciplinary core ideas) to help show the level of rigor that students are expected to master in their involvement with the content. The practices are the nexus between content standards and instruction—they explain how students should be interacting with the content ideas and this effectively raises the cognitive demand of the tasks that students will be engaged in. Whether we adopt the NGSS or not, it shouldn't stop us from understanding the practices in order to increase the rigor of intellectual engagement in our science classrooms.

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FAQs of the Next Generation Science Standards

From Jennifer Arnswald, Kent ISD, MSTA Curriculum Director

Excitement and momentum is growing in support of the Next Generation Science Standards throughout the state. As I travel to districts, teachers in Michigan have shared their passions for the vision of the NGSS but several questions seem to resurface. This is what educators have been asking....

Q. Where do I find the Next Generation Science Standards (NGSS)?

A. The finalized Next Generation Science Standards can be found at http://www.nextgenscience.org. Michigan will be utilizing the "Topic" version of the standards. There is also a printed version of the standards that can be purchased on online[1] and a free NGSS app[2].

Q. Will Michigan be adopting the standards?

A. There has been a lot of preparation for the adoption process at the state level. Educators and members of MSTA have played a huge role in creating materials that will be presented to the Michigan Board of Education in favor of adoption. At this time, adoption will likely go to the board late in 2014.

Q. Are the Next Generation Science Standards the same as the Common Core State Standards?

A. No, the standards were created by a group of researchers, educators, and other stakeholders in partnership with Achieve, the National Science Teachers Association, the American Association for the Advancement of Science and the National Research Council. Middle and high school teachers will have the Common Core Literacy Standards for Science in addition to the NGSS. There are many overlaps in the practices in NGSS and the literacy standards contained in the Common Core. The Understanding Language (ELL) group at Stanford University has been working on creating materials that take emphasize the overlaps in CCSS and NGSS[3].

Q. We haven't adopted the standards, what should we do now?

A. Take time to study the practices. Appendix F (Science and Engineering Practices)[4] contains useful K-12 progression charts that show the expectation for each grade band. This is a great place to start with a district or building level science team. Start slowly and try out each practice. Remember that if the practice seems foreign to you, then your students are probably feeling the same way.

Q. Who has adopted the NGSS?

A. California, Rhode Island, Maryland, Vermont, Delaware, Washington, Kentucky, Kansas, and the District of Columbia

Q. Are there groups working on creating materials that are aligned to the NGSS?

A. Yes, many states are currently working on materials to help with transition. There are many grant projects at universities in Michigan focusing on the creation of quality, aligned NGSS-based instruction units. In addition to local and state level organizations, the National Science Teacher Association is working on gathering the "best of the best" resources and then adapting them to be aligned to the NGSS.

Q. What about assessment?

A. At this time there is not an assessment aligned to the NGSS. In December a report[4] was published outlining the recommendation when creating assessments that align to NGSS.[5]

[1] *Next Generation Science Standards: For States, by States*. Washington, D.C.: National Academies, 2013. Print. ISBN 978-0-309-27227-8
[2] Mastery Connect http://www.masteryconnect.com/learn-more/goodies.html
[3] http://ell.stanford.edu/
[4] http://bit.ly/SciEngPractices
[5] http://sites.nationalacademies.org/DBASSE/BOTA/Developing_Assessments_for_NGSS/index.htm

From the President - *continued from front page*

WE NEED YOUR HELP! Please become an advocate for science education in Michigan.

Write a letter to your state representative about your support of the NGSS and how it can impact learning. Send an email to a state board of education member about NGSS. Attend a state board of education meeting. Make your voice heard.

It has been my pleasure to serve the organization. Let's continue to work together to make it even better!

Conference Update from the Co-Chairs!

The 61st Michigan Science Teachers Association Conference is quickly approaching March 6th, 7th, and 8th, 2014, so get your registration in as soon as possible. Below are some of the highlights you can expect this year.

Do you want to hear about NGSS directly from the national leader of the project?
We are very excited to welcome Dr. Stephen Pruitt as our dynamic keynote speaker. He comes to us from Achieve where he is the Senior Vice President of Content, Research and Development. More importantly, he served on the National Academies of Science's committee on Conceptual Framework for New Science Education Standards, which developed the *Framework for K-12 Science Education*. This document is the basis for the development of the *Next Generation Science Standards (NGSS)*. Dr. Pruitt led the entire writing team of the NGSS document. This session will run unopposed at 8:00 on Friday morning, so be sure not to miss it. However, if you miss it on Friday, the PowerPoint will be repeated on Saturday morning at 8:00.

The title of Dr. Pruitt's session is: "TOP TEN REASONS SCIENCE EDUCATION IS CHANGING."
The description is: Science education is in a time of change. The change is a good one and moves "school science" toward real science. This session will inform, entertain, and push your thinking on how science education will need to look to prepare all Michigan students for their futures.

Do you want to hear about what is happening in our state right now in regard to NGSS? Following the keynote address, a panel discussion will take place. The participants feature:

- Dr. Joseph Krajcik, professor at MSU and team leader of the writing team for the Physical Science portion of NGSS
- Susan Codere Kelly, NGSS Project Coordinator for the Michigan Department of Education
- and other state leaders in science education.

The panel discussion is designed for interactive participation. You will have the opportunity to ask questions ahead of time, many of which will be answered by the panel.

How do I start bringing more engineering practices into my classroom? There are many sessions being offered by teachers just like you, sharing what they are doing in the classroom to embrace NGSS. Try one of the Boot Camps for an intense look at how to start incorporating engineering practices into your classroom right now.

Are you worried that you can only attend the conference one day and will miss out?
Not to worry! The panel discussion and boot camps will happen both Friday and Saturday. With Dr. Pruitt's permission, his Friday keynote address will be shared by Robby Cramer and Betty Crowder on Saturday. There are about 150 sessions being offered on Friday and about 90 on Saturday spanning levels from early elementary to college so there is something for everyone.

Friday night - What to do?
The MSTA conference committee is excited to announce that we have two great events planned. The first is the Awards Banquet, where you can join this year's MSTA award winners and be awed by these inspirational teachers. Following the banquet, there will be a free movie night featuring videos from the Howard Hughes Medical Institute. The videos are about 20 minutes long and there will be someone from the Institute to answer questions. There will also be a session and a booth hosted by the Institute. Anyone who views the video will receive a free one and a teacher resource packet.

Both of these events will be held at the Lansing Center. Check your program for times and details.

Are there sessions that are more in depth?
The workshops on Thursday last from a half to a whole day. These popular and informative sessions require pre-registration so be sure to check them out.

Do you want to have a more personal relationship with MSTA? The MSTA Conference is offering a new feature this year – a meet and greet with your regional director. During the break between the morning and afternoon sessions, the regional directors will be in the exhibit hall ready to talk you and let you know what is happening in your region.

Do you have some new ideas for MSTA or want to get more involved? Come to the general membership meeting on Saturday, chat with Board Members, and make your voice heard.

Do you want to see the newest materials out there to use in your classroom?
Visit the exhibit hall to see the largest concentration of science educational materials available anywhere in the state. Enter a drawing for giveaways from the exhibitors. Also visit the always popular MESTA rock shop, NSTA book store, and the Cyber Café.

We look forward to seeing you make this MSTA Conference your *Pure Michigan* destination.

Karen Kelly and Liz Larwa
Co-conference chairs

CONGRATULATIONS TO THE 2014 MSTA AWARD WINNERS!!

Thanks to Marlenn Maicki, MSTA Awards Chairperson

The Board of Directors of the Michigan Science Teachers Association is proud to announce this year's award winners. The awardees will be honored at a special dinner at the 2014 MSTA Conference in Lansing, Michigan on March 7th, 2014. Please plan to attend and pass on your best wishes for their continued success! Drumroll please.....

Teacher of Promise: *Nicole Jakubowski (Detroit Country Day School)* **and** *Kristy Butler (Forest Hills Central High School)*

Elementary Science Teacher if the Year: *Julee Cowher (Spencer Elementary School)*

Middle School Science Teacher of the Year: *Mark Koschmann (St. John's Lutheran School)*

High School Science Teacher of the Year: *Richard Eberly (New Buffalo High School)*

College Science Teacher of the Year: *Dr. Mary Helen Brown (Lansing Community College)*

Informal Science Educator if the Year: *Paula Gangopadhyay (The Henry Ford Museums)*

MSTA Distinguished Service Award: *Michael Klein (Macomb Intermediate School District)* **and** *David McCloy* **(***Saginaw Valley University, Retired)*

MSTA George G. Mallinson Award: *Dr. Joseph Krajcik (Michigan State University)*

From Betty Crowder, MSTA Past President and member of the Michigan Presidential Award for Excellence in Mathematics and Science Teaching (PAEMST) committee.

Press Release 13-207
President Obama honors outstanding mathematics and science teachers

More than 100 teachers receive nation's highest K-12 math and science teaching award

December 20, 2013

WASHINGTON, D.C.--President Obama today named 102 mathematics and science teachers as recipients of the prestigious Presidential Award for Excellence in Mathematics and Science Teaching. This year's awardees represent all 50 states, the District of Columbia, Puerto Rico, and the Department of Defense Education Activity. The educators will receive their awards at a Washington, D.C., event in the coming year.

The Presidential Award for Excellence in Mathematics and Science Teaching is awarded annually to outstanding K-12 science and mathematics teachers from across the country. The winners are selected by a panel of distinguished scientists, mathematicians, and educators following an initial selection process done at the state level. Each year the award alternates between teachers teaching kindergarten through 6th grade and those teaching 7th through 12th grades. The 2012 awardees named today teach kindergarten through 6th grade.

Winners of this Presidential honor receive a $10,000 award from the National Science Foundation to be used at their discretion. They also are invited to Washington, D.C., for an awards ceremony and several days of educational and celebratory events, including visits with members of Congress and the Administration.

"These teachers are inspiring today's young students to become the next generation of American scientists, mathematicians, and innovators," President Obama said. "Through their passion and dedication, and by sharing their excitement about science, technology, engineering, and math, they are helping us build a promising future for all our children."

Excellent math and science teachers, exemplified by these awardees, are critical to getting more students engaged in the increasingly important science, technology, engineering, and math (STEM) fields. That's why President Obama has committed to strengthening STEM education and has called for preparing 100,000 excellent science and mathematics teachers over the next decade-a goal that inspired the creation of "100k in 10," a coalition of leading corporations, philanthropies, universities, service organizations, and others working to train and retain STEM teachers across the nation. The President has also proposed to further strengthen the STEM teaching profession by launching a new STEM Master Teacher Corps, leveraging the expertise of some of our nation's best and brightest teachers in science and mathematics to elevate the teaching of these subjects nationwide.

Nominations for the 2014 PAEMST are open through April 1, 2014. For more information about PAEMST, please visit http://www.nsf.gov/cgi-bin/goodbye?http://www.paemst.org/.

See NSF's PAEMST Fact Sheet for more information about this award.

The awardees for Michigan are:

Brian Peterson (Science)
5th Grade
Musson Elementary School
Rochester Community Schools
Rochester Hills, Michigan 48306

Emily Theriault-Kimmey (Mathematics)
5th Grade Mathematics
Pattengill Elementary School
Ann Arbor Public Schools
Ann Arbor, Michigan 48104

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So What's All the Hype About Engineering?

By Elizabeth Larwa, MSTA Elementary Director, Conference Co-Chairperson

Engineering –This is the new buzz word in education. If you are like me, this word may strike fear in your heart and/or put lots of questions in your head.

- **What exactly is engineering, and what does an engineer look like?**
- **What is going on with the state and the NGSS document?"**
- **What could I be doing about engineering in my classroom since NGSS has not been adopted, but I am under pressure to be doing something? I don't have time to be doing new things or to add new things to my day.**
- **I know I am supposed to be teaching my students differently, but what should this look like?**

What is engineering, and what does an engineer look like? Engineering is applying science and math to practical applications, such as the design, manufacture, and operation of structures, machines, processes, and systems. An engineer is someone who uses his/her knowledge of science, math, and creativity to design objects, systems, or processes to solve problems. There are many different kinds of engineers. Computer engineers designed the PC. I am using to type this article. Chemical engineers refined the paper and the printer ink I use. Civil engineers design and build the roads and bridges on which we drive. Mechanical engineers design and manufacture systems that build cars, while metallurgical engineers improved the steel and aluminum alloys in the car. Biomedical engineers develop knee and hip replacements, and the food you eat for breakfast and lunch is processed by methods developed by agricultural engineers.

What is going on with the state and the NGSS document? NGSS, or Next Generation Science Standards, is a very well thought out and comprehensive document based on the *Framework for K-12 Science Education* developed by the National Research Council. The NGSS document went through many revisions and was thoroughly reviewed before a final draft was released. Some states have already adopted the NGSS. The Michigan State Board of Education is in discussion about adopting it. Members of MSTA and other interested parties have presented to the state board in favor of adopting the NGSS.

What could I be doing about engineering in my classroom since NGSS has not been adopted, but I am under pressure to be doing something? The NGSS document does list core ideas in science that all students should be learning, but where this document differs from previous ones is that students should be learning the core ideas in the "context of science and engineering practices." (NGSS, Appendix F, 2013, p.1) So teachers can start making change in their classroom by looking at NGSS Appendix F: Science and Engineering Practices*. These practices are deemed "essential for all students to learn." (p. 1) They are described in detail for all levels K-12 in order to "provide valuable insights into the nature of science and engineering, as well as the connections between these two closely allied fields." (p.2)

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So What's All the Hype About Engineering

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The eight practices listed in Appendix F are "based on an analysis of what professional scientists and engineers do." (p.2) Teachers will find that they are easy to incorporate into their daily routines since they are similar to strategies found in the *Common Core State Standards* for mathematics and English language arts and literacy. In fact, three of the practices are exactly the same in science, math, and ELA. They are:

- Engage in argument from evidence
- Construct explanations and design solutions
- Obtain, evaluate and communicate information

I know I am supposed to be teaching my students differently, but what should this look like? I found that after 39 years in the classroom, the way I made change in my teaching was by starting with a lesson I was comfortable teaching, tweaking it to reflect the new direction I wanted to go, reflecting back on how well the lesson went, and tweaking it again until I was happy with the change. It's not easy being a veteran teacher and feeling like a student teacher all over again when a lesson doesn't go well.

Let's take a very specific example. I would like to look in depth at Science and Engineering Practice 7, *Engaging in Argument From Evidence*. If you delve into the finer explanation of this practice under Grades 5-8, it will say two things:

- Respectfully provide and receive critiques from peers about a proposed procedure, explanation, or model by citing relevant evidence and posing specific questions.
- Construct and/or support an argument with evidence, data, and/or a model.

My students would have to create a model of the Earth, sun, and moon following specific guidelines in order to demonstrate to me their understanding of revolution, orbit, day and night, etc. To me this was good teaching, and I was comfortable with this lesson. I was asking my students to construct a model and use some higher level thinking skills. They would present it, and I would grade it. That was the end of the lesson. But, have I asked my students to "make an argument with evidence" or given them the opportunity to "respectfully provide and receive critiques"? Here is the perfect place to start the change from just teaching the core idea to teaching the core idea in the context of science and engineering practices.

To change, or tweak, this lesson to reflect more of Science and Engineering Practice 7, I could now ask my students to look at each other's projects and critique them by "citing relevant evidence and posing specific questions." Anyone who has ever worked with children and asked them to critique their peers' work, have probably experienced the same phenomena I have. Every child will say "great" or "good job" or "awesome" for every project. If you ask them to look more closely they will tell you that one word is misspelled or "I like the colors you used." These critiques do not "cite relevant evidence" nor do they "pose specific questions". This is where my teaching needs to change. I have to model for my class how to ask specific questions based on evidence, how to respond with a supportive argument, and (this is the hardest one to get students to do), how to change a model to reflect the criticism from their peers so it is more accurate.

It has taken me several years of working with the science and engineering practices to start to lose the fear in my heart and quiet the questions in my head. I know my teaching will change, and my students will be better off for it. Change is inevitable.

> ***"…national initiatives are emerging for a new wave of standards through the NGSS as well as Common Core State Standards (CCSS) for English language arts and literacy and for mathematics. As these new standards are cognitively demanding, teachers must make instructional shifts to enable students to be college and career ready." (NGSS, Appendix D, 2013, p. 1)***

*To find a copy of the NGSS and the Appendices go to www.nextgenscience.org

Clean Water Engineering Activity

By Lynn Thomas, Region 14 Director

Clean, healthy, drinking water is something students tend to take for granted. This engineering task is easily adapted across grade levels. It allows students to begin thinking about what it takes to provide a safe, fresh, water supply as they design and test their own filtration systems.

For each group:

- A sample of visibly "contaminated water" containing a variety of substances (both soluble and insoluble) such as potting soil, crumbled leaves or other organic material, food coloring, vegetable oil, etc.
- 2-liter bottle cut in half. The top portion should be inverted with the cap removed. This will serve as the funnel in which students create their filtration system. The bottom portion can be placed underneath to collect the filtered water.

Materials for filtration:

- Sponge
- Sand
- Gravel
- Kitty litter
- Cotton balls
- Coffee filter
- You may also wish to provide activated carbon (sold as an aquarium supply). However, it might be best to provide it after students have tested the other materials and are looking for a more effective filter. Activated carbon is charcoal that has been processed to open up millions of tiny pores between the carbon atoms. Activated carbon was engineered in response to the need for a more effective filter.

Divide the students into teams of 2-3 students. Challenge the students to choose no more than three of the available filter materials to design a layered filtration system. Individual teams should construct and test their filtration system design. At the end of the experimental tests, each team should present their findings. Teams should explain their choice of materials and describe how well the filtration system performed. Finally, all results should be consolidated and students should decide what they would do differently if they were to design another filtration system.

Note: Students should be aware that, in reality, mechanical filtration alone is not enough to provide safe drinking water from surface water sources. Viruses and bacteria can pass through filtration and must be further inactivated.

NOTE: This activity addresses the following Next Generation Science Standards

Disciplinary Core Ideas:

ETS1.A: Defining and Delimiting Engineering Problems

ETS1.B: Developing Possible Solutions

ETS1.C: Optimizing the Design Solution

Judy Morlan, Retired M S teacher, Grosse Pointe School

Many science teachers recall the Rouge River as Detroit's polluted urban river. It is also widely known as the organization named Friends of the Rouge, or FOTR. The group spearheaded a campaign to clean up the Rouge River. Since 1986 Friends of the Rouge has implemented a plan that allowed students in science classe to participate in a water quality testing program. Enter Dr. Bill Stapp from the University of Michigan and his graduate student, Mark Mitchell, who developed a program and authored a book entitled *Field Manual for Water Quality Monitoring. The book is in its 11th Printing! The program was called Rouge Education Project., or REP.*

Early Memories of the Rouge Education Project

My 6th graders from Brownell Middle School, participated in REP program from 1989 until 1999, when I retired. The REP was a wonderful experience for my students and for me!

Our "bible' was the Field Manual for Water Quality Monitoring, written by Bill Stapp and Mark Mitchell.

Mark was a graduate student of Dr. Stapp's in the School of Natural Resources at the University of Michigan.

The manual was developed as a comprehensive step-by-step guide to water quality testing specifically designed for the Rouge River. This is how I remembered the experience:

I remember teaching students to use the relatively complex Hach equipment to test for water quality. Students tested for dissolved oxygen, pH, nitrates, phosphates, fecal coliform, turbidity and temperature to produce a Water Quality Index to be used in comparison with other sites. Students cataloged the macro invertebrates present in the river and developed a stream survey, which included river banks, velocity and and man-made structures nearby.

I remember that teaching their parents to use the equipment so they could oversee the various tests on site was the way to go. Both were equally challenging!

I remember using the excellent VCR individual test tapes, produced by Dave Tessier and FOTR, over a summer, to prepare students and parents for the actual test day at the Rouge River.

I remember test day, when the bus began to roll and I hoped I had not forgotten to pack every last piece of necessary equipment!!

I remember analyzing the results with students and sending them over to the FOTR office where a comprehensive report was prepared. Results where then forwarded to the DEQ. Today this part of the program has been deleted for technical reasons.

I remember preparing for the Student Congress, an event where students share their excitement, their results, and their changes in attitude. Creativity was the key for my students and several times we performed a rap, incorporating unique aspects and humorous occurrences! Another strategy I used often was a team approach with the English teacher, who helped students create river poetry and the art teacher, who worked with the students to illustrate their poems on large paper. At the Student Congress the best poems and art work were shared onstage with the audience. Other classes developed models of the river bank, watershed, or bank erosion. Some made posters about "Saving the River" or illustrated how tests were performed and pasted in their results . Displays were prepared and snacks provided, since these gatherings were after school. The very best site was the Detroit Science Center, but schools presented exciting results as well.

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Friends of the Rouge

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I remember field trips for teachers in the REP. The two best ones were the bus trip to view the Rouge River from its headwaters to its mouth at the Detroit River, led by Dr. Orin Gelderloos. Bill Stapp led a day long trip to Walpole Island, an Indian Reservation, which is connected to Harsens Island by a bridge. The old dikes and wild rice fields were still discernible. Much of the pollution upriver in Sarnia continued to flow down past the reservation, affecting the health and livelihood of the residents. This continues to this very day.

The Friends of the Rouge is alive and well. The program consists of student testing of the Rouge River. There are numerous water quality tests; a field trip to the river is a must. The FOTR conducts training sessions for teachers and offers all the equipment needed . Testing is done in the fall, in the spring or at both times. The Rouge Education Project is open to teachers in the upper elementary through high school levels. For information please contact Cassie Bradley at cbradley@therouge.org or call 313-792-9626 ex. 104

I remember when the REP Task Force met in the Gabriel Richard Center on the U of M-D campusl. It pleases me to to continue to serve on the REP Task Force committee, which meets at the FOTR office at U of M-Dearborn.

Web Gems- 3D Printing

From Pete Peterson, MSTA Region 7 Director

The big push for the upcoming year for all science teachers is "how do I get more STEM (Science, Technology, Engineering and Math) into my classroom?" I recently ran across some Web Gems which I think might fit your STEM education needs.

One of this year's hot topics is 3D printing. 3D printing is the process of taking a digital two dimensional drawing or file and using it and a device called a 3D printer to reproduce the image as a solid three dimensional object. The printer works by translating the file into thin slices which it then uses to guide the production of the object, layer by layer. Currently, any object that can be converted to a digital image can be produced as a solid 3D object in plastic or metal. The following link is a good introduction to 3D printing: http://www.youtube.com/watch?v=hFRVIAGupeI

This topic also lends itself to classroom debate and/or written response (Common Core Standards) if you consider the aspect of ethics, patent rights and copyrights. PBS produced this short video clip which describes the upcoming legal difficulties 3D printing could encounter/cause if left unregulated: http://video.pbs.org/video/2339671486/

I feel that by using cutting edge science and technology subject matter you can easily augment your current curriculum and expand your students STEM exposure.

How Do You Combine Place-based Education, NGSS Scientific and Engineering Practices. and Michigan Rivers? Here's How!

From Kathy Agee, Science Program Coordinator, Regional Math and Science Center, Grand Valley State University

As we join teachers across the nation in unpacking the Next Generation Science Standards, we are all looking for opportunities to have our students be researchers and scientists, not just learn about science. By living in the Great Lake State, most of us have this opportunity in our own backyard.

It is estimated that we have over 2,500 dams in Michigan. Of these, only about 114 are utilized for hydropower. Hydropower production is a very small component of Michigan's energy production and is unlikely to grow significantly. In fact, several additional hydropower projects may be retired in the coming decades. This has been the trend since at least the 1960's when Consumers Energy and Detroit Edison divested many of their smallest and least efficient hydropower dams. These many retired hydropower dams are now state or municipally owned projects that have not produced power for many years and are often in serious disrepair. As a result, many communities are interested in removing their dams.

Dam removal produces many environmental, economic, societal, and technical/engineering issues. However, this also gives teachers the chance to bring these issues into the classroom so that students can participate in the NGSS Scientific and Engineering Practice of Engaging in Argument from Evidence. "The study of science and engineering should produce a sense of the process of argument necessary for advancing and defending a new idea or an explanation of a phenomenon and the norms for conducting such arguments. In that spirit, students should argue for the explanations they construct, defend their interpretations of the associated data, and advocate for the designs they propose."(NRC Framework, 2012, p. 73)

There are several examples that students can investigate. Below are three examples of dam removal projects: one completed, one in process, and one proposed. These cases will give you an idea of the issues that can be involved. Probably the best places for students to begin research are at the Michigan DNR Dam Management website and MLive newspapers. (URL's for these sites are given at the end of this article).

In Osceola County, the Village of Hersey wanted to repair or remove the Hersey Dam, which was in poor structural condition and had been cited in two MDEQ Dam Safety Reports. The dam also blocked fish passage and significantly raised the water temperature in the Hersey River, a designated trout stream. Hersey worked with the Muskegon River Watershed Assembly to raise 100% grant funding for the project. This project restored natural stream conditions and improved cold water habitat by reducing thermal pollution and reconnected 7.5 miles of the Lower Hersey to the Muskegon River in 2006.

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Michigan Rivers

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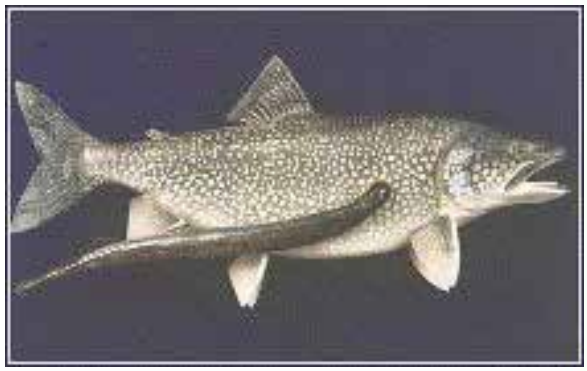
In Ionia county, in the village of Lyons, the 9-foot dam's removal has been a controversial topic for years as the village sought funding for either removing the structurally hazardous dam entirely or repairing the dam for use as an electricity generator and keeping the landmark. Plans were moving forward and the village had hoped to begin the project in 2013 until an endangered species, the snuffbox mussel, was discovered last October. The mussels must be relocated before the dam project can begin. Any relocation would likely occur late summer 2014, when the water is low. Once the mussels are removed, the dam project must begin within 60 days. The estimated dam project cost has nearly doubled, from $1.2 million to about $2 million due to the complication with the mussels.

In Kent County, the city of Grand Rapids has been embarrassed for years that the downtown section of the "Grand" River has no "Rapids". In 2009, an organization, Grand Rapids Whitewater (GRWW), was formed with the objective to "…remove the dams, and enhance the channel bed and banks, to restore the ecological, cultural and recreational functions of the historic rapids" (GRWW). In order to accomplish this, the current plan is to bring in 400 million pounds of rocks and boulders to create 12 acres of exposed rock piles to divert the water. They are also planning to build an adjustable dam upstream of the current highest dam (which will be removed/lowered) in an attempt to keep the predatory invasive sea lamprey from entering the 1500 miles of the Grand River and its tributaries upstream. The estimated cost of this is $30 million.



I would encourage you to challenge your students to investigate and argue the benefits and disadvantages of dam removal (hopefully with a dam near you). In the process, they just might become more informed, committed, and engaged stewards of their communities.

Resources:

DNR Dam Management page: Here you can find the history of Michigan dams, environmental impacts, examples of dam removal, success stories, and a decision-making guide. http://www.michigan.gov/dnr/0,4570,7-153-10364_52259_27415---,00.html

Grand Rapids Whitewater (for the proposed plan on the Grand Rapids project) www.grandrapidswhitewater.org

MLive Media (for current news articles regarding dam removal in Michigan) www.mlive.com

2014: **A Solution to Pollution**

CSTL Center for Science Teaching & Learning
CLEAN TECH COMPETITION

Real-World Issue

The presence of pollution is detrimental to the health and livelihood of people everywhere. Air, water, noise, land, radioactive, and thermal pollution pose unique and serious threats to those affected. Globally, pollution affects hundreds of millions of lives in a variety of ways.

The world needs input from the next generation of innovators to develop clean technology solutions.

Your Challenge

With a team, identify a pollution hazard anywhere in the world, and design a solution that uses clean energy technology to address the problem, help meet human needs, and improve lives.

The Clean Tech Competition is a unique, worldwide, research and design competition for pre-college youth. The program encourages scientific understanding of real-world issues and the integration of environmentally responsible energy sources.

For more information and to register, please visit:

www.cleantechcompetition.org
Phone 1-516-764-0045
Email cleantech@cstl.org

Featured Lesson

The Cardboard Boat Challenge**

From Kathy Mirakovits, Portage Northern High School, MSTA High School Director

In late May, after my senior International Baccalaureate Physics students take their exams, we usually have about two weeks before senior sign out and graduation. Keeping students focused on academics after exams can be a challenge. For the past five years or so, however, one of the most successful projects has been the Cardboard Boat Challenge.

The task is to design and build a full size boat made only of uncoated, corrugated cardboard and duct tape. Cardboard boats must hold *at least* two people and travel the length of our school's pool and back without sinking. Duct tape can only be used for seaming, not as a waterproofing material.

Student grades are based primarily on the physics of their design, not solely on the success of their craft. Concepts such as buoyancy, Archimedes Principle, center of mass, fluid dynamics, fluid friction and structural integrity must be researched by students and demonstrated in their design. Students must build and test a prototype of their boat and test it to see how much mass it can hold before sinking. By doing this they also learn about scale drawing. All of the research design and test results are incorporated into a report that comprises the majority of the project grade. The emphasis is on learning and putting into practice sound physics principles, not just on whether the boat float was successful. There are so many extraneous factors involved in race day, such as the lack of rowing and navigation skills!

The scoring for the race is based on mass of the boat, mass of the riders, and the time to go across the pool and back (50 yards). The best score comes from the team that has the shortest time, lightest boat and greatest mass IN the boat. Prior to race day the mass of student boat riders as well as the boat must be determined. I use a bathroom scale, record the weight in pounds and convert it to kilograms (1kg = 2.2 lbs). I also give students points for self and peer assessment twice during the project since this is a group effort.

The entire project emulates the NGSS Science and Engineering Practices and might be a great project for any physics or physical science course.

**Credit and thanks to Drew Isola, Allegan High School, for sharing this idea with me.
Youtube videos of 2012 and 2013 Portage Northern Cardboard Boat Challenge: http://www.youtube.com/watch?v=IHpyD-npv3s
http://www.youtube.com/watch?v=_w3_X2xV_C4

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Cardboard Boat Challenge

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Cardboard Boat Project
IB Physics II Final Project

Purpose: Student groups of no more than 4, are to design, build, launch and successfully navigate a hand made cardboard boat carrying two students across the middle school pool and back.

Rules:

1. The boat can only be built from natural brown corrugated cardboard (not more than $\frac{1}{4}$ inch thick) and duct tape. Coated, waxed, or painted cardboard may NOT be used. Stacking or layering of cardboard will be allowed. A minimal amount of printing on the cardboard will be allowed (only with waterproof markers). Duct tape may be used for attachment only and NOT for waterproofing the outside of the vessel.
2. Any team found using glue or materials other than listed in the rules will be automatically disqualified and will receive no more than 60% of their project grade.
3. The boat must be able to successfully carry two students across the pool and back. The boat must only be propelled by 2 paddles, 1 for each occupant of the boat. Paddles can be constructed by group members or can be real, prefabricated paddles, but cannot have any metal parts or sharp edges. Paddles cannot touch the sides or bottom of the pool.
4. Each boat must stay within its own lane during the race portion of the competition. Projects must not damage the school grounds, school property, or injure spectators or participants at any time. No intentional interference, swamping, or sabotage of other boats will be allowed.
5. No repairs will be allowed to the boat during the race except by the boat's occupants. Additional tape or cardboard may not be brought onboard for repairs. Occupants may not bring extra objects or devices for "bailing" onboard.
6. The race begins with the boats OUT of the water, on deck. The timer starts when the starter says "go". The boats must be placed in the water, loaded, and launched by team members only. Once underway, occupants may not touch the bottom of the pool or use the sides for assistance in any way. Team members not in the boat may not help the boat or its occupants in any way after the boat has started across the pool. Boats do not have to be turned around at the far end of the pool, but a boat occupant must physically touch the far end with their hand. Timing stops when the boat touches the starting end of the pool.
7. At the conclusion of the competition, the team's equipment/trash is to be cleaned up and disposed of by team members. Boats must leave the pool immediately after their race and any residue retrieved.

Scoring: Boats will be given a score for each race determined by the following formula:

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Cardboard Boat Challenge

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Weight of Occupants in kg
Dry Weight of Boat in kg x Race Time in Minutes

Design Tip: For the vessel to float, the weight of the water displaced has to equal the weight of the boat and its occupants. The volume of the boat has to be great enough to displace enough water to hold up the weight of the occupants (1 cm^3 of water = 1 gram). Also think about any extra volume you will need for stability.

Grading: For this project, individuals will be graded periodically during design and construction phases on teamwork and each person's contribution to the project (materials, ideas, effort). Each group will turn in a design at the beginning of the project and a final paper at the end of the project detailing the physics involved in the design and operation of their vessel. And, of course, you will be scored on your VOYAGE!

Rubric for the Cardboard Boat Project

Team # _____ Group Members _____
Circle your name.

Design of Boat Turned in on Time _____/10

Prototype Boat Built and Tested _____/10

Quality of Prototype Boat Design _____/5

First Group Assessment—Prototype/Initial Design (your grade based on honest assessment) _____/5

Self Assessment (your contributions) Good-Somewhat helpful-Minimal help to group

Team Member Last Name _____ Good-Somewhat helpful-Minimal help to group

Team Member Last Name _____ Good-Somewhat helpful-Minimal help to group

Team Member Last Name _____ Good-Somewhat helpful-Minimal help to group

"Boat Design Physics" Paper Turned in on Time, Typed, with Bibliography _____/10

Content & Quality of Paper _____/40

Second Group Assessment—Paper Content/Final Design (your grade based on honest assessment) _____/10

Self Assessment (your contributions) Good-Somewhat helpful-Minimal help to group

Team Member Last Name _____ Good-Somewhat helpful-Minimal help to group

Team Member Last Name _____ Good-Somewhat helpful-Minimal help to group

Team Member Last Name _____ Good-Somewhat helpful-Minimal help to group

Race Day Scoring

Total Mass of Payload (kg) _____ kg

Dry Mass of Boat (kg) _____kg

Race Time (minutes) _____minutes: seconds

Final Race Score _____/10

Total Project Points **_____/100**

Helping Your K-12 Students Understand Earth-Moon Relationships

by Jeffrey Conn, Senior Lecturer, Wayne State University

"The moon is at her full, and riding high, Floods the calm fields with light. The airs that hover in the summer sky Are all asleep tonight."

— by Wm. C. Bryant

Part One: Earth-Moon Scale

Introducing the Idea: We often include a discussion of the Earth-Moon scale, both in size and distance, as part of the science presentations that we make to K-12 school groups visiting the Wayne State University Planetarium. In addition to helping give the students a fairly firm notion of the Earth-Moon relationship, this demonstration/experiment has the added benefits of introducing some math (large numbers) into the discussion and setting up the students for similar discussions about models on a larger scale, such as planets and the solar system, neighboring stars, and even galaxies. Another plus is that two or three students can be actively involved, and the remaining students can participate, as well. And, of course, one can use scale models to go in the other direction, into the microscopic and atomic realms. Also, there is essentially no cost to perform the experiment!

What follows is a description of this exercise that may prove to be useful in your classroom.

Preparing for the Experiment: As a preview to the experiment itself, ask your students to picture looking at a full Moon in the sky. They can pretend that they are seeing the moon up against the classroom wall at the front of the room. Have them show you, with arms fully extended, how big a circle they would have to make with their thumbs and index fingers to just fit around the image of the moon in the sky. Their average guess is usually a circle that is a few inches across. Interestingly, people of all ages make this same estimate. Then ask them to hold up one thumb with their arm fully extended. It turns out that the moon's image is only approximately 1/3 the size of their thumb across. This seems rather hard to believe, at first. This holds true for adults as well (adults have larger thumbs, but their thumb is farther away from their eyes with the arm fully extended). Note: This exercise will have your students looking for the moon in the sky to corroborate what you've told them. And they may be surprised to find that they are routinely seeing the moon in the daytime sky, as well as at night. This will help prepare them for that time when they consider the phases of the moon; but more on that in a future article.

As for the experiment itself: To begin with, you must choose an earth that is properly-sized, given the size of your classroom. As the distance from Earth to Moon is approximately 30 times the Earth's diameter, you need to be able to line up, at least in principle, 30 of your earths across your room. For example, if you use an earth beach ball (very attractive; can be found at science stores) that is 12 inches/1 foot in diameter, your room should have a straight-line distance that is 30 feet long, along some direction in the room; say, corner-to-opposite-corner, if necessary. As the Moon's diameter is roughly ¼ that of Earth□s, a balloon blown up to have a diameter of 3 inches will work great as your model Moon.* If the 12 inch-diameter model earth is too large, choose some smaller spherical object as your earth, and then a model moon of ¼ that diameter for your moon. In any case, whatever the objects that you've decided upon for your model earth and model moon, you are ready to go.

Ask for two volunteers. Let's say you have chosen Corey and Caitlan. If you haven't yet talked specifically about the Earth and Moon sizes, it can be interesting to ask the entire class which is larger. Do this before letting

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Earth-Moon Relationships

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them see your model moon. After agreeing that the Earth is the larger of the two, ask your students "How much larger? How many times greater is the diameter of the Earth?" The answers here can be very interesting. Then show them your model moon that is appropriately sized as ¼ the diameter of your model earth. Now tell your class to imagine that they are in a rocket ship travelling to Mars. As they look back from their rocket shop to the Earth they've left behind, they are to decide how far apart the Earth and Moon should appear to properly represent the Earth-Moon distance. Begin with Caitlan holding the Moon alongside Corey's Earth. Tell the class that Caitlan will slowly move the Moon away from the Earth. As she is slowly moving along, the students have time to picture how far apart the two should be. When a student thinks the Moon is the right distance away from the Earth, he or she should say "stop". Students enjoy this. They will tend to keep saying stop, maybe even louder and louder each time. You may have to remind them to only say "stop" once. It's good fun. And remember, Caitlan does not stop moving when her classmates say stop. She just keeps slowly sliding away from the Earth that Corey is holding. Usually, most students have made their feelings known as to the correct separation by the time that Caitlan has moved about ten feet or so from Corey. At this point, you can take a check to see if any students are left who still think that Caitlan should keep moving. There may be one or two.

Now you can have Caitlan move all the way across the room, to a place that is 30 of your Earth diameters away from Corey. Talk about the fact that this is the correct separation for the Earth and Moon, compared to their sizes. Now you can ask a number of your students to come up to where Corey is standing. They can hold their thumbs up at arm's length to look at the apparent size of the Moon that Caitlan is still holding up across the room. They will see that it occupies about 1/3 the width of their thumb. And you can point out that this is how big the actual moon looks in the sky.

A Wrap-Up, Plus

Speaking of your students looking back at the Earth and Moon while on their way to Mars: You can have a red balloon blown up to ½ the diameter of your model Earth. Say a few interesting things about Mars. Then show all three model objects alongside each other. Mars is twice the diameter of the Moon; Earth is twice the diameter of Mars. This is a very nice, and easy to remember, relationship between these three objects. Then have some fun by asking how far Caitlan would have to go, away from Corey and the model Earth, with the red, model Mars to properly represent the correct separation, to scale, between Earth and Mars. It turns out that when Mars is in its best location for viewing in the night sky (relative to the Earth and the Sun) Caitlan would have to go approximately 200 times the Earth-Moon separation in your classroom. For example, if you have the Earth and Moon models separated by 30 feet in your room, Caitlan would have to go 6,000 feet, over a mile, away!

I hope this exercise helps your students understand the Earth-Moon size and distance relationships. It may also help them understand in the future other interesting examples of scaling, in the realms of both the very large and the very small. Watch for a follow-up article on other aspects of the Earth-Moon system.

** Note: Some balloons are better than others for coming close to approximating spheres - as opposed to appearing pear-shaped.*

The Astronomer's Toolbox.

- The diameter of the Earth is roughly 8,000 miles. The diameter of the moon is roughly 2,000 miles. The Earth –Moon distance is approximately 240,000 mi; that is 30 Earth diameters.
- The average distance from the Earth to the Sun is approximately 93,000,000 miles. This distance is defined as one astronomical unit (1 AU). Using the AU makes discussions of these distances much more comfortable, on those occasions when using miles or kilometers is not necessary.

Michigan Skies, February through May 2014

Thanks to: *Robert C. Victor, was the Staff Astronomer at Abrams Planetarium, Michigan State University. He is now retired and enjoys providing skywatching opportunities for school children in and around Palm Springs.*

- Don't miss telescopic views of Venus, especially while it still appears in crescent phase. Venus will appear half full, and smaller in size, by late March. In case you didn't notice it during all the cold and cloudy weather, Venus switched from the evening into the morning sky during the second week of January. Venus is bright enough to observe in daytime morning hours at school. It is brightest in February.
- Jupiter, Mars, and Saturn all switch from morning to evening during the early months of 2014. And don't miss the total lunar eclipse in the early morning hours of Tuesday, April 15.
- Mercury will have its best evening apparition of this year during May.
- Following is a sample of the visually most striking sky events during February through May 2014. Diagrams of these events appear on the ***Sky Calendar***, published by Abrams Planetarium at Michigan State University. For more information about the calendar, point your web browser to www.pa.msu.edu/abrams/skycalendar/
- Before the end of April, a complete Sky Calendar for May 2014, along with a star map of the evening sky, will be available at the same website. May 2014 will be a great month for sky watchers, because the three bright outer planets as well as the innermost planet, Mercury, will all be visible at dusk. And there is a good chance of a very strong meteor shower, possibly even a meteor storm, in the predawn hours of Saturday, May 24, during the Memorial holiday weekend.
- For free, simplified monthly sky maps following the first-magnitude stars and the naked-eye planets at morning and evening twilight accompanied by descriptive notes, and for many other charts and activities for students, go to www.pa.msu.edu/abrams/msta/
- Check that site now and then for additional postings.
- For illustrations of the following events, refer to the February 2014 Sky Calendar.
- Feb. 6-8, one hour after sunset: Watch Moon pass Aldebaran, Hyades, Pleiades.
- Feb. 10 & 11, one hour after sunset: Watch Moon pass Jupiter, Pollux, Castor.
- Feb. 19 & 20, one hour before sunrise: Watch Moon pass Mars, Spica.
- Feb. 21-23, one hour before sunrise: Watch Moon pass Saturn and Antares.
- Feb. 25-27, 45 min. before sunrise: Watch Moon pass Venus and approach Mercury.
- Feb. 28, 30 min. before sunrise: Watch for very thin Moon rising to lower left of Mercury. Binoculars help. If you spot the Moon, note the time and calculate how much time remains until New Moon on March 1 at 3:00 a.m. EST.
- For illustrations of the following events, refer to the March 2014 Sky Calendar.
- Mar. 1, one hour before sunrise: Find Mars and Spica in SW. Mars passed near Spica on Feb. 3. Watch Mars retrograde past Spica in coming weeks, and pass it a third time in July. The event is an example of a *triple conjunction*.
- Mar. 1, about 25 min. after sunset: Using binoculars, try to see a very thin, young crescent Moon, very low, just south of due west. If you spot it, note the time, and calculate the Moon's age, or time elapsed since New Moon, which occurred at 3:00 a.m. EST today.
- Mar. 3, one hour before sunrise: Saturn begins retrograde to upper right of Antares and to east (left) of Alpha in Libra. Watch Saturn move 7° west (closer to Alpha Librae) from now until mid-July, when Saturn ends retrograde.
- Mar. 4, about 45 min. before sunrise: Mercury 20° lower left of Venus.
- Mar. 9-11, one hour after sunset: Watch Moon pass Jupiter, Pollux, Castor.

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Michigan Skies

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- Mar. 18 and 19, one hour before sunrise: Watch Moon pass Mars and Spica.
- Mar. 20-22, one hour before sunrise: Watch Moon pass Saturn and Antares.
- Mar. 26-28, one hour before sunrise: Watch Moon pass Venus.
- Mar. 31, about 30-45 min. after sunset: Look for young Moon very low, just north of due west. If you spot it, note time, and calculate Moon's age (time elapsed since New Moon on March 30 at 2:45 p.m. EDT.
- For illustrations of the following events, refer to the April 2014 Sky Calendar.
- April 2-4, one hour after sunset: Watch Moon pass Pleiades and Hyades star clusters, and Aldebaran.
- Apr. 5-7, one hour after sunset: Watch Moon pass Jupiter, Pollux and Castor, and Procyon.
- Apr. 8, one hour after sunset: Catch Mars at opposition tonight, as Earth passes between the Red Planet and the Sun. Note Spica to the planet's lower right.
- On Apr. 13 and 14, one hour after sunset, and on April 14 and 15, one hour before sunrise, the nearly Full Moon will appear near Mars and Spica.
- Don't miss this total lunar eclipse. The following table lists the times, and the location of Moon and planets in the sky as seen from mid-Michigan.
- **Morning of Tues. April 15, 2014 (Spica very near Moon, Mars 9°-10° away)**

Moon enters umbra	1:58 a.m. EDT	azimuth 187°, altitude 37°; Jup 296°, 6°; Sat 156°, 28°
Totality begins	3:06 a.m.	azimuth 207°, altitude 33°; Saturn 175°, 31°
Deepest eclipse	3:46 a.m.	azimuth 217°, altitude 29°; Saturn 186°, 31°
Totality ends	4:25 a.m.	azimuth 226°, altitude 24°; Saturn 197°, 30°
Moon leaves umbra	5:33 a.m.	azimuth 240°, altitude 14°; Saturn 214°, 24°

- See the April Sky Calendar for a chart depicting the lunar eclipse in star field at beginning of totality at 3:06 a.m. EDT.
- Beginning in the latter half of April, within about one hour after sunset, look nightly for these stars in western sky: Aldebaran, the Hyades, and the Pleiades in Taurus; Orion including Rigel and Betelgeuse; Sirius the Dog Star in Canis Major. Keep track of the dates you see them. They will all be gone before the end of May.
- Apr. 17 and 18, one hour before sunrise, the Moon will appear near Saturn on one morning, and widely north of Antares on the next morning.
- Apr. 25 and 26, one hour before sunrise: Watch Moon leapfrog past Venus.
- The complete May Sky Calendar will be available online at www.pa.msu.edu/abrams/skycalendar/ by late in April.

Clear skies!

Professional Opportunities

PROFESSIONAL DEVELOPMENT OPPORTUNITY! CHECK IT OUT!

Apply for $1000 Professional Development Scholarships *(March 1st, 2014 deadline)*

http://www.amazonworkshops.com/educators--naturalists.html *(case sensitive)*

2014 Educator Academy in the Amazon Rainforest + Machu Picchu

The July 1-11, 2014 Educator Academy is a cross-curricular professional development workshop for K-12 formal and informal educators to learn and use:

- **21st Century Instruction:** 5E Lesson Design, Inquiry-Based Exploration, STEM Problem-Based Learning
- **Inquiry Protocols:** Project Learning Tree, GLOBE, Cornell Lab's BirdSleuth
- **Global and Cultural Perspectives:** Service Learning, Sustainability, Global Education

Join Dr. Mo Walters, ASU; Al Stenstrup, Project Learning Tree (PLT); Jennifer Fee (BirdSleuth), and Christa Dillabaugh, Amazon Rainforest Workshops; and work side-by-side with scientists Dr. Steve Madigosky, Widener University; and Randy Morgan, Curator/Entomologist, Cincinnati Zoo. The Amazon experience is a real world lens through which to view global issues as -- sustainable development, global health, energy, population, water, quality of life and the meaning of service. Experience:

- a 1/4-mile Rainforest Canopy Walkway and research on Weather and Climate
- interactions with Indigenous Yagua, Riberenos and a Village Service Project
- ReNuPeruEthnobotanical Garden and problem solving inspired by Biomimicry
- Monkey Island Conservation Project

PLT Certification, BirdSleuth and GLOBE training and PD Hours included. Academic Credit and Machu Picchu Extension optional. Land cost is $2140, plus air. $1000 scholarship deadline March 1, 2014. Land cost is $1140 for scholarship recipients. Space is limited! Register early to secure your spot! See Syllabus on Webpage: http://www.amazonworkshops.com/educators--naturalists.html *(case sensitive)*. Contact christa@amazonworkshops.com or 1-800-431-2624.

Professional Opportunities

A new free resource from ACS!

Thanks to Adam Boyd, Senior Education Associate, American Chemical Society a_boyd@acs.org

Energy Foundations for High School Chemistry

Visit highschoolenergy.acs.org for free fully-developed laboratory investigations, demos, student readings, and multimedia that you can use to teach the big ideas about energy in your high school chemistry classroom. Each content item, as well as the entire resource collection, is available for free download in PDF format.

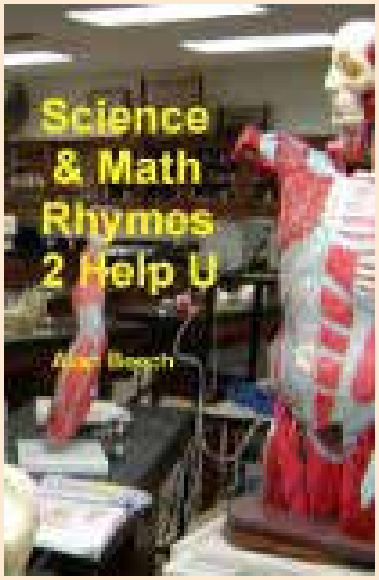
A New Teaching Resource!

Science & Math Rhymes 2 Help U by Alan Beech has just become available on Amazon. It contains 100 rhymes about concepts in chemistry, physics, biology, general science and mathematics. The rhymes are designed as mnemonics, or memory aids. A short summary of the relevant science is included in front of most rhymes.

Science & Math Rhymes 2 Help U is targeted mainly to science teachers. If a teacher introduces a mnemonic after a class has studied a subject, the students can learn it, discuss and criticize it or write a science rhyme of their own as an assignment. A companion blog has been opened at http://beechsciencerhymery.blogspot.com where students and others can submit their science rhymes for possible publication under their own names.

A short one in the book is Human Body Systems Reminder. The systems and mnemonic are:

Respiratory, skeletal, muscular,	Lungs, bones, meat
Endocrine, circulatory, digestive,	Steroids, heart, eat
Reproductive, nervous, excretory,	Sex, fear, excrete



Most rhymes give direct information, rather than reminders, in a clever succinct form. Forty rhymes are about physics. Here is a short one about sound waves:

> Every verbal expression
> Evokes waves of compression

In chemistry, many elementary concepts are defined plus some help with equations. The longest biology rhyme is human taxonomy classification. In math the circle, triangle, Pythagoras' theory, its extension to all triangles and trig functions are covered. Long ones in General Science are The Solar System and Thunderstorm Electricity.

This marriage of art and science offers a new, exciting way to learn.

ISBN: 978-0615895697 Amazon List $14.95 (discounted). E-book $8.95

Professional Opportunities

Exploring the Past: Archaeology in the Upper Mississippi River Valley

Walking beside thousand-year-old burial mounds, flaking raw stone into tools, learning how potsherds tell us about human behavior, and understanding how humans adapt to complex, ever-changing environments.....Our 2014 NEH Summer Institute features all this and more.

The Mississippi Valley Archaeology Center at the University of Wisconsin-La Crosse will offer a three-week NEH Summer Institute on July 14-Aug. 1, 2014. This dynamic learning experience for K-12 teachers will explore how Native Americans and Euro-Americans have adapted to the Upper Mississippi River Valley over the past 13,500 years, and how archaeology leads to an understanding of how human cultures change and adapt through time.

The Institute will feature a one-day excavation experience, field trips to archaeological sites, hands-on laboratory and workshop activities, demonstrations, and classroom activities. Individual projects will help participants tailor the content to their own teaching areas. NEH Summer Scholars receive a $2,700 stipend to help offset their expenses.

Application and other information on the Institute is available online at http://www.uwlax.edu/mvac/neh.htm. The deadline for applications is March 4, 2014.

Any views, findings, conclusions, or recommendations expressed in this program do not necessarily reflect those of the National Endowment for the Humanities.

Bonnie L. Jancik
Director of Public Education
Mississippi Valley Archaeology Center
at the University of Wisconsin - La Crosse
Phone: 608-785-6473
E-mail: bjancik@uwlax.edu

We look forward to working with you!

Professional Opportunities

Professional Development Opportunity for Teachers (and everyone else!!)

NEON Citizen Science Academy

From Liz Goehring, Natiuonal Ecological Observatory Network (NEON)

Registration is Open NOW for the 2014 Winter and Spring Sessions

http://www.citizenscienceacademy.org/courses

Would you like your students to become Citizen Scientists and learn about phenology and climate issues? Learn how with NEON's Citizen Science Academy.

The NEON Citizen Science Academy offers facilitated, self-paced, online courses for K-12 Formal and Informal educators wanting to incorporate citizen science into their educational programs. Courses run approximately 1 month.

In addition to our Project BudBurst course sequence (CSA501 & CSA502), we are happy to announce two new courses for 2014:

CSA 503 "Project BudBurst Certification Program for Educators"
Have you completed both CSA 501 (or 551) and CSA 502? Are you an enthusiastic educator who would like to take your participation in Project BudBurst to a new level by engaging other citizen scientists? Take this practicum course and become a certified Project BudBurst Instructor! Due to the practicum aspect of this course, participation in this 60-day course will be limited to the first 10 qualified applicants, so be sure to register today!

CSA 520 "Introduction to Citizen Science: Explorations in Educational Settings"
Do you currently use Citizen Science in your teaching or outreach? Would you like to? In this course, you will become familiar with five successful Citizen Science projects especially suited to both formal and informal education.

Winter Term Offerings (February 4 - March 7, 2014)
- CSA 501a/b: Introduction to Project BudBurst for Educators
- CSA 502: Working with Project BudBurst Data in an Education Setting
- CSA 503: Project BudBurst Certification Program for Educators (ends April 4)
- CSA 520: Introduction to Citizen Science: Explorations in Educational Settings

Course fee: $35
Each course is limited to 50 participants, except for CSA503 with a maximum of 10.

For those interested in teacher re-certification, all 30-day courses can be taken for 2 optional, graduate level continuing education credits from Colorado School of Mines. The fee for 2 optional credits is $90. Participants in CSA503 (60-days) are eligible to earn 3 optional credits.

Questions? Email us at CSAregistrar@neoninc.org
Register at http://www.citizenscienceacademy.org/courses

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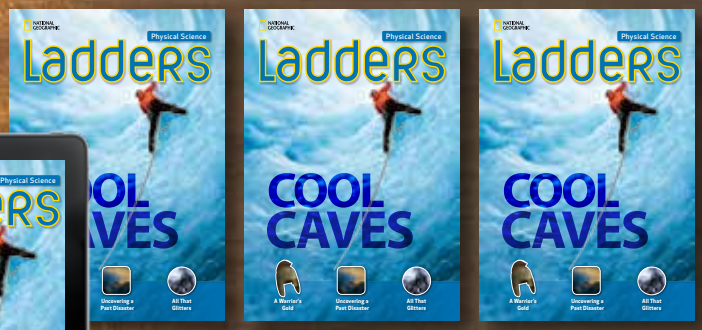

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Wanted: Partnerships for STEAM-Powered Learning!
From June Teisan, MSTA Director-At-Large

What began as a project-based learning experience in one urban classroom has flourished in southeast Michigan and holds promise for impact across our state.

Approximately 200,000 school-aged children live in the city of Detroit - children who face incredible challenges, children who possess amazing talents. Education that fosters hope and resilience, builds cognitive skills and cultivates career aspirations is imperative for the success of each child. A unique program that meets this challenge is coming to life, and support of STEM partners can help it grow.

In the 2012/2013 school year, Michigan Teacher of the Year and MSTA Board member June Teisan collaborated with the Detroit Institute of Arts (DIA) staff to use art to connect her urban middle school students with the history, politics, social issues, technology, scientific and engineering successes of Detroit of yesteryear. The project theme, "Detroit 1933/2033" drove instruction and STEM experiences. Her classes soaked in the artistic themes of Diego Rivera's incredible "Detroit Industry" murals related to the Ford Rouge plant, first through virtual tours of the art and a DIA docent visit in the classroom, and then on three successive visits to the DIA. During this 'arc of discovery' DIA staff delivered targeted guidance to the student tour groups and the talented DIA studio staff designed three separate art projects tied to the project. After exploring the past, the project moved on to connect students' present passions and skills to find each child's possible role for building Detroit's future. These art-centric "place-based learning" events harnessed the "Wow!" factor - educators know when it happens as a child's face opens up, and eyes wide, the connection to deeper learning is made. Students viewed their city through the empowering lens of science magnified by art. Student aspirations for STEM careers and hope for the future of their city grew exponentially.

As a teacher leader and President of the Network of Michigan Educators, Teisan sought to share this same STEAM-powered unit with other educators. Teaming up with Matinga Ragatz, a fellow Michigan Teacher of the Year and Network member, the two found funding to build a cutting-edge training experience. Again the Detroit Institute of Arts joined in partnership to support a four-day workshop, along with Pearson's Model Classroom staff and the Network of Michigan Educators. Twenty teachers from Detroit and first-ring suburbs in the tri-county area created projects that would challenge students to action. Throughout the four day training teachers themselves participated in active and collaborative problem-solving activities centered in the heart of Detroit, including deep dives into the inspiring Rivera murals. These educators designed STEAM learning experiences tailored to their grade level, subject area, and neighborhoods to immerse young people into work that can positively impact their schools, community, and the metro-Detroit area. These projects are yielding incredible results through STEAM-powered teaching and learning across southeast Michigan, and now Teisan and Ragatz seek to grow the project to urban centers across the state.

Is your organization interested in offering students an active role in the renewal of their communities? Would you like to partner with the Network of Michigan Educators to show teachers the meaningful role science, technology, engineering, art, and math can play in a project-based approach to learning? If so, please contact networkofmieducators@gmail.com and check out their website at: Network of Michigan Educators -- www.michiganeducators.org

The Fledgeling

The Fledgeling flies! MSTA science lessons for elementary teachers is published as a recurring feature in the MSTA Newsletter. Establishing good science practices are essential for a solid science program. This is true for all age groups. Through hands-on, inquiry based science, special needs students are achievers too! The Fledgeling is edited by Sally DeRoo, MSTA.

COLD: ICE, SNOW AND MELTING!

What do we know about freezing, melting and evaporation of water??

The following activities are suitable for a wide range of grade levels including children with special needs. The activity would make a suitable teacher demonstration with student assistance. Record data on a large classroom chart. Teacher supervision is always recommended during science activity.

This weather certainly has given all a chance to experience snow and ice. The Fedgeling offers a few very simple "experiments" to answer some of our questions. Let's find out about ice, snow and melting.

When doing simple experiments, always consider the "variables"! Can a slight difference in procedure or materials make a difference in the outcome of the experiment?

- Problem: How long does it take an ice cube (same size) to melt at classroom temperature?
- Materials Needed per GROUP of students.
- Assorted clear plastic / glass jars with lids.
- Ice cubes – permanent marker pen
- Data Sheet-Excel- Science Journal
- Thermometers C/F

Procedure:

1. Divide students into suitable working groups. Partners are fine if suitable materials are available.
2. Explain the procedure of the experiment, distribute materials and data sheets.
3. Review reading the (temperature) thermometer in both C and F.
4. Record the date, time and room temperature C/F.
5. Place the thermometer in the jar and record the temperature i.
6. At this point, you might ask the students what is in the jar. Nothing??? AIR?? So, we are measuring the air temperature in the jar?
7. Place on ice cube in each jar. Ask each group to guess how long they think it will take the ice cube to melt? Be sure to record the "guess"!
8. Discuss "VARIABLE '- WHAT MIGHT MAKE A DIFFERENCE IN THE EXPERIMENT RESULTS?
9. Begin recording the temperature in the jar every 30 minutes (or sooner, but on a specific time schedule).

continued on page 33

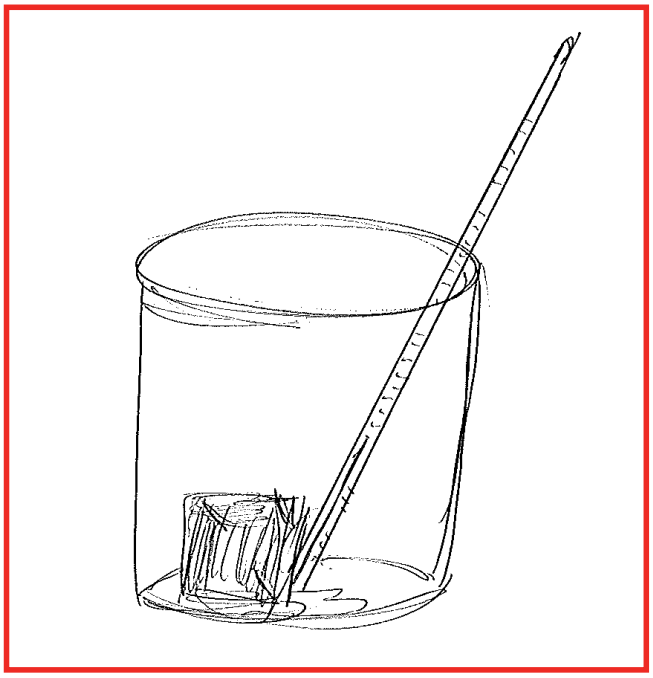
COLD: ICE, SNOW AND MELTING!

continued from page 32

FOLLOW UP QUESTIONS:

The questions should be based on the data and observations of the activity.

1. How long did it take an ice cube to melt?
2. Did the ice cube melt at the same rate for each group?
3. As the ice cube melted, what was displaced?
4. Ice, water and air are forms of? They take up space!! (MATTER)
5. Was there a difference in the "melt time" in plastic or glass containers?
6. Did temperature taken during the ice melt change at a measurable rate?
7. When the ice cube melted, did the "melt" water, temperature stabilize?
8. How long did it take for the "water temperature" to rise after the melt?
9. When the ice has melted, mark the water level on the jar.
10. Ask each group to "guess" how long it will take the water to evaporate at home temperature (Check and record room temperature).
11. Discuss the activity.
12. Students should write a "review" of the activity in their Science Journal. Illustrations and labels help to show the results.



Extensions:

1. Repeat the experiment using snow. Use jars of loose snow and others with packed snow.
2. Place a piece of colored paper under one of the jars.
3. Place a lid on the jar, remove, record and replace. (Variable: Student holding the jar, warm hand?) Does the heat from the hand warm the jar?

Science Vocabulary: Talk, Think and Write like a Scientist!

- Temperature
- Thermometer
- Celsius
- Fahrenheit
- Variable
- Evaporate
- Matter
- Solid
- Liquid
- Gas
- Ice
- Water, Air

Fledgling continued on page 34

COLD: ICE, SNOW AND MELTING!

continued from page 33

Data Sheet – Name_____

Date	Time	Room Temperature	Jar Temperature*	C / F (Circle)
1			*Without Ice* _____	
2			*Ice* _____	
3				
4				
5				
6				
7				
8				
9				

** change to snow, packed snow, for extensions.*

Books for new readers:

Scholastic Early Childhood ISBN #0-590-10727-5 Water

Scholastic ISBN# 0-590-41284-1 Snow Day

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