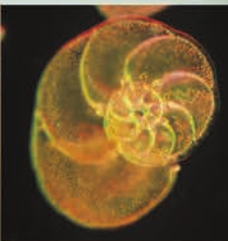


MSTA Newsletter

MICHIGAN
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From the President's Desk

By Charles Buciencki, MSTA President

Next Generation Science Standards (NGSS) are arguably the most important science topic for teachers, students, parents, administrators and school boards throughout Michigan and other states across the United States. To increase awareness and address many of the questions that parents or the public have about these new standards, the National Science Teachers Association (NSTA) has provided a great resource for informing all concerned about the NGSS. The document provides an overview of NGSS, details on how it increasingly focuses on Science, Technology, Engineering and Math (STEM) careers, current adoption status, how it will change the local science classroom, and student preparedness ideas for parents.

As a professional with an investment in our education system, it is important to be aware of resources that can help you and all those concerned about NGSS and the benefits it provides to all students. This resource can be printed or linked to provide information regarding NGSS to parents or anyone wishing to learn more about it.

The NGSS document can be found at this link: <http://ngss.nsta.org/parent-q-and-a/>

From The Desk of Your Executive Director

From Robby Cramer, MSTA Executive Director

The MSTA 2015 conference theme will be "Engineering GRAND Ideas in Science." This conference will be held in Grand Rapids, Michigan on February 26-28, 2015. The MSTA Board of Directors began drafting an action plan for the 2015 conference by analyzing your 2014 post-conference surveys. Please share with us what you would like to attend at the conference. Watch for updates regarding conference plans.

The Conference Committee is seeking speakers that will enable Michigan teachers to enhance their professional practices. Speaker proposal forms are already posted on the MSTA Website (<http://www.msta-mich.org>).

The leaders from Michigan Department of Education began the process of articulating a vision for science education in our state that will meet the needs of Michigan children in the future. To view this presentation: http://www.michigan.gov/documents/mde/Item_D_KEYNOTE_PPT_MI_

[Science_Vision_Presentation_May2014_457084_7.pdf](#) In August they addressed assessment in science.

Currently 29% of the students in the United States live in states that have adopted the Next Generation Science Standards. Materials and resources continue to be developed and released for science teachers, science department heads, curriculum leaders, and administrators. The National Science Teachers Association has **The Hub!** (<http://ngss.nsta.org>) Take time to check it out! For example, if you will be talking with parents about the shifts in science practices in your classroom look at the parents' questions and answers article: (<http://ngss.nsta.org/parent-q-and-a/>). Consider the book *Introducing Teachers and Administrators to the NGSS: A Professional Development Facilitator's Guide for your colleagues, departments, and or district* (<http://ngss.nsta.org/nsta-products-and-services/#books>).

The Intersection of Standards and Culture

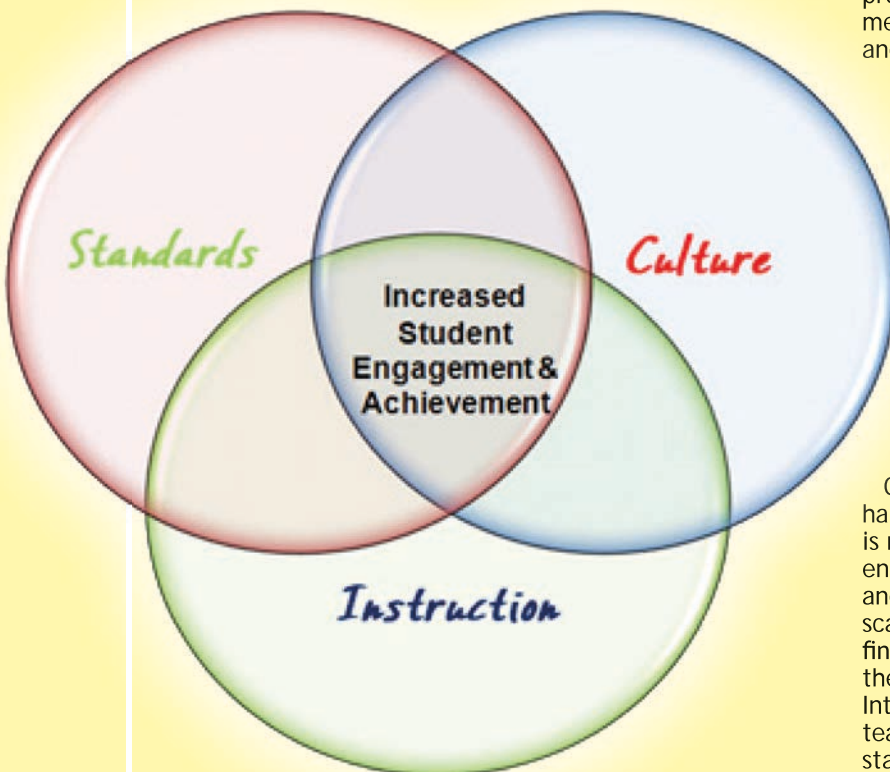
From Megan Schrauben, Michigan Department of Education

It has been a year since we briefly introduced to the MSTA community 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 then took an in-depth look in the Winter 2014 Newsletter at how *standards and instruction* intersect in the classroom, followed in the Spring 2014 Newsletter by *how instruction and culture* intersect in the classroom. Now we will look more closely at how the final intersection of *standards and culture* looks in the classroom.

Lessons that address appropriate grade level standards and include content relevant to student lives are the result of standards and culture intersecting. In the standards category we consider the grade level standards as well as curriculum and materials used to meet those standards. When planning for culture, we consider the assets students bring to the learning environment such as skills, knowledge, life experiences, and interests. Each student should be given the opportunity to access the standard and grow from where their knowledge and skills currently place them.

Within the standards is freedom of choice for curriculum. Attention to how materials are chosen can be the key to success to creating engaging context for the content. In fact, providing culturally relevant materials may involve making sure student culture is reflected in the materials or making sure the materials are relevant to student lives.

To illustrate intentional instructional planning for the *standards and culture* intersection, let's look at a learning opportunity that we may be grappling with in our classroom. We can be intentional in planning by matching what we know about students' skills, knowledge, and interest to the content being taught. For example, if we are teaching in an urban district in southern Michigan and beginning a unit on ecosystems in 4th grade, most likely the majority of our students haven't experienced deserts or oceans, and many may not even be familiar with the closest Great Lake, but they are probably quite familiar with the small creek that runs through the local community playground. Conversely, if we are teaching in a rural lumber community in northern Michigan, we may choose a forest as a common beginning ecosystem to get students engaged personally. By linking the familiar ecosystem to others that students may have been exposed to, the whole class can learn from others experiences. Once we have introduced the idea of ecosystems, then we can allow for expansion to other types of ecosystems like deserts and oceans. This method provides a common starting point for all, gives added meaning to the personal experiences of some students, and links all students intricately to the material.



We have high expectations for all students. To intentionally plan with a goal of maximum success for all students, it is important to consider skill levels. Continuing with the ecosystems examples, we may want to build on background knowledge through reading. While we can introduce the idea of ecosystems to everyone in our 4th grade classroom, some students may need to read a book about ecosystems at a 1st grade level while others are reading at higher than a 4th grade level. Regardless of reading level, all students can engage in grade level conversations about ecosystems.

Overall, the intentional instructional planning that happens when standards and culture are considered is meant to increase the likelihood that students will engage with content at deeper levels of critical thinking and performance. This is the point in planning where scaffolding needs are considered so that students may find an appropriate entry point to build on the assets they already bring to the learning environment. Intentional planning for standards and culture allows teachers to bridge the gap between what the standard states and what matters to our students.

Engineering in Science – “How might we describe engineering for students in our science classroom?”*

(Part 1 of a 3 Article Series)

From R. Charles Dershimer, Clinical Assistant Professor, University of Michigan

The Next Generation Science Standards (NGSS) describe why it is important to help students learn about both the content and practice of science. These new standards also encourage us to bring engineering into the science classroom and ask us to connect engineering content and practices to what students are learning about science. In my conversations with secondary teachers, I hear many teachers make statements that recognize why these connections are important and show interest in making these connections happen. However, I also see that they have lack familiarity with engineering, which makes it hard to make these connections happen smoothly and comfortably in daily science teaching.

The NGSS Appendix I- “Engineering Design in the Next Generation Science Standards” (NGSS Lead States, 2013) can help address this lack of familiarity with engineering. This document provides a useful definition of engineering and a framework for how science and engineering practices can be brought together in the science classroom. In this series of MSTa newsletter articles, I will examine and review some of the key engineering ideas in the NGSS Framework and Appendix I to help teachers better integrate engineering into their science teaching. These articles will also include literacy and laboratory activities and suggest additional resources to help teachers get a more robust sense of what engineers do, say, think, and feel around the practice of engineering. The intent is to help teachers learn more about engineering, while also providing materials that are appropriate for use in the classroom with students. I hope that after reading this series of articles, teachers who are new to engineering will be comfortable and ready to answer the question “How might we bring more engineering core ideas and practices into our classroom?”

Article 1 - How might we define engineering to make it accessible to our students?

We can approach a review of the NGSS practices for engineering described in Appendix I using what engineers would call a ‘design challenge,’ and focus on designing a description of engineering that makes it accessible to all of our students in the classroom. The first step in the design process is to define the problem, and as engineers would, also identify any constraints associated with this problem. Therefore, before we define engineering and

outline the practices in which engineers engage, we first need to recognize if any of our current ideas limit how we think about engineering OR push us to a particular understanding of engineering.

Why might we have a limited understanding of engineering? Research done by the National Academy of Engineering (NAE) indicates that K-12 students and teachers have poor or limited conceptions of what modern engineers do (Yowell and Sullivan, 2008). We might expect this with teachers since traditional science teacher certification programs don’t usually include the study of engineering as a requirement for becoming certified. Science teachers from these programs graduate with a major in the natural or physical sciences and have most of their practical experiences through fieldwork or laboratory settings, not engineering contexts.

Research on pre-teens, teens and the parents of these students provides insight into what conceptions students bring to our classrooms. The 2008 NAE report addressing public perceptions of engineering reports that younger children have narrow views of the engineering profession, with children describing engineers as ‘people who work on engines’ (Vest, 2011). In addition, research investigating why high school girls do not choose to study engineering found that girls do not understand what engineering is or what engineers do, and that the girls in the study did not feel that engineering ‘was for them’ (EWE, 2005 as cited in Wolsky, 2011). The authors of these studies note that there is a misguided public perception that a certain ‘type of person’ is best suited to become an engineer. Secondary school students identify engineers as ‘good at math and science’ but they do not identify themselves as intelligent enough to become engineers (Vest, 2008). Engineering educators at the university level note that these public perceptions are not surprising - media representations of the modern work of engineering are scarce and not as frequent in the popular media as other professions that require similar academic preparation (Yowell and Sullivan, 2011). In addition, public role models representing a diverse engineering workforce are scarce. Prior to 1999, ethnic minority groups represented approximately 30% of the American population, but these same groups represented only 9.1 % of the Americans working in science or engineering occupations (Vest, 2011.)

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Engineering in Science

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As educators, we can address and change the public perception of what an engineer is and what kind of people can learn about engineering. The NGSS Framework emphasizes engineering design practices that all citizens should learn and the standards represent a commitment to integrate engineering into science teaching at all levels. If we are to teach engineering so that we can reach and engage all students, we need to address our own preconceptions or misconceptions about engineering that may hold us back from attaining this goal.

Examining Our Beliefs and Knowledge

To help us define engineering, examine our current ideas and address any preconceptions that might influence our own beliefs, I will model the use of a literacy assignment called a “P-R-E” activity that I often use at the start of a unit. I begin by asking students to make predictions about the new topic, as a way to get their initial conceptions out on the open. I then have them build on their initial ideas by reviewing the textbook, articles, diagrams, a video or a lab demonstration. The activity ends with an evaluative discussion that has students discussing their original ideas in relation to any new ideas identified in the review. In this article, we can use the same P-R-E activity to help us prepare to read and make sense of Appendix I of the NGSS. We will make predictions about defining engineering to surface our initial ideas. We will then review some new information about engineering and different engineering practices by watching some videos about current practices in engineering. We will then evaluate and examine both our old ideas and the new ideas from these different sources to prepare us for the ideas in the NGSS Appendix I “Engineering Design in the NGSS.” The goal is to use the “P-R-E” assignment to create a more up-to-date personal definition of engineering. In addition, I will model an activity that you can use in your science classroom to help your students learn more about engineering.

*(NOTE: * P-R-E writing stands for Predict, Review/Read, and Evaluate/Explain, It is a form of metacognitive writing designed to help students surface ideas and construct new concepts from text and other media sources.)*

Step 1 of the P.R.E Activity - Making Predictions

To get started, please take five minutes to jot down or type out your answers to these two prediction questions:

ACTION - Write out short answers to these questions:

1.a) WHAT: How might we define Engineering?

The NGSS framework documents define science as both a body of knowledge about the natural world and a set of practices used to establish, extend, and refine this knowledge of the natural world. How might we similarly define engineering?

1.b) WHO: What do Engineers do, say, think and feel?

We also need to have to have a clear sense of the practices that Engineers use in the same way we are familiar with the practices of scientists. What kind of work do Engineers do; what do they talk about and think about when doing this work; and, how do they feel about doing this work?

Step 2 of the P.R.E Activity - Read/Review

Let's build on these initial predictions by reviewing some current ideas about engineering.

2.1 Reviewing an Engineering Definition:

I recently checked with a colleague, Peter Norton, an historian who teaches hundreds of engineers a year at the University of Virginia in the Department of Science, Technology, & Society. I asked him about the origin of the term “engineering” and how the meaning of this word may have changed over time. I shared my perception that engineering comes from the work associated with maintaining steam engines in the 1700's. He countered that while ‘engine’ is a word used to describe a ‘creative device that transforms energy,’ it is not the root of the word ‘engineer.’ Instead, the word ‘engineer,’ comes from the French word ‘ingenieur.’ Early French ingenieurs served in the military and were the first college graduates in engineering, circa the 1790's. They earned their degrees at the prestigious French college, the ‘École Polytechnique,’ to support the military functions of their time and solve military problems. In addition, the word ‘engineering’ has historical origins as an Indo-European word composed from the roots ‘gen,’ ‘gin,’ ‘ken’ or ‘kin’ with each of these roots carrying the meaning ‘to create.’ Engineering is conceptually related to ‘genius,’ ‘generation,’ ‘genetics,’ ‘gene,’ and ‘genesis.’ This suggests a noble word origin that can help us think differently about a definition of engineering.

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Engineering in Science

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Instead of seeing engineers as members of a profession that arose out of the need to maintain engines, engineering, and engineers, can be described as related to a profession that addresses the 'creative' solving of problems and the 'creation' of new ideas.

2.2 Reviewing the Engineering Process:

A good place to learn about the current practices of engineering is to review the work being done in different university-level professional engineering programs. We can see how these programs are working to develop the practices of future engineers; how these programs describe what engineering is and the process that engineers use; and, how the students in these programs describe the qualities that they feel engineers possess. Three university-level programs are presented here: the University of Newcastle's Faculty of Engineering and Built Environment in Australia, Stanford University in California, and The University of Michigan in Ann Arbor, Michigan. [NOTE: These programs are picked based on the author's familiarity with the programs and the clarity for how each program defines engineering. He is not intending to endorse any of these programs.]

As you watch these three short videos take notes on 1) how is engineering defined and 2) what the engineers in the videos do, say, think and feel about engineering:

ACTION- Watch these videos and take notes:

2.a) Video 1 (length 4:18): "What is Engineering?" from University of Newcastle's Faculty of Engineering and Built Environment in New South Wales, Australia: <http://www.youtube.com/watch?v=bipTWWHya8A>

2.b) Video 2 (length 3:14): "d.school Bootcamp: The Student Experience" from the Hasso Plattner Institute of Design at Stanford University in California, USA: <http://www.youtube.com/watch?v=kAvVd1lpw68&feature=share&list=PLAD1F87125529A918>

2.c) Video 3 (length 3:21): "Introduction to Engineering 100" from the Engineering 100 course at the University of Michigan, in Ann Arbor, Michigan, USA: <http://you.tube/ItcqInI0igo>

Step 3 of the P.R.E Activity - Evaluate and Explain:

Let's use these videos to compare and contrast your prewriting ideas with some current ideas about engineering. Below is a sample set of possible ideas

a viewer could gain from the videos. Review the list to see how these ideas align with your prewriting ideas. Make sure to identify any similarities and differences you observe between the list and your prewriting ideas, as well as ideas from the video that extended your thinking about engineering into a new direction not previously considered.

ACTION- Review the list of notes on what students of engineering do, say, think and feel about engineering and compare them to your own list of video notes:

WHAT: How might we define Engineering?

- Engineering helps solve problems to improve our world
- Problems are the engineer's inspiration
- Math and science are the creative tools that engineer's use to solve problems

WHO: What do Engineers do, say, think and feel?

- Engineers use math and science to solve problems in order to improve our world
- Engineers are focused and structured, but they bring creative confidence to solving problems
- Engineers are excited about impacting the world and they never stop seeing opportunity in the world
- Engineers collaborate with different people
- Engineers like to try out ideas and they are not afraid to admit failure, move on and try again

The final explain step in the P-R-E literacy activity involves summarizing some key take-away ideas to create a manageable and succinct message about the concepts that are being introduced and studied. In our case, we need to create a succinct message about engineering and the engineering process to allow us to move forward with our review of the NGSS Framework and Appendix I. Three key ideas from the series of review activities synthesize the information from the videos and help explain the practice of engineering:

- I. Engineering is about solving problems to improve and impact our world.
- II. Engineers are focused and creative; they use math and science to solve problems creatively.
- III. Engineers like to try out ideas; they are not afraid to make mistakes; they learn from their mistakes to try again.

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ENGINEERING CORNER

Engineering in Science

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Defining 'engineering' to make it accessible to our students

This definition and key ideas about the practices of engineering can now help us review and use Appendix I in the NGSS standards. In addition, examining our preconceptions in relation to a more modern and current view of who engineers are and what practices engineers engage in can support our thinking about how to bring engineering into the science classroom. Working with a concise set of key ideas will also help us clearly communicate these ideas to our students and support our planning as we work to engage all of them with engineering. In the next article we will use these three key ideas to review and examine how Appendix I in the NGSS framework represents the practices of the engineering design process and different core engineering ideas. We will then use what we learn from this review to explore how we can bring these engineering core ideas and practices into the science classroom with and through laboratory activities.

*Acknowledgements:

Ideas in this article series were first developed with work done for the MAISA Title I Professional Development Modules for support of NGSS.

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Engineering Challenge: Designing Boats That Float from Natural Materials

From Joan Chadde, Education Program Coordinator, Michigan Technological University

Target Grades: 6-8

Middle School Next Generation Science Standards (NGSS)

- MS-ETS1-1** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

Materials

- natural materials provided by the teacher (Note: if students are in an outdoor environment, they may look for boat-building materials in nature, taking care not to harm the environment (only use downed wood; no breaking branches off trees). This is ideal as it provides more opportunity for them evaluate materials and be creative. Possible natural materials include: grass, sticks, leaves, pine cones, etc.
- nearby pond, lake, stream, or children's plastic swimming pool
- biodegradable cotton string or yarn (optional); alternative, use long grasses, etc.

Engineering Challenge

Build a boat that will stay afloat on a pond, lake, stream, or pool. An added challenge is for the boat to carry weight which can be represented by rocks of progressively larger sizes.

Time

20-30 minutes for students to design and test their boats. More time is needed if they have to search for their materials.

Assessment

Have students demonstrate their boats. Which design features contribute to their boat's success? What is one improvement they could make if they redesigned their boat?



OUR CAMPUS IS DETROIT.

Fall Open House

Saturday, October 11
10 a.m.-2 p.m.



Encourage your students and their families to join us for an insider's look at college life. Fall Open House is free and open to the public. Attendees will explore campus and the dozens of undergraduate STEM programs available at WSU, as well as enjoy many activities.

Open House attendees can visit our academic resource fair and attend several helpful information sessions and financial aid presentations to learn how to become a Warrior. Visitors can also experience Wayne State up close by taking in a planetarium show or joining tours of campus and the College of Engineering labs.



AIM HIGHER

For directions, parking details and more information, visit openhouse.wayne.edu.

CONFERENCE REPORTS

Five Tips for the MSTA Conference First Timer

By Sarah Leedy, Southwest Elementary School, Howell Public Schools

1. Arrive early!

Better parking spots, no long lines waiting to register, and being able to scope the lay of the land are just a few of the perks of arriving early. Grab your name tag, a program (sometimes there are even freebies), and then find a good seat for the morning keynote session. Many people skip these, but I found it a great way to get fired up about the day. While you wait for things to get rolling, you'll have time to go through that program book and figure out which breakout sessions you want to attend. Don't forget the power of casual chit-chat: I was fortunate to sit near others who had attended several MSTA conferences and they were able to give me advice on how to plan my day.

2. Make a plan...and a back-up plan.

The MSTA did a fantastic job offering several options for sessions that met different levels and areas of interest. When deciding which sessions to attend, here are some things to consider:

- **Pick a couple of sessions out of your comfort zone.**
I was unsure of the session titled "Host a Family Engineering Night", but I decided to give it a shot. By the end of the session I was live tweeting how awesome (and absolutely do-able) it was.
- **Select 2 (or 3) possibilities for each session.**
Schedules will change - that is a lesson every educator knows all too well. Sessions fill up, cancel - some even get added last minute, so having a back-up plan will ensure that you make the most of your time.
- **It's OK to take a break.**
After enthusiastically attending 5 sessions back to back I realized that I was going to need a vacation to recoup from the conference and that I probably needed some time to eat lunch! Initially there was a bit of guilt, but I realized that I needed time to rest, digest, and process all that happened in the morning.

3. Remember the 1 - 2 punch.

I will be the first to admit that I was excited after the first session and felt like I had been punched in the head after the second. I was swimming in the new learning, all the notes I typed, all the photos taken. I figured that I would just absorb all this newfound wisdom by osmosis and be able to implement it immediately into my teaching. Once I stopped laughing at my naiveté, I took a more realistic approach. I would focus on 1 or 2 great takeaways from each session. That allowed me to focus on the parts of the presentation that I felt would be most beneficial for me and my teaching and I was actually able to begin using some of what I learned immediately in my classroom.

4. Take time to smell - well maybe just talk to - the vendors and exhibitors.

I was a bit overwhelmed when I first walked into the exhibitor area and had to do a quick lap just to take it all in. On the second lap I took some time to actually talk to some of them and ended up walking away with a ton of freebies. I walked away with whiteboards, markers, books, and fossilized dinosaur poop. The last was by far my students' favorite!

5. You are not alone!

One of the benefits of attending a conference is being able to talk about, process, and share your newfound knowledge with others. Embrace Facebook, Twitter, Google+ and other great social networking websites to share your a-ha moments and to see what others are taking away. I was able to share my key takeaways in my classroom newsletter with parents, for which they were greatly appreciative. Sharing some of my personal discoveries with colleagues began important conversations of steps we could take to improve our science instruction schoolwide.

After attending the MSTA conference I have found a new excitement about bringing more of what I learned to my students. I am grateful for the opportunity to be able to attend the MSTA conference and learned so much about science and myself as a science educator.

CONFERENCE REPORTS

CONFERENCE REFLECTIONS

My Experience at the MSTA Conference

From Todd Stump, Armada High School

My trip to the MSTA Conference this last spring was a great experience. I was not quite sure what to expect since I had never attended the conference before. I had heard great things from some of my colleagues about it, but still was uncertain. I left feeling I really benefited from attending the conference. The sessions were very informational and low-key. I asked questions and saw direct application of what the speakers were explaining. Vendors demonstrated numerous ways to use their equipment. Teachers explained the issues you might run into when you try to incorporate new activities and how they dealt with those issues. I felt and still feel that to improve as a science teacher, attending the MSTA conference is a tremendously efficient use of my time. I will be attending this conference for years to come and I would recommend attending to anyone that wants to improve as a science educator

My First MSTA Conference

From Jennifer Carey, Bullock Creek Community Schools

What an honor to be awarded the MSTA scholarship this past winter! I was delighted to be attending my first MSTA conference. I was overwhelmed by the many sessions there were to attend in the two days of the conference. I chose wisely and gravitated toward early elementary and nature science. I was so impressed by the speakers and teachers who shared their passion for science. They were inspiring to those of us that were just getting our feet wet. So inspiring, in fact, that when I returned to school the following Monday, I saw an unused alcove area that I had not really noticed before. I knew that there were four large classroom windows that overlooked this area, and I immediately thought this would be a great area to observe and experience nature. I spoke to my principal about this. He shared that he had been thinking the same thing for some time. He sent me an email for a grant application he had just received. We applied and were awarded money to start a science nature garden. Our intentions are to turn this into an outdoor classroom and observation area for the students in our building, incorporating a raised garden and outlining the area with various flowering plants. When brainstorming with other colleagues, we decided to use wood stumps turned vertically to line the area as a border fence. We are trying to keep the area as natural looking as possible. We would like to have bird feeders, a compost barrel, and will be working hard this fall to incorporate all of our ideas. We will ask for help from parents, the community and will solicit donations as well. The MSTA conference was so interesting and inspired me in so many ways. I am very grateful for the experience and opportunity to attend. It reinforced the importance of science for our students and in our classrooms.

Thank you again for the MSTA scholarship award.

CONFERENCE FAVORITES

Incorporating Lessons from the MSTA Conference

From Jessica Larrabee, Escanaba High School

I have been teaching in the Upper Peninsula of Michigan at Escanaba High School for nine years. Currently, I am teaching 10th grade Biology and Advanced Placement Biology. I am pleased that I had the opportunity to attend the 2013-2014 MSTA Conference. I would like to thank my regional director, Mrs. Lynn Thomas, as well as Sue Campbell, for making this happen last minute. Attending this conference was well worth it.

The sessions that I attended this year were fabulous. In particular, I enjoyed the *"Evolving Switches, Evolving Bodies - the Changing Face of Molecular Genetics"* and *"Natural Selection and the Molecular Mechanisms for Adaptations."* The Howard Hughes Medical Institute (HHMI) is a great resource for science teachers. I would like to thank HHMI for all of the wonderful resources handout out both at the sessions and exhibit.

I was so impressed with the resources that have been developed. I have already incorporated two HHMI lessons into my Biology and AP Biology curriculum. I had my AP students complete the *Virtual Stickleback Lab*. The lab took three class periods to complete and might have taken more if I didn't assign some independent student work. The lab was broken up into three main experiments with assessments given at the completion of each one. Natural selection, rate of evolution in populations, mutations, and chi square analysis are some of the key concepts reinforced by this virtual lab. The student handouts made it very easy for students to follow the lab. The questions were well designed to enhance critical thinking skills. The short films provided excellent visuals. My students really enjoyed this lab using Chromebooks.

I incorporated the *Rock Pocket Mouse - Molecular Genetics* lesson into my Biology class. The students enjoyed watching the short film. Once again, the student handouts for each activity were well designed. This lesson reviewed nonsense, missense, and silent mutations. Students also gained more practice going through transcription and translation. This lesson also reinforced protein structure and function.

When I have more time, I plan on exploring *HHMI's biointeractive website* in more detail. I cannot thank HHMI enough for designing educational opportunities that science teachers can implement into their classrooms. These lessons "spice" things up. What students really enjoy is that all of HHMI's content is relevant and current. Authentic examples are provided. Students love authenticity.

FEATURED ARTICLE!!

Using Technology to Manage a High School Chemistry Classroom

From Carl Van Faasen, Holland High School

Background

When I got my first teaching job 22 years ago, I was the only 1 of 33 other graduates from my school to enter public education. My first department chair invited me to his house for dinner. I met his family, chatted for a while, and then he handed me the school's official textbook and wished me good luck. I never heard from him again. My first probationary evaluation was, among other feedback, "I have no idea what you are talking about, but the kids respond well to your teaching." I quickly learned that I was alone.

As a result of that, I decided to create my own measuring standards against which to evaluate my curriculum and performance. I needed to be:

- An independent, self-motivated learner
- A good self-evaluator
- A good self-advocate

I also decided that it was critical that I teach my students these same skills so that they could be successful in their lives. The project I am sharing with you is the ongoing, evolving product of that work. Over the last 22 years, I have developed my Intro Chemistry and AP Chemistry Curricula into a series of notes, homework assignments, labs, and assessments on MS Word. In the past, I would photocopy boxes of this material on differently-colored paper to help students organize their work. As of two years ago, our district issued iPads to each student at Holland High, so I now have it all posted on a Google Site and communicate to students through Edmodo. In this article, I will explain how I use these resources to help students achieve the three learning goals I listed above. If you are a new teacher, I hope this will help provide a baseline from which you can create your own class. If you are a veteran, I hope this gives you a fresh idea or two to enhance what you are already doing

well. For all who have read this far, I hope that this will also stimulate some good discussion about how we approach science teaching with our adolescent learners.

Idea #1: The "textbook", my Google site: (<https://sites.google.com/a/hollandpublicschools.org/carl-van-faasen/>)

When students enter my classroom on the first day of school, I introduce myself, go through the names, and then I instruct them to do two things: bookmark my Google site, and join our classes' Edmodo group (described in the next section). When I was informed that we were going to 1:1 technology for our kids, I immediately decided to try to go as paperless as possible in my classroom. For my "textbook", I decided to put together a Google Site that could be used as a home base for the class. I had a fellow teacher show me how to create this. I started with a quick welcome page to be the home base (see Fig. 1). When you do this yourself, make sure to have a clear plan (I envision a flowchart) in mind of what you want the structure to be. My Chemistry class divides into 16 units, while AP Chem has 12, so there are pages for each class with each unit placed below the appropriate class. This structure appears along the left margin of the page. Note that the pages are automatically alphabetized, so I had to add letters to some names to make them appear in the order I wanted.

When you click on one of the unit page links along the left column, you will be sent to a unit page. (See Figure 2) Note that I simply created a table that laid out the basic structure of the unit to help students understand the appropriate sequence. Each column represents a resource that students can access.

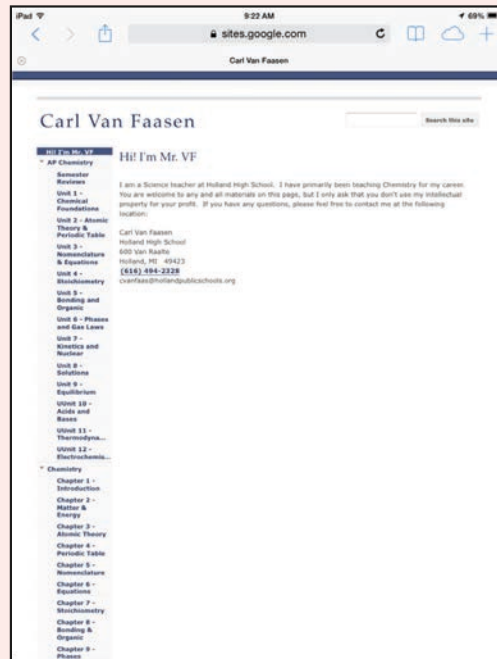


Figure 1



Figure 2

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Using Technology

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The podcasts (Figure 3) were created by an app known as “Show Me”, a simple screen capture tool that works well with an iPad. “Show Me” also offers cloud storage, so all the links in this column tie to this site. All the notes and homework sheets (Figure 4) are created in MS Word, converted into pdf’s, and stored on my Google Drive, so all the links for students tie in there. In training students to be good independent learners, I emphasize using the homework as a daily quiz for the students to correct themselves using the posted answer key. I then expect students to be good self-advocates by coming the next day with questions ready. This is a message that I constantly preach, and one I feel the online resources help to reinforce.

Under “additional resources”, I pasted other useful things, such as the PhET applications you might have used yourself. Again, learning these steps was simple (about 30 minutes), and the rest of the time was simply repeating those steps for each unit. Once you have your own structure in place, it is very easy to modify. Veteran teachers, please note that the AP Chem content is still based on the “old” curriculum. My project for the 2014-15 school year is to update this set of pages.

Idea #2: Edmodo, the “daily news” tool

For those of you that don’t use tech tools much to organize your students, the easiest way to describe Edmodo is that it is like Education Facebook. In fact the layout of a page looks much like a Facebook wall. I created a Moodle page as well, but I haven’t used that as much for two reasons. Moodle has more powerful features, but also requires a registration for each student from the ISD which is a bit of a hassle. The other reason is that more of my colleagues use Edmodo, so that has become our school’s communication standard.

Edmodo has a few really nice features that I like to employ. One way I use it is as my “daily news” for each class. Each day, I create an entry for my

classes which includes a couple sentences describing the plan for the day and links with the podcasts for the lesson, and homework assignments or labs they are doing. In Edmodo, I create groups for each class (some teachers like to do one for each section, but I don’t). I have 3 preps usually, so that’s 3 entries per day. Students quickly get into the habit of checking when they walk in each day, and many are diligent about checking even when they are absent. This really gives students a good opportunity to practice those independent learning skills. It is also useful if your district requires a posted set of written objectives for the students each day. The disadvantage is that after a while (2 weeks or so) the page starts to get a bit “chunky,” so I am in the habit of clearing posts on the day they take the written assessment.

The other nice feature of Edmodo is the calendar. I post on the calendar approximately one week ahead of time with due dates for homework, labs, and assessment dates. I get myself in the habit of doing this every Friday or on the day of a test. The nice part about this feature is that it is quick and easy, and, if most of the teachers in your building use it, the students have their entire calendar in front of them when needed. They can even set filters on the calendar for what they see as priorities. I use this feature for my Quiz Bowl team as well to post practice and competition dates. We do have an online grading program (Infinite Campus) that students can access for grades and due dates, but I find that they use the Edmodo calendar more often.

Idea #3: To flip or not to flip

Two years ago, I ran a sample class for my school in which students met only 3 times a week, with the expectation that they do podcasts/homework at the same pace as the other sections. Although many variables could be involved in the experiment, I found that it did not

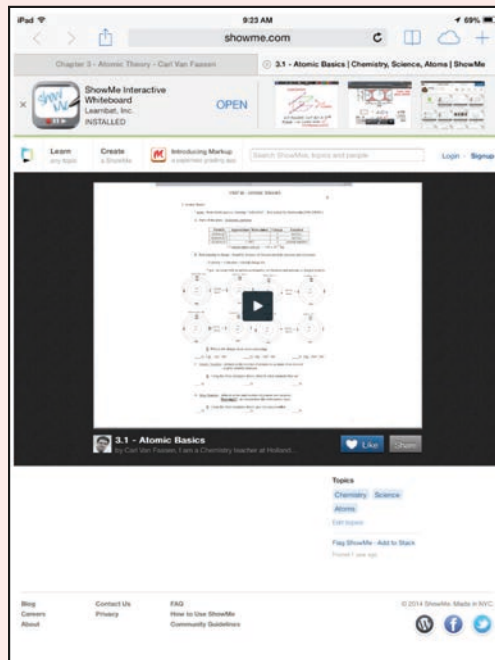


Figure 3

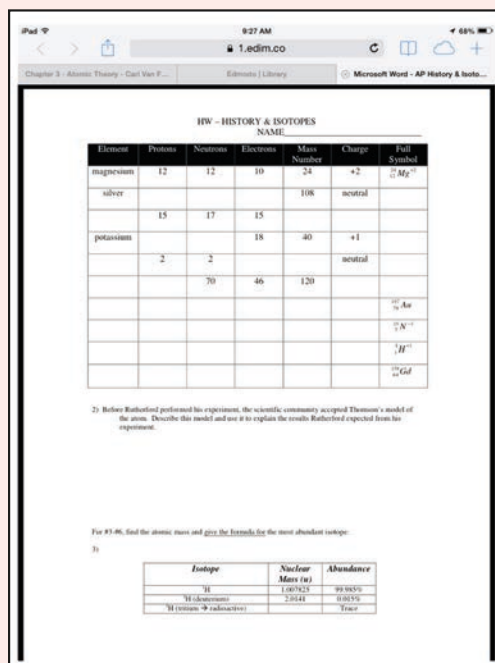


Figure 4

go that well. The student grades were a bit lower (only ~1/3 of them watched the podcasts) and many of them came in on the “off” days asking “Can you please just TEACH me this stuff?”

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Using Technology

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After analyzing these results and comparing them to the results from other subject areas, I think I have a hypothesis as to why it did not work. In our subject, there are many different brain functions that must be employed: symbolic reasoning (equations and nomenclature), mathematical reasoning, visual-spatial reasoning (picturing atoms and molecules), as well as vocabulary skills. That makes our content area one of the most multi-dimensional ones offered in a high school. That means that we teach skills, but also later apply those skills to advanced problems. As any guildmaster from Medieval Europe will tell you, skills are best taught by an expert demonstrating them directly to a live student. I think that the technology tools (podcasts, etc.) fall short here.

Expecting students to have a firm grasp on these complex topics is a lot to ask using these media. As a result, it is critical that we, as Chemistry teachers, continue to emphasize this point to our educational leaders. Using podcasts as a replacement for direct instruction (this includes summer school and other remediation programs) simply will not produce the same result as a live, lab-based experience. That being said, I have found these tools extremely useful for students as they review for projects or end-of-the-term assessments. As I said above, I clear out my Edmodo page every two weeks or so, but all the materials are available 24/7 on the Google site for students to use as they would use a textbook. In fact, many students this past school year said that they found those resources very useful, especially at the end of the semester.

Conclusion

I hope that you find these resources useful, and you are welcome to all of them. I would also recommend that you tailor them to the needs of your students. If you are interested in any of the labs or tests, I am happy to share them with you as well. Feel free to e-mail me. I only ask that you do not post or share the tests. As with all of you, my work is simply building on the shoulders of the giants that came before me, and I hope that my efforts will not only serve you, but through you, a whole new generation. In addition, if I have made errors (I know they're there), please let me know so I can make corrections. If you have any other questions or comments, I'd love to hear those as well.



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CURRICULUM IDEAS

Sky Events for the School Year 2014-2015

From Robert C. Victor, Abrams Planetarium, Michigan State University

Your students/audiences can receive much inspiration from direct observation of nature. As you present astronomy, we encourage you to include opportunities for direct observation of the heavens. Here, we offer a selection of sky events for the school year 2014-2015 and beyond, to assist in planning your instruction.

Teachers who want to encourage students to view **Saturn's rings through a telescope at a convenient early evening hour should plan a sky watch for September 2014**. In October, Saturn will be sinking low into the southwest evening twilight glow, not to return to the early evening sky until mid-May 2015. By May, sunset occurs quite late, which might discourage some parents from agreeing to have younger students attend a sky watch. **Yet the presence of three planets for telescopic viewing will make sky watching in late May through June and into July 2015 well worth doing**, despite the late hour of nightfall.

Descriptions of **the lunar and the solar eclipses in October 2014 and of the lunar eclipse in April 2015**, with web links for obtaining local visibility, are given in the summary of sky events, below.

Each month, have students **search for the young crescent Moon in the western sky at dusk on the earliest possible date**, usually one to three days after New Moon. **Then, by observing the Moon nightly for the next two weeks, the student can follow the Moon as it moves eastward** against the background of naked-eye planets and bright stars of the zodiac. Several examples occur in the sky event summary.

A really outstanding event during School Year 2014-2015 is the **simultaneous visibility of the two brightest planets, Venus and Jupiter**, in the early evening sky from **late January 2015 through late July-early August**. In late January, these two planets will begin to present themselves on opposite sides of the sky. As months pass, they'll gradually come together for an event which will attract the attention of even the casual observer: **a spectacular close pairing of Venus and Jupiter on the evening of June 30, 2015**, when they will appear just one-third of a degree apart in the western sky. **The five-month run-up from late January to June 30 provides an excellent chance for students of all ages to follow the planets and watch for changes**. Not until the year 2035-2036 will there be such a long interval to monitor these two bright planets on their way to a brilliant pairing.

Students can model the changes they observe in 2014-2015 by plotting planets' positions on orbit diagrams or by "acting out" the motions of the planets in the classroom. You are invited to download orbit diagrams and plotting data from a special section of our website for teachers, www.pa.msu.edu/abrams/msta/

You'll also find there a set of simplified monthly sky charts depicting just the five naked-eye planets and first-magnitude stars at evening and morning twilight. A related activity for beginning skywatchers involves following the departure of a large number of bright stars as they descend the western sky in mid-April through mid-June each year. Check that web page for updates and additional activities.

Another valuable resource is the Sky Calendar from Abrams Planetarium. Future issues will illustrate most of the events described in this summary. Subscription information and a sample are available at www.pa.msu.edu/abrams/skycalendar/



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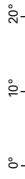
Sky Maps

continued from page 14

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An aid to enjoying the changing sky

Use this scale to measure angular distances between objects on diagrams below.



Planetarium business office:

(517) 355-4676

Abrams Twitter Account:

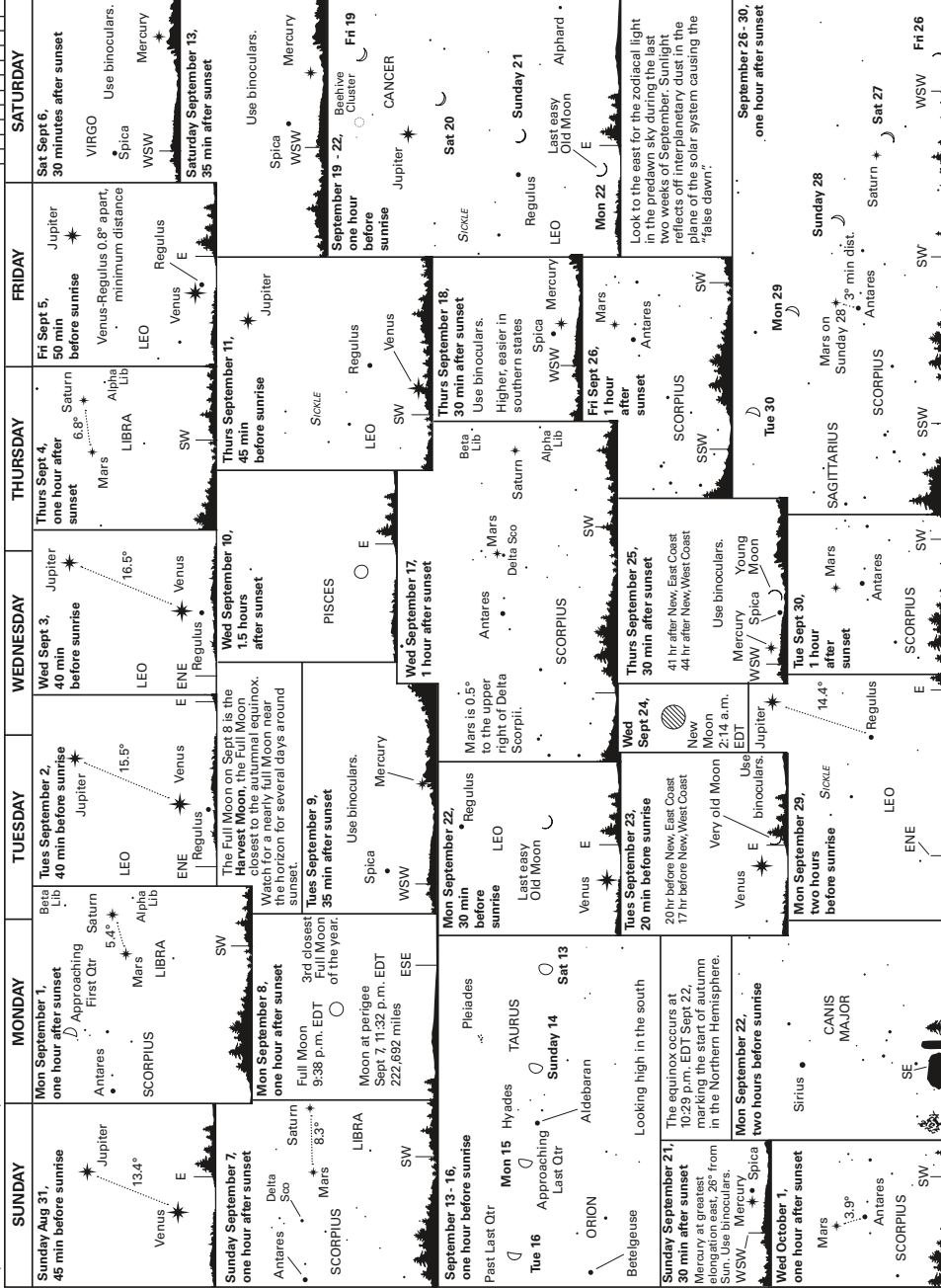
https://twitter.com/AbramsSkyNotes

Evening planets:

The red planet Mars starts the month about 5° to the lower left of the ringed planet Saturn low in the southwest. Mars sets a little less than three hours throughout the month. At mid-month, Mars is 1.5 AU or 135 million miles away from Earth. Mars passes Antares, the rival of Mars, on Sept. 28 by just 3°. At the start of the month, Saturn sets about three hours after the Sun. By the month's end, Saturn sets two hours after the sunset, 21 degrees to the left of Mars. A thin crescent Moon is to the lower left of Saturn on the 27th. Mercury continues its poor appearance this month very low in the west, never appearing in a dark sky. Mercury sets 45 minutes after sunset on September 1 and 35 minutes after sunset on the last day of the month. Mercury fades in brightness rapidly after the 3rd week of September.

Morning planets:

Venus is below Jupiter in the eastern sky at dawn. Brightness rises after midnight as its orbit takes it behind the Sun. Jupiter climbs higher in the morning sky. Jupiter rises about two and a half hours before sunrise at the start of the month. By the end of September, the giant planet appears on the horizon more than four hours before the Sun. Look for the waning crescent Moon near Jupiter on the morning of the September 20. The brightest star Sirius in Canis Major rises three and a half hours before sunrise at mid-month.



Subscription: 755 Science Rd. East Lansing, MI 48824 or online at www.pa.msu.edu/abrams/SkyCalendar/ \$11.00 per year, starting anytime, from Sky Calendar, Abrams Planetarium, Michigan State University.

John S. French
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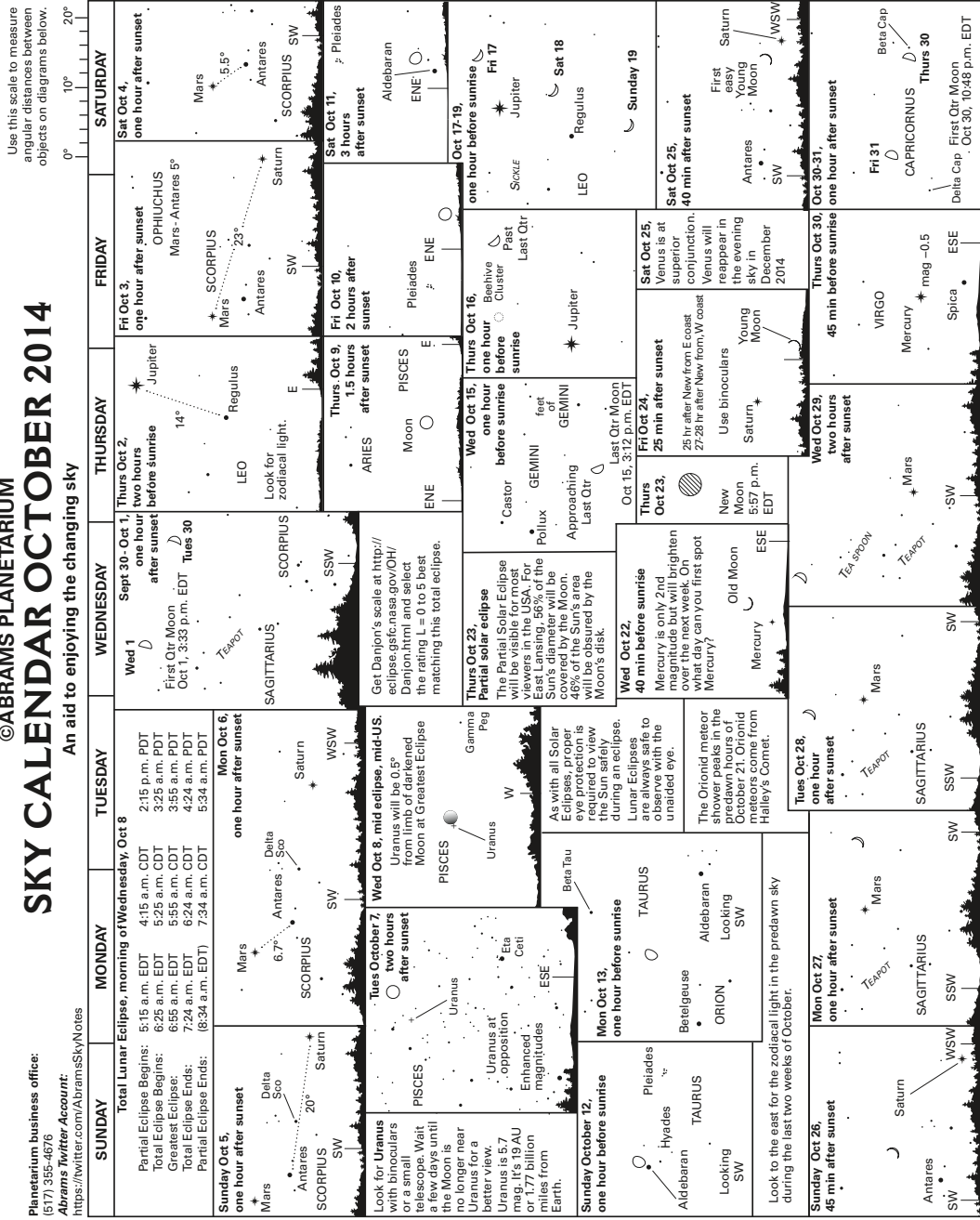
Sky Maps

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CURRICULUM IDEAS

Celestial Highlights for School Year 2014-2015

September 2014

Sept. 8: Tonight's Full Moon rises shortly before sunset. At nightfall, the Moon is unusually bright, because it is just outside Earth's shadow and reflects light strongly back toward Earth and Sun. Stand between a bright light source and a highly reflective road sign, and you'll notice the same "phase effect" as a bright "halo" around the shadow of your head. This week in Michigan, watch the Moon rise only 30-40 minutes later each night: The "Harvest Moon" effect.

Starting Sept. 10, mornings: As first activity at start of school day, look for Moon at same time each morning through Sept. 21. Record its phase (shape) and orientation, and position in the sky. Sept. 15 and 16 are really good dates for viewing the Moon through a telescope. If you're viewing in the daytime, you can greatly improve the contrast of Moon against the sky by installing a single polarizing filter into the low-power eyepiece of your telescope. Even without a telescope, just look at the Moon those two mornings through a pair of Polaroid glasses. While directly facing the Moon and wearing the glasses, try orienting your head in different ways, including (1) with your "ear axis" pointing toward the Sun, and (2) with the top of your head most directly exposed toward the Sun. In the latter case, your head's "vertical axis" would be pointing toward the Sun. Compare the contrast of Moon against the sky in those two situations.

Jupiter is climbing well up in the eastern sky these mornings if you look an hour before sunrise. Watch for the Moon in the same part of the sky Sept. 19-21 and Oct. 17 and 18. [Editor: Use diagrams from Sky Calendars showing Moon and Jupiter on those dates.]

Sept. 27, early evening: Crescent Moon 2°-3° lower right of Saturn. Mars passes 3° above Antares tonight and tomorrow evenings; compare their colors! [Editor: Use diagram for Sept. 26-30 from Sky Calendar.]

Sept. 29, early evening: Compact gathering of Moon, Mars, and Antares.

October 2014

October's Two Eclipses; (1) In Michigan on Wednesday, Oct. 8, early risers can witness the opening partial stages of a lunar eclipse in a dark predawn sky, followed by total eclipse in brightening morning twilight. Partial eclipse begins at 5:15 a.m. EDT, as the Moon begins to enter the dark central core of Earth's shadow. In East Lansing, the Moon will then be 26° up in WSW. Total eclipse begins at 6:25 a.m. EDT with the Moon 14° up, just S of W. The totally eclipsed Moon is likely to fade from view as twilight brightens. Deepest eclipse with Moon only 9° up in west at 6:55 a.m. EDT

might still be seen, but the Moon is likely to fade into twilight before totality ends at 7:24 a.m., only 4° above the horizon, 4° north of due west. Will anyone notice the Moon emerging from the umbra then? The partially eclipsed Moon sets in East Lansing at 7:50 a.m. (A total lunar eclipse with all the surrounding partial stages visible awaits Michigan residents late in the evening of September 27, 2015.)

On Thursday afternoon, Oct. 23, 2014, a partial solar eclipse will get underway in the Lansing area at 5:37 p.m. EDT, just over an hour before sunset. The Sun will be just 11° up in WSW as the Moon's disk makes first contact with the right edge of the Sun's disk. When the solar disk rests on an ideal, unobstructed horizon at 6:40 p.m., the Moon's disk will cover just over half of the solar diameter. If you plan to have students observe this eclipse directly, be sure to order solar eclipse filters in time.

Follow these web links to obtain information on visibility of eclipses for any locality:

Solar eclipses: <http://eclipse.gsfc.nasa.gov/JSEX/JSEX-index.html>

Lunar eclipses: <http://eclipse.gsfc.nasa.gov/JLEX/JLEX-index.html>

Oct. 10-21: Good dates for daytime Moonwatch as first activity of school day. See September description of same activity. Oct. 14-18 are good dates for viewing lunar surface details through telescope and binoculars. If in daytime through telescope, use low-power eyepiece and single polarizing filter to enhance contrast of Moon against the sky.

Consider holding a predawn session in October. While we're still on daylight saving time, starting your session 1-3/4 hours before sunrise wouldn't be unreasonably early by the clock, and you'd get good looks at Jupiter and a preview of the stars of late winter without the bitter cold temperatures.

Oct. 17 and 18, dawn: Jupiter near crescent Moon.

Oct. 25 at dusk: Can you spot Saturn 3° lower right of young Moon?

Oct. 26 at dusk: Antares 8° lower left of Moon.

Oct. 27 and 28, dusk: Mars near Moon.

November 2014

Nov. 3 and 11-12, nightfall: Mars passes close to stars in the Teapot of Sagittarius.

Nov. 23 at dusk: Young Moon low in SW to WSW.

Nov. 25 and 26 at dusk: Mars near Moon.

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CURRICULUM IDEAS

Celestial Highlights

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December 2014

Dec. 22 at dusk: Look early in evening twilight for Venus 6° lower left of thin crescent Moon.

Dec. 23: Look early in evening twilight for Venus 11°-12° below and slightly right of crescent Moon.

Dec. 24 at dusk: Find Mars 6°-7° left of Moon.

Dec. 29 at dusk: Look early in evening twilight for Mercury within 4° lower right of bright Venus. Binoculars help. As sky darkens, find Mars 26° upper left of Venus.

Mercury will get easier to spot in coming days, as it moves higher and closer to Venus, which is itself getting a little higher daily.

Watch these three evening planets daily until two of them drop out.

January 2015

Jan. 1 at dusk: Note Aldebaran lower left of Moon, and check hourly for several hours. In early evening twilight, note Mercury 2.8° lower right of Venus, and Mars 24° to Venus' upper left. Look nightly. As sky darkens, before Mars sets, note 3rd- and 4th-mag. stars near Mars and watch for nightly changes in the position of Mars.

Jan. 2 at dusk: Aldebaran 6°-7° upper right of Moon. Mercury 2.5° lower right of Venus. Mars 23° upper left of Venus.

Jan. 5 at dusk: Mercury 1.6° lower right of Venus. Mars 22° upper left of Venus. Look nightly!

Jan. 6 at dusk: Mercury 1.3° lower right of Venus. Can you guess what will happen at the end of this week?

Jan. 7 at dusk: Mercury 1.1° lower right of Venus. Mars 21° upper left of Venus.

Jan. 8 at dusk: Mercury 0.9° lower right of Venus. Don't miss next several nights!

Jan. 9 at dusk: Mercury 0.7° lower right of Venus. Mars 20° upper left of Venus.

Jan. 10 at dusk: Mercury just over 0.6° lower right of Venus. This is as close as they will get this time around! As seen from Earth, Mercury does not overtake Venus, but falls short. This event is called a quasi-conjunction, an approach within 5° but with no actual conjunction, when one planet passes another and shares the same right ascension or celestial longitude, the "x-coordinate" for describing apparent motions of planets.

Jan. 11 at dusk: Mercury 0.7° lower right of Venus, a little farther than last night. Mars 19° upper left of Venus.

Jan. 12 at dusk: Mercury 0.8° lower right of Venus.

Jan. 13 at dusk: Mercury 1.0° lower right of Venus. Mars about 18° upper left of Venus tonight and tomorrow.

Jan. 14 at dusk: Mercury 1.3° lower right of Venus. Mercury now appears at greatest elongation, farthest from Sun this time around, 19°.

Jan. 15 at dusk: Mercury 1.7° lower right of Venus.

Jan. 16 at dusk: Mercury 2.2° lower right of Venus. Mars 17° upper left of Venus.

Jan. 17 at dusk: Mercury 2.7° lower right of Venus.

Jan. 18 at dusk: Mercury 3.5° lower right of Venus. Mars 16° upper left of Venus.

Jan. 19 at dusk: Mercury 4.3° lower right of Venus. Mercury has been fading slowly. It is now of mag. 0 and will fade more rapidly in coming days, as it heads between Earth and Sun and shows us less of its lighted side. Try to observe Mercury on the last possible date, as weather allows. Binoculars will help!

Jan. 20 at dusk: Mercury 5.4° lower right of Venus. Mars 15° upper left of Venus.

Jan. 21 at dusk: A beautiful gathering of the young crescent Moon and all three of the other terrestrial planets of our solar system. Look for the crescent Moon low in WSW with brilliant Venus 5°-6° to its left and a little lower. Mercury is 4° below the Moon, and Mars is 17° to Moon's upper left.

Jan. 22 at dusk: The Moon has climbed higher since last evening, and now Mars is 4° to its left. Venus shines 12° below the Moon, and Mercury glows at first magnitude 8° to Venus' lower right. Mercury will fade sharply in next few nights, so you may have difficulty following it through the weekend.

Jan. 23 at dusk: Find Mars nearly 12° lower right of crescent Moon and nearly 14° upper left of Venus. Binoculars may show Mercury within 10° lower right of Venus.

Jan. 28 at dusk: Tonight and tomorrow evening, near the Moon, look for the star Aldebaran, eye of Taurus the Bull. Look for Mars 11° upper left of Venus. Not long before Venus sets in WSW, watch in the opposite direction, ENE, for Jupiter rising. If you look at the right time of evening, you will easily catch both planets simultaneously. Tonight they are 167° apart. Keep track of these two brightest planets for the next five months, until a wonderful event involving Venus and Jupiter will take place on June 30. Make sure to make arrangements to view the planets through a telescope that night!

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CURRICULUM IDEAS

Celestial Highlights

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February 2015

Feb. 3 at dusk: In case you missed seeing Jupiter, here it is, just 6° to the left of the Full Moon early this evening. Before Jupiter rises too high, catch brilliant Venus low in WSW, with Mars 8° - 9° to its upper left. Jupiter will reach opposition and all-night visibility on Feb. 6 as Earth passes between Sun and Jupiter.

Feb. 11 at dusk: Starting tonight through March 4, Mars is never more than 5° away from brilliant Venus. In ten days, on Feb. 21, they'll appear only 0.4° apart.

Around midtwilight this evening (Feb. 11), some 45 minutes after sunset, Venus in WSW and Jupiter N of E are both about 15° above the horizon, and you should have no difficulty seeing both simultaneously unless your view is blocked by nearby buildings and trees.

Venus-Jupiter are now 148° apart. Keep watch of these two brilliant planets until the end of June and about a month beyond, and enjoy the show!

Feb. 15 at dusk: Venus-Mars within 3° .

Feb. 17 at dusk: Venus-Mars only 2° apart.

Feb. 19 at dusk: Venus-Mars only 1.1° apart! Look for a very thin crescent Moon 15° lower right of Venus. Don't miss Friday evening's spectacular gathering!

Feb. 20 at dusk: Early this evening, brilliant Venus gleams only 1° - 2° to the south (left) of the young crescent Moon with earthshine on its dark side. Face WSW to W. Dim Mars glows just 0.7° to upper right of Venus tonight. This is a real treat for unaided eye, binoculars, and telescope! Don't overlook Jupiter - just turn around!

Feb. 21 at dusk: The Moon has moved on since last night, and so it appears some 13° upper left of Venus. Mars is just 0.4° north (upper right) of Venus at their conjunction tonight. Follow these objects nightly.

Feb. 24 at dusk: A fat crescent Moon is about 9° SSW of the Pleiades star cluster. Note the bright star Aldebaran about 13° E of the Moon. Check again tomorrow evening. Venus-Mars are now 1.3° apart.

Feb. 25 at dusk: Aldebaran is less than 1° below the Moon. Venus-Mars are 1.8° apart.

March 2015

Mar. 2 at dusk: Bright Jupiter is 6° N of Moon. Mars is 4° lower right of Venus.

Mar. 4 at dusk: Venus-Mars 5° apart. Venus-Jupiter are within 120° apart; 118 days to go!

Mar. 5 at dusk: Full Moon rises shortly after sunset. As sky darkens, note lineup of four solar system bodies along a line arching almost overhead. From west to east, they are Mars, Venus, Jupiter, and the Moon.

Mar. 15 at dusk: Venus-Mars have spread to 10° apart. Venus is getting a little higher each day, Mars a little lower.

Mar. 21 at dusk: The Moon is back! Look for the thin crescent low in west within 13° below Venus. Note Mars just over 1° upper right of the crescent. Can you guess where the Moon will appear tomorrow evening?

Mar. 22: This afternoon before sunset and at dusk look for Venus 3° N of the crescent Moon. As the sky darkens, Mars appears 13° to the lower right of Venus. Jupiter shines well up in ESE. Regulus, heart of Leo the Lion, appears 17° to Jupiter's lower left. How many days do you think must pass before the Moon will appear near Jupiter? Tonight, while the Moon is still thin, use binoculars to look for the Beehive star cluster, 5° - 6° upper right of Jupiter.

Mar. 24 at dusk: Moon near Hyades cluster and Aldebaran, a bright foreground star. Venus-Mars 14° apart; Moon-Aldebaran 4° apart.

Mar. 27 at dusk: Venus and Jupiter are now 90° apart. In 95 days, a very special event will occur involving these two bright planets. Mars now appears 15° - 16° lower right of Venus.

Mar. 29 at dusk: Later tonight, the Moon passes 6° to the south of Jupiter.

April 2015

Fri. Apr. 3: The Moon rises just over half an hour before sunset this evening. As the sky darkens, watch for the rising of Spica about 14° below and a little left of the Moon. A lunar eclipse will get underway Saturday morning, April 4, at 6:16 a.m. EDT, as the Moon, only 11° up in WSW for East Lansing, begins to enter the umbra, or dark central core of Earth's shadow. Before the brightening dawn extinguishes it, catch Spica 11° upper left of the Full Moon. Unfortunately, the Moon will set before total eclipse here in Michigan, but folks out near the West Coast and in Hawaii will have an excellent view of nearly all stages of the event.

Sat. Apr. 4, predawn lunar eclipse. See entry for Apr. 3.

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CURRICULUM IDEAS

Celestial Highlights

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April 2015 cont.

Apr. 4 at dusk: Watch for moonrise about 10° S of E within 30 minutes after sunset. As the sky darkens and Moon rises higher, look for Spica about 3°-4° to Moon's lower right. Within an hour after sunset, look for a lineup of four solar system bodies stretched along a line nearly 170° long. From W to E they are Mars, Venus, Jupiter, and the Moon. If you include some well-known background objects in the broader belt of the zodiac, then the list becomes: Mars; Venus; Pleiades star cluster, Hyades star cluster, and Aldebaran, of Taurus; Castor and Pollux of Gemini; the Beehive cluster of Cancer; Jupiter; Regulus of Leo; the Moon; and Spica of Virgo.

Apr. 10-12 at dusk: Using binoculars as the evening sky darkens, look for the beautiful Pleiades star cluster as Venus passes 2°-3° to its south. Can you still see dim Mars about 22° to Venus' lower right? Through binoculars, the Beehive cluster appears 5° west of Jupiter. Two months past its Feb. 6 opposition, Jupiter has ended retrograde and begins normal eastward motion, away from the cluster. Not until the year 2026 will Jupiter again appear as close to the Beehive.

Apr. 13 at dusk: Tonight the star Spica in Virgo reaches its annual opposition to the Sun. The star is visible all night, setting just a few minutes before sunrise. You can estimate the time of night by observing Spica's position in the sky. Spica reaches its high point in the south in the middle of the night, about 12 hours after the Sun does so.

Apr. 18 at dusk: Look early during evening twilight, very low in WNW, for Mercury, of magnitude -1.4 and 30° lower right of Venus. As sky darkens a little, before Mercury sets, look for fainter reddish Mars (mag. +1.4) 5° upper left of Mercury and 25° lower right of Venus. Mercury begins its evening apparition at considerable brightness, but low in bright twilight. Although Mercury will fade in coming weeks, it's getting higher day-by-day until May 5, and for now it's getting easier to see.

Apr. 19 at dusk: About 40 minutes after sunset, look for a thin, young crescent Moon very low in W to WNW, 25° lower right of Venus. Just 7° lower left of Venus, find Aldebaran, eye of Taurus, the Bull. About 7° lower right of the Moon, look for Mercury, very low. Within 4° upper left of Mercury and about 4° lower right of Moon, look for faint Mars.

Apr. 21 at dusk: As evening twilight deepens, find the crescent Moon well up in west, with brilliant Venus 7° to its right, and Aldebaran within 4° to Moon's lower right. Some 27° to Venus' lower right find the Mercury-Mars pair 1.6° apart, low in WNW,

with Mars as the fainter member, to Mercury's upper left.

Apr. 22 at dusk: This evening Mercury appears to overtake Mars, as our solar system's innermost planet passes 1.3° north (upper right) of the faint more distant red planet. Look for the planet duo low in WNW, 27° to lower right of brilliant Venus. Both members of the pair are now beyond the Sun, or more distant from us than the Sun is. Mercury, moving faster than Earth, is gaining on us and getting higher each evening until rounding the "top of its orbit" as seen from Earth in the first week of May. Mars, moving slower than Earth, is being left behind, so it appears lower each evening, until it reaches conjunction with the Sun in mid-June. Bright Jupiter now appears high in SSW at dusk, 60° east (upper left) of Venus tonight. Jupiter will eventually suffer the same fate as Mars, that is, it will get lost in the glare of the Sun, but not until August.

The zodiac belt or plane of the solar system is well marked by four planets and several bright stars. In order from W to E, they are the Mercury-Mars pair, 1.3° apart; the Pleiades or Seven Sisters star cluster 14° to upper left; the Venus-Aldebaran pair 8° apart and 13°-14° upper left of the Pleiades; the Moon, 16°-17° upper left of Venus-Aldebaran; Pollux (with its fainter Gemini Twin, Castor, 4.5° away), 29° upper left of the Moon; Jupiter, 20° E of Pollux; Regulus, heart of Leo, 17° E of Jupiter; and finally Spica, the spike of wheat in the hand of Virgo, low in ESE to SE, 54° E of Regulus.

Apr. 24 at dusk: Find bright Mercury (now of mag. -1.0) low in WNW 25° to Venus' lower right. Can you spot Mars (mag. +1.4) 3° below and a little left of Mercury, and the Pleiades star cluster 10° above Mercury? By Apr. 27, Mercury will narrow the distance to the Pleiades to just 5°, and widen its distance from Mars to nearly 6°.

Apr. 25 at dusk: Tonight the Moon is at First Quarter phase, 90° E of the Sun and half full. Tonight and tomorrow the Moon is not far from bright Jupiter.

As the Earth moves in orbit around the Sun, it's moving directly away from a place in the sky 90° from the Sun, just upper right of tonight's First Quarter Moon. Each year around Apr. 27, the Earth moves directly away from the Beehive cluster in Cancer, the Crab. By late in July the cluster is hidden on the far side of the Sun.

Apr. 27 at dusk: The waxing gibbous Moon has moved 18° E of Jupiter and passes only 4° S of Regulus, heart of Leo. Bright Mercury (mag. -0.7) is low in WNW. Binoculars help locate the Pleiades star cluster about 5° above, and Mars nearly 6° below Mercury.

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CURRICULUM IDEAS

Celestial Highlights

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April 2015 cont.

Apr. 30 at dusk: Tonight through May 9, Mercury fades from mag. -0.4 to $+0.6$ and stays 22° lower right of Venus. In only three weeks, the Pleiades or Seven Sisters star cluster will be on the opposite side of the Sun from Earth and will therefore be hidden from view. But tonight, with the help of binoculars, the cluster can be spotted in twilight, within 2° upper right of Mercury.

May 2015

May 1 at dusk: Find Spica about 6° below the Moon, two days short of Full.

May 2 at dusk: Tonight and all next week, Mercury is highest in its current evening apparition, 10° up in WNW at midtwilight, some 50 minutes after sunset from lower Michigan. But in one week, from tonight until May 9, the planet fades from mag. -0.2 to $+0.6$. Look soon, rather than waiting!

May 6 at dusk: Venus-Jupiter are 45° apart tonight; 55 days to go! Mercury reaches greatest elongation tonight, 21° east of Sun.

May 8 at dusk: Tonight a planet and two first-magnitude stars lie 22° - 23° from Venus: Mercury (mag. $+0.5$) to Venus' lower right; Aldebaran 8° to Mercury's lower left; and Pollux to Venus' upper left. Aldebaran and Pollux are 45° apart, with Venus midway between them tonight.

May 11 at dusk: Mercury, now of mag. $+1.0$ and 23° lower right of Venus, becomes difficult to observe this week. Mercury will fade to mag. $+2.0$ by Saturday, when it will be 27° to Venus' lower right. Using binoculars, try for first-mag. Aldebaran within 8° lower left of fading Mercury all this week. If you spot Mercury, try to see four planets simultaneously; in order, they are: Mercury, very low in WNW, to lower right of Venus; Jupiter well up in WSW; and Saturn very low in ESE. Mars at a dim mag. $+1.5$ sets before midtwilight and just after Saturn rises, so it would be very difficult to see all five naked-eye planets simultaneously. An easy opportunity to do so will come in late January and early February 2016, before dawn.

May 19 at dusk: A beautiful thin crescent Moon with earthshine can be spotted in WNW, 22° lower right of Venus. Mercury at mag. $+2.8$ and 11° lower right of the Moon is likely too faint to be spotted in bright twilight, even with binoculars. Follow the Moon daily at dusk for next two weeks.

May 20 at dusk: Moon 12° below Venus.

May 21 at dusk: Moon 9° lower left of Venus. Venus forms an isosceles triangle with Gemini's "Twin" stars Pollux and Castor, 9° from each. Jupiter is 30° upper left of Venus. Only 40 days until their spectacular event!

May 22 at dusk: Moon 17° upper left of Venus and 15° lower right of Jupiter, and 14° - 15° left of Pollux, in a nearly straight line with the Twins. Venus-Jupiter-Saturn span 135° . Saturn is now at opposition and visible all night.

May 23 at dusk: Moon 6° lower left of Jupiter.

May 24 at dusk: Moon 6° lower right of Regulus. Tomorrow evening it will be 9° lower left of Regulus.

May 28 at dusk: Moon 10° upper right of Spica. Tomorrow evening it will be within 4° upper left of Spica.

May 29 at dusk: Venus passes 4.0° south (lower left) of Pollux. Castor is 4.5° to right of Pollux.

May 31 at dusk: Locate Saturn 9° lower left of Moon, and Antares 11° below and a little left of Saturn.

June 2015

June 1 at dusk: Venus lies in a nearly straight line with the Gemini Twins, Pollux and Castor, 5° and 9.5° to Venus' right. June will be an excellent month for impressive telescopic views of the "showpiece" planets. Venus, now about half illuminated, will become a crescent, one-third full and nearly 50 percent larger in apparent size by month's end as the planet begins its swing between Earth and Sun and draws closer. Jupiter, 20° to upper left of Venus tonight, shows its lineup of four satellites discovered by Galileo, and two dark equatorial cloud belts. Saturn shows its incomparable rings, now tipped 24° from edgewise.

Tonight Saturn (mag. $+0.1$) is 4° upper right of the nearly Full Moon. Antares, heart of the Scorpion, is 11° below and a little left of Saturn.

June 2 at dusk: Moon, just past Full, is 17° lower left of Saturn and 11° - 12° left of Antares. Tonight and tomorrow after darkness falls, use binoculars to search for the Beehive cluster about midway between Venus and Jupiter, 9° - 10° from each.

June 6 at dusk: Venus reaches greatest elongation, 45° from Sun. The planet is rounding the apparent end of its orbit and rapidly approaching Earth

June 7 at dusk: Using binoculars at nightfall, look for the Beehive cluster 5° upper left of Venus and 10° lower right of Jupiter.

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CURRICULUM IDEAS

Celestial Highlights

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June 2015 cont.

June 12 at dusk: Through binoculars or a telescope tonight and Saturday after nightfall, look for the Beehive cluster centered about one degree south of Venus. Jupiter is about 11°-12° upper left of Venus.

June 13 at dusk: Saturn is 12° upper right of Antares this weekend.

June 14 at dusk: Venus-Jupiter are 10° apart. Just 16 days to go!

June 17 at dusk: Using binoculars about 30 minutes after sunset, try for young Moon very low in WNW about 28° lower right of Venus. Tonight Jupiter is 8° to Venus' upper left. Just 13 days remain until their spectacular conjunction!

June 18 at dusk: Moon easy to see this evening, in W to WNW, 17° lower right of Venus.

June 19 at dusk: Moon in W, about 7°-8° lower left of Venus. Jupiter-Saturn are now 100° apart. About 5½ years from now, on the evening of December 21, 2020, Jupiter-Saturn will have a spectacular pairing, their closest since 1623. Mark Dec. 21, 2020 on your calendar, and keep track of Jupiter and Saturn until then!

June 20 at dusk: Jupiter 5°-6° to Moon's upper right, and 6° upper left of Venus. Only ten days to go! Note also Regulus 9° upper left of Moon.

June 21 at dusk: Regulus 6° upper right of crescent Moon and 10° upper left of Jupiter. Tonight Jupiter is just over 5° upper left of Venus. Just 9 days to go!

June 23 at dusk: Venus-Jupiter 4° apart. One week to go! Nearly 90° from Sun, Moon is approaching First Quarter and is nearly half full.

June 25 at dusk: With only five days until their close conjunction on June 30, Venus-Jupiter this evening are just 2.8° apart. Look for Spica in SSE, 3° lower left of gibbous Moon, two-thirds full.

June 26 at dusk: Spica is 11° right of gibbous Moon, three-quarters full.

June 27 at dusk: Find Saturn 12° lower left of gibbous Moon. Venus-Jupiter are 1.7° apart.

June 28 at dusk: Saturn is about 1° to Moon's lower right. Antares, heart of the Scorpion, is 12°-13° to their lower left. Venus is 1.1° to lower right of Jupiter. Now two days before their closest pairing, they can already be viewed together within the same field of view of a telescope.

June 29 at dusk: In the west, Venus and Jupiter appear within 0.7° apart, with Jupiter still to upper left. What will the pair look like tomorrow evening?

In SE to SSE, the Moon two days before Full appears 14° lower left of Saturn and 9° upper left of Antares.

June 30 at dusk: Do not miss this spectacular pairing of Venus and Jupiter, just one-third of a degree apart during evening twilight! Fit them in the same telescope field, and you'll notice that Venus is a crescent, one-third full, while fully-lit Jupiter is accompanied by its four Galilean satellites, brightest Ganymede to the east of the planet, and Europa, Io, and Callisto to the west. Tonight, the disks of Venus and Jupiter appear the same size, because Jupiter, with an actual diameter 12 times that of Venus, is by coincidence at this conjunction, 12 times farther away. Viewed with a magnification of about 60-power, both planets will appear as large as the Moon does with unaided eye, 32 minutes across, or just over half a degree.

July 2015

July opens with Venus-Jupiter within 0.6° apart, and the star Regulus just 8° to their upper left. The two planets spread farther apart, to 1° on July 2, to nearly 2° on July 4, and to 5° on July 13. It is during this period Venus attains greatest brilliance at mag. -4.7 while showing a thin crescent resolvable even in binoculars, if you look in afternoon or not long after sunset, to reduce the glare of Venus against a darkened sky.

The star Regulus remains the highest member as the gathering sinks lower into the twilight glow each evening in July. On July 14, Venus approaches within 2.4° below Regulus and gets no closer: A quasi-conjunction! On July 18, the waxing crescent Moon makes one final, spectacular pass just over a degree south (lower left) of Venus. On July 23, Venus-Jupiter are 6.3° apart while Regulus, 4° from each planet, marks the apex of an attractive isosceles triangle. Follow them for another week or so until they disappear into twilight.

Coming attractions: In School Year 2015-2016, a total lunar eclipse on evening of Sept. 27, and glorious predawn planet gatherings

By late summer 2015, the planet-watching scene shifts into the eastern morning sky. Keep watch during dawn twilight, and you can catch Mars emerging by late July 2015, Venus by late August, Regulus in early September, and Jupiter in the second week of September. So not long after the 2015-2016 school year begins, three planets will adorn the eastern sky. From the second week of October until early November, Mercury will add a spark of light to the twilight glow, well to the lower left of the prominent gathering.

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CURRICULUM IDEAS

Celestial Highlights

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July 2015 cont.

After their spectacular June 30 evening pairing, **Venus and Jupiter will have a second pairing in 2015, well up in the eastern morning sky before sunrise, on October 25 and 26.** Then they'll appear 1.1 degrees apart, again fitting within a low-power telescope field. Venus will appear half full at that conjunction, but only three-quarters the apparent size of Jupiter.

An added bonus is that **Mars will appear near the Venus-Jupiter pair, so that all three planets will fit into a 5° binocular field, forming a "trio" for eight mornings, Oct. 22-29, 2015.** Yet another perk will be that the Moon will form impressive gatherings with the planets on the mornings of September 10-11, October 8-11, and November 6-7. With daylight saving time still in effect in September and October, you and your

students can observe these gatherings in the fall of 2015 at a time not too much earlier than the start of your school day.

Finally, in **January-February of 2016, there will be a wonderful opportunity to observe the Moon and all five naked-eye planets simultaneously, in a long arc across the morning sky Jan. 23-Feb. 7.** The Moon then drops out, but **the five planets continue to be seen in mid-twilight until Mercury drops out in the final week of February.** The Moon returns to the scene on Feb. 22. There will be no conjunctions of planets throughout the period, the lineup remaining, in order of increasing apparent distance westward from the Sun: Mercury, Venus, Saturn, Mars, Jupiter. Mercury appears highest around Jan. 31, reaches greatest elongation on Feb. 7, and approaches to just 4.0° lower left of Venus during Feb. 11-15 in a quasi-conjunction.

OPENS SEPTEMBER 27!



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CURRICULUM IDEAS

Teaching Through Nature

By Julee Cowher, Kindergarten Teacher, Brighton Public Schools

This summer I had the privilege of spending a week with my family at a cottage on Lake Michigan. While we were there I saw a transformation in my children as their senses took over and technology was left behind. My ADHD son quietly focused on sand creations for hours on end and was relaxed by the lapping waves beside him instead of distracted. My teenage daughter, who we lovingly refer to as our texting and fashion diva, was totally captured by the sizeable waves and endless cloud formations that only a great lake can offer.

Questions poured out of each one of them as they discovered new things with their eyes, ears, and hands. "Why does my hole in the sand fill with water when I dig deep?" "What is a current and why does it pull? Why is the sky orange after the sun sets?" There on the beach, real life learning was happening. They were taking in information with multiple senses to be stored in their long term memories. Now we could turn to technology for a reason - to find answers to our real life questions.

All of this made me think about the children in my classroom. My five and six year old students are now expected to be in a classroom sitting all day, taking in endless amounts of information with only one or two of their senses. Why do we have so many behavior problems and lack of interest with children? It should really be obvious to all of us educators how important real life multi-sensory learning is to student engagement and retention. Unfortunately, the pressures of a demanding curriculum, which is tied to teacher's evaluations, tends to put real life outdoor learning at the bottom of the priority list.

When I graduated from college, full of spunk and youthful energy, I decided the artificial world of the classroom wasn't for me so I took seasonal jobs at nature centers determined to make a difference in the lives of children through real life learning in nature. What I quickly found was that one short little burst of real life learning outside on a one time field trip really didn't make that much impact. So I headed to the classroom so I could have more time to make an impression on kids. Both the new little kindergartners and I were completely overwhelmed. It took me years to learn the curriculum well enough to make any competent alternations to it. And even longer to build my confidence enough to explain my thinking to administrators.

Now, 19 years later, I smile at all the mistakes I have made and marvel at my own learning. My own real life hands-on learning in the classroom has led me to a place of interwoven balance. A balance between the required curriculum and nature. We are humans and our bodies are designed to take in new learning through our senses. Through trial and error I have found a way to interweave the curriculum with real life learning outside that can utilize more of my students' senses. I typically work with nature because I am comfortable and trained in using the outdoors as a teaching tool. Of course this isn't the only type of real life learning that can be done. Anything that you know about and have a passion about that evokes the senses can be brought to students with bountiful benefits.



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CURRICULUM IDEAS

Teaching Through Nature

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Soon, I will start another school year and on the first day of school I will introduce my new students to our class tree. We will feel it, smell it, listen to it, hug it and then draw it, write about it, and read about it. We will ask questions about our tree and look for answers using technology. Then the second week of school I will ask my new students to help me harvest the sunflowers in our class garden that were planted by last year's class and we will measure them with tape measures, compare them to our heights, look at them with magnifiers. We will record what we notice in our nature notebooks using pictures and words and make a class diagram so I can model labeling and record the many wonders I know the kids will have. We will use all our senses, work on the common core standards, build a classroom community and interweave our learning just as our bodies were designed to do.

To interweave nature with the common core curriculum is easier than you might think. The first thing I do is thoroughly read through the provided units or standards and jot down the big ideas. Then I consider how I can teach the abstract concepts using real life experiences in nature. For instance, when I teach a unit on small moment writing, I precede the abstract work of writing with a real small moment hike to our outdoor classroom. Last year this occurred during one of the many snowfalls and the children were submerged in waist deep snow. I took along our class iPad to take pictures of our adventure and stopped often to ask the kids what they noticed and how they were feeling.

After we returned to the classroom and shed the many pounds of snow suits, the red cheeked children were keenly engaged in recording our shared experience. Their brains were full of oxygen from the strenuous walk and even the hardest to engage students had something to share. Of course all of this took more time than just using the mentor text suggested by the unit, but it provided the emotional sensory connection that placed this learning into their long term memories. I was able to draw on this experience for weeks as I taught the many steps and mini lessons that go with that unit. And when students got stuck in their writing and said it was too hard I reminded them how they walked bravely through the snowstorm that day. "If you can do that then I know you can try your best at writing".

Last year I began a classroom blog to record our real life learning so parents could see what we were doing. Perhaps you will follow our journey this year by going to www.dragonflykindergarten.blogspot.com or check out our classroom website <http://brightonk12.com/webpages/jcowher/science.cfm> where there are more teacher tips for teaching through nature. Teaching through nature can take a bit more time but I have found that the benefits of higher student engagement and retention are worth it. Start small by taking the kids to a tree or garden on the school grounds or bring something real inside - an old rotten log, a giant sunflower, or a bucket of pond water. Instead of adding nature to the curriculum think about what part of your curriculum you could teach using nature.



CURRICULUM IDEAS

Gateway Bugs

from Chris Modrack, Michigan Elementary Science Teacher of the Year, 2010



You've heard of gateway drugs. I'm a user of gateway BUGS...eggs, larvae, pupa and adult monarchs serving as an introductory species that opens the door to the mystery of our natural world. An up-close study beginning with one football shaped egg the size of the head of a pin contains a microcosmic sample of nature's patterns and systems and can fuel a curiosity for other species of butterfly, insect and animal. That 1/16 inch diameter egg holds the potential for unveiling life study concepts from predator/prey, natural defense, reproduction, migration and metamorphosis straight on up to core concepts of the NGSS - natural selection, adaptation, growth and development of organisms or interdependent relationships in ecosystems.

With Michigan's proximity to the migration pathways that wind along the shores of our great lakes, the monarch is a natural focus of study for our students and has become as common and expected in elementary school curriculum as addition and subtraction math facts. Little did I realize how one self-educated, inspired lepidopterist, Brenda Dziedzic, could have enriched my back-to-school September science studies: But I bet she can help you, too!

Before Brenda: Over 37 years of elementary teaching, many years we'd pack up the family the day before school started and head from Detroit to the shores of Lake Huron. We'd fix on Oscoda to tap into the abundance of monarch egg and larvae treasure to be found along the last points of land before the monarchs take flight across Saginaw Bay and continue their southbound migration toward the protective mountain climate of Michoacán, Mexico. I always hoped to find one critter per student at any stage of development but would often settle for a few for each table and sometimes over the last many years of our endangered monarch populations, I'd have to settle for just one classroom aquarium for all to observe and share. Though the monarch is not on the Endangered Species List, many factors contribute to threaten their survival. Climate change precipitating drought in our southwestern states affects milkweed availability. The creation of Round-up resistant corn and soybean crops that share land with milkweeds and account for some 70% of the overall food source for monarchs leads to dangerous over-spraying. In addition, aerial insecticide spraying to control mosquitos and the West Nile virus they carry has been shown to be lethal to monarch caterpillars in early instars. Roadside mowing by maintenance crews down monarch habitat plants by the millions, depleting the host plant supplies across our entire country. In our larger cities, ozone pollution is known to affect the sensitive milkweed plant. Add to that, deforestation for logging and water diversion for irrigation in the overwintering grounds of Mexico and even monarch-oriented tourism negatively impact these ancient sanctuaries. In all, we witness the fragile interdependent relationships between ecosystems that threaten the monarch, a creature quickly becoming a symbol of man's thoughtless monetary initiatives that compromise our planet as well as man's potential to turn it all around.



Meet Brenda Dziedzic

Brenda's mission is to save the monarch one butterfly at a time. Since her retirement from her career in a technical trade several years ago, Brenda has traveled around the world from Mexico to the Amazon rainforest studying her passion, butterflies. A Westland, Michigan resident, she developed a butterfly garden in her own backyard that was so successful she gives tours and lectures on her processes and procedures. She spent more than \$20,000 of her own money to create a habitat that has nearly a dozen types of butterflies living and breeding at a Westland gardening center, Barson's Greenhouse. What is unique about Brenda's butterfly habitat, setting it apart from other exhibits around the county, is that her species are all native to Michigan and her efforts to propagate them impact their survival in Michigan as well as other neighboring states.

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CURRICULUM IDEAS

Gateway Bugs

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Brenda's goal is to educate people about butterflies so they will become stewards of their survival. Barson's Greenhouse owner, Joe Barson, made space for her large enclosed habitat and supports Brenda's project by selling over 50 species of perennials, annuals and herbs, many from Brenda's own seeds, that attract different species of butterfly to host their eggs and larvae or nectar themselves and their offspring.

Brenda also founded SEMBA, the Southeastern Michigan Butterfly Association. Monthly meetings at Nankin Mills Metropark in Westland enable members to share expertise and even barter for eggs, larvae and plants. Educational feature presentations are part of each meeting.

On her Facebook page, Brenda's Butterfly Habitat, Brenda posts a continuous feed of butterfly information – much of it global in scope and of interest to any lepidopterist or simple enthusiast as well as an update on available species.

Available species?!

No more desperate last minute trips to the shores of Lake Huron for me! Check out this chart. Throughout the summer, Brenda posts available eggs and larvae that she is willing to give away to a good home (ie., dependable food source) or part with for a donation to Monarch Watch, a non-profit organization oriented to saving the endangered monarch butterfly. I overheard Brenda say that last summer she kept track of her giveaways (eggs and larvae in her habitat that she would not have enough host plant to feed) and they numbered over 17,000 adopted by those of us who had host plants in our own home gardens to take them through their life cycles and then release.

Note: A butterfly egg in nature has small odds of reaching adulthood and gains much improved chances with a human caretaker who can control natural predators. Whatever your position on promoting the butterfly population in this egg/larvae adoption scheme, a model which meets with occasional controversy, Brenda's precious stock is a sure-fire start to your school year with a hands-on science learning lab that could just be that gateway experience to other species, other eco-systems. Better yet, this exciting view into the natural world could set a tone for inquiry and investigation as well as set the stage for high level science thinking that could impact thinking in all domains of this year's classroom curriculum.

| | Eggs/Caterpillars | Host Plants | Barson's Sell |
|-----|---------------------------|--|---|
| Yes | American Lady | Pearly Everlasting, Silver Brocade, Pussytoes | Pearly Everlasting, Silver Brocade |
| Yes | Monarch | Milkweed | Swamp Milkweed, Butterfly Weed, Tropical Milkweed |
| Yes | Mourning Cloak | Elm, Hackberry, Paper Birch, Poplar, Willow | Prairie Willow |
| Yes | Question Mark | Elm, False Nettle, Hackberry, Hops, Nettle | False Nettle |
| | Red Admiral | False Nettle, Nettle, Pellitory | False Nettle |
| Yes | Black Swallowtail | Carrot, Common Rue, Dill, Fennel, Parsley, Queen Anne's Lace | Common Rue, Dill, Fennel, Parsley |
| | Eastern Tiger Swallowtail | Cherry, Hop Tree, Lilac, Sweet Bay, Tulip Tree, Willow | Cherry, Lilac, Prairie Willow |
| Yes | Giant Swallowtail | Citrus, Common Rue, Hop Tree, Prickly Ash | Common Rue |
| | Pipevine Swallowtail | Dutchman's Pipe (any variety except Aristolochia gigantea) | Dutchman's Pipe |
| Yes | Spicebush Swallowtail | Sassafras, Spicebush | Spicebush |
| | Hummingbird Clearwing | Viburnum | Viburnum |

Connecting with Brenda

Unfortunately, it took retirement from teaching for me to find time to connect with a resource like Brenda. Her impact on my current butterfly raising methods is significant. Beyond the thrill and personal satisfaction of raising butterflies in my own 10 foot by 3 foot mini-greenhouse with screens, I'm able to provide monarchs and several other butterfly species to my former elementary school for their September nature studies. As of August 1st, I raised from eggs and released over 50 butterflies including monarchs, giant swallowtails, black swallowtails, red admirals and question marks. By summer's end I hope to break 100.

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CURRICULUM IDEAS

Gateway Bugs

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What I now know from Brenda...

- That if I plant the milkweed host plants for monarchs in my own yard, and host plants for other species, the butterflies find me rather than my needing to find them. I remember planting my first milkweed plant and that afternoon I had monarch eggs on it!
- That several types of butterfly eggs and larvae available from her habitat in Westland offer up important comparative studies to the monarch prompting that important widening out toward other species and ecosystems.
- That learning to raise and care for butterflies is an ongoing experiment. I'm continuously forming hypotheses and testing them out for something real...butterfly survival and propagation in my own habitat.
- That the process of scientific thinking is inherent to every butterfly raising problem and solution and that student involvement in this process is a daily lesson in thinking skills that enhances thinking in all content areas.
- That the tough luck or lucky breaks of a butterfly hunt need not determine the if's and when's of a classroom investigation. With Brenda's cache and some planning, every first day of school can begin with the study of a live butterfly moving through metamorphosis.

Butterflies in the Garden

There is a wealth of information on raising eggs and larvae to adulthood (internet blogs, Youtube videos, books, Brenda's website as well as her self-published book *Butterflies in the Garden*) so that raising them is not the problem: Being able to count on having live organisms to observe can be. In this climate of educational cut-backs, fragile and expensive live organisms are an easy target. But nothing supports natural science learning like direct experience with these organisms and Brenda makes it possible in a new way.

Consider what Brenda did after her retirement. She created a habitat that each summer provides thousands of eggs and larvae to butterfly enthusiasts who promise to raise and release each and every adoptee. I regret it took some of the down time of my own retirement to discover these opportunities, some that would have advanced my teaching, my students and the investment of personal time required for hands-on, inquiry-based science learning.

But you don't need to wait to retire. It's all right here, thanks to Brenda and these links to her resources. And whether these ideas have a place in this year's classroom plans or not, do visit Brenda's Butterfly Habitat at Barson's. Take inspiration from Brenda's single minded commitment and from the butterflies that fly, float and loop in graceful figure eights around their loyal steward.

*Submitted by: Chris Modrack, Michigan Elementary Science Teacher of the Year, 2010.
Chris develops and writes curriculum with a focus on integrating inquiry-based science into the classroom.
She retired in 2010 after 37 years of K-5 teaching.*

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Resources:

Facebook: Brenda's Butterfly Habitat

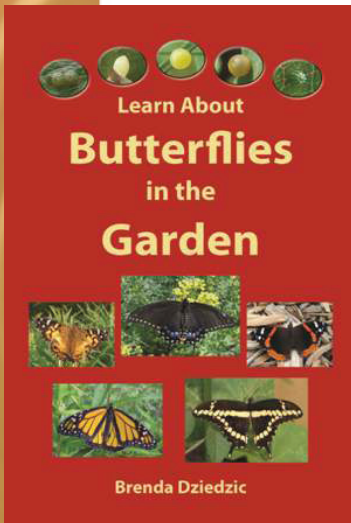
Brenda's website: www.ButterfliesinTheGarden.com. Lists habitat days/hours at Barson's.

Barson's Greenhouse. 6414 N. Merrican Road, Westland, MI 734-421-5959. <http://www.barsons.com>

SEMBA. Southesat Michigan Butterfly Association. www.sembabutterfly.com Check on-line for monthly meeting dates and additional resources.

Dziedzic, Brenda, *Butterflies in the Garden*, self-published, May 2011.

Wildtyper Native Plant Nursery, Mason, Michigan. Source for native host and nectar plants for Michigan butterflies. www.wildtypeplants.com. Limited public shopping days on-site and on-line catalogue available.



Professional Resources & Opportunities

7 Must Have Websites to Score Success this School Year

From Jennifer Arnswald, Kent Intermediate School District, MSTA Curriculum Director

Are you looking for some new fresh ideas for resources that have been tested and used in classrooms? The Michigan Science Teachers Association is starting a new section in the newsletter highlighting the best of the best resources selected by Michigan educators. All of the resources identified by Michigan teachers will ultimately be linked to the MSTA website.

1. PBS Learning Media

<http://www.pbslearningmedia.org/>

The PBS Learning Media website had thousands of credible resources (interactives, artifacts, video clips, images) that are filtered for quality. Educators value the fact that they don't have to worry about the contents of the resources. After creating an account teachers are able to store resources in an online folder.

Contributed by: Mike Fillman, 5th Grade Teacher, Murray Lake Elementary, Lowell

2. Scholastic Community Club

<http://teacher.scholastic.com/commclub/>

The Scholastic Community Club can be easily accessed by students. It contains a variety of informational text appropriate for K-2 students. Each text has the ability to be read to the student.

Contributed by: Lauren Honeysett, 1st Grade Teacher, Creative Technologies Academy, Cedar Springs

3. CK-12 Flexbook

<http://www.ck12.org/>

CK-12 is a freeware open source textbook that houses STEM content for the secondary level. In addition to text materials, the website contains interactives and videos. Students login in using their google sign in. Pre-written concepts in math, science, STEM, and ACT prep can be copied and modify, under a creative common license. A personalized textbook for students then can be linked to a website or downloaded as a PDF.

Contributed by: Melinda Rose-Eadie, East Lee Campus, Godfrey Lee Schools, Wyoming, MI

4. BBC Kids: Bite-size Science

<http://www.bbc.co.uk/bitesize/ks3/science/>

Information, video clips, games, quiz forms on various science topics. Good for grade 3-7.

- Organisms, behavior and health: Life processes, cells, health, variation and classification, feeding relationships

- Chemical and material behavior: Solids, liquids and gases, periodic table, pH scale for acids, bases and alkalis
- Energy, electricity and forces: Energy, forces, electric currents and magnetism
- The environment, the Earth and the universe: Rock types, astronomy, and the environment

Contributed by: Sandra Yarema, Adjunct Faculty Instructor, Wayne State University

5. Energy Kids- U.S. Energy Information Administration Website

<http://www.eia.gov/kids/index.cfm>

For Teachers and Learners. Physical Science Energy concept, definitions, glossary, activities, information, games, quizlets, energy calculators good for grades 2-7.

Contributed by: Sandra Yarema, Adjunct Faculty Instructor, Wayne State University

6. NASA- Planet Quest Interactives

<http://planetquest.jpl.nasa.gov/interactives>

Interactive "game" programs to support NASA/Jet Propulsion Laboratory/California Institute of Technology Program: Search for Exo-planets. Additional Links and other resources for educators, learners, professionals.

Contributed by: Sandra Yarema, Adjunct Faculty Instructor, Wayne State University

7. Periodic Table of Videos

<http://www.periodicvideos.com/>

The Chemistry department at University of Nottingham (Great Britain) has way too much time on their hands to create this fun and informative periodic table containing video information on nearly all the known elements. Most include footage of the element in an explosive or burning reaction. Excellent for use with conceptual chemistry or physics coursework for learners of all ages, middle school and up.

Contributed by: Sandra Yarema, Adjunct Faculty Instructor, Wayne State University

Do you have a website you would like to share with other Michigan educators? If so, send the link and a brief 2-3 sentence description of the resource to Jennifer Arnswald, MSTA Curriculum Director, jennifer_arnswald@msta-mich.org

Dan Wolz Clean Water Education Grant

The Michigan Water Environment Association (MWEA) is pleased to announce the “Dan Wolz Clean Water Education Grant” for this year. The Dan Wolz Clean Water Education Grant was established eight years ago to heighten public awareness of the career opportunities our industry has to offer and to improve the quality and quantity of Clean Water community education in Michigan’s public schools. Dan Wolz was a true environmental steward of the earth. Thus, in recognition of the passion Dan had for education, this award continues to reach hundreds of Michigan students.



Details:

The MWEA partners with the Michigan Science Teachers Association to identify those teachers who have a great program and are in need of financial assistance to execute a project within a curriculum focused on water environment issues.

As a grant recipient, a teacher will be provided with:

- Complimentary conference registration and one night stay in a hotel for both the MSTA Annual Conference (to accept the award in the year given and to attend/present at the following year’s conference).
- Your school employer’s cost for substitute pay will be covered both years.
- Complimentary conference registration and one night stay in a hotel for attendance at the Michigan Water Environment Association’s Annual Conference, the year following award. Mileage for travel to this conference is reimbursed.
- \$1000.00 cash award for purchase of classroom and project supplies.

Following the use of the Dan Wolz Education Funds and implementation of classroom projects the following school year, the recipient is expected to:

- Give a 30-40 minute presentation as a featured speaker at the MSTA Annual Conference.
- Give a 15-20 minute presentation at the MWEA Annual Conference.
- Write an article for both the MSTA newsletter and the MWEA magazine describing your experiences implementing the classroom project.

Grant Application Process:

Grant applications are published in the fall issue of the MSTA newsletter, with an October 31, 2014 submission deadline. Determination of the award recipient will be made in November. The award will be presented at the MSTA conference in February 2015 at the awards banquet. This year, the award will be given to up to two middle/high school MSTA science teachers.

Process and Procedures for Applying:

1. The Dan Wolz Clean Water Education Grant application is available in this newsletter.
2. Submit the application by October 31, 2014 to the MSTA offices at: scampbell@managedbyamr.com with “Dan Wolz Award” in the subject line.
3. The MSTA Awards Committee and MWEA will make determination jointly.
4. Determination of the award winner will be made by end of the informing them of the selection decision. Applications can be considered for at least two years.
5. The Award recipient will be introduced at the MSTA Conference at the awards banquet in February 2015.

Expectations of the award recipient:

- Be available to accept this award at the MSTA State Conference Awards Banquet February 2015
- Write an article for both the MSTA and MWEA newsletters
- Give presentations at both the MSTA (March) and MWEA (June) state conferences in 2016

Past Recipients of the Dan Wolz Education Grant:

- | | |
|--|--|
| 2007 - Mary Lindow, Battle Creek | 2012 - Chris Groenhout, Grandville High School |
| 2008 - Emily Curry, Jackson Public Schools | 2013 - Dave Chapman, Okemos High School |
| 2009 - John Martin, Waterford School District | 2014 - Tammy Coleman, Lowell High School |
| - Randy Cook, TriCounty Schools | - Don Hammond, Flint Beecher High School |
| 2010 - Gary Cousino, Rochester Community Schools | |
| - Douglas Morrison, Manistique Middle School | |
| 2011 - Susan Tate, Whitehall Middle School | |

Need more Information?

- For more information about the award go to: <http://www.mi-wea.org/danwolz.asp>
- For more details regarding the grant itself, contact MWEA representative Joe Keefe at United Water at 734-675-2190.
- For more information about the Michigan Water Environment Association go to <http://www.mi-wea.org/main.asp>
- Questions about your applications? Contact Susan Tate at susan_tate@msta-mich.org

Dan Wolz Clean Water Education Grant Application

The mission of the Michigan Water Environment Association:

Michigan Water Environment Association will be a recognized authority on and advocate for preserving, restoring, and enhancing Michigan's water resources

Grant Narrative:

- Describe your project and share how this project relates to your curriculum and teaching practice with students and or science teachers (Maximum one page.)
- Purpose of Grant: Give your statement of how you can share with others in your community as well as other educators in the state of Michigan what you have implemented with your students. (Maximum one page.)
- Provide a summary of why you are interested in Michigan's water resources Identify the locations and contact information for the nearest water treatment plant(s) in the school district where you teach. Do these facilities offer tours? (Maximum one page.)
- Rubric used in the selection process will be available on the MSTA web site <http://www.msta-mich.org/>

Contact Information:

Name: _____

Home Address: _____

City: _____ State: ____ Zip: _____

Phone Number: _____ Email Address: _____

School District: _____

School Name: _____

School Address: _____

City: _____ State: ____ Zip: _____

Position/Title: _____ Grade Level (s): _____

Completed Applications must be received by MSTA by October 31, 2014.

Email completed applications to: scampbell@managedbyamr.com with "Dan Wolz Award" in the subject line. Questions regarding the application process or your grant proposal should be emailed to Susan Tate at susan_tate@msta-mich.org.

Dan Wolz Clean Water Education Grant Rubric

| Criteria | Unsatisfactory (0 - 9 points) | Basic (10 - 14 points) | Average (15 - 19 points) | Above Average (20 - 25 points) | Distinguished (26 - 30 points) |
|----------------------------------|---|--|---|---|--|
| Project Description | Project not clearly defined | Project description is marginal. | Adequate project description. | Proficient project description. | Superior description of project |
| Connection to GLCES and/or HSCES | No Connection to GLCES and/or HSCES | Marginal reference to GLCES and/or HSCES | Adequate reference to GLCES and/or HSCES | Reference to GLCES and/or HSCES is proficient. | Detailed connection to GLCES and/or HSCES |
| Dissemination Plan | Does not articulate a dissemination plan | Marginal evidence of dissemination plan | Adequate evidence of dissemination plan | Proficient evidence of dissemination plan | Detailed dissemination Plan |
| Sustainability | No evidence of sustainability | Marginal evidence of sustainability | Adequate evidence of sustainability | Evidence of sustainability is proficient | Details evidence of Sustainability |
| Links to Grant Goals and Results | Application does not have a link to the stated goal and intended results of the grant | Poor attempt to link to the goal and intended results of grant | Adequate attempt to link to the stated goal or intended results of the grant. | Application is linked to the stated goal and intended results of grant. | Distinguished link to the stated goal and intended results of grant. |

The goal is to enable Michigan teachers to be aware and promote careers in water environment, water quality, and wastewater management not only to their students but also to the science community.

The results we are seeking would be students throughout Michigan who will have a much greater awareness and appreciation of the contribution this great industry makes to our society and maybe even become inspired to choose a career path that would make them a part of that contribution.

Professional Resources & Opportunities



Presidential Awards for Excellence in Mathematics and Science Teaching

Do you know, or are you an exemplary math or science teacher in seventh through twelfth grade? Please consider nominating him or her for the PAEMST Award. The Presidential Awards for Excellence in Mathematics and Science Teaching is the highest recognition a K-12 teacher can receive for outstanding science or mathematics teaching in the United States.

Why apply? Recipients of the award receive the following:

- A certificate signed by the President of the United States.
- A paid trip for two to Washington, D.C., to attend a series of recognition events and professional development opportunities.
- A \$10,000 award from the National Science Foundation.

In addition to recognizing outstanding teaching in mathematics or science, the program provides teachers with an opportunity to build lasting partnerships with colleagues across the nation. This growing network of award-winning teachers serves as a vital resource for improving science, technology, engineering, and mathematics education and keeping America globally competitive.

Awardees are recognized for their contributions to teaching and learning and their ability to help students make progress in mathematics and science. In addition to honoring individual achievement, the goal of the award program is to exemplify the highest standards of mathematics and science teaching. Since the program's inception in 1983,

more than 4000 outstanding teachers have been recognized for their contributions to mathematics and science education. If you know great teachers, nominate them to join this prestigious network of professionals.

Nominations will soon be accepted online (www.paemst.org) for the 2015 Presidential Awards for Excellence in Mathematics and Science Teaching. (Please continue to check the website for the opening of the 2014-15 cycle.) Teachers may nominate themselves or someone else (e.g., principals, teachers, parents, or other members of the general public) may nominate them for this award. **The PAEMST Online Application will be available later this fall.** To apply, teachers must first be nominated for the award. Once nominated, teachers will receive an email with a login and password to access the online application. The application deadline for secondary teachers (Grades seven through twelve) is May 1, 2015. Elementary teachers (Kindergarten through sixth grade) are eligible to apply in 2016.

The Michigan Department of Education has asked the Michigan Science Teachers Association to oversee this program for the State of Michigan. We are honored to be the host of this awards program. If you have any questions, please feel free to contact, Betty Crowder, our State Coordinator, at betty_crowder@msta-mich.org. In the meantime, please visit the Presidential Awards website to find the nomination form for the teacher of your choice! Why not you? www.paemst.org The rewards are worth the effort! You deserve it!



greatlakes place-based education conference 2014



Earn SCECHs!
SCECHs (formerly SB-CEUs) offered by Kent County ISD. (Additional fee may apply.)

Join us for a **grand gathering** in Grand Rapids, Michigan!

Our 4th annual Great Lakes Place-based Education Conference (November 6–8) brings together practitioners and teachers, local partners, and other organizations, all of whom provide vital leadership and resources for the development of environmental stewards of the Great Lakes and their ecosystems.

Students involved in place-based education better understand complex subjects like math and science, and help make their communities and the environment a better place in which to learn, live, work, and play.



expandingclassrooms
strengtheningcommunities
developingstewards



This year's conference is co-hosted by the Great Lakes Stewardship Initiative and Groundswell, a regional GLSI hub at Grand Valley State University.

glstewardship.org



IT'S HERE!! Register today for this year's annual MAEOE Conference!

This year promises to be a can't-miss event! Pack your bag and head up to Higgins Lake and the peaceful surrounding of the Ralph A. MacMullan Conference Center. Online registration is scheduled to be live by the end of July/beginning of August. Let's STREAM through Environmental and Outdoor Education together!

Friday Conference Highlights

Workshops and Field Trips:

- Michigan Elk Management Field Trip
- Hartwick Pines and Kirtland's Warbler Field Trip
- Waste Management Landfill Field Trip*(new)
- MEECS Ecosystems and Biodiversity Training
- Project WILD Aquatic Curriculum Training
- Flying Wild Curriculum Training
- ABCs of Ecology Curriculum Training
- Mischievous Mushrooms and Mysterious Molds Workshop
- Habitatitude Workshop with MI SeaGrant

Friday night, enjoy a twist on an old favorite - an after dinner Share-a-Thon. Bring a five minute activity, a make-and-take, or a synopsis of your favorite lesson along with something for "sharee's" to take home. To all you shy folks - this is a great way to dip your feet into the idea of presenting! If that's not a sweet enough deal, the first ten sharers who pre-register* their topic with the Program Chair will receive a free conference T-shirt! *by the September deadline. Mix, mingle and share best practices in eSTEM!

Saturday Conference Highlights

On Saturday, investigate mammals, learn about best practices in taking kids outside to learn, hear how urban teachers are finding a place in EE or get tips on getting grant money to fund that awesome idea you have! Or attend sessions on how to plan programming for less targeted audiences like special needs or older populations, or learn strategies connecting STEM and nature with your audience of all ages. Not intrigued yet? How about touring Higgins Lake by canoe, learning about a teacher's experience at the Iditarod, or sampling edible wild plants you can use in the classroom! There is something for everyone at the MAEOE conference! Don't miss the Saturday midday keynote address, the special sessions about Michigan's Environmental Literacy Plan, and of course, the annual MAEOE Awards Ceremony. (P.S. If you know of a deserving nominee, Kevin Frailey is this year's Awards Chair. Deadline for nominations is August 31! For Awards forms, see the

MAEOE Conference website at the bottom of the page: http://www.maeoe.com/2014_Conference.html.

Cap off the evening with a campfire, stargazing, and other woody events along with awesome social networking - the kind that doesn't need a battery! Feel free to BYO-whatever to share with new and old friends. Campfire musicians are welcome too!

Sunday Conference Highlights

Don't leave right away on Sunday morning! There are Sunday sessions too, as well as the MAEOE Annual Meeting! School greenhouses, tips and tricks, and other great information await you before you head home to begin re-STREAMing in your home town.

All-weekend-long events!

Don't forget these conference favorites: vendors, exhibitors, the book store and the Silent Auction. Bring home a treasure you didn't even know you needed! Bring your donations and your checkbook! (*This year's Silent Auction chair is Katie Kunze. Contact her if you have donations, big or small. Don't worry - donations are always welcomed at the door as well!)

Here are some suggestions of what to bring:

- Clothes for the weather ... It's Michigan, it's October and it's north, which means we have 50 degree range of possible temperatures! Raingear, boots, warm layers or who knows, maybe a swimsuit might be a good idea! Remember, some sessions will have an outdoor component.
- Sunscreen and insect repellent... just in case
- Toiletries and personal items
- Your reusable cup or water bottle
- A notebook/pen/pencil to write down awesome ideas
- Your favorite snack or beverage to share at a campfire or social
- Binoculars
- A Share-a-Thon activity with ample copies to share
- Business cards
- Silent auction donations
- Your camera (it will be fall color tour season!)

Looking forward to seeing you there!!

- Anne Jeannette LaSavage, Conference Program Chair

For more details and to register, visit http://www.maeoe.com/2014_Conference.html

Professional Resources & Opportunities

Midland Section of the American Chemical Society Teacher Workshops

From Gina Malczewski, American Chemical Society, Midland

A FANTASTIC FALL opportunity is being provided to science educators by the Midland Section of the American Chemical Society. Please be on the lookout for an email invitation for you to register for the FREE teacher workshop being offered at Bay City Western High School on Saturday, Nov 1st, 8 am to 5 pm. This workshop will focus on preparation for and compliance with Next Generation Science Standards. It will feature the following FREE sessions (with activities suitable or modifiable for K-12, especially middle school), for which SCECHs are expected to be offered:

MORNING, 8-12 (parallel sessions; choose ONE)

Hands-on workshop: Sci Tech Next Generation, Part 1, 6 units with many activity options (4 hr) Max 30

- Connected to NGSS standards
- Observation and Measurement (including Temperature), Density, Energy, Weather and Climate, Water, and Science/technology Interface
- FREE booklet with details on all activities, modifications, safety
- Opportunity for FREE supplies

Hands-on "classic" workshop: Bringing Science to Life in the Classroom (4 hr) Max 30 Participants

- 16 short units in several groups: Properties of Matter, Acids and Bases, Chemical Reactions, Diffusion, and Food Chemistry
- FREE booklet with details on all activities, modifications, and safety
- Opportunity for FREE supplies

Family Engineering Overview (sponsored by SVSU Science and Math Center)

- One hour; participants will experience the FE stations and learn how to they can facilitate their own FE event.

Fisher Scientific workshop(s): TBD—more info to come

LUNCH 12-1pm , Media Center

Speaker: Dr. Melanie Cooper, the Lappan-Phillips Professor of Science Education and Professor of Chemistry at Michigan State University

"Working with the Next Generation Science Standards (NGSS)"

Why do we need NGSS? How do we address the standards and prepare for them?

AFTERNOON 1-5pm (parallel sessions)

NEW Hands-on workshop Sci Tech Next Generation, Part 2, 6 units with many activity options (4 hr; max 30)

- Part 1 is NOT needed as a prerequisite
- Connected to NGSS standards
- Reactions, Polymers, Science and Art, Microbiology, Wave phenomena, and Field phenomena
- Free booklet with details on all activities, modifications, and safety
- Opportunity for FREE supplies

Family Engineering Overview (sponsored by SVSU Science and Math Center)

- One hour; participants will experience the FE stations and learn how to they can facilitate their own FE event.

Fisher Scientific workshop(s): TBD—more info to come

ACS Mini-activities, one hour each—if attendance warrants

Panel discussion/Speak Out Session (TENTATIVE): What concerns you about NGSS

Mini-vendor station during the day:

- Fisher Scientific
- Get a ticket for FREE giveaways from Educational Innovation
- Get a ticket for FREE ACS science kits

Are You Prepared... to Teach in the 21st-Century Classroom?

Lawrence Technological University

Can Help!

Master of Science Education

- \$1,320 per course scholarships for all K-12 educators (DI or non-DI endorsement).
- Most courses offered online and asynchronous, with a science experiment component to be completed using science kits and activities.
- Science content developed by Lawrence Tech in partnership with the Detroit Zoological Institute, Cranbrook Institute of Science, Aquinas College, and the University of Detroit Mercy.
- Courses aligned with the Michigan Department of Education requirements for Science and the DI (Integrated Science) Endorsement.

Master of Educational Technology

- \$1,320 per course scholarships for all participants.
- 100 percent online and asynchronous format.
- This practice-oriented program is offered by Lawrence Tech in partnership with Marygrove College. Courses cover up-to-date technologies in instruction, Web-based learning tools, streaming video, electronic communication, and software and hardware options.
- Complete the seven required courses of the Master of Educational Technology degree and be eligible for the NP endorsement on your existing teaching certificate.
- Some curriculum requirements will be tailored individually based on the candidate's goals. Instructional Technology graduate certificates (12 credits) are also available.

Explore over 100 undergraduate, master's, and doctoral programs in Colleges of Architecture and Design, Arts and Sciences, Engineering, and Management.

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Professional Resources & Opportunities

Developing Middle/High School Students as Forest Stewards in Urban Detroit

By Joan Chadde, Urban Forest Stewardship Project Coordinator and Education Program Director, Center for Science & Environmental Outreach at Michigan Technological University

The 5-day Urban Forest Stewardship Teacher Institute at Belle Isle in Detroit (June 23-27) was jam-packed with information, resources and exciting lessons from experts in the fields of forestry, nature and environmental science. I look forward to implementing hands-on lessons and investigations for my students during the 2014-2015 school year on trees, birds and insects. It is my goal to inspire a sense of caring and stewardship in my students so that we can do our part in promoting the health of Michigan forests and the plants and animals that live there," enthusiastically explains Zakiya A. Jackson, Special Education Teacher, Ralph E. Bunche Preparatory Academy, Detroit Public Schools.

Jackson is one of 56 middle & high school teachers from 29 urban schools who have participated over the past three years (July 1, 2011 to September 30, 2014) in the "Building Community Capacity to Manage Private/Public Forests & Develop Forest Stewards" project funded by an \$80,000 grant from the U.S. Forest Service. Together, these 56 teachers will reach more than 1,800 Detroit and Wayne County students in Grades 5-12 each year.

Michigan Technological University received the grant in 2011, in partnership with the Michigan Alliance for Environmental & Outdoor Education (MAEOE), Hawk Woods Nature Center (Mike Mansour), Belle Isle Nature Zoo (Mike Reed), Michigan Forest Foundation (Bill Botti), Detroit Public Schools Office of Science (Alycia Meriweather), and Michigan Project Learning Tree (Ada Takacs), who together provided the required 1:1 cost share by volunteering their time, providing facilities, and/or curriculum resources at no charge.

Each of three cohorts of approximately 20 Detroit upper elementary, middle, and high school teachers attended a year-long teacher professional learning program that included three Saturday workshops during the school year and a 5-day summer teacher institute focused on forest ecology, management, and stewardship, as well as, developing outdoor teaching skills and engaging hands-on lessons. In addition, teachers received classroom/field supplies, field trip travel expenses,

and a stipend to develop a schoolyard natural area using native Michigan tree, shrub and flower species. Students visited Belle Isle 2-3 times during the school year, culminating in their participation in a stewardship project on Belle Isle (trail improvements, invasive plant removal, shoreline plantings, stream clean ups, and planting a wildlife garden).

La Trelle Pierre, another teacher participant from Bunche Academy, observed, "Participating in the Urban Forest Stewardship Program has reminded me to be more aware that I need to integrate the environment into my classroom planning. Having the chance to be outside is very important for my students during this time in their lives in order to make them aware of environmental issues. As a result, many of my students are now showing signs that they care about our school grounds and the local community. I have seen students reminding others to recycle and picking up trash around school."

Learn more about the project at http://www.maeoe.com/Urban_Forest_Initiative.html or contact Joan Chadde at 906-487-3341 or email jchadde@mtu.edu at Michigan Technological University.



Professional Resources & Opportunities

Michigan Technological University Urban Forestry Teacher Institute at Belle Isle

By Theresa Clayton, Mark Twain School for Scholars, Detroit Public Schools



Michigan Technological University held a fantastic one-week summer course at Belle Isle in Detroit called "Urban Forest Stewardship Teacher Institute". I made an excellent choice when I decided to attend this institute. Our hosts/instructors Joan Chadde and Chris Hohnholt were

knowledgeable, professional, enthusiastic, personable, accommodating, and timely. The activities Joan Chadde and Chris Hohnholt planned for us taught me how to encourage my students to enjoy and respect nature.

The Institute took us on several field trips introducing us to organizational experts in the fields of insects, soils, trees, forests and urban forests. I had the opportunity to meet Dean Hay and Wade Rose from the Greening of Detroit who educated us about tree identification, urban forestry and their impacts in Detroit. Bill Botti of the Michigan Forest Association taught us tree anatomy and how to measure and understand tree and forest health. Jim Hunt of the Hardwoods of Michigan Sawmill gave us a tour so we could learn how a sawmill operates. Alan Chartier taught us how to bird watch. Kevin Sayers of the Michigan Department of Natural Resources took us on a tour of some of Detroit's urban forests. Chris Hohnholt had us make "insect traps" and helped us identify various insects native to Belle Isle and Michigan (some of us science teachers were a bit squeamish). All of the experts discussed forest ecology, conservation, and the emerald ash borer's effect on the nation's ecosystems. They invited us to bring our classes for tours and gave us their contact information with directions to call on them if we needed assistance.

Lisa Perez of the United States Department of Agriculture and Mike Reed of the Belle Isle Nature Zoo were with us the majority of the week. They assisted us in maneuvering around Belle Isle and answered our questions pertaining to federal and local initiatives in urban forestry. The icing on the cake was our overnight camping trip with Mike Mansour to Hawk Woods Nature Center. It was great! We were very busy as Mike planned a long adventurous day for us that included delicious meals. During our time with Mike Mansour, we hiked through Hawk Woods, a truly serene and beautiful place, explored Project Learning Tree activities created for our students, discussed urban forestry and educational policies as they affect us and our communities, and brainstormed ways to improve our teaching of urban forestry.

Urban, suburban, rural, private, public, elementary, middle and high school Michigan educators attended this institute. There were seasoned science teachers and those of us who felt our science teaching could use a boost. I enjoyed conversing with my colleagues about our diverse educational experiences and environments. The Michigan Technological University Urban Forestry Teacher Institute at Belle Isle was a great experience that I definitely recommend to other educators. Next year I would like to attend the Teacher Institute held on the campus of Michigan Technological University. Thanks to Chris Hohnholt, Joan Chadde, the School of Forestry Resources and Environmental Sciences at Michigan Technological University, the Michigan Forest Foundation and the United States Forest Service for making this Institute possible and affordable for educators.

Pure Michigan *Science*
Engineering Grand Ideas in Science
Amway Grand Plaza Hotel, Grand Rapids, MI

MSTA 62nd Annual Conference
February 27-18, 2015

Professional Resources & Opportunities

Touching, Seeing (and Smelling) a Fisheries Lesson: All Aboard the Summer Discovery Fisheries Cruise

By Autumn Poisson, Michigan Sea Grant



Heading out on the water to learn about the aquatic environments makes sense when the opportunity presents itself! I was able to do just that recently, joining in on a Summer Discovery Cruise out of Lake St. Clair, at the heart of the Great Lakes. Summer Discovery Cruises offer everyone the chance

to explore Lake Erie and the Detroit River or Lake St. Clair. Participants learn about a wide variety of Great Lakes topics from lighthouses and shipwrecks to fish, ecology and restoration, depending on which cruise is selected. It's just one of the ways Michigan Sea Grant, one of the sponsors of the cruises, helps connect people to the Great Lakes and freshwater education.

The Discovery Cruise I boarded was the fisheries-themed trip on Lake St. Clair. Learning about the fish that call Lake St. Clair home was a great way to connect with the vast aquatic ecosystem located right in our backyards. While shallow — its deepest point is 27 feet and its average depth is 11 feet — Lake St. Clair is a fishing promised land for anglers. Smallmouth bass, yellow perch, musky and walleye are the top four species sought and caught.

A Michigan Department of Natural Resources (DNR) fisheries biologist led the cruise, along with expert educators. The cruise leaders discussed the different characteristics of Lake St. Clair, handed out helpful food web graphics and answered crowd questions. As the cruise went on, the leaders took out a bag of frozen fish — letting us get an up-close-and-personal look to improve our fish identification skills with real specimens.

As a special bonus, we even got the chance to observe a DNR fishing research vessel as fisheries workers tagged and measured a lake sturgeon. While populations are growing through restoration efforts such as fishing restrictions and citizen protection groups, lake sturgeon are still a relatively rare and wonderful species. The specimen the DNR boat

tagged was estimated to be about 40-70 years old, somewhat young for a sturgeon depending on its sex. They are the largest and the longest-lived fish species in the Great Lakes region. A male lake sturgeon lives for 50-55 years, on average, while females have a lifespan of 80-120 years.

While it was a fun ride out on a beautiful lake looking at fish, it was also more than that. It was an interactive way of learning about the Great Lakes. For example, I went with a group of coworkers from Michigan Sea Grant, and we were able to do our own water sampling to generate some water quality data and to test out a new citizen-science-in-the-field app.

It was fantastic to be in the field, seeing and touching (and smelling, in the case of the frozen fish) the things we were learning about. It's not difficult to understand why many educators and students are leaning toward more experiences outside of the classroom. While the Summer Discovery Cruises are a great way to get out on the water — there's even a science-teacher-themed cruise — Michigan Sea Grant has other means to help connect educators, students, and citizen scientists with the Great Lakes.



Professional Resources & Opportunities

Inspiring Detroiters to Consider Careers in Natural Resources & Environmental Science

From Joan Chadde, Education Program Coordinator, Michigan Technological University

If you ask many who are employed in the natural resources and/or environmental science field, "why they chose their profession?" they are likely to recall their fond memories of spending time in Michigan's "great outdoors" which makes one wonder how urban children will be attracted to this profession? After spending 3 years getting Detroit students outdoors at Belle Isle State Park, their enjoyment of the outdoors had clearly increased. But it was not clear if they had a better understanding of natural resource career paths. Research has demonstrated that we are inspired by role models—so posters displaying Detroiters in natural resource career paths was created to provide role models for today's youth. Increasing the diversity of our future work force in natural resources and the environment is a goal of federal agencies and universities.

Michigan Technological University took the lead and partnered with the U.S. Forest Service Urban Connections Program, Michigan Alliance for Environmental & Outdoor Education (MAEOE), Belle Isle Nature Zoo, and Michigan Department of Natural Resources (MDNR) to create two posters whose goal is raising awareness and encouraging urban Detroit youth to consider careers in natural resources and environmental science fields. The posters were designed by Hannah Abbotts, graphic designer in the Michigan Tech School of Forest Resources & Environmental Science. This fall, the posters will be displayed in the MDNR's new Outdoor Adventure Center in the Globe Building in downtown Detroit across from Milliken State Park.

The posters profile eight people who grew up in Detroit, currently aged 20 to 50-something, who work for a variety of employers, in a range of careers. Each person describes their current job, what inspired them, their degree(s), and which Michigan University they attended.

Read about these inspiring Detroiters and their... CAREERS IN NATURAL RESOURCES AND ENVIRONMENTAL SCIENCE

TERRIANNA BRADLEY
Research Lab Assistant,
Michigan Technological University
I chose a major in natural resources after working on a fall semester while in high school at Belle Isle in Detroit. After my medical career ended, Dr. Bradley was inspired by Dr. Keith Young, who I met at Michigan Tech. I was inspired to do a research project on water quality research lab assistant at the Great Lakes Research Center where I conducted experiments on algae and phytoplankton collected from Lake St. Clair. I spent my final year in college at Michigan Tech. I was inspired to do a research project on water quality research lab assistant at the Great Lakes Research Center where I conducted experiments on algae and phytoplankton collected from Lake St. Clair. I spent my final year in college at Michigan Tech.

BRITNEE SHOWS
Wildlife Biologist Trainee,
U.S. Forest Service
High School: Cass Tech
College: Michigan State University
Major: B.S. Fisheries & Wildlife
The things that I love the most about my job are taking trips to the Grand Zoo and visiting Animal Planet when I am going to work. I found it to be an interesting job. After exploring several majors at Michigan State, I enrolled in my first Fisheries & Wildlife course. I had no idea you could even obtain a degree in Fisheries & Wildlife when I began college. On our first day of class we were introduced to the field of fisheries and wildlife management. I had never heard of it on the right page.

GARY WILLIAMS
Urban Natural Resources Outreach Program Coordinator,
Michigan State University Extension
My dad was an avid outdoorsman and I shared his love of the outdoors with his family. I have always been an avid outdoorsman. I love to camp, hunt and fish. As an Urban Natural Resources Outreach Program Coordinator, I have the opportunity to engage children and teens in outdoor activities. I have been successful in teaching them about fishing, hunting, and camping, and have inspired over 100,000 youth in Michigan to get outdoors.

KATHY GARLAND
Archery Education Coordinator,
Michigan Department of Natural Resources
I am responsible for promoting outdoor and bow hunting statewide through in-school and out-of-school programs. As the state coordinator of the Michigan National Archery in the Schools Program, I am responsible for the planning, development, and implementation of the program. When the opportunity came to work for the Michigan Department of Natural Resources, I was inspired to see students demonstrating their archery skills in school or at the park is a powerful thing. An amazing feeling of accomplishment is what inspires me from all over Michigan compete in archery.

See Larger version on page 41.

Read about these inspiring Detroiters and their... CAREERS IN NATURAL RESOURCES AND ENVIRONMENTAL SCIENCE

MICHAEL REED
Park Ranger, Belle Isle Nature Zoo
I got inspired to work by being neighborhood (the walk) my class while attending Central Michigan University. As a student and as a student, I was always "tired out the window." My parents encouraged me to go to college to get a degree in environmental science. I was inspired to go to college to get a degree in environmental science. I was inspired to go to college to get a degree in environmental science.

GARY CRAWFORD
Fisheries Biologist,
Environmental Consulting & Technology Inc.
High School: Cass Tech
College: Wayne State University & Eastern Michigan University
Major: B.S. Biology
The natural world interested me from an early age, but I never considered it as a career. I went to college at Cass Tech, then Eastern Michigan University. I was inspired to go to college to get a degree in environmental science. I was inspired to go to college to get a degree in environmental science.

SHELTON JOHNSON
Interpreter, Ranger,
National Park Service
Shelton is an advocate for bringing minorities, particularly African Americans, to the National Parks and connecting them to the natural world. He is dedicated to researching the history of the Buffalo Soldiers - African American veterans who served the protection of the new National Parks in California's Sierra Nevada in the 1800s. He has created innovative interpretive programs to teach visitors about the Buffalo Soldiers in Yosemite National Park. In 2009 he received the National Freeman Tilden Award as the best interpreter ranger in the National Park Service - and he was invited to meet President Obama at the White House.

TAMIKA DANDRIDGE
Biologist, U.S. Fish & Wildlife Service
High School: Redford
College: Michigan State University
Major: B.S. Zoology
I was inspired to go to college to get a degree in environmental science. I was inspired to go to college to get a degree in environmental science. I was inspired to go to college to get a degree in environmental science.

See Larger version on page 42.

| Person | Profession | College | Degree | Employer |
|-------------------|---|-----------------------------------|----------------------------|--|
| Mike Reed | Environmental Education, Wildlife Biologist | Wayne State University | B.S. Biology | Detroit Zoological Society/Belle Isle Nature Zoo |
| Shelton Johnson | Interpreter | University of Michigan | B.A. English | Yosemite National Park |
| Gary Crawford | Fisheries Biologist | Eastern Michigan University | B.S. Biology | Consulting |
| Tamika Dandridge | Wildlife Ecologist | Michigan State University | B.S. Zoology | U.S. Fish & Wildlife Careers |
| Terrianna Bradley | Environmental Engineering | Michigan Technological University | B.S. Env. Engin. | Michigan Tech University |
| Britnee Shows | Wildlife Biologist | Michigan State University | B.S. Fisheries & Wildlife | U.S. Forest Service |
| Kathy Garland | Archery in the Schools State Coordinator | Central Michigan University | B.S. Community Development | Michigan Dept. of Natural Resources |
| Gary Williams | Natural Resources Outreach Educator | Eastern Michigan University | B.A. Mass Communications | Michigan State University Extension |

Read about these inspiring Detroiters and their...
NATURAL RESOURCES AND ENVIRONMENTAL SCIENCE CAREERS IN



TERRIANNA BRADLEY
 Research Lab Assistant,
 Michigan Technological University

High School: Cass Tech
College: Michigan Technological University
Major: B.S. Environmental Engineering

I chose a major/career in natural resources after working as a lab assistant while in high school at EcoTek Lab in Detroit, taught by Dr. Keith Young. When I came to Michigan Tech, I was invited to do a research project and asked Dr. Martin Auer to be my mentor. I now work for Dr. Auer as a research lab assistant at the Great Lakes Research Center, where I conduct experiments on algae and phosphorus collected from Lake Cayuga in upstate New York. I also teach younger students (grades 4-12) as a part of the "Ride the Waves" program funded by General Motors. I love taking them on the lake aboard the Agassiz research vessel to collect samples that we bring back to the lab!



GARY WILLIAMS
 Urban Natural Resources Outreach Program Coordinator,
 Michigan State University Extension

High School: Mackenzie
College: Eastern Michigan University
Major: B.A. Mass Communication

My dad was an avid outdoorsman and he shared his love of the outdoors with his family. I have always been an active outdoorsperson - I love to camp, hunt and fish. As an Urban Natural Resources Outreach Program Coordinator, I create programming to engage children and urban residents in outdoor activities, including fishing, archery, camping, and nature studies. Since 1999, I have involved over 102,500 people in outdoor learning.

BRITNEE SHOWS
 Wildlife Biologist Trainee,
 US Forest Service

High School: Oak Park
College: Michigan State University
Major: B.S. Fisheries & Wildlife

I've always had a love for animals! I enjoyed taking trips to the Detroit Zoo and watching Animal Planet when I was growing up. Early on, I planned to study veterinary medicine. After exploring several majors at Michigan State, I enrolled in my first Fisheries & Wildlife course. I had no idea you could even obtain a degree in Fisheries & Wildlife when I began college! On our first day of lab we were electroshocking fish in Red Cedar River - it was at that moment that I knew I was on the right path!



KATHY GARLAND

**Archery Education Coordinator,
 Michigan Department of Natural Resources**

I am responsible for promoting archery and bow hunting statewide through in-school and recreational programs. As the state coordinator of the Michigan National Archery in the Schools Program, I am responsible for the planning, development, implementation, and evaluation of school programs. When the opportunity came my way, I could not pass up the chance to introduce archery to students! To see students demonstrating their archery skills in school or in the parks is priceless! It is an amazing feeling of accomplishment to watch students from all over Michigan compete in archery.

High School: Cass Tech
College: Central Michigan University
Major: B.S. Community Development
 M.S. Health Service Administration



WHAT IS A NATURAL RESOURCES & ENVIRONMENTAL SCIENCE CAREER?
 People often choose natural resources careers because they enjoy nature, want to learn more about plants and animals, protect air and water quality, manage forests, state and national parks, work on environmental justice issues in urban areas, promote public health through a cleaner environment & provide outdoor recreational opportunities.



VISIT WWW.FOREST.MTU.EDU

Read about these inspiring Detroiters and their...

CAREERS IN NATURAL RESOURCES AND ENVIRONMENTAL SCIENCE

Gary visited Belle Isle often as a boy, coming there to fish with his father and grandfather. He loved being outside. He often said he was "most at home on the lake."

Gary felt strongly that he wanted to encourage youth to consider careers in natural resources. He said "we need to mentor young African Americans to take our place."



GARY CRAWFORD

Fishery Biologist,

Environmental Consulting & Technology, Inc.

High School: Cass Tech

College: Wayne State University & Eastern Michigan University

Major: B.S. Biology

The natural world interested me from an early age, but I never considered a career in it until college. As a child, I enjoyed National Geographic and later the Discovery Channel (I wanted to be like Jane Goodall or Diane Fossey, but with wolves, not primates).



TAMEKA DANDRIDGE

Biologist, U.S. Fish & Wildlife Service

High School: Redford

College: Michigan State University

Major: B.S. Zoology

M.S. Fisheries & Wildlife

Oversees implementation of the Endangered Species Act and recovery of federally listed species by working with federal agencies and through education.

Provide presentations on Michigan's endangered/threatened species, lead students in the field to search for these species.

Work with other federal and state agencies, NGOs, zoos, and others on the recovery of endangered and threatened species.

MICHAEL REED

Manager, Belle Isle Nature Zoo

I got hooked on science by taking neighborhood nature walks with my class while attending Courville Elementary in east Detroit. My teacher used to tell my parents I was always "staring out the window!" My parents encouraged my love of science by giving me my own space in the basement which I called the "Lab." I was the first person in my family to graduate from college.

I've worked with over 400 species of animals. Spiders are my area of expertise. I am responsible for the health and welfare of the animals at the Belle Isle Nature Zoo.

As an Environmental Educator, my greatest pleasure comes from mentoring youth and adults to be stewards of the environment.



High School: Benedictine

College: Wayne State University

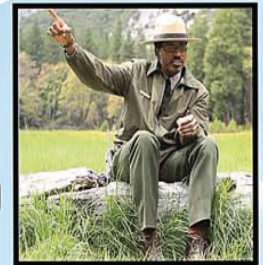
Major: B.S. Biology & General Science

27 years working for the Detroit Zoological Society

Environmental Scientist, Zoologist, Environmental Educator

SHELTON JOHNSON

Interpretive Ranger, National Park Service



Shelton is an advocate for bringing minorities, particularly African-Americans, to the National Parks and connecting them to the natural world. He is dedicated to researching the history of the Buffalo Soldiers-- African-American regiments assigned to the protection of the new National Parks in California's Sierra Nevada in the 1880s. He has created numerous interpretive programs to teach visitors about the Buffalo Soldiers in Yosemite National Park. In 2009, he received the National Freeman Tilden Award as the best interpretive ranger in the National Park Service ...and he was invited to meet President Obama at the White House.

High School: Cass Tech

College: University of Michigan

Major: B.A. English Literature

People often choose natural resources careers because they enjoy nature, want to learn more about plants and animals, protect air and water quality, manage forests, state and national parks, work on environmental justice issues in urban areas, promote public health through a cleaner environment & provide outdoor recreational opportunities.

VISIT WWW.FOREST.MTU.EDU



Professional Resources & Opportunities

Opportunities: Grab Some!

From Mary Brown, MSTA Conference Scholarship Winner

Introduction

We're at the beginning of another school year. Teachers know there is no more exciting time! We have new classes, a new group of students, and an opportunity for another great year. Here's hoping your plans for the upcoming school year include a greater involvement with science. This article will focus on opportunities I used to our advantage over the past several years. I always liked to review these at the beginning of a new school year. Whether you're an elementary, middle school, high school or college level teacher, hopefully you can find something useful in this brief list.

Citizen Scientists

In my class of pre-service integrated science elementary education majors, we investigate many citizen scientists' sites. The course has a folder of linked sites we explore. Some sites you probably know: E-Bird from Cornell (which also has a nest watch, feeder watch and other bird related sites); Frog Watch; Monarch and Journey North, and Zooniverse. My students really like Zooniverse as it has deviated from the traditional nature options and includes opportunities to participate in space, genetics, cancer, and climate investigations. In our class, the assignment is to develop a quick lesson using these sites. They use NGSS to do so. It's a great opportunity to combine math common core as many of these sites have graphs and show trends. "Engaging in argument from evidence" is one of the science and engineering practices. This is a great source for using evidence and interpreting data.

NSTA has a citizen science lesson book available and details are in the reference section. The book is limited to biology, middle and high school. I have anecdotal evidence from former students that they are using some of the sites we reviewed in upper elementary classrooms.

Contest

During the school year it is very noticeable how much attention is paid to athletic contests. As the year progresses, the school moves attention to football, soccer, tennis, basketball and baseball. Each season is filled with a competition. The students in my class investigate opportunities for science or academic competitions. There are many! You are probably familiar with Science Olympiad. The Olympiad is a middle school and high school opportunity that starts in the fall and continues through regional contests in the early spring with state contests later and a world contest just prior to the end of the academic year. There is an elementary version as well and also a non-competitive elementary fun day. If you have never been involved in Science Olympiad, you should seriously consider. Just last week a high school English teacher related her excitement in being a co-coach for her school's competition. It's an opportunity to recruit parents and colleagues!

Students have researched E-cybermission; Toshiba/NSTA ExploraVision; Future City; Odyssey of the Mind (has technology problems to be solved) and Young Scientists Competition. My ExploraVision experience was in the middle school years. Our team advanced an idea of a robotic programmable lawnmower. They researched the design, learned how lawn mowers worked, the challenges of programming, and received a participation certificate! Our Odyssey of the Mind team built a robot and centered their dramatic play on their creation. They came in third at the state level but did not advance further. All the feedback from the participants, including their parents was positive.

Since engineering is such a strong focus of the new standards, you might wish to consider a robotics contest. The high school/college students have been involved in First Robotics. It seems very active in Michigan with teams starting with Legos as young as six years old.

Science Fairs are still active. My students have been involved in East Lansing's Science Palooza held at McDonald Middle School. The college students serve as mentors to the middle school students as they prepare their investigations. Although the traditional science fair can be quite controversial, an approach that encourages participation by focusing on multiple science disciplines and process seems to alleviate many issues.

Science Centers

In the mid-Michigan area, Impression 5 Science Center is an excellent resource. Not only do they run contests for children (Lego-Palooza), but also have special events on Saturdays (Nano-Day), opportunities for classes to spend the night, and workshops by demand. Other areas of the state have similar resources. Volunteering is an option for high school and college age students, and is highly recommended. Not only is there a training period, but the potential for learning is high. Students of mine have volunteered and were grateful for the experience.

Local zoos also offer educational programs. Potter Park Zoo in Lansing has a week-long program for elementary classes. This BIG lesson is an immersion experience also offered by the Kalamazoo Area Mathematics and Science Center. College students who have served as chaperones were impressed at the problem-solving opportunities within these lessons.

There are also a number of nature centers which offer opportunities, field trips and educational resources. In the mid-Michigan area, we visited Fenner Arboretum, Woldumar and Harris Nature Center.

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Professional Resources & Opportunities

Opportunities

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Preuss Pets is a Lansing pet store which offers educational opportunities. Classes can visit the store as a field trip or they may request the educational expert to visit the classroom. In addition, their education expert can give advice on animals appropriate for a classroom pet. My students have evaluated her sessions as extremely useful. Many have said Megan convinced them of the benefits of a classroom pet and helped make an informed choice.

There are also community groups which can provide resources to a teacher and the classroom. The Lansing area has so many resources including Herpetology Society; Capital Area Audubon and the Central Michigan Lapidary & Mineral Society. These community groups offer programs for adults and focus on education. They have annual "shows" where your students can meet with members and develop a lifelong passion for birds, rocks or lizards! Our local Nature Discovery will travel to your school for trips with their animals. They have the largest collection of living amphibians, reptiles and salamanders in the state.

Clubs

After school science programs can be very inspirational. A former student now works for Mad Science based locally in Kalamazoo but with a small Lansing program. Not only does it give her the opportunity to be involved with motivated children, it provides them an alternative to routine day care options. There are other after-school programs run by community centers, and Foster Community Center in Lansing has an outstanding program that often works in science activities.

My students were actively encouraged to join their college student organization: The Future Teachers' Club. As members of the club, we were involved in the college and local community. We sponsored two Scholastic Book Clubs, donating books to the local Reading Is Fundamental Lansing School District project. We helped with outreach activities in the community with a focus on active engagement. Students served as officers and learned educational procedures.

Central Michigan University offers students the NSTA-CMU club. Their focus is similar but with a strict emphasis on science. These students have gone to local schools and offered family science nights too!

Family Science

My students were highly encouraged to be involved in our Science and Math Elementary Exploration each fall semester. This community program offered a Saturday morning with more than 50 different science/math related activities for

children and their families to explore. Students often served as event supervisors along with faculty and community experts. It was a very rewarding experience.

Michigan State University hosts a week-long event each April which they call a Science Festival. They have a number of community partners and great involvement in children's activities.

Curriculum Resources: Michigan is also very rich in curriculum resources for science. We are honored to have several fine public and private universities focusing on education. Many of these universities offer outreach programs which assist teachers. Most offer for credit opportunities directed specifically for educators. It is a wise plan to stay in contact with your in-state alma mater for the support they can provide after your graduation. This article will mention only a few programs with the hope others will become better known.

The GEMS Center at Central Michigan University provides STEM opportunities in mid and northern Michigan. They have opportunities for teachers (and pre-service teachers) to volunteer and also provide resources for teacher cohorts.

Battle Creek Math and Science Center has a curriculum that is commonly used in the lower half of the state. My students find their teacher background sheets very thorough and helpful.

My students are asked to explore the various "projects" which offer curriculum. They look at Project Wild, Project Wet, COSEE-Great Lakes, and Project Learning Tree, finding many local opportunities.

Conferences

Attendance at a conference, whether at the state level, or the national level is always a great opportunity for networking and professional growth.

My students have attended the National Science Teachers Association Conference (this year it's in Chicago!) and the Michigan Science Teachers Association (this year it's in Grand Rapids). I not only encouraged their volunteering for a reduced registration but also have them as co-presenters.

They have also attended other great conferences in state: Michigan Alliance for Environmental and Outdoor Education; Fall Update through Grand Valley State University and Metropolitan Detroit Science Association. These conferences are in the fall of the year and provide the opportunity to boost enthusiasm for those long winter months!

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Professional Resources & Opportunities

Opportunities

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Attending a conference also includes membership. Membership benefits for these organizations provides a network of intelligent individuals who can answer questions and many other resources. National Science Teachers Association has several listserves which are very helpful. They also provide electronic access to past journal articles. My plan for the next academic year is to include my students as members and use the website to deliver their content materials. Such a plan allows a reduced membership and access to all the content selected!

Funding

As you look through these opportunities you may be saying to yourself that you don't have the money for clubs, family science, memberships, curriculum materials, conferences etc...I understand that situation.

There are grants available, both through MSTA and NSTA. You can check those websites and also a simple search of "grants for Michigan teachers" brings you to the Michigan Department of Education website with a full page devoted to science.

One of my former students just posted a request on Donors Choose. She'd like help affording some technology for her lab. That's another avenue.

Summary

The list above is not at all comprehensive. It is regional. Other areas in the state will provide different opportunities. I highly recommend you consider new opportunities to excite you and your students about science. These can not only involve parents and the community but remind you of your commitment to your discipline and excite your students. Any of these opportunities just might carry you through to June!

Sites/text referenced in the article:

E-bird (<http://ebird.org/content/ebird/>)
Frog Watch (<https://www.aza.org/frogwatch/>)
Monarch (<http://www.mlmp.org/>)
Journey North (<http://www.learner.org/jnorth/monarch/>)
Zooniverse (<https://www.zooniverse.org/>)
Citizen Science: 15 Lessons That Bring Biology to Life, 6-12., edited by Trautmann, Fee, Tomasek and Bergey. NSTA press
Science Olympiad (<http://soinc.org/>)
E-cybermission (<https://www.ecybermission.com/>)
Toshiba/NSTA ExploraVision (<http://www.exploravision.org/>)
Future City (<http://futurecity.org/>)
Odyssey of the Mind (<http://odysseyofthemind.com/>)

First Robotics of Michigan (<http://www.firstinmichigan.org/>)
Young Scientists Challenge (<http://www.youngscientistchallenge.com/>)
Impression 5 Science Center (<http://www.impression5.org/>)
Potter Park Zoo (<http://www.potterparkzoo.org/>)
Kalamazoo Area Mathematics and Science Center (<http://www.kamsconline.com/>)
Preuss Pets (<http://preusspets.com/>)
Herpetology Society (<http://www.michherp.org/main1.html>)
Capital Area Audubon Society (<http://www.capitalareaaudubon.org/>)
Central Michigan Lapidary-Mineral Society (<http://michrocks.org/>)
Nature Discovery (<http://www.naturediscovery.net/>)
Mad Science (<http://kalamazoo.madscience.org/>)
Foster Community Center (http://www.lansingmi.gov/foster_community_center)
Fenner Arboretum (<http://www.mynaturecenter.org/>)
Woldumar (<http://woldumar.org/>)
Harris Nature Center (<http://www.hncfoundation.org/harris-nature-center.html>)
SMEE (http://www.lcc.edu/science/youth_programs/smee/)
Science Festival (<http://sciencefestival.msu.edu/>)
GEMS Center-CMU (<https://www.cmich.edu/colleges/ehs/unit/gems/Pages/default.aspx>)
Battle Creek Math and Science Center (<https://www.bcamsc.org/>)
Project Wild (<http://projectwild.org/>)
Project Wet (<http://www.projectwet.org/>)
COSEE-Great Lakes (<http://coseegreatlakes.net/>)
Project Learning Tree (<https://www.plt.org/>)
NSTA (<http://www.nsta.org/>)
MSTA (<http://www.msta-mich.org/>)
Michigan Alliance for Environmental & Outdoor Education (<http://www.maeoe.com/>)
Fall Update (<http://www.gvsu.edu/rmsc/>)
Metropolitan Detroit Science Association (<http://www.mdsta.org/>)
Michigan Department of Education (<http://www.michigan.gov/mde/>)
Donor's Choose (<http://www.donorschoose.org/>)

Professional Resources & Opportunities



ScienceProfOnline.com: Free Biology Education Resources for Instructors, Students & Parents

From Tami Port, MS, Biology Instructor at Kalamazoo Valley Community College and Chief Executive Nerd of ScienceProfOnline.com

ScienceProfOnline.com is a web resource I started developing several years ago, in cooperation with Colorado high-school science teacher Alicia Cepaitis, MS. The purpose of the site was to make all of the biology teaching materials that we have created over the years available, free of cost, to instructors, students, and parents. Below is a summary of what the site offers.

Free College & High School Biology Resources

SPO features completely developed and classroom-tested college-level microbiology, cell biology, general biology, and soon, anatomy & physiology course materials. Resources available include PowerPoint lectures, laboratory exercises, homework assignments, practice test questions, study guides, sample syllabi, as well as a science photo and video library. These college and high school materials are organized a couple of ways:

Virtual Classrooms



These are the main pages where I have my microbiology and cell biology students go to directly access course material during the semester. These are essentially ready-made micro and cell classes that any instructor teaching these subjects could use.

Currently we have instructors and students from 100 countries around the world and all 50 US states utilizing our resources as complete courses or pick and choose pieces to supplement lessons. All resources can be modified and customized to suit the individual using them. For examples of these course main pages see:

- The Virtual Microbiology Classroom: <http://www.scienceprofonline.com/virtual-micro-main.html>
- The Virtual cell Biology Classroom: <http://www.scienceprofonline.com/virtual-cell-main.html>

“Instructors Corner” Main Pages

Rather than being organized as a complete course that students would access directly, “Instructors Corner” pages have links to all of the site’s teaching resources organized by topic. For example, if an instructor is looking for a basic inorganic chemistry or molecular genetics lecture and supporting class materials, these can easily be found in the “Instructors Corner”. For an example, see:

- The Science Prof Online “Instructors Corner”: <http://www.scienceprofonline.com/instructors-corner/instructors-corner-main.html>

Free Grade School, Home School, and Parent Science Education Resources

I have young children and wanted to do more home science projects with them. So I also developed an area of the website for kids, where we could post the science experiments and activities that we do at home. Topics include frog metamorphosis and care, flatworm regeneration and care, pond life, and home microbiology experiments. We are also developing a new monarch butterfly metamorphosis page and a section recommending additional kid friendly science resources. Many of these topics include detailed observations, experimental design, science coloring pages and word search activities. As with the Virtual Classrooms described above, the kid science topic pages can be used, as is, for class science projects, or teachers can pick, choose and modify any of these resources.

The main page for these kid science activities is our Home School and Classroom Science Main Page: <http://www.scienceprofonline.org/home-school-science-biology-curriculum-experiments-activities.html>

More about ScienceProfOnline.com Website



The ScienceProfOnline.com website does have some advertising on it. These ads generate a very modest income from the site that helps compensate us for the thousands of hours we have put into making our teaching materials available. We

continually try to hone the ads to be minimally obtrusive and maximally relevant to the topic of the page they appear on.

The materials on ScienceProfOnline.com are particularly useful for new instructors looking for fully-developed, classroom-tested resources as well as experienced instructors seeking some new materials to add to their curriculum. MSTA members, please feel free to contact me with any questions or comments on the ScienceProfOnline.com website.

Professional Resources & Opportunities

Kitch-iti-kipi—One of Michigan’s Greatest Wonders

By Jenny Daniels, Clarkston Community Schools

Last summer my husband I and decided to take a tour of Michigan’s Upper Peninsula. Like many Michiganders, we both had lived here our entire life and had never been to many of the wonders that our state holds. We started off our tour at Sault Ste Marie to tour the Soo locks. Then we headed west toward Tahquamenon Falls, Copper Harbor, and Pictured Rocks. Our tour was to conclude with a visit to the Porcupine Mountains to see Lake of the Clouds and the many other wonders that are held in that state park. As we were headed home a call to my father changed our itinerary. He was adamant that we had to stop at Palms Book State Park and see Kitch-iti-kipi. After two long weeks of camping through many nightly rain storms we were ready to go home. He promised that we would not be disappointed. He was right.

Kitch-iti-kipi is like nothing that we had ever experienced before. Located near Manistique, it is Michigan’s largest natural fresh water spring. The name means big cold water and is sometimes called The Big Spring. The Native Americans called it the “Mirror of Heaven” and we could see why.

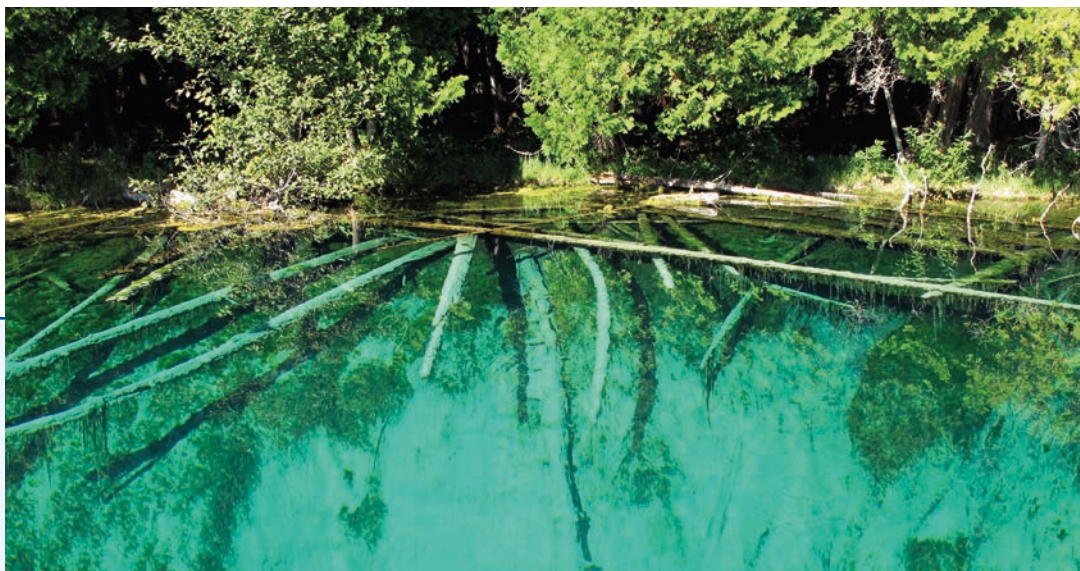
The state of Michigan acquired the property for \$10 when John Bellaire, owner of the Manistique Five and Dime Store, convinced Frank Palms of the Palms Book Land Company to sell the spring and the 90 surrounding acres to the state. The Palms Book Land Company had been using the area to dump unwanted trees that they were

logging in the area. One condition of the sale was that it was to be forever used as a public park bearing the name Palms Book State Park.

Kitch-iti-kipi is about 300 feet across and about 40 feet deep. The bottom seems to glow the color emerald. Ancient tree trunks with mineral encrusted branches can be seen as you look toward the bottom of the spring. The water is crystal clear and flows about 10,000 gallons per minute at a constant temperature of 45 degrees Celsius. The fish that swim here; lake trout, brown trout, and brook trout are huge. The shapes on the sandy bottom of the spring change constantly due to the large volume and constant motion of the water.

Some of the best views of the spring and its bottom are from the raft that is propelled by arm power out into the middle of the spring. The day we visited the park was not very busy and we were joined on the large raft by one other family. Their young son was only too eager to be our captain and took us out and back with ease.

No words can describe this wonder of Michigan and pictures do not do it justice. On our next trip to the Upper Peninsula this is our number one stop. We can’t wait to see it again! It was worth the extra time it took us to get home. It has become our favorite place in Michigan.



Professional Resources & Opportunities

Detroit's New Outdoor Adventure & Discovery Center Aims to Please

From Brian Peterson, Rochester Community Schools

Recently, I had the opportunity to tour the DNR Outdoor Adventure Center located on the Detroit riverfront. This new center represents the incredible revitalization that is occurring in the city of Detroit. The designers have incorporated the old with the modern at the historic Globe building. The Globe building was built in 1892 as part of the Detroit Dry Docks Engine Works where Henry Ford worked as an apprentice machinist. The building then became the Detroit Shipbuilding Company and later the Detroit Edison Company. Currently, it houses the Southeast Michigan Field Office of the Department of Natural Resources (DNR). In early 2015 it will also serve as the Outdoor Adventure & Discovery Center (OAC).

My heart was racing with excitement as we entered the main center. Lining the hallways were large "before" pictures of what the building looked like before construction started. The pictures displayed broken windows, graffiti filled walls and garbage everywhere. Now there is a beautiful building with 43,000 square feet of space that has a mixture of the new and the old. It has the historical charm with most of the original steel beams and many of the original brick walls, some of them graffiti and all! This skeleton has provided the foundation for the main attractions that are going to make this outdoor adventure center the destination of school groups, families and outdoor enthusiasts.

When you walk through the main doors there is an information desk that will be connected to a gift shop. Upon entering the main room your eyes don't know what to look at first! You can't help but focus on a three story waterfall that flows into a pond that will have many surprises to explore. After exploring the ponds take the path that walks under the waterfall and leads to a cave where you can learn about various Michigan species of plants and animals. Emerging from the cave you see a hunting blind that will educate you about healthy hunting in Michigan. You quickly realize you're in the shadow of a Cessna Airplane that could have been originally used to spot a wildfire or maybe was used to track Michigan



wildlife. For a more bird's eye view, literally, take the elevator, stairs or rope bridge to the large eagle's nest that allows you to view the massive waterfall and ponds below. Also upstairs try sitting in the Cessna Airplane or visit the display about invasive species of Michigan.

Your adventure does not end there! You can get a virtual feel of what it is like to kayak on Michigan rivers using a kayak simulator, or explore the beauty of Michigan on a snowmobile, bike, or an off-wheel recreational vehicle. Learn about the fish of Michigan swimming in huge freshwater tanks. Maybe you will want to test your skills of archery using the indoor archery range.

The OAC plans to incorporate other successful programs at their center. You can learn more about programs like Project Wild, which teams up with the No Child Left Inside Coalition; Project Learning Tree and the DNR led program Salmon in the Classroom. There are numerous classrooms, meeting rooms and a large cafeteria. The center is projecting one million visitors each year and based on what I was allowed to see these visitors will not be disappointed and will want to come back for more!

For more information or to schedule a program you can call 844-OAC-MDNR or visit their website at www.michigan.gov/outdooradventure. The director of the Outdoor Adventure Center, Linda Walter, can also be reached at 313-396-6876.