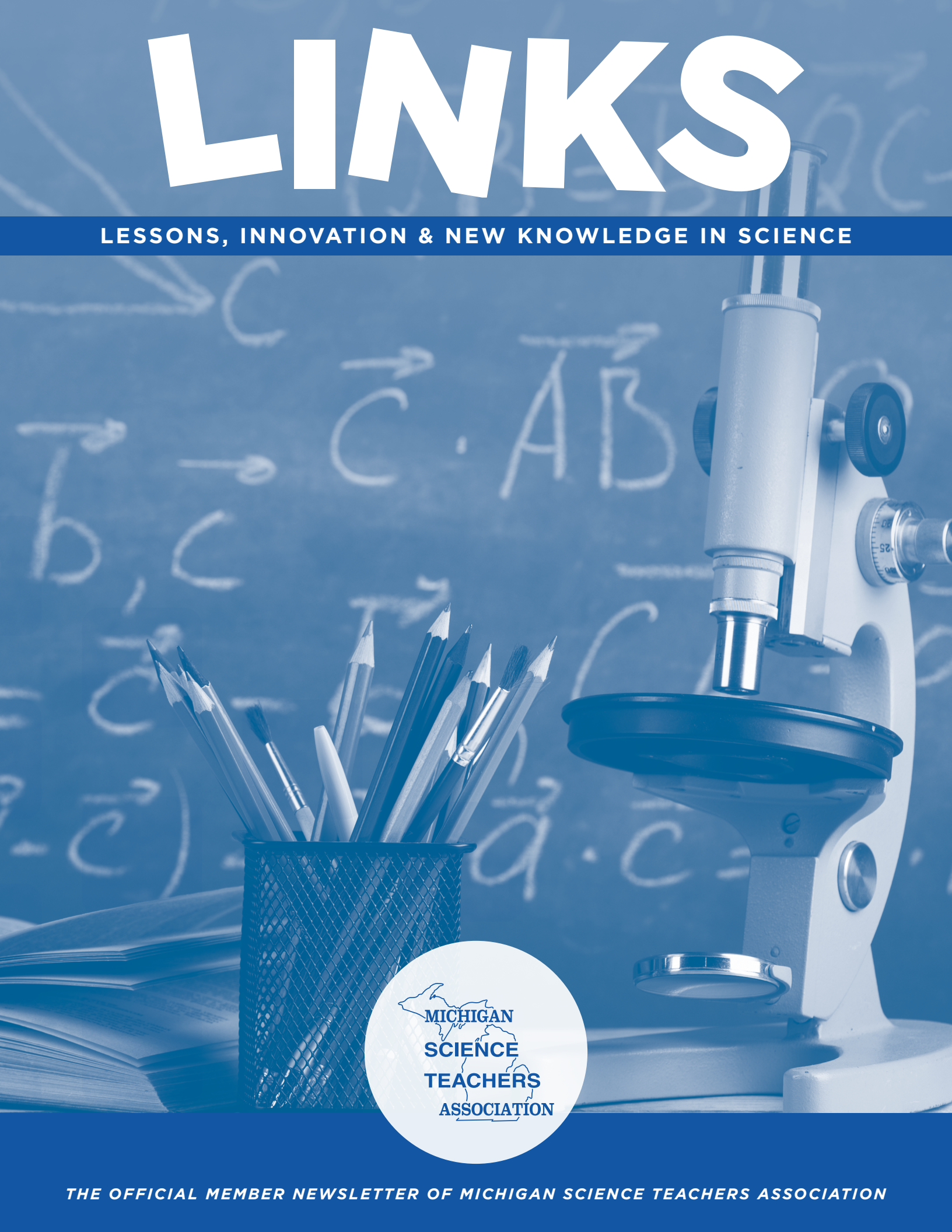


LINKS

LESSONS, INNOVATION & NEW KNOWLEDGE IN SCIENCE



THE OFFICIAL MEMBER NEWSLETTER OF MICHIGAN SCIENCE TEACHERS ASSOCIATION



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FROM THE DESK OF THE EXECUTIVE DIRECTORS

Robby Cramer and Betty Crowder

Dear friends, colleagues, and associates of the Michigan Science Teachers Association,

The time has come for us, Betty Crowder and Robby Cramer, to step back from our role as the Executive Directors of MSTA. We believe that our professional organization is in the best of hands with our current MSTA Board of Directors. Over the course of this summer the MSTA Executive Board has successfully transitioned from our former management company. As MSTA begins to forge the relationship with our new management company Ngage, this is an excellent time to enable our current officers to take the helm.

Somehow one always knows when to move into a new direction both within organizations

and as individuals. We are very proud of what MSTA has accomplished over the years during the 23 years we have served in a variety of ways as Regional Directors, Presidents and Executive Directors.

We will continue to attend and volunteer at the MSTA state conferences. We will enjoy seeing you and saying hello! We look forward to cheering you all onward as you continue to focus on how to fulfill the mission of MSTA in these uncertain times.

Warmest regards,

Robby Cramer and Betty Crowder



MSTA COMMITMENT TO ACTION, SUPPORTING NSTA'S STATEMENT ON SOCIAL JUSTICE AND SCIENCE EDUCATION

MSTA Executive Board

The Executive Board of the Michigan Science Teachers Association (MSTA) supports and affirms the NSTA Statement on Social Justice and Science Education, and is committed to taking necessary actions suggested within. Reiterating the NSTA position, the MSTA Board believes that taking a stance against racism is not enough. We believe embracing diversity, equity, and respect is both a path to eradicate racism and essential to our ability to provide leadership for the improvement of science education throughout Michigan. We pledge support to the development of a plan that will allow these commitments to be manifested within our organization.

First, the MSTA Executive Board commits to continued, intentional learning with the goal of creating a more equitable organization and will conduct a thorough review of policies within our Strategic Plan. In his book "How To Be an Anti-Racist (2019)," Dr. Ibram X. Kendi states, "There is no such thing as a non-racist or race-neutral policy. Every policy in every institution in every community is producing or sustaining either racial inequity or equity between racial groups." We recognize that doing this work

begins with learning how to apply an equity lens to all aspects of the organization.

Second, the MSTA Executive Board pledges to increase opportunities to amplify the histories, voices, and identities of science teachers of color and children of color all across Michigan. In their book *Empowering Science and Mathematics Education in Urban Schools* (2012) Angela Calabrese-Barton and Edna Tan write, "As an individual joins a community, he or she brings resources in the form of particular historical and cultural experiences, which by their activation can transform the discourses and practices of the community." Data analyzed by the National Academies of Sciences, Engineering, and Medicine's *Science Teachers' Learning Report* (2015), shows that 90% of the science teaching workforce is white. The Board acknowledges that representation matters and will work with each Committee Chair and Regional Director to ensure that diverse voices not only inform the organization, but also help transform and strengthen it.

Third, the MSTA Executive Board commits to providing teachers with access to a continuum of resources that support their development of classroom experiences that will sustain an anti-racist pedagogy. Two examples of such content are Scott Milam’s 2020 MSTA conference presentation “Anti-Racist Teaching Methods” and the MiSciChat podcast episode featuring Duha Fahmy’s ideas for Culturally Relevant Instruction. Given the additional challenges brought on by COVID-19, the Board will seek not only a continuum of experiences but extended-access formats to increase the availability of relevant content and the opportunity for members to engage in professional learning.

We believe that the MSTA, NSTA and other educational professional organizations have a role to play in eradicating racism in learning environments. The actions listed above are both a commitment and an invitation to our members and community partners to join us in this critical work. Please lend your support to our efforts.

For more information, please contact the Board via info@msta-mich.org or 734-973-0433. MSTA Executive Board



[READ NSTA STATEMENT](#)

[ANTI-RACIST TEACHING METHODS](#)

[MiSciChat PODCAST EPISODE](#)



DO YOU FOLLOW MSTA ON SOCIAL MEDIA?

MSTA will be sending membership a monthly email newsletter and other email updates as necessary, but connecting with us on social media is a great way to keep up to date!

Click on the links below to give us a follow!





DAN WOLZ CLEAN WATER EDUCATION GRANT APPLICATIONS DUE: OCTOBER 30, 2020

Description:

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 fourteen 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, the teacher will be provided with:

- Complimentary conference registration and one night stay in a hotel for 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.
- \$1,500.00 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 summer issue of the MSTA newsletter, with an October 30, 2020 submission deadline. Determination of the award recipient will be made in November. The award will be presented at the MSTA conference in March 2021 at the awards banquet. This year, the award will be given to one K-12 MSTA science teacher.

Process and Procedures for Applying:

- The Dan Wolz Clean Water Education Grant application is available on the MSTA website.
- Submit the application by October 30, 2020 to: susan_tate@msta-mich.org with “Dan Wolz Award” in the subject line.
- The MSTA Awards Committee and MWEA will make the determination jointly.
- Determination of the award winner(s) will be made by the end of November 2020, with notification occurring in December. Applications can be considered for at least two years.
- The Award recipient(s) will be introduced at the MSTA Conference during the awards banquet in March 2021.

Expectations of Award Recipient(s):

- Be available to accept this award at the MSTA Conference Awards Banquet in March 2021.
- Write an article for both the MSTA and MWEA newsletters
- Give presentations at both the MSTA (March) and MWEA (June) state conferences in 2022.

Past recipients of the Dan Wolz Education Grant:

- 2007 – Mary Lindow, Battle Creek
- 2008 – Emily Curry, Jackson Public Schools
- 2009 – John Martin, Waterford School District, Randy Cook, TriCounty Schools
- 2010 – Gary Cousino, Rochester Community Schools, Douglas Morrison, Manistique Middle School
- 2011 – Susan Tate, Whitehall Middle School
- 2012 – Chris Groenhout, Grandville High School
- 2013—Dave Chapman, Okemos High School
- 2014—Tammy Coleman, Lowell High School
- 2015—Josh Nichols, Heritage Elementary School, John Travis, Williamston Community Schools
- 2016—Connie Atkisson, Thirkell Elementary-Middle School, Detroit Public Schools, Lea Sevigny, Central Middle School, Forest Hills Public Schools
- 2018--Holly Hereau, Thurston High School, South Redford Schools
- 2019--Carolyn Mammen, Old Mission Peninsula School, Chelsea Bender, Grand Haven High School
- 2020—Jennifer Edwards, Ronald Brown Academy, Detroit Public Schools, Cristina Marvin, Reeths-Puffer Intermediate



DOWNLOAD GRANT RUBRIC

DOWNLOAD GRANT APPLICATION

MORE INFORMATION ABOUT THE AWARD

MORE INFORMATION ABOUT MWEA

Contact office@msta-mich.org
with any application questions



MI-STAR UNIT RECEIVES DISTINCTION AS A HIGH QUALITY NGSS RESOURCE

Marianne Semones, Doug Oppliger and Chris Wojick

Mi-STAR's Unit #6.4: "Protecting Your Cell Phone from Damaging Forces" was recently put through an extensive peer review process using the EQuIP Version 3.0 rubric. As a result of that review, the unit is now recognized on the NextGenScience (formerly Achieve) website, nextgenscience.org, as an example of a high quality unit designed for the NGSS. The unit is now posted on the NextGenScience website and on Mi-STAR's website, making the materials available for nationwide (and international) use by teachers.

NextGenScience is the successor organization to Achieve, which was funded by the Carnegie Foundation to design the Next Generation Science Standards (NGSS) based on recommendations and guidance provided by the National Academies of Science and Engineering. Many states' science standards, including those for Mi-STAR's home state of Michigan, are based on the NGSS.

Having a unit recognized on the NextGenScience website is a great achievement because it is a highly sought-after endorsement of quality in the curriculum-

development world. Earning this recognition places Mi-STAR's work among the very best being done by science curriculum developers anywhere. It is notable that this Mi-STAR unit is the FIRST middle school unit on the NextGenScience website listed as an exemplary NGSS resource under the INTEGRATED Science Discipline.

In Unit 6.4, students use what they've learned about forces and motion to design a protective cell phone case that meets student-specified criteria and constraints. Like every other Mi-STAR unit, Unit 6.4 focuses instruction around a challenge that students must address as they work their way through the unit's storyline. The storyline for Unit 6.4 centers on students helping a friend who keeps breaking his phone. The friend can't get a new phone unless he (with our help) can explain the science behind the forces causing damage and the engineering required to design a home-made case that will protect the new phone.

The unit provides a framework that gives students the opportunity to explore how a case can protect a cell phone from the forces when

it is dropped or crushed under something, and to then use engineering practices to design a cell phone case that meets specified criteria and constraints. Throughout the unit, students use hands-on experiences and systems modeling to explore properties of force and motion, while planning fair investigations for their cell phone case designs.

In order for students to successfully solve the cell phone case challenge, they first learn how to represent forces as vectors with a magnitude and direction and identify the equal and opposite forces acting during interactions between two objects. Students then identify balanced and unbalanced forces on single objects by testing paper towers they design themselves. They learn about the components of a fair test, while exploring the effects of mass and force on the acceleration of pennies. Students investigate the distribution of forces during collisions as they drop eggs onto various cushioned surfaces. Finally, students look closely into a complex collision scene. Using specific frames of reference, they identify the direction and magnitude of forces in a compiled systems-model mural. All of these learning experiences help students act as engineers to design and test their own phone cases using systematic methods. Their content knowledge, test results, and design are all communicated to others at the culmination of the unit.

The main difference between the Open Educational Resource (OER) version of Unit 6.4 available on the NextGenScience website and the version of the unit that is available to Mi-STAR subscribers on the Mi-STAR curriculum portal is that the OER version contains a great deal more three-dimensional formative and summative assessment

opportunities along with suggestions for re-teaching support. Due to time concerns, we feel that the shorter version of the unit on the curriculum portal is more appropriate for use in most Michigan classrooms.

If you would like to learn more about Mi-STAR or access this unit, you can connect with Mi-STAR directly and request more information.

If you are interested in learning more about the NextGenScience review process, you can take a look at the webpage linked below.



EQUIP VERSION 3.0 RUBRIC

6.4 PROTECT YOUR CELL PHONE

MI-STAR WEBSITE

NEXTGENSCIENCE WEBSITE

NEXTGEN SCIENCE REVIEW PROCESS



SWITCH ON

Sophie Byard, Acros Films

Switch On, a new 79 minute documentary film about energy in the developing world, is streaming for free right now on SwitchOn.org. Join Dr. Scott Tinker on an amazing global adventure, to remote corners of Africa, Asia, and Latin America to meet leaders, entrepreneurs and everyday citizens working to eradicate 'energy poverty' in their countries. In a journey that's enlightening and emotional, uplifting and unforgettable, Switch On will change the way you look at energy and the developing world forever.

Teachers can create a custom page for their class or classes to stream the film. Switch On educates about humanitarian issues, social studies, current events, globalization, environmental studies, geography, and health. Set-up a streaming page for your class at the links attached.

Synopsis: Across developing Africa, Asia, and Latin America, billions of people suffer from the lack of safe and reliable energy -- impacting literacy and education, water and food supply, communication, healthcare, and the economy. But inspiring leaders,

entrepreneurs, and everyday citizens are standing up to bring power to their people.

In this sequel to the highly acclaimed energy documentary Switch, join Dr. Scott Tinker on another amazing global adventure, to meet people and communities as they Switch On. In a journey that's enlightening and emotional, uplifting, and unforgettable, Switch On will change the way you look at energy and the developing world forever.

'Switch On' is streaming for free on the Switch Energy Alliance website right now! Customizable streaming pages are available for companies, classes, or other groups looking for a way to connect virtually during this time.

Switch Energy Alliance is a 501(c)(3) dedicated to inspiring an energy-educated future that is objective, nonpartisan, and sensible.



WATCH 'SWITCH ON'

DOWNLOAD SHORT ANSWER QUESTIONS



NEW PROGRAM TO CERTIFY TEACHERS IN EARTH SCIENCE FROM AMS



American Meteorological Society

The American Meteorological Society established the Certified AMS Teacher (CAT) Program to recognize and support educators actively engaged in raising Earth science literacy. CAT specifically connects K-12 educators to AMS, which strengthens their connections to the atmospheric community and its resources (which includes oceanography, climatology, space weather, hydrology, and more).

This is only the third certification program the AMS has established. The other two are to certify broadcast meteorologists (as seen on television.) and consulting meteorologists. It is an indication of the respect AMS has for teacher and understanding of how important they are in educating the public.

The CAT program provides an opportunity for continued professional growth for Earth science educators, helping them remain up-to-date on new developments in Earth science and teaching standards.

New Jersey science teacher Missy Holzer wrote “The CAT program felt like the perfect

credential to demonstrate my passion for teaching and learning about atmospheric science and oceanography. The rigorous application process was an opportunity to reflect on my practice while expressing my creative side in curriculum development. Being awarded this professional designation validates my effort to provide quality science education.”

All K-12 teachers and informal educators are eligible to become CAT certified. Unless you have a degree in a related science you need to have taken at least two of the AMS courses for teachers. To learn more or start the application process, visit the AMS website.



[VIEW ELIGIBILITY AND APPLY](#)

[CONTACT DAVE CHAPMAN](#)



AMS EDUCATION PROGRAMS: WEATHER, OCEANS, CLIMATE SCIENCE

The American Meteorological Society

The American Meteorological Society offers a variety of learning experiences for K-12 teachers.

Three on-line courses for teachers are currently available. In each case the courses run about 13 weeks: once in fall (September – early December) and repeated in spring (end of January – April). Each week a different topic is addressed (through readings, on-line presentations, and activities). The amount of time varies from teacher to teacher due to different levels of prior knowledge. But participants say you should expect to put in 4 to 6 hours a week. Textbook, lab activities, extensive web site, some supplies, and three graduate credits are provided for a minimal fee of \$450 - or \$350 if you are (or become) an AMS member.

[Much less than the actual cost of 3 graduate credits.] There are, however, a limited number of slots for teachers each semester. Interested teachers are encouraged to apply early.

Two things are required of teachers signing up for a course: (1) They are expected to

participate fully, doing all they can to finish the course. [Teachers who start the course but drop out early have kept some other teacher from taking the class.] (2) Teachers are also asked to find some way (or several ways) to share some content of the course with students by designing lessons plans using course material. In addition it is hoped that you will share some course content or lesson plans with other teachers. This may mean informal sharing with colleagues down the hall - to formal workshops at state or national conferences.

Climate Course

(DataStreme Earth's Climate System): This course identifies the factors that determine and define climate. The connections are made between climate and solar input, temperature, humidity, precipitation, and severe storms. Methods of measurement and modeling of climate, both recent and ancient, are discussed. The question of global climate change is discussed in the context of science research.

Ocean Course

(DataStreme Ocean): This is primarily a physical oceanography course which includes, among other things, physical and chemical properties of water, ocean plate tectonics, currents, tides, ocean-atmosphere interactions, Great Lakes, basic marine ecology, and the role of the ocean in climate.

Weather Course

(DataStreme Atmosphere): Basic concepts of meteorology are the focus of this course. They include separate chapters on weather measurements and tools, composition of the atmosphere, heat and temperature, air pressure, humidity, clouds and precipitation, wind, air circulation, air masses and fronts, hazardous storms, and weather forecasting.

Summer Courses

There also are two comprehensive summer courses: one about weather (Project Atmosphere) at the National Weather Service Training Center in Kansas City and the other about Oceanography (The Maury Project) in Annapolis, Maryland.

For more information about the course or to apply contact:

Dave Chapman
2637 Raphael
East Lansing, MI 48823
Voice or text: 517 - 599-3326
Email: chapmad@comcast.net



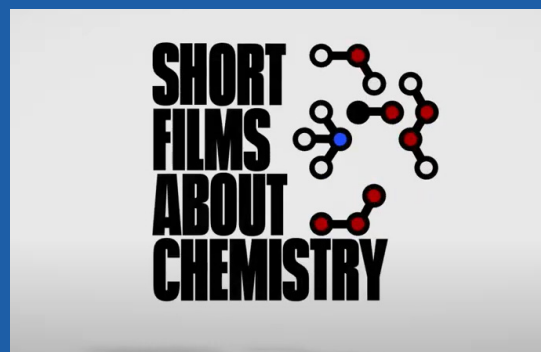
CLIMATE COURSE

OCEAN COURSE

WEATHER COURSE

PROJECT ATMOSPHERE

THE MAURY PROJECT



Chemistry Short; a new series of brief films that spotlight important contemporary issues that chemists and chemical engineers are working to solve. Each film is accompanied by a lesson plan that is aligned with Next Generation Science and Common Core standards.

The first three films and lesson plans are available at the links below.

**DIRECT AIR CAPTURE &
THE FUTURE OF CLIMATE CHANGE**

Christopher Jones (Georgia Tech)

UNDER THE SKIN

Zhenan Bao (Stanford)

REWRITING LIFE

David Liu (Harvard)



MI-STAR REMOTE LESSONS TO KEEP LEARNING ON TRACK IN THE TIME OF COVID-19

Marcia Goodrich and Amanda Dine

On April 2, Gov. Gretchen Whitmer issued Executive Order 2020-35, closing Michigan’s public schools to slow the COVID-19 pandemic. Within the month, districts were required “to provide alternative modes of instruction.”

“We went into overdrive,” recalled Amanda M. Dine, an eighth grade science teacher with Godwin Heights Public Schools. “I spent two or three weeks going back and forth with other teachers, just troubleshooting, brainstorming about what we could do.”

“It was very stressful,” she added. “I was worried, not so much for myself as for my kids. I was concerned that I wasn’t going to be able to meet their learning needs.”

Mi-STAR steps up

At Mi-STAR (Michigan Science Teaching and Assessment Reform), staff who were putting the finishing touches on the middle-school science curriculum were suddenly faced with a new reality. “For years, we’ve been building units that incorporated teamwork and experiential learning, with the teacher as

mentor and guide,” said Tony Matthys, Mi-STAR curriculum development associate. “Our whole purpose has been to give Michigan teachers tools they could use in the classroom to meet the state’s science standards. Then suddenly the schools closed. It felt as if we’d run into a brick wall.” So Mi-STAR pivoted. “The Mi-STAR educators told us that what they needed right now were lessons they could teach remotely,” said Matthys. In response, Mi-STAR quickly wrote eight remote learning lessons. All are aligned with the Michigan Science Standards and have been made available for teachers with a Mi-STAR subscription. In addition, the team made two of those lessons available on the Mi-STAR website to all middle school science teachers.

Each of the short, targeted lessons is written to account for unequal internet access among students who are learning away from the classroom, said Stephanie Tubman, Mi-STAR’s coordinator of curriculum development and implementation. “We’ve also incorporated some hands-on activities, but they are a stretch requirement, because some students may not have all the necessary materials in

their household. Not everyone has baking soda on their kitchen shelf.”

The lessons can be administered at a rate of one per week and are intended to take an hour or two for students to complete on their own. They also mesh with the regular Mi-STAR curriculum, serving as introductions to units or reinforcing familiar concepts. Furthermore, each lesson is appropriate for students in any of the middle-school grades.

For Dine, that made the final months of spring semester a bit easier. “When Mi-STAR came out with its remote learning lessons, my kids were able to do science,” she said.

Making the lessons their own

Godwin Heights Public Schools adopted Mi-STAR’s remote learning lessons as a district, with all middle school science teachers working together to mold them into an integrated curriculum for grades 6–8. The lessons proved easy to work with, Dine said. Online versions were simple for both students and teachers to navigate. Paper versions provided identical information, assuring that students without internet access received the same instruction.

The teachers created variations of each lesson for each grade level and for English learners. “We have at least five different languages spoken here,” Dine said. “But all my science students were able to engage.”

Other than being adapted for distance learning, the eight lessons are similar to in-person Mi-STAR lessons, addressing target cross-cutting concepts and science and engineering practices. That proved helpful for students familiar with the Mi-STAR approach.

“My students could transfer skills they learned in class,” she said. “They’d done this before.”

Serendipitously, the state-ordered remote learning dovetailed with a new educational goal. “We did a lot of self-directed learning this year in Mi-STAR, so for my students this was a relatively easy transition,” she said. “A couple of kids who are more dependent learners needed to talk things through more often, but that wasn’t a problem, because all the teachers were on call for guidance.”

Learning together from a distance

Remote lessons may have provided a laboratory for self-directed learning, but even at a distance, it’s hard to keep students apart. The Godwin Heights teachers didn’t use synchronous learning per se, but they did have office hours in Google Classroom, and students took advantage. “Every day, I had students working together during my office hours completing their work,” Dine said. “It was kind of organic.”

Mirroring their classroom culture, students quickly began to help each other out. “I had a couple of kids who didn’t have materials for their activities, while others did,” said Dine. “They texted and talked, and one of the girls who had materials told the others she would be doing the lab during office hours.” Her friends dropped in to follow along, and the practice spread. “Different kids would pop in and say, ‘Okay, Mrs. Dine, we’re going to do our lab now.’”

Not everyone could make it to Dine’s office hours. However, the students crafted their own solution: dropping in on another teacher’s office hours to do their work. “The math

teacher texted me and asked me to be there,” Dine said. “She said, ‘You need to see what’s happening.’”

After that, the teachers continued the practice, which helped students who couldn’t make it to Dine’s regular office hours. “It was definitely fun.”

Fun lessons with a future

The lessons kept students engaged; for example, one includes a lab that explores why some animals survive very cold temperatures. “The overarching question is about blubber,” Dine said. Students put their hands in ice water, note how that feels, coat their hands thickly with a solid fat, such as butter or shortening, and repeat. “They could get creative with materials they had at home,” she said. And if there was no fat at home, they could watch the experiment on a video or connect with their friends.

The lessons worked so well they might live on after social distancing. “They would be a really great, low-stress way to introduce skills,” Dine said, and could also be incorporated into a hybrid curriculum involving at-home and classroom learning.

Ultimately, Mi-STAR’s lessons helped to turn remote learning into a more worthwhile experience for both students and teachers. Of Dine’s 154 students, only five did not engage. “We really enjoyed it,” she said. “We were able to make it work for our population easily. I loved how beautifully the lessons came together, and my students loved them too.

“It was quite a blessing that Mi-STAR had our back when we were in emergency-figure-it-out

status,” she added. “No question we would do it again.”

Anyone interested in using Mi-STAR’s two publicly available lessons can access them online at the links below. To gain access to all eight remote-learning lessons, and Mi-STAR’s complete curriculum, visit mi-star.mtu.edu for more information on how to get started.



[VIEW REMOTE LEARNING LESSONS](#)

[VISIT Mi-STAR WEBSITE](#)



SOCIAL EMOTIONAL LEARNING IN THE SCIENCE CLASSROOM: YOU ALREADY HAVE THE TOOLS!

Lucinda Martinelli

Recently, at a Michigan Association of Biology Teachers Table Discussion session, my breakout room had an interesting discussion about social emotional learning and the ties it has to teaching science. I'd like to share some insights from that discussion with you.

When we teach science, we guide our students through a process aimed at changing their thinking about the way the world works. We give them the tools to gain new knowledge in a sequenced, predictable way. We teach them methods for categorizing and naming everything we encounter. We use concrete, hands on experiences to anchor learning.

Sometimes we shy away from teaching in the social and emotional realm. The topic seems too nebulous and the methods too touchy freely, until you realize that the very same methods we use for teaching science can be used to teach social and emotional skills.

The teaching of science has shifted in the last few years. The emphasis is much more on asking questions, teaching our students to ask questions of their own and guiding discussion

about their experiences and their thinking. Phenomena based teaching and learning asks us to begin with something that makes our students curious. For example, one teacher used the phenomenon of an ecosphere, a self enclosed aquatic ecosystem. When we begin a unit about ecosystems, we might show the ecosphere and ask questions like:

- What do you notice?
- What do you wonder?
- What do you observe?

These questions focus the attention of our students on noticing details they might miss at first glance and on asking questions to lead them further into investigation.

As they're investigating, we encourage students to clarify what observable qualities, changes or characteristics are actually there and to examine their thinking about what they see.

We then guide our students to make sense of the data and formulate new models by asking

them to explain their conclusions or revise their original models.

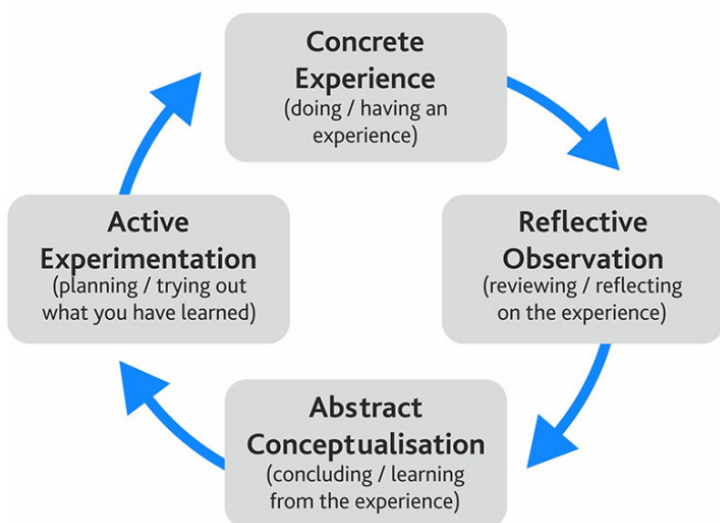
And finally, they use their new model to plan a new investigation or apply it to a new concept.

In Social Emotional Learning, the process is very similar and follows a similar cycle. The phenomena we examine and the observations they make are different, but all the skills we teach our students to question, reflect, make sense and try out new knowledge are the same. The cycle we follow is the Experiential Learning Cycle. When we compare it side by side with the Scientific Method, we can see how similar they are.

THE SCIENTIFIC METHOD



THE EXPERIENTIAL LEARNING CYCLE



In looking at these two cycles, we can see that each step in the scientific method has a correlating step in the experiential learning cycle. But instead of starting with an experiment, it might start with an experience your students are having or an activity from a SEL curriculum.

If we were to use this in building classroom culture this fall, we might use our classroom, or our virtual classroom, in place of the ecosphere to start a discussion about classroom norms. We could ask the same questions:

- What do you notice about school this year?
- What are you wondering about?
- These questions are also useful to address issues that come up in the classroom during the year:
- What did you notice about our class meeting today? Did we adhere to our classroom rules?
- What went well? What could we improve?
- We can also use similar questioning to help students identify how they're feeling:
- What do you notice about how you're doing with remote learning this year?
- What do you notice about how you're feeling today?

We categorize and name things in science all the time. Identifying and naming emotions and feelings is just as important.

Once we get the conversation started, we can use all our science investigation techniques to do some analysis with the students: driving question boards, discussion using sentence stems (I agree, I disagree, I need more information), describing or drawing their thinking and adjusting their thinking with

new information and opinions from their classmates. Encouraging non-judgmental questioning and anonymous responses, just like in science analysis, will tend to get more honest contributions to discussion. Just as in science, finding patterns is also important. Does this happen often? When and how do we see it?

Finally, we can use what we learn from discussion to formulate a plan for the class or the individual student for moving forward. Perhaps it's a list of student generated guidelines or group norms describing how to behave in science class. Maybe it's an individual study plan for a student who's struggling. Maybe it's a plan for checking in with each other in small groups.

This kind of questioning and discussion does several important things at once:

- It normalizes discussing what they think and how they feel. It sends the signal that you want to hear about their thoughts and feelings, which can open up dialogue among you and your students.
- It models how science discussions will work with topics your students care about.
- It increases buy in and engagement. When students know they have a teacher who cares and classmates who will support them, they are much more likely to show up for school, no matter what format it's in. When they know their input is important to the group, they will continue to show up, even when it may be difficult.

Social Emotional Learning doesn't need to be a separate program or set of activities to be effective. We can use the techniques we

already know to help our students examine and engineer their own behavior, thoughts and feelings. This year, when life is uncertain and school is so different, science teachers can lead the way to social and emotional wellness for our students.



BLUEBIRDS IN THE SCHOOL YARD

Landon Bell, STEAM Educator, New Branches Charter Academy

I finished my first-year teaching STEAM; nothing like I pictured it would turn out to be 100% online. In my fifth year of teaching, I transitioned from teaching fourth and fifth-grade science to building and teaching a new K-8 STEAM program at New Branches Charter Academy. New Branches sits on 12 acres of land on the southeast side of Grand Rapids and is an environmental science school. Our mission is to integrate nature-based education and environmental practice in all classrooms.

This past school year, I worked on building a STEAM curriculum that aligned with the school's Environmental Science focus. The program is a specials class that all students attend multiple times a week. In the class, we focus on science and engineering practice, following Next Generation Science Standards (NGSS). The class allows students to participate in discovery and inquiry, make observations, collect data, and form arguments with evidence to support their observations. Students participate in community-focused project-based learning that involves the needs of their school and the surrounding community.

One of the projects that we were working before schools transitioned to online learning in March was installing bluebird houses with cameras on the school grounds. With this community-focused project, we partnered with members of the Michigan Bluebird Society and the Grand Rapids Audubon Club to help our students design and assemble to right birdhouses to attract bluebirds. The plan was for students across multiple grade levels to work collaboratively to assemble, install, observe, and collect data from the birdhouses as birds moved in and began building nests. The video clips that we would collect from the houses would be used by kindergarten and fourth-grade students to observe and determine the species of birds in the house, the presence and characteristics of the eggs, the stage of the infant birds, survival rate, and length of time in the nest. The eighth-grade students were to create a web page with video clips from the nests and share the collected data.

Well, 2020 truly is a year for the birds. My eighth-grade students were able to assemble the bluebird houses and install them on the

campus, in locations that were likely to attract bluebirds. The eighth-grade students also designed data collection templates for both kindergarten and fourth-grade students. That was as far as we could get in the project before schools moved to online learning. The plan to have students across multiple grade levels monitor and collect data from bluebirds' houses via web cameras, was put on hold. The project sat unattended for months. Thankfully we were able to install eight of the birdhouses before the building closed. The original plan was to install self-monitoring cameras activated by motion detection, but everything within our power was put on hold. The birds, however, did not need to wait on us.

Over March, April, May, another staff member and I monitored the houses ourselves. In the eight houses on campus, only one was occupied by a bluebird; two had house wrens, three of the houses had sparrows, one had a decoy nest (most likely built by a house wren), and one was left unoccupied. By June, we were finally able to obtain our cameras and install them in early July, in two houses.

The two cameras were installed into one of the houses that had remained empty, and the other had the decoy nest. Both of the cameras are powered by solar panels and connected via WiFi to a secured self-monitoring application. Since installing the camera, a female house wren was attending to the decoy nest and pecking at the camera. The empty nest has seen no activity as of mid-July.

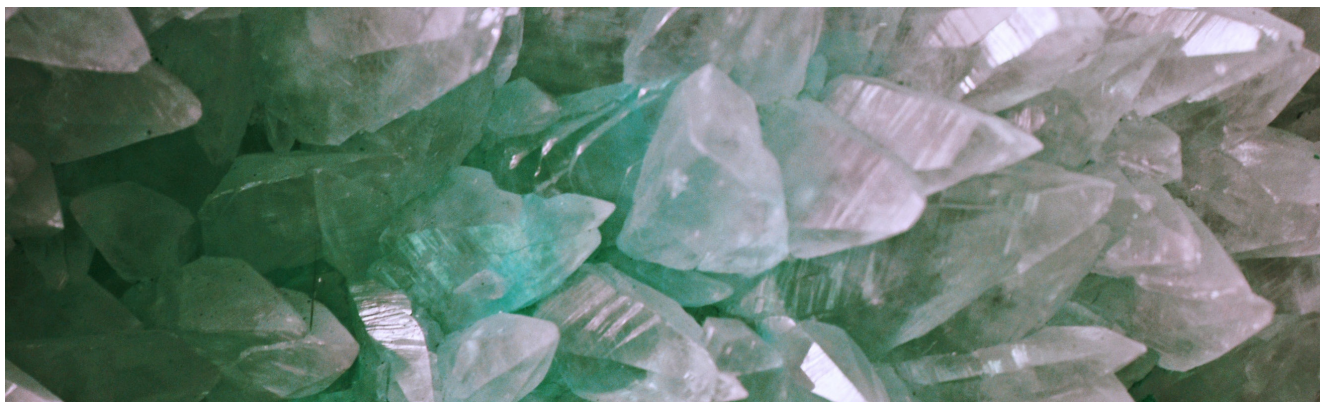
Whatever school looks like this coming year, we are now set up to continue with this project, as intended. The students will be able to monitor the cameras and birdhouses, either from school or online. You can check out

the latest videos of our bluebird houses at the link below.



WATCH THE LATEST BLUEBIRD VIDEOS





SCIENCE AT HOME, GROWING CRYSTALS

Steve Kosmas and Mark A. Benvenuto

Abstract:

Revisiting the idea of crystal growth of various materials that can be found in households can provide us with ways to enhance learning science, even during times of the COVID pandemic. Using materials and equipment found in most homes, growing crystals can be a safe, effective way to capture students' interest, and seems well in line with at least one NGSS: "HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes."

Introduction:

In a year in which many of us will have to adapt science teaching, methods, and phenomena from the classroom and the lab to a home environment, it may be wise to take some old, established experiments and determine if they can be adapted for home learning and for new goals. One that is very old and established, but that has significant potential for any home learner is crystal growth, using a variety of common, household materials.

A great deal of discussion has gone on in the past few months about how a genuine laboratory experience can be provided to students when they are not at school or in the lab. The idea of what has been called kitchen chemistry certainly has some applicability in the current situation. Safety concerns are never more than that which is usual in a kitchen, such as boiling water. Measurements may be less precise than in a lab, since the equipment found in most kitchens is usually not more precise than measuring cups, teaspoon and tablespoon sets, and possibly food scales used by people on strict diets. But even when masses cannot be determined as exactly as they would be in a lab with a balance that reads to 0.01 g, using volumes and the density of substances like water, sugar, salt, or other materials should give us good measurement approximations.

Methods:

For many science teachers and faculty, or for general education teachers who teach science at the K-8 level, growing crystals is a good, qualitative experiment that allows students to

see something “appear” from “nothing.” This is the growth of ordered, crystalline, opaque matter from a solution – that which seems to “appear” – often a clear solution that seems to have “nothing” in it.

For any example of crystal growth that can be done at home as well as in a lab, the basic steps of the method are as follows:

1. Start with some amount of a solid material, such as table salt, sugar, or Epsom salt. Measure it in terms of volume, possibly using a home measuring cup, or a teaspoon and tablespoon set, if the quantities to be used are relatively small.
2. Measure some amount of water and boil it.
3. Add the salt to the boiling water in some glass or plastic cup. If done slowly and carefully, the student can often find the point at which no more salt or sugar can dissolve, even in the heated water. Some solid will simply begin to fall to the bottom, the solution now being saturated.
4. Tie a string about a pencil at its mid-point, immerse the string into the hot solution, resting the pencil on the rim of the cup, to hold part of it above the solution, for easy removal later.
5. Allow the solution to cool to room temperature. If the solution is sufficiently concentrated, crystals may begin to form simply as the solution comes to room temperature.
6. If desired, allow the solution to stand for days, or even weeks, to see how large the crystals grow.

While this can be considered a standard method for which crystals have been grown by generations of students, we can add detail

to this in several areas, and even align some of the process with the NGSS.

Materials:

The list of materials a person might need for these crystal growth experiments is not complex, and includes the following, which can usually be found in a kitchen.

- Table salt
- Sugar
- Epsom salts
- Water
- String and pencil
- 1-cup or 2-cup measuring cup
- Teaspoon – tablespoon set
- Glass or plastic cup
- If possible, food scale or jewelers scale

Concepts that can be studied:

Perhaps the obvious bit of learning that goes on in growing crystals is that students have to determine what the best conditions are for crystal formation. That translates to knowing something about the solubility of various materials in water. And that itself can be quite educational.

Solubilities at 20°C are:

Table salt 36.0g/0.1L

Sugar 200.0g/0.1L

Epsom salt 25.0g/0.1L

Solubility at 100°C:

Sugar 500g/0.1L

Concepts that can be studied in this experiment include more than simply solubility, but we can begin at that point.

Solubility

Knowing the solubility of a substance at 20°C and at 100°C means it can be pre-measured as can the water into which it will be solvated before the mixing occurs. This allows a student to see just how much sugar, for instance, will end up dissolving in a measured amount of water. This alone can be a novel observation – an eye opener – if a person has not done this before.

Terminology

This experiment allows the teacher to introduce the terms “solute,” as well as “solvent” and solution into any discussion. Additionally, it can be the beginning of understanding concentration and units of concentration, as we mention below.

Molarity

Knowing the mass of a solute and the volume of a solvent allows us to determine molarity, using $M = \text{moles solute} / \text{liters of solution}$. It provides us with an easy introduction to computing moles from the grams of solute – such as sugar. If a person does not have a fine enough scale at home to determine the mass of small amounts of sugar, it can be determined using teaspoon-tablespoon sets and the density of 0.7g/cm³.

Molarity

In high school and college chemistry text books the term “molarity” is often given a nod or brief mention, but little more. Generally this unit is more applicable for heavy masses of

material and thus for engineering situations. But the unit $m = \text{moles solute} / \text{kg solvent}$ can be used in any situation. In this one, it allows a teacher or home learner to further hone their arithmetic, and to compute a second type of concentration.

Weight percent

Another means of determining concentration is weight percent, $\text{wt}\% = \text{mass solute} / (\text{mass solute} + \text{mass solvent})$. Once more, this allows a student to see just how much of a solute, such as sugar or salt is part of the overall solution.

Volume displacement

The numbers just given for the solubility of sugar in water, especially that when using boiling water, are quite large. The example given above, 500g/0.1L, can be extrapolated to 5,000g/1L or 5.0kg/1L. This is essentially the same as dissolving more than a 10-pound bag of sugar in roughly a quart of water (11.02 lb. / 1.06 qt)! We don't encourage readers to attempt the experiment on this scale (although the potential results are amazing to contemplate), but point out that this high solubility means that there will be a noticeable volume displacement when sugar is dissolved in water. An easy observation is to mark with tape or a marker the level on a glass when water has been poured into it, at any temperature, then note the difference when the solute has been added. This can be the starting point for a fruitful discussion on what occurs at the molecular level when a substance dissolves.

Heat transfer

If these experiments are conducted using boiling water, the teacher can easily initiate a discussion on what happens to the heat over time. Students may be quick to point out that the heat “goes away.” But how it dissipates into the surrounding atmosphere can be an interesting thought exercise, teaching students that heat never simply “goes away.”

Applying this for home instruction:

The idea of growing crystals is certainly an established one, and has probably been done at home many times, either as some science project or simply for fun. But it is possible to develop this experiment into more than just a phenomenon that produces rock candy. We have seen seven areas of general science and chemistry that are applicable here. As well, this seems to align with the Next Generation Science Standard HS-ESS2-5. “Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.”



REFERENCES

HOW TO MAKE CRYSTALS

NEXT GENERATION SCIENCE STANDARDS

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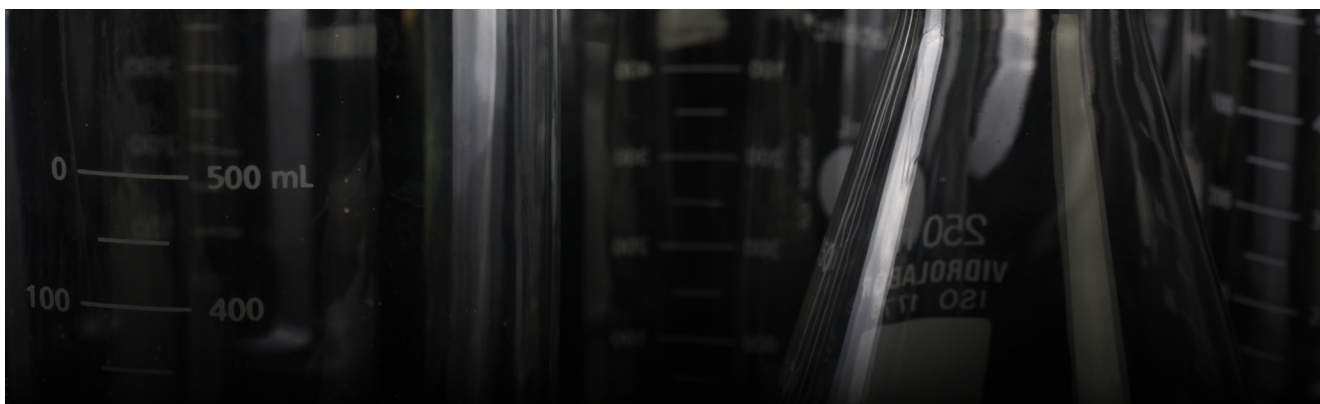
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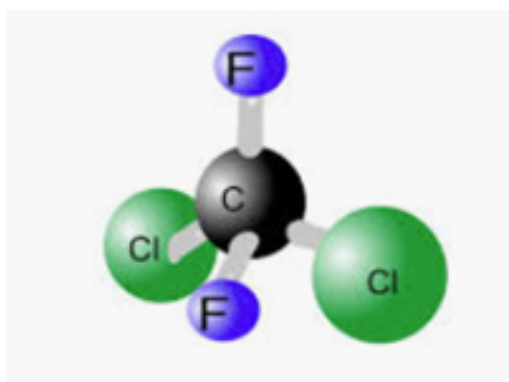
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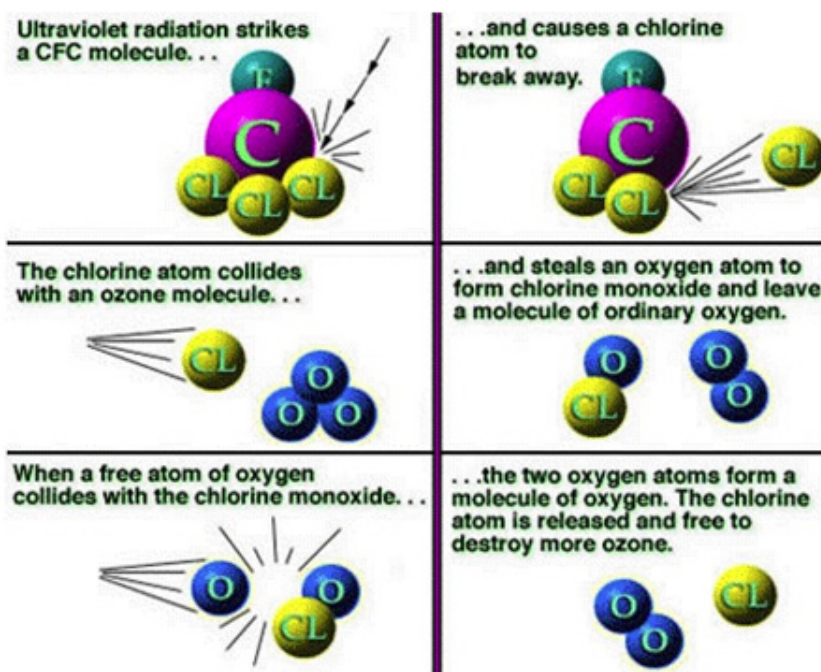
GREEN CHEMISTRY CONNECTIONS, REFRIGERANTS



CFC-12

Chlorofluorocarbons (CFCs) were phased out in the 1990's and should not be used in air conditioning since they leak into the atmosphere from equipment and destroy ozone. The ozone layer protects us from harmful UV rays. The Cl atoms from the CFC molecule can end up depleting the ozone. One Cl atom can destroy 100,000 ozone molecules. This is like a domino effect. If anyone still plays with dominoes, then they understand the chain reaction effect.

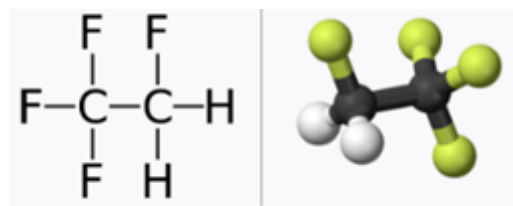
There are opportunities to teach green chemistry/sustainability with real applications. The authors suggest that these opportunities surrounded us. For example, this CFC-12 molecule has been given multiple names. In this article on green chemistry connections, this molecule will be referred to as CFC-12 (chlorofluorocarbon-12). The following are all names to describe the molecule on the left: Dichlorodifluoromethane (R-12 or Freon-12 or CFC-12).



How Ozone is Destroyed by CFCs

Chlorofluorocarbon (CFC): a compound of consisting chlorine (Cl), fluorine and carbon

In the early 1990's, the refrigerant HFC-134a was used for the air conditioning in cars. This was a large improvement, since 1,1,1,2-tetrafluoroethane (HFC-134a) does not impact the ozone to the same degree and has a much lower global warming potential. According to the chart below from the Environmental Protection Agency (EPA), CFC-12 has a very large global warming potential and depletes the ozone. HFC-134a appears to solve the problem. If a green chemistry growth mindset (GCGM) is applied, then further questions are necessary. The next question is are there gases that will have a significantly lower environmental impact than HFC-134a that can be used as the refrigerant for air conditioning?



Names

R-134a, Freon 134a

(HFC-134a=hydrofluorocarbon-134a)

| MVAC* Refrigerant | Molecule | Global Warming Potential | Ozone Depleting |
|-------------------|----------|--------------------------|-----------------|
| <i>CFC-12</i> | | 10,900 | Yes |
| <i>HFC-134a</i> | | 1,430 | No |

*MVAC stands for motor vehicle air conditioning.

**This table was reformatted from the EPA website.

The global warming impact of the change from CFC-12 to HFC-134a went from a global warming potential (GWP) of 10,900 to 1,430 (a factor of nearly 10). This is a very significant change. The impact is that the GWP has been reduced almost 90%. The green chemistry growth mindset does not allow a mindset that stipulates that the problem is solved, but instead asks are there even better alternatives? Your friendly EPA has been working on this topic. The table below indicates that the global warming potential can be greatly reduced by switching to a different refrigerant.



LINKS

OZONE DESTRUCTION

EPA WEBSITE

Environmental impacts of Motor Vehicle Air Conditioning (MVAC) Refrigerants

| MVAC Refrigerant | Global Warming Potential |
|-------------------------|--------------------------|
| HFC-134a | 1,430 |
| HFC-152a | 124 |
| HFO-1234yf | 4 |
| CO ₂ (R-744) | 1 |

**This table was reformatted from the EPA website*

The EPA has a Significant New Alternatives Policy (SNAP) program which addresses the risks of using new refrigerants and assesses the global warming potential of these new alternatives. The goal is to stop using HFC-134a and phase it out in the automobile industry by model year 2021. The table above indicates that the global warming potential can be reduced another 90% again by just changing to a new refrigerant.

Sustainability is a topic that can be integrated into the science curriculum and is supported by the Next Generation Science Standards (NGSS). The science and engineering activities that tie into sustainability are the following: 1) using mathematics and computational thinking, and 2) constructing explanations and designing solutions. Only one disciplinary core idea will be given, 1) human impacts on earth systems.

The crosscutting concepts include the following: 1) cause and effect and 2) the influence of science, engineering and technology on society and the natural world. This is just a cursory list of connections to the NGSS and is by no means exhaustive. The authors would be remiss if they did not mention that students need to be given the opportunity to connect chemistry to the United Nations Sustainability Development Goals. This will be a topic for a future Green Chemistry Connections (GCC) article.

If you are interested in learning more about a Green Chemistry Growth Mindset (GCCM), please click on the links below.

If you are a K-16 instructor and interested in writing a book chapter on Green Chemistry/Sustainability, please contact:

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Mark Supal

Former STEM Educator
Macomb Math and Science Center
Einstein Fellow
Recycling App Designer/Inventor



REFERENCES

GREEN CHEMISTRY GROWTH MINDSET

NEXT GENERATION SCIENCE STANDARDS

SUSTAINABLE DEVELOPMENT GOALS



SCHOLARSHIP WINNERS SHARE THEIR EXPERIENCE

Cortney A. Ford

There is always more to learn in the profession of teaching. This is one aspect of the job that drew me in and has continued to appeal to me. After more than seventeen years in the profession, I still walk out of my classroom each evening with a goal to be a better educator for all students tomorrow than I was today. Attending MSTA clearly echoed that I am not alone in this mindset. It was exciting and empowering to sit in crowded rooms amongst colleagues sharing the same goal to learn and grow.

To be honest, I wasn't sure what I was looking to get out of the sessions at MSTA this year. Maybe some ideas that will give me confidence and insight in teaching two new classes next year. Maybe more suggestions on using phenomenon to drive my units. Maybe more hands on, real world lessons that would guarantee to get my students excited and engaged. Maybe a hodge podge of these. Any or all of these would motivate me and empower me to take yet another step in learning and growing as an educator.

What I left with on Saturday was so much more than I had anticipated. I walked out of my last session with an excitement and ideas that I couldn't wait to put into place in my classroom. Aside from numerous fun and engaging activities and many valuable conversations with other educators, using interactive notebooks and embedding cross cutting concepts in daily instruction were my two huge takeaways from the 2020 MSTA conference. I found myself drawn to multiple sessions focused on these two topics. Each presentation grew my interest, my motivation and my excitement. Cross cutting concepts quickly transitioned in my mind from simply a component of NGSS to skills that my students could recognize in instruction and assist them in their learning. Interactive notebooks were presented as informational works of art that served as a portfolio of student work.

I left the conference with a desire to implement these into my instructional practices as soon as possible. And I did just that on Monday. Monday, the start of a new trimester, provided the perfect stage to put into action some of the new strategies that the masterful presenters of MSTA spoke of. Attending the

conference this year reminded me even after almost two decades of teaching, there is still so much for me to learn. It provided the opportunity to interact with brilliant educators from all over the state. MSTA was the platform that helped me reach a level in my limitless goal of being a better educator tomorrow than I was today.

Freddie Willbanks

It was the calm before the quarantine storm. The weekend of the 67th MSTA Conference, March 6th-7th, where a large group of teachers invested in networking, learning, presenting, and sharing high quality science education would converge at the Lansing Center. Hand sanitizer could be found everywhere, from a squirt station located as you entered from the parking lot to at just about every exhibitor and vendor table. Fast forward to a couple weeks later and we can look back at how blessed we are to have shared the many wonderful science experiences together. In the past two weeks after the conference, science teachers have now had time to dissect, digest, and share with their local administrators, colleagues, and curriculum teams affirmations of current practices or some considerations for change with the hopes of impacting science education within their district.

As a teacher of science education in Gratiot County now since 2006, the curriculum has evolved from the Michigan Curriculum Framework to the Grade Level Content Expectations (GLCEs) and now the Michigan Next Generation Science Standards (NGSS). It finally is starting to feel like a curriculum that has evolved based on the best practice for teaching science and will be a survivor of the fittest. NGSS and best science teaching

practices can be the antidote for the contagious virus mindset of teaching like we always have. Change is necessary for growth, but can only happen when we are made to feel uncomfortable. To use another analogy, the MSTA Conference can be the activation energy to spark that chemical change needed at times in our education journeys.

Some common affirmations or considerations were noticeable in every session attended at the 67th MSTA Conference this year. First, was the importance of shifting science education into having students participate in modeling, sense-making activities, or labs before teaching a concept. Then, teachers should build off that by using student sense-making to guide the development of a concept before teaching specific vocabulary. This was exciting to see from many of the presenters, and is commonly known as ABC, CBV. Also, hearing presenters using language such as “the person doing the talking is the person doing the learning” encourages MSTA participants to find ways to invest in cooperative learning strategies. “It’s always about the students,” and, “nobody cares what you think,” are other comments heard, which affirmed making lessons more student centered as good teaching practices. Teachers should be doing whatever it takes for students to feel invested in their own sense-making through modeling and using the science and engineering practices for an understanding of how the world works.

If these are not affirmations for you of your current practice, then let this be the encouragement needed to take some time and invest in coming to next year’s 68th MSTA conference to sharpen up on best practices in science education. Science education has

most definitely evolved and improved over the years, and we need to change our behaviors as educators and decide to accept and embrace the fact that science education looks different than it did in 2006. If not for our survival, then for the future scientists we are trying to develop into next generational leaders. Thankfully, the MSTA conference can do that for you.

Holly Schmidt

As I walked up to the Lansing Center on the morning of the 6th, I was not really sure what to expect out of my first ever MSTA Conference. This was my second year teaching, and everybody at my school had been raving for days about how awesome the conference was, about how I would learn so much from my time there, about all of the amazing swag that was to be found in the exhibit hall. In true scientific fashion, I was withholding judgment until I got to see what it was about for myself.

By the time I got to my second session, I knew that this was going to be a game changer for me. The presenters at the conference were all involved in the science community in Michigan, and were all genuinely interested in presenting the ways they analyze their lessons for quality, show other teachers ways to use materials to change how students approach their learning, and emphasizing inquiry for both student engagement and extending student's learning. Even the presentations that were not as thrilling or as spectacular as I imagined still offered teachers like me thought-provoking content, intent on changing the way we look at our classrooms, and doing their best to make sure every teacher there went home with some amazing resources that would be shared with their students. The presenters were what made the conference awesome.

In the end, I was one of the last to leave the conference on Saturday, staying right up until the end to experience as much of the conference as possible. I will also note that I went back to class the following Monday with TONS of ideas about what to do to help my students engage more in class and ask more questions. I couldn't wait to share what I had learned with my students. And next year, when the time comes to sign up, I will be the next person in line to rave about how amazing the MSTA conference is.

Edward Railing

Looking for a way to get inspired and bring new engaged learning to your science? The MSTA Conference has much to offer with various informational sessions to pick from. On March sixth and seventh I was given an opportunity to attend the 2020 MSTA Conference with scholarship assistance. I had a great experience.

The registration, program guide, facilities, volunteers, and presenters were all well organized. I had a hard time deciding which sessions to attend as I wanted to maximize my learning. As a fourth grade teacher I looked for sessions I could bring back to the classroom.

Mammal Mania with Kevin Frailey was one of the great sessions I attended. The hands-on learning with animal furs and skulls was right up my alley. I loved the predator / prey relationships that were presented. We even wrote a Limerick to tie in writing. Any time we can use cross - curricular lessons is beneficial.

Animal Adaptations Rotations with Nicole Jakubowski, Meghan Kurleto, and Marlenn Maicki was yet another great hands-on session. I have done similar hands-on lessons with bird

beak adaptations in my classroom. I learned new ideas about different materials to use to represent different beak styles. The food sources that match the beak style will be fun for students to discuss and justify.

I appreciate the opportunity and those that made the scholarship possible.

Laura Minnear

During the session “Why aren’t they Talking” I received a wonderful template for planning out discussions in the classroom. This shift to numerous consensus-building discussions in the classroom has necessitated the need to plan how to have a discussion. It’s no longer enough to write the word “discuss” on our lesson plans- having a set way to facilitate the discussion is key, as is knowing what your expected outcome should be. Using this template will help me with this.

- The session on CER’s led by Mi-STAR was amazing. I will be revising my teaching of CER’s in the following ways because of what I learned during this session:
- CER’s do not ONLY belong at the end of a lesson. Can write an initial one and go back and revise as more information is gathered
- When using evidence in a CER the evidence must be agreed upon by the group first.
- Need to provide students with many opportunities to read CER’s and identify what makes some stronger than others.

One of the modeling sessions provided a whiteboarding technique I’ve not used before. A square is drawn in the middle of the

whiteboard. The remaining space around the square is split between the group members. Group members use this space to draw their own initial models. From there a consensus model is drawn in the center square after the initial models are complete.

The final session I attended, Demonstrations that really grab attention, didn’t leave me with a specific takeaway, but rather helped me remember exactly why I do what I do. It’s all about engaging student curiosity. Yes, the SEP’s, DCI’s and CCC’s are important, but the focus needs to be on capturing and engaging student’s natural curiosity about the world around them. The presenter was retiring this year, and to see his passion and enthusiasm for what he did was contagious.

Thank you for the opportunity to attend the MSTA conference this year!



www.msta-mich.org