GOVERNOR'S STEM ADVISORY COUNCIL

STEM EDUCATION AWARD FOR INSPIRED TEACHING

SPONSORED BY KEMIN

Mike Wedge

High School Science Teacher & STEM Coordinator

Sibley- Ocheyedan High School

2015 STEM Resource Document

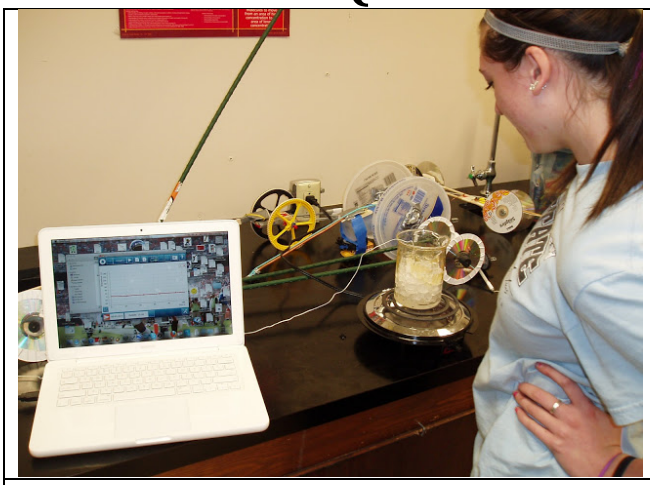
Northwest Region

KEMIN

INSPIRED MOLECULAR SOLUTIONS™

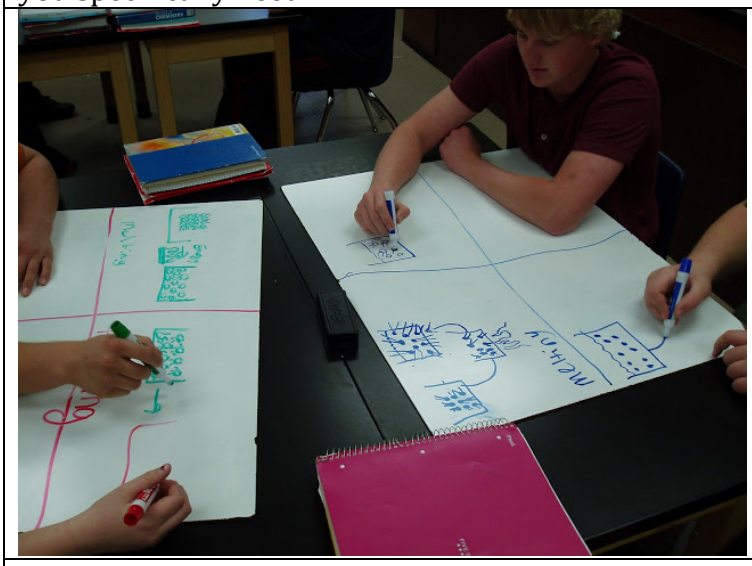
Mike Wedge
mwedge@thegenerals.org
Sibley-Ocheyedan CSD
Sibley, Iowa
- Grades 10-12 Science (chemistry, physics, applied biology, college biology, college chemistry, applied physics, robotics)
- District STEM Coordinator

"Science is a Process Scrapbook" (with advice and inspiration)

	
(2011-Chemistry) Student is using one of our Pasco probes. These probes attach to their laptops and provide exceptionally accurate data. She is using a temperature probe. After intense lobbying, our district purchased a set of 10 computer-to-probe connectors, 10 chemistry sensors, 10 physics sensors, 3 motion detectors and 1 force sensor. The total cost was $4,500. We share these amongst district science teachers; our 4th grade used the temperature ones to complete an experiment with energy. **WEDGE'S ADVICE:** Search for grants, put a full court press on your administrators, start small (buy a few each year and build up), get as many district teachers to buy into them as possible, show your teachers how they work (model them so the anxiety is decreased).	**(2010-Applied biology)** Sibley is 6 miles from a county nature reserve and 30 minutes from Okoboji. I reached out to our local DNR people as well as Jane Shuttleworth from Lakeside Labs. We've done several trips to explore life and it is always a big hit. **WEDGE'S ADVICE:** Make connections to your local wildlife/conservation board or DNR…it's all about connections. Once you've got someone that can help, the rest is easy(ish).

(2011-Applied Physics) Students completed 2L pop bottle rocket experiments. It'sa great way to begin the course on controlling variables and making complex data tables. You can buy bike pumps for $10-15 (or ask around). The lauchers themselves vary in expense, Pitsco sells them cheap (but they're low quality). A google search for water rocket/pumps is probably the way to go—buy what you specifically need.

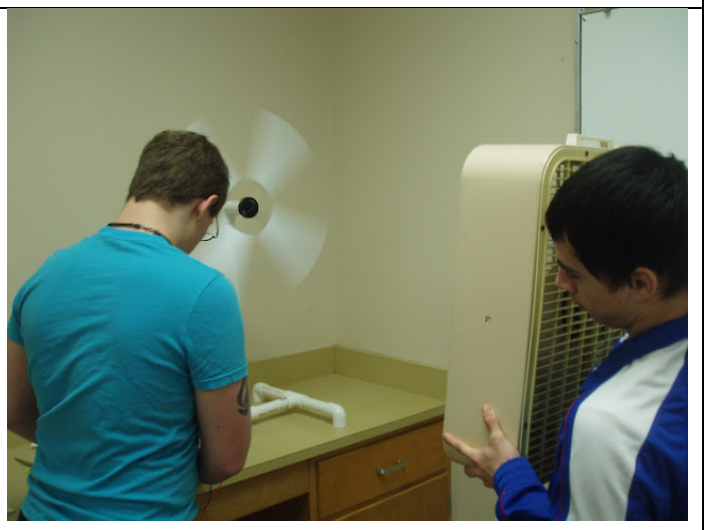
(2013-Chemistry) What happens when you don't correctly use a Bunsen burner.

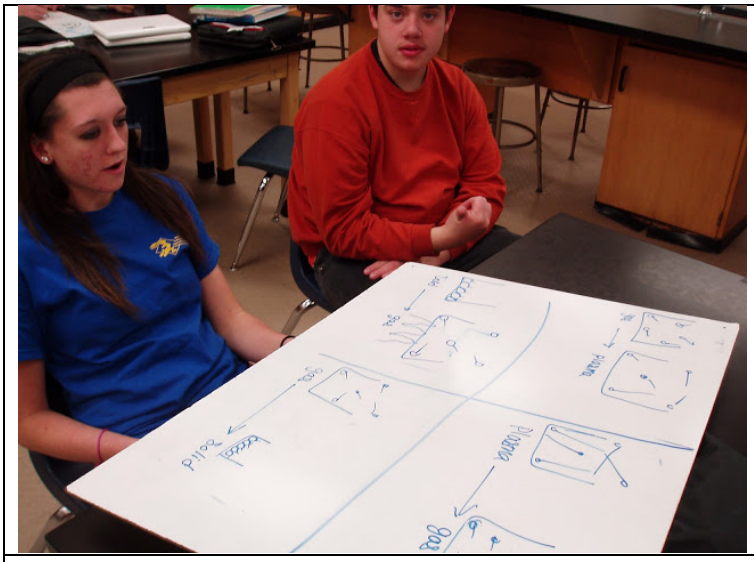


(2009-Chemistry) Students are in the process of a whiteboard session. These are THE ABSOLUTE BEST ASPECT OF MY CLASSROOM AND TEACHING! This is not my original idea—it is from the Modeling program out of Arizona State University. Google search chemsitry modeling or whiteboard sessions. We have 100 of these whiteboards that are shared amongst district science teachers. This is a cheap, easy, engaging and EFFECTIVE replacement for lecture sessions. There are many tricks and tips to running robust whiteboard sessions, but the primary

(2012-Colorful Chemistry STEM Camp) One of our many all-day, once a quarter STEM camps for students (and parents) in grades 3-5. The theme of this camp was chemical reactions involving color changes. We had nearly 40 kids and 18 parents attend. Below is a link to our STEM page which goes through all of our STEM camps since 2009.

https://sites.google.com/a/thegenerals.org/sibley-stem/

advantage is that kids do the thinking and discussing. **WEDGE'S ADVICE: Get them!!!**	
(2011-Applied Physics) Part of the Water rocket experiment or Egg-o-naut project. Google search Egg-o-naut! The students had to design a 2L pop bottle rocket that had a capsule (above) with a parachute that would deploy once the rocket hit optimum height. What's inside the capsule? An egg that had to survive upon landing.	**(2012-Colorful Chemistry)** We bought some Steve Spangler bubble magic solution and the kids (and parents) loved it. Google search science bubble experiments---it's amazing how many standards and activities can be hit with bubbles!
	
(2012-Physics) I had 5 young men in my physics class this year and (what has since become a tradition), we end our momentum unit with sledding experiments. Earlier we did experiments with lubricants on the sleds.	**(2011-Applied Physics)** One of our STEM scale-up grants was *KidWind* . Here, students are testing if blade number affects electrical generation. Google search for Kidwind, it has been by far, the most successful and popular (at our school) project. We now have grades 4, 5, 8, 11 and 12 doing some aspect of kid wind.



(2011-Chemistry) A sample whiteboard, in this case, students had to whiteboard their "Wet Dry Ice" Lab. Google search wet dry ice lab (from Flinn), it's a super fun way to get kids engaged with changes of state and it's easy and cheap. These whiteboard sessions allow me to determine if the kids really understand a topic at a conceptual level (without the need for worksheets, etc.)

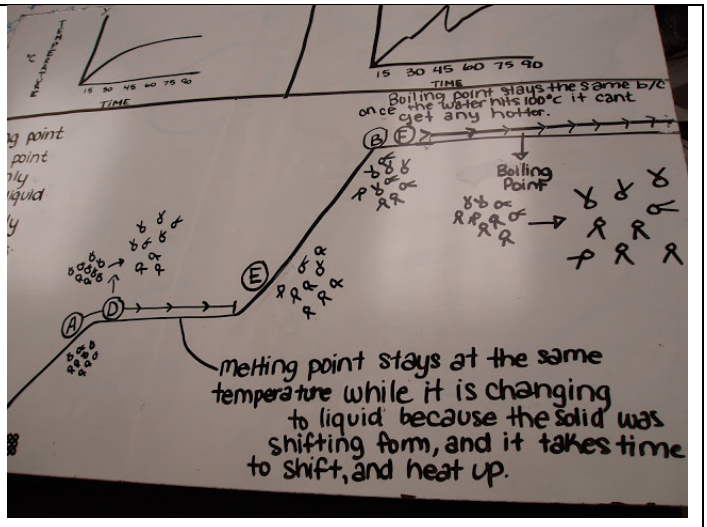
(2012-STEM Colorful Chemistry) Here, mom and daughter are trying to solve "Mystery Solutions", an activity from Flinn that really makes them observe carefully.

(2014-Applied physics) I try to do a design challenge at least once every two weeks. In this case, it's the "Marshmallow Challenge".

(2012-5th grade science) Can you see the balloons of hydrogen gas (or is it helium)? Students, with teacher help, made balloons of hydrogen gas using zinc and hydrochloric acid. Yes! 5th graders got to blow them up!

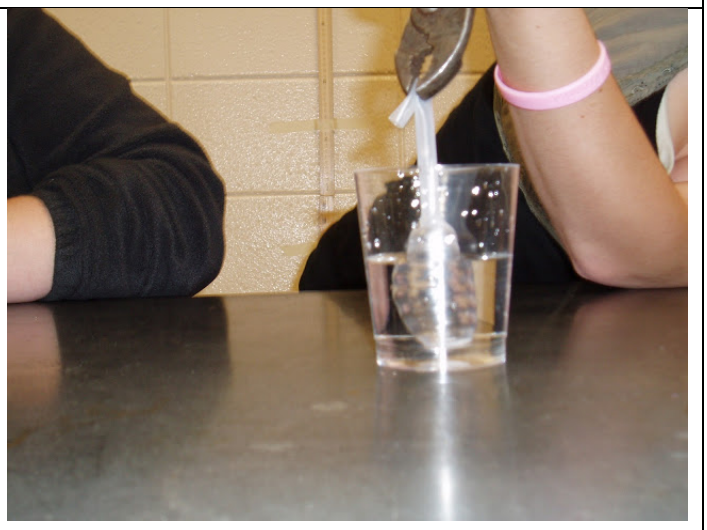
WEDGE'S ADVICE: Get middle school kids doing chemistry!! I helped our 5th grade teacher do this and then they made molecular models of the reaction using our atom kits.

(2012-Physics) Physics students are working on their rocket project…they only have 1 day left before test flights. We got these from Estes.com. A must do!! We even had this as one of our STEM camps for grades 3-5….but, that required more monitoring and safety checks!



(2011-Chemistry) A close up view from the "Hot Cold lab" where students melted a beaker of ice. They had to draw particle motion models at certain points. The upper quadrants where their predictions of what the graph would look like.

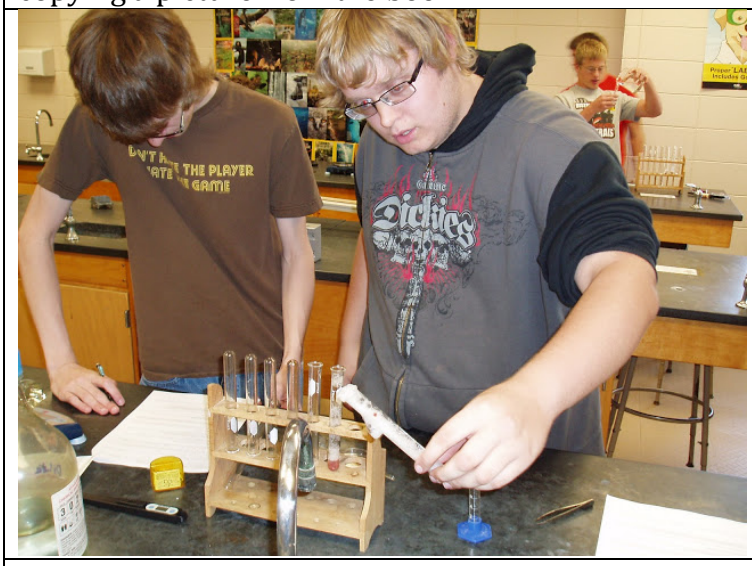
(2011-Applied physics) Students are testing to see if their parachute will deploy after it detaches from the Egg-o-naut rocket. The unit took 2-3 weeks, but the data and experiences were well worth it!



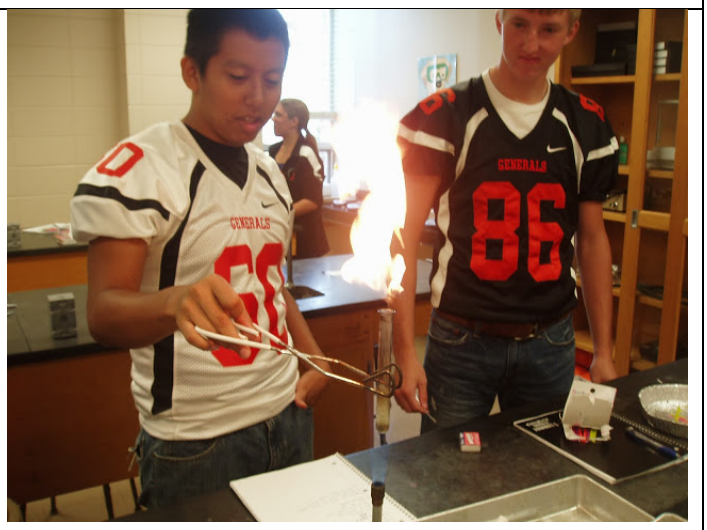
(2012) 6th grade science I worked with our 6th grade science teacher to do the "Wet Dry Ice" lab (that I also do with my chemistry kids). It was a great way to get MS students thinking about phase changes and to interpret phase change diagrams.

(2011-College Biology) Students had to make DNA using candy. The "twist" was that I gave them only vague descriptions of what DNA actually looks like, they had to build it off of that description, NOT just copying a picture from the book.

(2009-Colorful Chemistry STEM camp) The absolute best picture in my teaching career! *Why did this happen?*



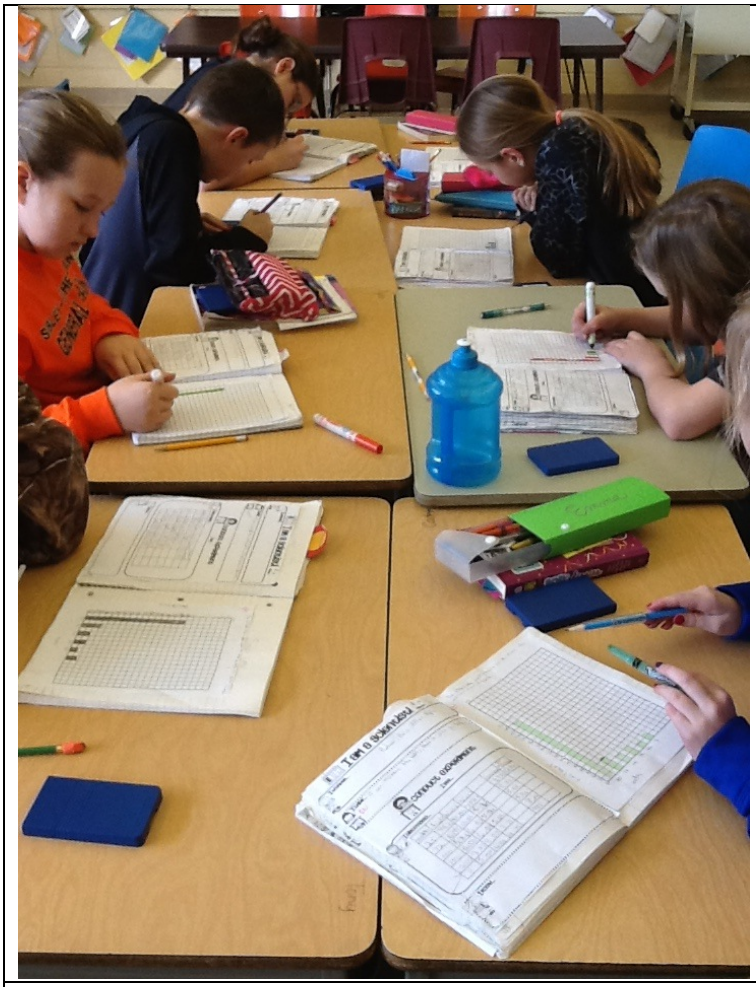
(2012-College Biology) Students are running their own experiments using the catalase enzyme from beef liver. I refuse to give these students a procedure, they run their own experiments!



(2013-Chemistry) From Flinn, "Combustion of Candle Wax," students are conducting an experiment to answer this question: What actually burns in a candle: the wax or wick-or something else? Again, I gave them no procedure.

WEDGE'S ADVICE: Wean your students off of you for directions—let them explore, grapple, fail, try again, fail, try again. I use the word 'grit' a lot in my classroom!

(2010-Flight School STEM Camp) Here, students in 3rd grade are working on their "Thrust Wars" challenge from Flinn. In this case, they have to get this balloon to travel down a string as fast as they can. We gave them no directions; they were told the goal and given supplies.	**(2014-ChemSTEM camp)** Here, students are making Glurch; again no procedure was given. They were provided with supplies and had to design their own recipe. Note this student's t-shirt. Keith Merrick, a local printing/apparel company, provides us discounted t-shirts to sell. Thus far, we have sold over 200 STEM t-shirts. It's great to see kids wearing them around school and town!
(2013-College Chemistry) After a successful titration (and tough first exam), seniors are roasting marshmallows using the bunsen burners.	**(2015-4th grade science)** My wife, a fourth grade science teacher, is having her students do "Rainbow Lab." As a HS teacher, with access to most of the "cool" science supplies, it's my job to help make sure other teachers get supplies they need.

	
(2014-4th grade science) All district science teachers agreed to do some version of a science notebook; we begin in grade 2 and go up to HS. Here, 4th graders are completing a graph following an experiment. Several teachers attended a science notebooking training sessions.	**(2015-Preschool)** I helped our preschool teacher get a Pint Size Science grant and secured additional funding to get some other "cool" things. Here, four year olds (!) are doing STEM; building a roller coaster from Lakeshore.com.

OTHER ADVICE AND THOUGHTS:

- Flinn scientific puts out free videos and activity guides that can be used as is, modified (for your needs or different grade levels). Check them out!
- Stop being the "Oracle" i.e. ultimate source of information---get your kids to research, think, ask questions.
- In modeling training, our instructor, Shannon McLaughlin (at Norwalk HS), used the word *explicit* constantly i.e. "Be explicit in your thinking," "provide a more explicit answer." Making our students be explicit (clear) is absolutely essential. Force them to elevate their thinking.
- Get other teachers to buy into STEM and inquiry based. Show, not tell, them. Be a leader in your district. An important component of being successful is getting your administration and parents on board. I sought out particular parents to get them involved.
- Network! Make connections to other teachers in your district, to businesses, to STEM people across the state!
- The ultimate advice is to TRY…I know that is clichéd, but it is what I did.

OTHER SOURCES:
https://sites.google.com/site/sosmadscientist/ (my teacher webpage, which includes curriculum and lesson plans). But, really, I do most of my work through google! :)

AND…THANK YOU!
In 2009, I was asked to give a commencement address for the graduating class from Central City HS (in Central City, IA), where my wife and I taught for two years. After wrestling with a theme and revising the speech multiple times, I decided to make it simple. Shortly before the ceremony, I met with the seniors and asked each to fill out two notecards, each with a message of gratitude to someone who made a difference for them in the past 18 years. I collected them all and my "speech" was a few minutes of me expressing the importance of showing appreciation and gratitude and then I read all of the notecards the kids wrote. Afterwards, I had parents, teachers, grandparents, community members all come up to me and say that it was the best speech they ever heard and most had no idea that their son/daughter/neighbor felt that way about them! To this day, once a month, I have my students write "Generals' Cards" to staff members, other adults, students at S-O as a way to remind everyone the importance of gratitude. Thus, I think it important to mention people who have inspired and helped me innovate and succeed in STEM.

- My wife, **Kate Wedge**, who has supported me and been an invaluable sounding board for ideas (and watched the kids while I travel to conferences, workshops and trainings)
- **Mike Anderson** and **Mike Compton** (the other Mike's) of our STEM program in Sibley-Ocheyedan. Mike Compton is with ISU-Osceola County Extension and Outreach and has worked to help build bridges to our friends in non-formal education. Mike Anderson is a former S-O elementary science teacher and current instructional coach with Prairie Lakes AEA. Mike is certainly the T in our STEM and has brought so many incredible gadgets and gizmos to our program.
- **Jeff Herzberg**, former S-O superintendent and current Prairie Lakes AEA chief administrator. Jeff was the person who most pushed me to expand my thinking about what being a teacher is; he helped knock down walls and provided me opportunities for me to improve. He also inspired me to never, ever show videos in my classroom by telling me, "We need kids doing science, not watching it."
- **Dr. Jeff Weld**. Dr. Weld has been instrumental in empowering teachers, like me, to do more and try new ideas in our classrooms.
- **Jordan Menning**, former S-O MS science teacher and current STEM consultant with NW AEA. Jordan was an incredible partner at S-O as we pioneered some of the new STEM activities and grants that came out. Jordan pushed his kids to do real science and provided insights into how middle school students think.
- **Heidi Douma, Karen Honken, Brenda Tutje, Karen Ten Napel, Jenna Dekeivers, Kate Wedge, Diana Lemke, Daryl Tutje, Nancy Watterson**, S-O's science teachers---a great team to be on; we're all working to make sure STEM gets into every classroom at every age level!
- **Diamond-Vogel Paints** and **Chuck Mork**, Diamond-Vogel was the company who sponsored me for the Externship program and Chuck Mork, head chemist and former science teacher, taught me what doing real chemistry is—lessons I've incorporated into my classroom.
- **Shannon McGlaughlin**, science teacher at Norwalk and Modeling trainer. Shannon was our trainer for modeling in 2011 and has worked ceaselessly to spread modeling around Iowa. This workshop has improved my teaching more than any other.
- **Kari Webb** and **Molly Faber**, NW STEM Coordinators. These two ladies have further empowered teachers to get STEM going in their schools and communities.
- **Governor Branstad's STEM Advisory Council and Iowa State Legislature**, for having the vision and energy to fund the scale up STEM grants, which are making crucial differences in the lives

(and most importantly) futures of our students! Teachers like me could never do these engaging activities without the financial support of the grants.

- **Sibley-Ocheyedan administrators, school board members and patrons**, all have been supportive of our efforts to get STEM into the school and to help train the next generation of scientists, engineers and thinkers right here in Osceola county!