Project Title: SEPA All about Arsenic

School: Machias Memorial

Grade Level: 9,11,12

Your Name: Jim Lenke

Project Partners: Tora Johnson, University of Maine, Machias

Teacher/Scientist Partner Profile: Finishing seventh year of teaching after roughly 35 years work in industry as a chemist/engineer. Studied Chemistry with minor in Mathematics at College, but with a keen interest in engineering(all types). Fun fact, I was given the first and only Chemistry Factotum award from my school. Having worked in several University research laboratories, I really like making the impossible possible by designing new equipment or techniques that ultimately are useful for other researchers or humankind. Upon entering the secondary teaching profession I quickly realized there are not many research opportunities available, so when AAA fell into my lap I jumped at the opportunity.

Summary: My project goal was two fold this year: get more conclusive bioassay data on Tardigrades and begin looking at how the project as a whole has been effective. This began by collecting approximately 20 samples from students and another dozen samples from colleagues of my science partner. All of these were processed as normal but a keen eye on Uranium as a few streets in our county have really high Uranium. Generally I reserve sample collection and basic data literacy for the Freshman while Juniors/Seniors in Chemistry get a more advanced data literacy and a bioassay.

For the bioassay this year, after discussions the students decided to let the algae grow in AsW and place the tardigrades in with the algae incubated under grow lights for several days. This uncovered several scientific problems because the effectiveness was based on death. But because tardigrades were disappearing it was impossible to obtain a count. Which ultimately led to where and why are the tardigrade disappearing. How ever important the bioassay was, the students were quite disappointed with tracking down something useless instead of learning about arsenic effects.

Discussions in the classroom about data and our community were pleasant and as always shocking.

Project Details:

- How many students were in the class that was involved in this project? In total, 32 freshman and 4 juniors.
- Detail specific curricular items such as questions, articles, books, YouTube videos, and labs. It's helpful if you provide links.
    - How effective has the arsenic project been?
    - What is As and where does it come from? Why is it found in New England?
    - Tardigrade feeding on algae exposed to AsW and monitored for living status.
- Did you:
    - Collaborate with any other teachers in your school?
    - Go on any field trips? Why and where? We did go into the forest to collect moss and isolate tardigrades to learn about their natural habitat.
    - Conduct any experiments? What kinds of questions did students ask?

    - Use your stipend to purchase anything for your classroom? If so, what, and how did you use it? Non-disposable equipment purchased was: adjustable volume pipettes, analytical balance (0.001), electronic components. Planaria, tardigrade, algae as well as micro rna tubes (0.2 mL).
    - Invite any guests to visit your classroom?
- How did you use Tuva, both for the arsenic data and for other datasets? TUVA was used to aid students to learn how to make different types of graph; interpret graphs; apply basic statistics.
- How did you plan your community outreach?
    - What did the students do?
    - What was the impact?
- Include any data analyses your students did.

Discussion:

- What did students learn? It's great to include quotes if you have them. Learned about Arsenic obviously, but most importantly how data can be skewed to tell a different story. They also learned how important data is to collect as well as interpret.
- What did you learn? I learned that conducting bioassays is much harder than doing non-living experiments. It was also learned that it can be hard to wedge advocacy into a curriculum.
- What would you do differently? Obviously do better on the bioassay. But this year the focus will be on advocacy to get more story out and reach more people.

Conclusion: Although pandemic situations weren't as hard this, switching school year organization (semesters) did throw a big kink in the flow of activities and for performance of students. Additionally, planning effective bioassays is increasingly difficult, but needs to happen to help bring students toward practical science. It was also learned that students have a hard time accepting arsenic as poison without credible proof and success. Regardless, I'm firmly involved in this project and all that it has accomplished for my community and school.

References:

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