

Project Title: All About Arsenic

School: Conners Emerson School

Grade Level: 8th grade

Teacher: Lynn Hanna

Project Partners: For this project I worked with Jane Disney, Anna Farrell, both from MDI Biological Laboratory and Steve Gable-Richards, a community member.

Teacher Profile: My name is Lynn Hanna and I am a 7/8 science teacher at Conners Emerson School in Bar Harbor. I started teaching at a private school in Washington, D.C. teaching 1st grade but soon moved to the 1-5th grade science teacher as my background was biology and education degree. After 5 years I moved to a public school in Northern Virginia. After 2 years I took a break and raised my two children, but got back into teaching in 2007 where I started as an Ed Tech at Conners Emerson School in Bar Harbor, but then moved into the 7/8 science position where I have been ever since. Teaching is my passion. I enjoy getting outside, hiking and sharing and finding experiences for students to do outside in the real world. I am interested in the All About Arsenic project because I feel it is important for students to think about the world around them, including what is in our drinking water.

Summary: For my project, students began by learn about atoms and elements. Students were given the choice of an element to research, but the choices students had were the elements that were tested for in the All About Arsenic project. Students were to create an “Element Baby Book” where students researched their element. Students then shared their elements with their peers so students would have some background knowledge to what our water samples were. We sent out 49 samples. Some students tested both their home water, grandparents’ water, and camp water; students were very involved. Steve Gable-Richards also collected community member samples. We ended up with 8 homes with arsenic above the 10 ppb limit and one home above the 5 ppb limit for New Hampshire. When we got the results back, students looked over the results, making general questions about what they saw. Some of the questions included,

- “What is the average levels of arsenic per town in Bar Harbor, Ellsworth, Seal Harbor, Lamoine, and Mount Desert?”
- “What is the difference in data between the types of wells?”
- “How many of the wells that previously had arsenic have it now or have changed?”
- “How come it’s more likely for previous arsenic to be found in drilled wells rather than public water?”
- “Does the well type affect anything?”

Students were also able to manipulate their data in TUVA, asking more questions from “Is there a correlation between arsenic and any other element?” to “Which part of the state had the most arsenic in their wells?”. Unfortunately, with COVID 19, we were unable to finish our project. The goal was for students to create a question, answer that question using TUVA, and then share their information with other classmates, the 5th graders, and/or the community.

Project Details:

- For this project, I had 49 samples tested from students, teachers, and community members.
- After getting data back, students looked over the data with these two questions in mind: 1. What do you notice? and 2. How do you suggest we go into this further?

- We used the <http://www.allaboutarsenic.org/> website and the <https://arsenicdata.tuvalabs.com/> website
- I used part of my stipend to purchase vials to send home with students. With the rest of the money, I was planning on purchasing daphnia, a microscope camera, and water filters, but that did not happen due to in-school classes being cut short.
- Students used Tuva to make some comparisons between different elements found with the arsenic data. Students also used Tuva for our Water Quality Lab where students go out into Somes -Meynell Pond and gather water temps and DO at different depths of the lake. Students used Tuva to show the correlation between the depth of the lake, higher concentrations of dissolved oxygen, and water temperature.
- Due to COVID 19, we were not able to do our community meeting.

Discussion: Students learned that there are elements that are unseen by the naked eye in their water. Students began to understand what these elements were, what they were made of, what are the side effects of having these elements in your body, and how we can get rid of the arsenic in our drinking water. Although my students did not get to testing any of the filters, since I had arsenic in my water, and I was going through the process of remediation, this led to some really great, rich conversations. We discussed data showing that the Zero water filters were way better at removing arsenic than other filters. We also discussed the under-the-sink water filtration model I was having put into my house – how I called around for estimates and then decided what was best for me. We also had a very rich conversation around “ethics”. I was able to afford this under the sink system, but it was quite expensive. Would everyone be able to do this? What levels were safe enough to have in the shower vs. drinking and how does that play a role in what system to purchase?

I learned a lot during this unit. I would definitely send out my samples as soon as I could in the fall to get the data back as soon as I could so I could use this data throughout the year. Because I teach semesters, it was difficult for me to make the timeline work. I also became very wrapped up in having to teach all the other “stuff” that I am responsible for, but once I worked through this unit I realized that I just need to incorporate more of that “stuff” I am responsible for teaching into this unit. I also realized that in my district, there aren’t any police that will come and arrest me if I don’t do all the curriculum and this project should and needs to be done. Students need to be thinking about advocacy and empathy.

As I mentioned in the last paragraph, some things on my mind for next year would be to send out my samples as soon as I could in the fall. I would also incorporate more standards into this unit. Another area I would like to incorporate next year is working with the ELA teacher and possibly work on writing letters to their state representatives regarding the results we find in our testing and the All About Arsenic project.

Conclusion: This was my first year teaching the arsenic unit. I had a lot to learn. I really enjoyed integrating talking about elements and specifically choosing the elements that we were testing for in our arsenic testing. That made looking at our results once we got them back much more meaningful to the students. I was looking forward to students thinking more in-depth and using Tuva to answer questions that students had come up with. This, however, did not happen due to COVID 19. I was also hoping to have students put together something to put in our school newsletter, but once the students started with online learning, the 8th graders switched to the social studies curriculum and they were done with science. I could not get any students to help. This has only fed the fire I feel, I’m pretty psyched to make sure this happens next year and dive even deeper into this project.

Acknowledgement: The work reported in this publication was supported by the National Institute of General Medical Sciences of the National Institutes of Health under Award Number R25GM129796. The content is

solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.