Project Title: All About Arsenic

School: Conners Emerson School

Grade Level: 8th

Your Name: Lynn Hanna

Project Partners: This year I worked with Jane Disney, Anna Farrell, and Sarah Dunbar

Teacher/Scientist Partner Profile: I am a 7/8th grade science teacher who teaches both life and physical science. I have been teaching for about 16 years, starting in 1993, but took a few years off to raise my two children who are now 21 and 24. I have a biology degree along with an K-8 education degree. I have just discovered backcountry camping, hiking, and fly fishing which have become a new passion for me. In school I am passionate about making the science classroom exciting and "different" than a lecture hall. I am interested in the All About Arsenic project because I want my students to be a part of gathering data that means something. A real life experience.

Summary: This year I started working with my 8th graders in January. Our push out of the gate was to get our water samples out to the public and back and then send to Dartmouth. While we were waiting for our results to come back students worked on researching the specific elements Dartmouth was testing for: arsenic, antimony, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, thallium, and uranium. Each student chose one of those elements to research and then put together an element baby book to share their information with their peers. Once our data was received, students began analyzing through TUVA. They came up with questions regarding their data. Specific questions like," How many families would be affected if we reduce the arsenic levels from 10ppb to 5 ppb? And "Is there any correlation between arsenic and any other element like lead or antimony?" Students then chose a specific question, organized their thoughts and research, and chose some way of sharing. Most students chose to do a poster, some chose to make a slide show, and one student chose to write a letter to the editor. This year I only had 29 water samples with only 1 case of high arsenic over 10ppb. Other elements tested were antimony, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, thallium, and uranium.

Project Details:

- There were 38 students involved with this project. 33 in person and 5 remote.
- We used TUVA Labs and the All About Arsenic website.
- With this project I worked with Anna Farrell, Jane Disney, and Sarah Dunbar, I did not work with anyone at my school, but there is talk of possibly doing a project with TUVA with the 7th grade math teacher next year.
- This year students conducted experiments using water bottle filters and different concentrations of arsenic. Students asked questions like: "Which water bottle takes the most arsenic out of the water?" Which water bottle works the best?".

- My stipend money was used to purchase arsenic testing kits for the water bottles, water bottles with filters, and 2 microscope pens.
- My students used TUVA quite a bit this year. I started their science year with having students complete "Analyzing Population Change in the US with Scatter Plots", "Asking Questions about the Chemistry of Well-Water", and "Conductivity of Metals". We even used TUVA and created our own data set. Students went around town and picked up trash. We then organized that trash into types. Once we had that information, we created a data set in TUVA and we were able to manipulate the data.
- This year for our community outreach students met virtually with MDES students to share their findings. One student even wrote a letter to the editor informing the public about arsenic in our well water.

Discussion:
Students really enjoyed working with the data we received this year. They enjoyed the fact that we were working with something that was real to them, this was happening to people in their communities, and they enjoyed learning about the effects of arsenic and other elements on the public's health.

I learned that I could do a lot more of my science curriculum through this unit. I spent over 1/2 of my time this year with 8th graders talking about water quality and arsenic. A topic well worth spending the time on! I even had one student who science wasn't her favorite thing, share in her 8th grade district writing prompt that she" liked the arsenic project and learning how she could help." I was able to test water bottles this year, something my students loved to do! It was really neat because MDES did the same tests and shared their data with me so I was able to share what MDES found for results. We both got just about the same results! The kids were blown away and so inspired that they were testing and doing the procedures correctly to gather the same data evidence.
Next year I would love to find some more time for students to do further tests on the water bottles. Students loved asking questions and then creating their own experiments with the water bottles.

Conclusion:
Even with the pandemic this year I was able to gather data that students could then manipulate and analyze. Students were awesome and we even went as far as having a virtual sharing, which was a first for me, but so well worth the time and effort, students love being able to share their learning.

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