

Project Title: “What’s Up and How Did it Get There?”

All About Arsenic Data Literacy Study

School: Winchester School

Grade Level: 8

Teacher: Jolene Miner

Project Partner: Verna Delauer, PhD, Associate Professor of Environmental Studies, Franklin Pierce University

Teacher Profile:

After spending 15 years in the medical field, I completed my undergraduate degree at Vermont College of Union Institute and University with a BS in Liberal Studies and a focus on middle school science instruction. I completed my graduate work at Antioch University with a Master of Education and a focus on curriculum and assessment. I have been teaching 6-8th grade math and science for 15 years with the last five years teaching 7/8 science. My teaching career has been in a small rural K-8 school in the southwest corner of New Hampshire. I primarily focus on environmental science, biology, physical science (chemistry and physics), and earth science as it pertains to current topics in my curriculum. My goal as a teacher is to present opportunities for the students to see where the skills and concepts, they are exposed to are relevant to their current and future lives. As a science educator I focus on the NGSS Science and Engineering Practice Standards [Science and Engineering Practices in the NGSS](#). I feel that these practices will be of benefit in any career path and life decisions.

Project Summary:

At Winchester School the 7th and 8th grade science curriculum is an integrated experience of all disciplines based on any given topic or concept. Through this project a water quality curriculum is being developed. The 2020-2021 school year had 34-37 hybrid and remote 8th grade learners participating in this work. They are heterogeneously grouped. Because a majority of the students were on the town water supply, staff and friends were recruited for the study. Forty-two samples were collected from thirteen different towns in Cheshire County. Because this was the first year Winchester participated in the study and most arsenic levels were within normal limits, the students focused on providing information to the public about all fourteen elements that are measured. The students felt that it would be beneficial to supply the community with information about all the elements in their water. In the end the students collaborated in small groups to work on a digital presentation to communicate their research

findings about these elements. They decided as a grade what information would be included in the slideshow. The slideshow was then printed and laminated for display at town and school board meetings. The slideshow will be posted on the town website and school website as well as the school Facebook page. Due to pandemic protocols the students did not present in person.

Project Details:

June 2020 - I participated in the remote Data Literacy workshop. I learned about the different aspects of the SEPA grant and the pieces I needed to incorporate into the well water analysis project. I was introduced to TUVa and how to use the platform to help the students answer their questions about data.

October 2020 - We began the process by talking and reading about what Citizen Science is. The students generated a living document that contained existing projects that were of interest to them.

October 2020 - We navigated the All About Arsenic website to familiarize them with this resource [All About Arsenic – Data to Action: A Secondary School-Based Citizen Science Project to Address Arsenic Contamination of Well Water](#) . We viewed [In Small Doses: Arsenic](#) , [Bringing Youth Into the Equation](#) , and [Citizen Science: Everybody Counts | Caren Cooper | TEDxGreensboro](#) .

October 2020 - I introduced the students to the TUVa platform. We viewed the tutorials on the All About Arsenic website [Tuva – All About Arsenic](#) . We then navigated the “Man’s Best Friend I and II” datasets.

October 2020 - We started to talk about research ethics. After a brief discussion of vocabulary terms from the City University of Hong Kong website, [Ethics in Research - Research Methods - Research Guides at City University of Hong Kong](#) and review of the video [Research Ethics](#) , the students participated in a carousel activity to assist them in a better understanding of the terms [Carousel Activity Protocol](#).

October 2020 - The students and I had a ZOOM meeting with Verna Delaur’s Environmental Studies class at Franklin Pierce University. Her students facilitated conversation with my students about Citizen Science. The university students then facilitated break-out sessions that pertained to ethics in research.

November 2020 - We went back to practice using TUVA by working through “Elks and Wolves in Yellowstone”. Some students completed it independently.

November 2020 - Due to my awareness that the arsenic levels were probably not going to be elevated in our region, a conversation ensued about what other information would be revealed in the test results. The students had studied the periodic table in 7th grade so the conversation about the other elements began. The students decided what important questions could be researched to disseminate out to the public.

November 2020 - We watched a couple of videos from the PBS series [Human Spark Experimenting with Experiments ~ Lesson Activities | The Human Spark](#) . The students then paired up to create an experiment to answer a question they had. The following assignment guided them through this process.

November 2020 - Sampling procedures and paperwork were reviewed. Sample kits were dispersed. Samples and paperwork were mailed out before Thanksgiving break.

November 16th - Full Remote

November 2020 - The students participated in a webquest focused on careers in the science field from <https://www.sciencebuddies.org/> .

December-February 2020 - The students continued to pick away at the experiment assignment as well as the TUVA activities. The individual research on the element assignment was also completed.

I was in email contact with Verna Delauer as I was trying to develop a water quality activity for the local stream and river. Verna was also trying to help me resource a geologist to help with integrating the geology behind how the elements wound up in the water.

March 2020 - All of the students met in the gym to consolidate their research on their specific element and designed the slide of information for the presentation. Remote students met as well with their partners.

March 2020 - Now that we were back in school, experiments were completed and write-ups done. All students who completed the assignment entered their data onto Google sheets. Some were able to upload their data sets to TUVA!



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March-April 2020 - We looked at the water data from our samples on TUVA. The students generated questions about the water data as they manipulated the attributes. I was in contact with Molly Schaufler, Sarah Dunbar, and TUVA Support with questions about accessing specific information.

April 2020 - Digital presentation posted for community members to view.

Discussion:

The students were exposed to many aspects of data collection and analysis, research ethics, and virtual collaboration. The focus of the data turned out to be more about their own experiments than it did the Arsenic Study. They realized that the way they lay out the attributes and data on Google Forms affects how their graphs will present themselves. They also realized how hard it was to graph some of the results given how the questions were asked. They had many more or different questions arise as they looked at their data.

I was reminded that the goal of this project was to expose and get the students familiar with and excited about data literacy. I was able to do this more by letting them spend the time on THEIR data instead of the water study data. I also learned a lot about how to set up digital tables and graphs. As always, I learned from the students techniques, short cuts etc. that the kids discovered.

This being a very different year, I don't know what I would do differently. It seemed like each time we had a schedule change, we had to adjust. I want to spend more direct instructional time on the TUVA activities next year. I also want to incorporate more geology as I feel that was

the missing discipline. I have purchased water quality test kits with the hopes of having the students testing the quality of the water from the stream on our nature trail. What is the correlation, if any, between the well water tested and the surface water?

Conclusion:

Given the instructional dynamics that changed constantly this year, I didn't know what to expect. I feel like we addressed and exposed the students to some very important concepts through this work. The primary goal that I feel like we achieved was to have the kids wonder about something; generate a question; figure out how they were going to answer the question; figure out what to do with the data; and what's the next question. There is definitely more to be done.

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