

FINAL CASE STUDY 2023

Project Title: Arsenic and Well Water

School: Mt. Blue High School

Grade Level: 10th grade

Your Name: Doug Hodum

Project Partners: I have two partners at the university level, though neither are fully engaged with the program as a whole. Terry Morocco and Doug Reusch are my two partners at UMF.

Teacher/Scientist Partner Profile:

I have been teaching for 23 years, nearly all at Mt. Blue High School. I was an independent major as an undergraduate, creating my own major of Environmental Technology (anthropology, environmental studies, math, physics). I went on to earn my MS in Ecology and Environmental Science. I love being outside and keeping fit all year. For the class, I love to see students making connections to the world around them and to understand how interrelated everything is. The “ah-ha” moment is the best time for a teacher. The connections that I hope to help students make are why I am interested in the All About Arsenic project. It allows students to see real issues that could affect our, or other, communities.

Summary:

I started the year off with the lettuce seed bioassay for all my students. It was a great way for me to have students DOING science and collecting data, which we later graphed and interpreted with all the classes pooling data. This was the link into data literacy. Unfortunately, the vast majority of my students were either on town water or not interested in having water tested. This year, for the first year of my participation, I was able to secure multiple samples, some from former students and some from current students. I had half a dozen samples submitted and analyzed for the presence of arsenic as well as other commonly found elements in the well water.

Project Details:

I did the bioassay work with all of my classes this fall. The honors and college preparatory classes both had 17 students. My two ecology classes had a total of 26 students, while my foundational biology course has 7. The total of students is 67 Mt. Blue High School students.

As with previous years, we used a simply bioassay lab with black seeded Simpson lettuce seeds. The seeds were exposed to tap water as a control or polluted water of differing concentrations (iron or arsenic: 10, 100 or 1000 ppm OR copper: 100, 1000, 10000 ppm). We used the protocol provided by Jane Disney, where each sample included 10 seeds per water type. The results did not reveal any clear pattern save for the fact that the most concentrated pollutants stunted the germination and growth over a 2-day period.

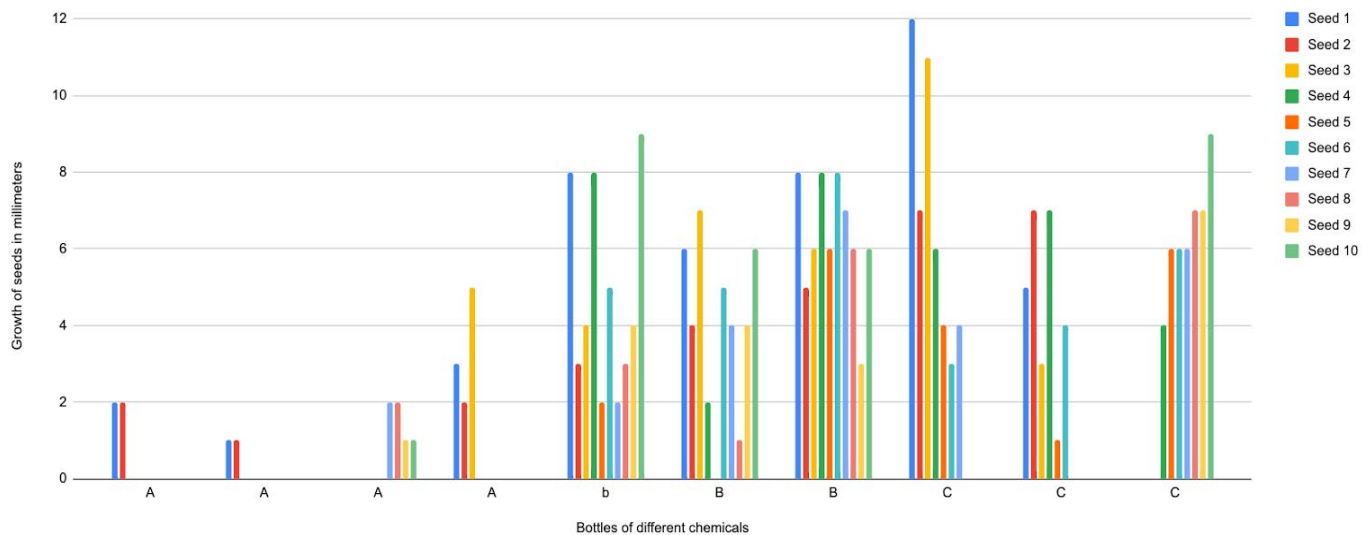
A small amount of money was spent to secure the seeds for the experiments. The pollutants were provided by Terry Morocco.

Rather than using Tuva, we used Google Sheets, which allowed them to all create graphs and identify patterns individually and as a class.

With such a small number of samples, and no results that were high values, we did not have a public forum on the topic of arsenic in well water.

One example of a graph students generated can be found below. The bottles labeled with C were the most diluted, and A were most concentrated. All students were required to generate graphs such as this for the data they collected from their bioassay work.

lettuce seed bioassay data 22-23



Discussion:

For many of my students, they learned how to enter data into a spreadsheet and then generate graphs using Google Sheets. Very few had any experience about how to do that. Once some of them were able to generate their graphs, they supported their classmates in making the graphs for themselves. Additionally, we discussed the variability and what might be the cause of that.

I learned that students come to me, as sophomores in high school, with very limited experience and knowledge of spreadsheets and generating graphs. Their ability to problem-solve when graphing is also limited. Despite being digital natives, they are not sure how to use the tools that are online.

With some of my students, I would have gone into more detail with the graphing and working more with additional statistical analysis. The honors students could handle that level of analysis.

Conclusion:

This was another year of participation where I involved students in testing of their well water. Additionally, students got to do a bioassay, which is not something I had ever done, or considered doing, before participating in this project. My students got hands-on experience doing something they had never done before, and families in my community now have data about the safety of their well water, which is a wonderful community service.

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