PINKERTON ACADEMY

Well, well, what's in your well?

School: Pinkerton Academy, Derry, NH

Grade Level: 11-12

Teacher: Michelle Mize

Project Partners: MDI Biological Laboratory, Healthy Acadia, Washington Hancock Community Agency, Dartmouth College, Derry and Manchester Municipalities.

Teacher Profile Michelle Mize, a NH native is a Career and Technical Education teacher for the past 17 years in plant science, natural resources, forestry and previously worked in the field. She has a M.A.L.S. degree from UNH with a focus in Environmental Education and Natural Resource Inventory (N.R.I.) applications and case studies. In addition she has a great interest in water quality and is excited about her students being involved in an EPA study about arsenic in drinking water. She is also involved in lake monitoring in Southern NH and has long volunteered to serve the NH Dept. of Environmental Services "Weed Watch Program" as well as the Sunset Lake Association.

As a product of CTE herself (KHS- '85) she realizes the value of hands on application in real life scenarios to interest and motivate high school students to develop cross-curricular critical thinking skills.

Summary (short paragraph):

- 2015-16 school year: students planned the execution, budgeting and ordering of supplies to take 2-30 sets of samples of student well water and a set of CTE faculty samples, as well as pH and nitrites strips.
- Students identified areas in need of testing and realized that Pinkerton students and staff cover a variety of towns that are in need of education. We toured Derry and Manchester municipal water and waste water plants and learned where much of our town water in Derry comes from and where it goes, as well as ways of water quality remediation and the quality of aquifers and potable water sources.

Introduction:

The students are from many towns in the surrounding area: Derry, Hampstead, Chester, Auburn, and Hooksett and students from Windham and Plaistow come for CTE courses. We focused on the issues of our soils types having high occurrence of potential arsenic, high past/present farm/apple orchards/pesticides and subsequent potential health issues. We broke down the parts of a water test, EPA parameters and aesthetic issues with drinking water. We looked at previous tests and students brought in test outcomes from home. Students were surprised that a few of them already had filters and many types of remediation, even arsenic and uranium. Some of our

faculty members and students were excited for test results and others had a "don't know, don't care" attitude which we found odd and wove into our next round of tests and education. Through the field trips we learned about the Massabesic watershed and its early conservation that has helped municipalities for decades. We also talked about who owns water and the USA Spring issues in nearby Nottingham and worldwide clean water availability and water privatization. The focus of our project was to understand arsenic, how it appears, and what it has been used for in the past and educating our community about the potential health problems it can cause. Provide a context for your project. For example, if you planned a watershed study, how did you connect that to the concept of arsenic monitoring?

Project Details:

Both years~

Several lectures and student research were completed as well as writing our proposal and obtaining materials.

- 2015-16: Students developed a "commercial" to show how to take a sample and tested pH and nitrites with science week students. They presented this to the Upper Room in Derry to young adults in a variety of programs as well as adults. Our focus was how different elements in drinking water can affect one's health, especially children. Chronic and acute toxicity and Blue Baby Syndrome were the focus for the audience. Water test kits were given out to those interested. We had Allied Clearwater of Kingston, NH come in and speak with us about our results and what types of remediation is available. We visited a municipal water supply of Derry that had arsenic/remediation for a subdivision, the Derry Water Treatment Plant, the Manchester Water Treatment Plant, and the Wastewater Division. Kathrin Lawlor arranged for toxicologist Britton Goodale regarding arsenic in food who came to the classroom year one. Her presentation was called "How does arsenic affect health" and it covered food, water, toxicology, and health.
- 2016-17: Due to a number of factors, we did not have enough time in the fall to devote to water quality and testing. This unit was more suitable for spring semester as it had been in 2015-2016. Students distributed 300 flyers at the Londonderry Hazardous Waste Day to encourage people to think about their drinking water and potential contaminants and offered a few tests and did receive responses from residents.
- Students became more aware of their impact on community related environmental issues and had a great deal of ownership and excitement as did I.
- Science week presentations were prepared for peer/peer teaching.
- Reflections were collected throughout the project as well as feedback from our audiences.

Discussion:

Students learned that it was important to be aware of one's own well and that municipalities have a responsibility under EPA requirements to provide clean drinking water. This project happened to coincide with the St. Gobain plant contamination in Merrimack, NH and it was relevant timing.

The project was exciting in that the students could see real life results and of samples, mapping and their community.

I think students are more apt to see other environmental issues in their communities and the world because of this experience and I found them much more willing as learners and presenters than normal due to a close reality connection.

Student input on what they learned:

- Which elements are common in water
- Types of water sources
- Processing and pH levels.
- What arsenic is.
- Arsenic is a carcinogen.
- Arsenic is very common in certain soils.
- How arsenic affects the body.
- E.PA. standards for levels acceptable in drinking water and how they have changed over time.
- That arsenic is a health problem that can be remediated if one is aware of the presence of the contaminant.

I learned that several of the areas surrounding Derry were in apple production for many years and several wells on these properties have an abundance of arsenic. I learned that student engagement was on a different level when they were going to present to adult and peer audiences and that they wanted to incorporate things like video and games such as "Kahoot". Because of several factors I was hard pressed to imitate the same development of the project from year one to year two with new students. Time restraints on the second year and the planning piece were already in place. The online information "All About Arsenic" was helpful as a cohesive place but I often had trouble finding it, navigating the blogs and all that needed to be done, mostly because the stops and starts of working with it and being pulled in other directions. If it was two complete school calendar years with a follow up period I think that would have allowed more time with the second group or year of students. I would like to continue this project or similar projects with students in the future.

Guest Speakers:

- **Chris Borst, Allied Clearwater, Kingston, NH**
- **Charles Myette, Brown and Coldwell, Andover, MA**
- **Britton Goodale, Dartmouth College, Andover, NH**