



Date: 4/3/26

Your Name: Bryan Lloyd

Your School: Fall Mountain Regional HS

Grade Level(s): 9-12

Course(s) Taught: Chemistry Honors, General Chemistry, Earth Science

Number of Students Involved (Total): 55

Name of your scientist partner and their institution, and any other partners (other partners can include, but are not limited to, collaborations within the school, community groups, non-profit organizations such as the YMCA, or stand out family or friend mentors that helped your project succeed):

Nick Baer, Colby-Sawyer College

Teacher Profile: A brief biography of yourself. How long have you been teaching? What did you study in school? What are you passionate about inside and outside the classroom? Why are you interested in the All About Arsenic+ project? How long have you been participating in SEPA and how were you recruited to participate?

I have been teaching high school science for 32 years. My bachelor's degree was in chemistry and I had a few years experience working part time in a product development lab at 3M while completing my degree and while in grad school. I studied physical sciences education in my masters program. I have taught in Minnesota and Kenya, but the majority of my career in New Hampshire. I am passionate about facilitating students' learning of science by gathering and interpreting their own data and having ownership of their learning. Being trained in the Modeling Physics methodology sent my teaching in that direction. After hearing about AAA+ from Nick Baer, I joined the program in 2025 because it fits nicely in my approach to teaching. Outside of the classroom, I am passionate about my family, studying and reflecting on the Bible (especially the Torah in the original Hebrew), cross country skiing, and hiking.

Abstract: Provide a 500-word summary of your project. Describe the **curriculum**. How was drinking water sampling, **data analysis**, and **science communication** integrated into that curriculum? Provide specifics (number of samples collected, what the samples were analyzed for, how Tuva was used, what opportunities students had to talk about their data through some public outreach, etc...). Did students use the **Science Communication Toolkit** and/or Solutionaries Framework to prepare for this outreach event or guide their participation in SEPA this school year? Did students participate in an **Intergenerational Learning** activity (pH exercise etc.)? Please include anecdotes or stories in this section!

This is my first year being involved in the program, and due to some administrative issues delaying my school district setting up an account with my grant funds to purchase materials, we were unable to collect data during my first semester classes and to begin implementing the program as planned. In my second semester courses we have finally been able to begin implementing the program, collecting 44 samples from a rural area of western NH that doesn't have very much previous data and have begun connecting our research to areas of the curriculum in chemistry honors, general chemistry and college prep earth science classes.

At this stage the students have learned how mass spectrometry works to identify atoms in our samples, tying the principles behind the instrument's operation to how mass to charge ratios and parabolic paths were used to discover electrons in the cathode ray tube, protons and isotopes of elements anode/canal rays. We will shortly be analyzing our data using TUVA in connection with our unit on mixtures and solutions, connecting to their understanding of the concept of concentration.

When we begin the unit on acids and bases, we will have student do the intergenerational learning pH activity. We will then develop the concept of acidity's impact on ability of water to dissolve metals like lead. We plan to look at our (limited) test results for samples with town water that did a standing water test first thing in the morning to try to see how the sample data compares to source data from the town water testing results that we've seen online and to see if lower pH samples have a greater elevation of metal levels compared to more neutral or alkaline samples.

For community outreach, we plan to present our findings in articles for the school newsletter, school facebook page and local newspapers. Additionally, we hope to present findings via poster presentation to the community in the lobby before/after a band concert, to the school board and/or a few of the selectman's boards in our local towns. We plan to use the communication toolkit to guide students' development of presentations and articles.

Details

Did you...

	No	Yes	Where appropriate, how many?
Collaborate with your Scientist Partner? - If so, how? (Discussions during SEPA training, email correspondence)	☐	☒	<u> 3 </u>
Use the Science Communication Toolkit? - If so, how? (Plan to use in developing our outreach in May.)	☐	☒	<u> </u>
Use the Solutionaries Framework? - If so, how? (Perhaps next years cycle through the process)	☒	☐	<u> </u>
Use any Intergenerational Activities? - If so, how? (Plan to use in developing our outreach in May.)	☐	☐	<u> 1 </u>
Collaborate with any other teachers in your school? - If so, who and what do they teach?(Discussions with another Earth Science colleague who may add this to her curriculum.)	☐	☐	<u> 1 </u>
Conduct any experiments? - If so, what kinds of questions did students ask? (Focus question planned: does lower pH increase metal content compared to source water tests?)	☐	☐	<u> 1 </u>
Go on any field trips? - If so, where and why?	☒	☐	<u> </u>
Have any guests visit your classroom? How many? - Who and why? What did the guest do?	☒	☐	<u> </u>
Have a Community Meeting? - If so, where was it, what did the students do, how many people attended, etc...?	☐	☐	<u> </u>
Have other Outreach Events? - If so, where were they, what did the students do, how many people attended, etc...? (Hope to share results in lobby before after band concert and/or at school board meeting.)	☒	☐	<u> </u>

Use your classroom award to purchase anything for your classroom? - If so, what, and how did you use it? (Looking into purchasing filter pitchers for families that had elevated arsenic and manganese.)	○	○	\$ <u>120</u>

Describe the student, or group of students, whose work most exemplified the All About Arsenic+ project this school year. What were they excited about? How did that facilitate their learning? Please include anecdotes and stories here.

It is early in our process as results have recently come in and I have upcoming specific curricular units where our next steps will be integrated. But the especially the chemistry students seem to be excited to be doing meaningful research that will hopefully start to uncover patterns in an underreported area of the state.

Reflect on your students' primary learning outcomes/gains with reference to data literacy, science communication, and using data visualizations in communication. What are they getting out of their involvement in this project? Please include anecdotes and stories here.

We will be shortly embarking on our data analysis using TUVA to visualize our data.

If you are a teacher who has participated in both SEPA grants, how have you shifted your teaching to include the additional goals of science communication and intergenerational learning?

This is my first year with the program, but we plan on integrating both science communication and intergenerational learning in upcoming activities. We waited to do the pH testing activity as we felt more samples would be obtained before the last testing deadline if we kept it simple and focused on just the outgoing samples in March. But the pH activity fits in well with our upcoming acid/base unit and will be an assignment coming in early May.

How did you use our Tuva drinking water dataset? Did you use the Tuva software for teaching, was it a tool students used to create data visualizations? What about other Tuva data activities? Did you use them in your teaching? Did students build skills using those activities? Please include stories that illustrate students understanding the link between data visualization and literacy and science communication. If you are a teacher who has participated in both SEPA grants, how have you shifted your data literacy focus to include this grant's science communication goal?

At this point students have been working to understand types of relationships in pairs of variables with data analyzed with vernier graphical analysis. But in our unit on solutions which includes the concentration concept, we will begin using Tuva to analyze our data.

What challenges did your students have with Tuva, the website, the datasheet, Anecdotal, anything related to the project process.

I will share difficulties encountered when we get to this point.

If you did not use Tuva this year, how did you analyze drinking water data? Please explain why you did not use Tuva. What challenges and successes did students experience with your chosen data analysis/visualization tool?

How did you enhance *your own* Data Visualization and Science Communication skills, as an educator or scientist partner?

Most of my personal data analysis experience and educator experience has been my or students focus on only two variables at a time on x,y scatterplots and deriving equations from curve or line fitting. I appreciate Tuva's ability to visualize three variables at once with color scaling of a third variable on top of the first two being on the x,y axes and it has been good for me to see other kinds of graphing tools.

Science Communication Outreach

What kinds of science communication outreach products did your students produce?

I will give students options: newsletter articles, newspaper articles/letters to the editor, poster presentations.

Did your students work with the Science Communication Toolkit this year? Yes ☐ No ☐

If yes, please describe how it went. What worked best? What improvements could be made?

(We plan to use it in our work next month.)

Please include anecdotes or stories here. If you did not use the Science Communication Toolkit, why not? What other resources and activities did you use to teach or facilitate science communication? Did the science communication skill building inspire outreach or build capacity in your students in ways not directly associated with the SEPA project?

(I will share what I find when we reach this point.)

Don't forget to add all final student products to your teacher folder on the shared google folder! (Feel free to add additional products that led to the final products. Simply create a separate folder under your teacher folder.)

Intergenerational Learning

Did you send an intergenerational activity home to parents? Yes ☐ No ☐ (Upcoming in our acid/base unit.)

If yes, please describe the activity. What are stories and anecdotes you can include about student participation in intergenerational learning activities?

(I will share what I find when we reach this point.)

If no, please describe why. What other resources or activities did you use to teach about or facilitate intergenerational learning?

What worked best? What improvements could be made?

(I will share what I find when we reach this point.)

Did the intergenerational activity go home at the same time as the drinking water samples? Yes ☐ No ☒
Please explain.

Because of delays in receiving our funds and with our district setting up an account for our funds, we were pushing the March sample submission deadline. To try to maximize student participation, I decided to make the sample collection process shorter at this stage by focusing only on the collection. The pH testing will integrate with the curriculum better in an upcoming acid/base unit as well.

What feedback did you hear about the activity?

(Will report this when we reach this point.)

Solutionaries Framework

Did you use the Solutionaries Framework in your class? Yes ☐ No ☒

If yes, please describe.

What worked best? What improvements could be made?

If no, why not? Please include other activities or resources you used to teach about or facilitate systems thinking, placed-based discovery, or project-based learning.

Trying to keep things simpler this first year with the program.

Did you attend the Institute for Humane Education series on the solutionaries framework in your class?

Yes ☐ No ☒

Which aspects of this Communicating Data project will you repeat next year?

I hope to repeat all of the aspects I've attempted, and hope to explore integrating the solutionaries frameworks materials next year.

Which aspects of this project will you change next year?

An earlier start will occur now that my district has set up an account for our funds. Purchasing materials will be easier to get started right away next year.

List and describe the resources that helped your students the most this year.

I think Tuva and the communications toolkit will both be helpful.

Provide a list, and links, if applicable, to specific curricular items such as online worksheets, articles, books, YouTube videos, and labs.

-Activities (Discovery of the electron, isotopes, principles of mass spectrometry) developing an understanding of parabolic paths of charged particles and how mass impacts the trajectories using the simulator link below.

<https://lab.concord.org/embeddable.html#interactives/interactions/electronProperties.json>

-Tuva

-Communication toolkit

Add addendums such as stories and anecdotes, photos, student assessments, testimonials from parents/students, etc.

What were gaps or barriers you experienced this year?

Logistical barriers delayed our start. Our funds were initially misaddressed and lost in the mail, and our district office took months to set up the account. Things are slow due to our being without a superintendent and due to new staff in the business office struggling to keep up with things.

What are the anticipated needs for the 2025-2026 school year?

I assume this was meant to say 2026-27.

It will help to have the experience of first time through the program. I don't foresee additional need at this point.

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