Developing Student-Driven Science Investigations

I don't think it is a secret to any of us that students learn best when they actively participate in their learning and when the learning is relevant to their life experiences. Developing a curriculum that effectively incorporates experiential learning and utilizes the local environs can be a challenge, yet the rewards are well worth the effort. Additionally, project-based, place-based experiential lessons provide an ideal opportunity to embrace the spirit of the Next Generation Science Standards.

Below is an example of how a simple student interest activity can evolve into quality student-driven science investigations.

Step 1: Get students into a rich learning environment (forest, garden, laboratory, etc.).
I have a group of students who are very interested in identifying and harvesting edible wild mushrooms. Wherever we go, we are on the lookout for fungi.

Step 2: Ask questions and listen to student questions (Learn together.).
As we search, we all inevitably ask questions about the mushrooms, habitats, and growing conditions.

Step 3: Focus on questions that can be tested.
One year, students wondered which substrates would provide a better medium for cultivating mushrooms in the classroom. The following year, students, curious about sustainable use of chaga, asked how many times a piece of chaga can be reused to make tea.
(Chaga, a slow-growing fungus that grows on birch trees, is one of my students' favorite fungi. It is used to make tea and has potential medicinal properties; and as people become more familiar with its potential health benefits, it is being overharvested in some areas.)

Step 4: Students plan and carry out an investigation to produce data to serve as the basis for evidence. The first year, students planned and carried out an investigation using straw and sawdust as a substrate for growing oyster mushrooms. The second year, students planned and carried out an investigation to determine the concentration of tea with each subsequent use of chaga pieces.

Step 5: Students develop a product to communicate their findings. For each investigation, students in the class work together to produce a paper, slide presentation, and information poster or pamphlet designed to educate the public.

Extension: I encourage, but do not require, students to present at a workshop/symposium or enter a science competition. For each of the investigations described above, a student presented the work at the Wisconsin Junior Science & Humanities Symposium.

Partnerships: To enhance these experiences, I rely heavily on collaborative partnerships. As I talk with people in the area, I learn about the science and research happening in the region. When I identify a potential learning opportunity, I ask if there is something my students can do to assist with the work. I recognize most professionals are busy and find it difficult to complete their work due to lack of time. So, rather than adding to their workload, I try to develop a partnership that will potentially take something off their plate. In return, my students get a deep, meaningful science experience. For example, both the Red Cliff Treaty Natural Resources Division and the Apostle Islands National Lakeshore have been interested in using remote trail cameras to

survey mammals in our area. After a few preliminary conversations, my students and I were recruited to place and regularly check a series of trail cameras on Basswood Island and on the mainland to assist with this project. Through this experience, students learned about study protocols, mapping, GPS, habitats, tracking, and mammal behavior.

The mushroom and mammal survey activities described above will continue to evolve and provide learning opportunities for years to come. As students engage in their work, their “sense of wonder” is triggered. Each lesson results in more questions than answers, and, as a result, new student-initiated studies emerge.

We all teach in unique settings, which means we all have unique opportunities available for our students. I recognize that it wouldn’t be feasible to conduct my specific activity examples in some other regions. However, the process I use to develop student science projects can serve as a guide that can be used in a variety of settings.

Rick Erickson