CBEL
Census 2019
COMMUNITY-BASED
ENVIRONMENTAL LEARNING

POWER PLANTS CASE STUDY

Messalonskee Middle School, Kennebec County
An exemplar of **scientific inquiry**

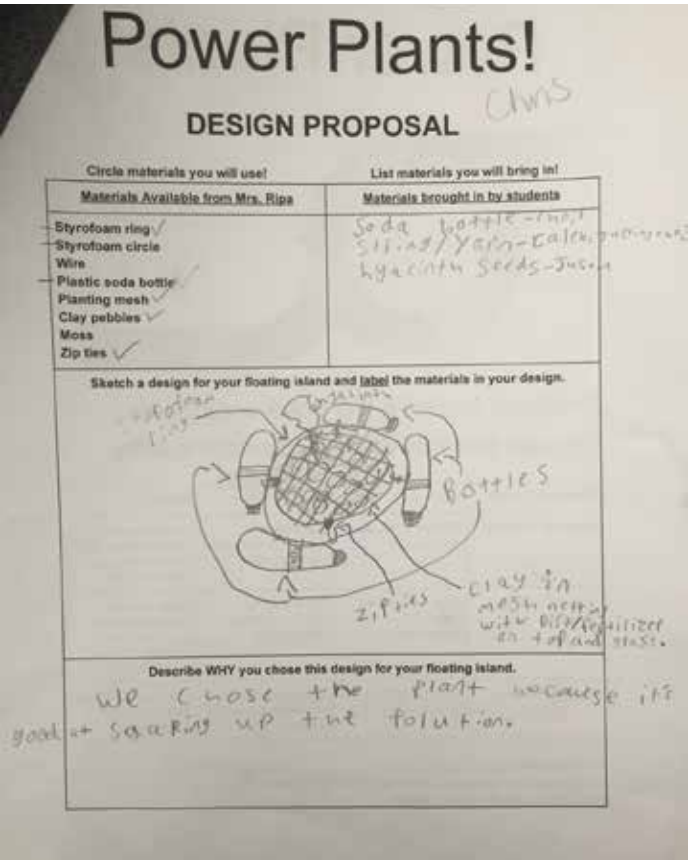
"So we kind of led them to [the floating islands], but they really took ownership of the idea and drew up models of what the floating islands could look like."

—AMANDA RIPA, 7th and 8th grade science teacher

PROJECT BACKGROUND

Students at Messalonskee Middle School are tackling water quality. Students are not limited within the walls of the classroom and are able to bring in and analyze samples from home as well as local bodies of water. Starting with a storm water pond located just behind the school, students began investigating questions such as: "What is in the water?" "Is it healthy?" and "What is the purpose of the pond?" To find answers, students analyzed pondwater samples and compared them to data collected by Colby College. Students did not stop there, they continued their research to learn how they could address and make an impact on improving local water quality.

Over several years, Amanda Ripa, the seventh and eighth grade science teacher facilitating this research, used students' questions and their curiosity to develop floating islands of plants that filter pondwater and reduce polluting nutrients. Students lead every aspect of this project, including designing the floating islands and choosing plants with the best water filtering qualities.



Students created design proposal drawings and prototypes of floating islands.

THE PROGRAM

Cinder blocks balanced precariously on the laps of Ripa and Kim Fish, the technology integrator, as they towed floating islands behind their kayaks into the center of the pond. The seventh and eighth graders watched from the banks of the pond and cheered on their teachers while also waiting to see if they would flip over. Ripa and Fish managed to throw the cinder blocks into the water in the center of the pond without incident and anchored the floating islands. The islands, structures with a foam underside and covered on top with mesh, have plants inserted into holes in the top, and soil added as needed. Aquatic plants grow around the edges of each island and terrestrial plants on top. Over a year of research, planning, and design led to this moment, and the work would continue afterwards.

During the first year of the project, students focused on measuring and analyzing water quality. Starting with samples from their homes and the pond, students mapped results using ArcGIS. Students also focused on ameliorating the water quality and learned how plants filter water by absorbing excess nutrients which can cause algal blooms, deplete the water of oxygen, and kill other organisms that live in the pond. Ripa then guided her students to their own concept of the floating islands as a filtration system. The students created models of floating islands and explained their research and design in a written assessment. Ripa used her students' work to apply for several grants and was able to win $2000 from the Maine STEM Education Innovation Challenge at the Maine STEM Summit to fund two floating islands.

The second year, Ripa wanted her students to take the floating islands to the next level. She used a systems approach for the curriculum and students were asked how they could make an impact on local lakes and share benefits with the community by using their data and experience from the pond. "To incentivize that, I had them apply to the Lexus EcoChallenge with their project ideas, which would give them $500." None of her students won the prize, but they all learned the process of applying for grants, creating a presentation, and following a template and rubric.

This year, students focused more on the community aspect and the partnership with the 7 Lakes Alliance. Students became resident experts on reducing nutrient

pollution and methods of maintaining healthy water quality. They presented the idea of having camps around the lakes create their own islands, as well as expanding the scope to erosion control plantings and lawn care for properties abutting the lakes. Over time, the project has developed and expanded, continually building off the work of past years and taking advantage of the interests of current students. Ripa said, "By the end of the year, the students realized everything connected. And I didn't really plan it that way, it's just nice when things kind of organically come up and the kids get that experience and they get to see it as coming from their work and their input into the community."

BENEFITS

The strengths of this program lie in the experiential aspects that are firmly rooted in the science curriculum and opportunities to connect to the local community. Although there are many lakes local to Messalonskee Middle School, not all students have the opportunity to visit them. Partnering with the 7 Lakes Alliance allowed the students to explore these local resources, learn from local experts on water quality testing, use scientific equipment, and simply be and learn outside while also contributing to the betterment of their community.

Technology integrator Kim Fish noted that Ripa's students become visibly engaged and excited when working on the projects. The collaboration between students reflects the engagement and the skills being developed: "So when they're sitting in groups, just the conversations that they're having about the material and how it might interact with the environment...It's awesome."

SUPPORT & PARTNERSHIPS

A former science teacher himself, Messalonskee Middle School's principal appreciates the value of the projects Ripa organizes and can be creative in finding financial resources for his teachers when they approach him with a project. One of his methods is to build resources directly into the budget. For example, teachers at the school are provided with one "free" field trip within twenty-five miles per team.

The Power Plants project had two main community partners: the 7 Lakes Alliance and the Salmon Lake Association. The 7 Lakes partnership began with water quality testing. An educator visited Ripa's classes once a month and they would co-write lesson plans together. The 7 Lakes Alliance has also helped with bringing the students out on boats to conduct water quality tests and learn about using scientific equipment as well as coordinating transportation to the site which is one of the largest barriers for field trips. Beyond their one budgeted field trip per team, teachers have to do their own fundraising or find alternative funding for field trips. Teachers are also required to plan field trips a year in advance, which limits flexibility.

The Salmon Lake Association partnership began with students presenting to the Association in the fall as part of their assessment. Later, the organization reached out and asked if students

PRO TIP

"I usually have them do a lot of writing in my class, so I assess them a lot through writing and presenting. I partnered with our ELA teacher, so I'll score on content and she'll score on writing. I've done that a lot, just so that they can improve their writing as well."

—AMANDA RIPA, science teacher

would be interested in implementing several of the measures they had recommended, including erosion control mulch and other plantings along the shore of the lakes. This partnership allowed students to be part of community efforts of erosion control and ameliorating lake water quality.

LESSONS LEARNED & NEXT STEPS

Currently, Ripa is embracing an opportunity to share her experiences and assist in the training of other teachers at her school in experiential learning in science class. Ripa is working in collaboration with Herring Gut Learning Center (HGLC) to develop a curriculum for all grade levels that would align with standards.

At the end of the academic year, HGLC hosted a three-day professional development opportunity to support other teachers participating in programming such as the ones Ripa led on watersheds and fish dissections, areas in which other teachers might have less experience. During the three-day training, teachers from any discipline and background were welcome, and nearly all teams had a representative attend.

Ripa sees a definite shift to more environmental and place-based learning in her school, "It's coming from the community and grant support and having me and other teachers with science backgrounds modeling this type of education."

For the Power Plants project, Ripa does not have specific designs created for the next year. She said she hopes to see the program evolve organically depending on opportunities that arise and student interest. However, she has been taking a nature-based art class and would like to incorporate more art into her science classes in the future.

ADDITIONAL RESOURCES ❖

7 Lakes Alliance
https://www.7lakesalliance.org/
McGrath Pond-Salmon Lake Association
https://www.mcgrathpond-salmonlake.org/
Herring Gut Learning Center
https://www.herringgut.org/
Captain Planet Grant
https://captainplanetfoundation.org/grants/
STEM Summit
http://mainestem.org/stem-summit/

TOOLKIT ✓

- Local and accessible natural resources (school pond and lakes)
- Local partnerships (7 Lakes Alliance, McGrath Pond-Salmon Lake Association, HGLC)
- Student leadership and ownership
- Supportive administration
- Accessible sources of funding
- Teacher collaboration (Technology integrator, ELA)

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For more information, please contact info@mmsa.org
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