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GREEN TEAM CASE STUDY

Cushing Community School, Knox County
An exemplar of community support

“Green Team is just one way that we are trying to engage the community to connect our kids with the resources that are here- the resources that we value and the resources that provide an economic foundation for our town.”

—DAWN JONES, Cushing Community School principal

PROJECT BACKGROUND

Three years ago, Dawn Jones, principal of Cushing Community School, pulled together a group of engaged community members to discuss an initiative to connect students and teachers at the school with local outdoor resources. Forming the group also allowed Jones to leverage the existing enthusiasm and expertise that individuals in Cushing had for contributing to the school. During an initial meeting comprised of gardeners, farmers, and other relevant enthusiastic experts, several goals for the initiative emerged:

1. Students should be aware of sustainability issues and learn how to be stewards of their environment.
2. Students need to be engaged in their learning, and connecting to the outdoors is a great strategy to do this.
3. Students need to learn about science.
4. Teachers need to feel comfortable going outside and knowing how to use the resources surrounding them at the school.

While no clear answer for achieving those goals emerged during the first meeting, the group made a shared commitment to continue to work together on this initiative. Individuals volunteered to do small projects at the school like helping to plant bulbs in the fall and clean up the school gardens. Over the course of the next year, the group along with other individuals, developed into the Cushing Community School Green Team and organized their first ever “Outdoor Science Day,” a full day of learning activities that used the school’s outdoor spaces and aligned with science learning standards.



THE PROGRAM

On a typical Outdoor Science Day, students follow community volunteer Debby Kraft along the nature trail behind Cushing Community School, iPads in hand, documenting the species they find along the way. The pictures they take will be used to create a field guide for the nature trail. At another station, a local apple orchard owner teaches students how to make cider, and teachers discuss how the design of an apple press can link to the Next Generation Science Standards (NGSS) engineering standards. At another station a community member with gardening experience helps students and teachers create jars with soil that will then settle over a period of time to demonstrate layering. Other stations manned by community members showcase different aspects of apples and ecosystem interactions. All stations are accompanied by information linking to the NGSS performance expectations so teachers can gain a better understanding of how Outdoor Science Day experiences can be linked to extended learning connected to standards in the future.

Outdoor Science Day not only engages students in fun and meaningful learning, but is designed to inspire teachers and give them ideas about how outdoor spaces can be a springboard for active science learning. Jones explains,

“I want the teachers to develop relationships with Green Team members. When they’re doing something in the classroom that relates to expertise in the community, I want them to feel comfortable bringing those people in. I would love to have the Green Team become a group of community members that teachers can reach out to enhance learning in their classrooms.”

Fifth grade teacher Tina Moro describes the first Outdoor Science Day as an “eye-opening and incredibly rewarding” experience that allowed her to think outside the box. When creating her math and science curriculum for the year, she plans to incorporate the school garden into her lessons so students can have real world connections with the materials they are studying. Green Team community volunteer Debby Kraft said, “The kids loved it. They were more open to learning because it was a day out of the classroom.”

◀ Volunteer Debby Kraft with Outdoor Science students.



Gardens developed at the Cushing Community School.

BENEFITS

One of the main benefits achieved by the Cushing Community School Green Team initiative and Outdoor Science Day was the excitement it generated in many of the school's teachers to continue using outdoor spaces to educate students. Moro explained that the teachers are getting more comfortable with the garden beds, which scared them a bit at first since many of them didn't have any gardening experience. Jones also echoed Moro in her observations that teachers were gaining more confidence in outdoor learning as a result of Outdoor Science Day. The community volunteers on the Green Team provided an opportunity for teachers to recognize that they could do this type of outdoor work as well, and Jones hopes to have even more outdoor learning after this year.

Another benefit of the program was its reduced cost. The Green Team is made up of community volunteers, and while there are some costs associated with getting the appropriate schoolground infrastructure (like garden beds, picnic tables, etc.) there are no large field trip or transportation costs because the resources are all on school grounds.

There are also benefits for the students involved. Jones explains, "Students get excited about outdoor spaces and how much they're learning from them. And in the process they're building a connection and feeling a sense of responsibility and stewardship for the wonderful community we live in."

LESSONS LEARNED & NEXT STEPS

The Green Team is just the first step in building a culture of outdoor learning at Cushing Community School. They are planning another Outdoor Science Day for the fall, and Jones explains that these experiences are laying the groundwork for teachers to develop relationships with community resources and increase comfort with outdoor learning.

One of the goals of the Green Team from last year was to increase teacher involvement, which they've achieved by recruiting fifth grade teacher Tina Moro to be part of the team. "It's really about building active teacher leadership, and getting teachers excited to do this type of education so they can get other teachers excited and become champions for it," said Jones.

PRO TIP >


To promote teacher use of outdoor spaces, make it accessible by ensuring that there are resources available like garden beds, birdfeeders, etc. Natural spaces for students and teachers to gather and reflect that include places to sit like picnic tables or stumps can help facilitate more outdoor learning.

Both Moro and Jones emphasized the importance of community member support for this program and the willingness of local experts to share their knowledge with students. For other schools interested in developing their own Green Team, Moro suggests, “Reach out to community members and you will be amazed at what other people know. Ask for help. People want to help and see kids get excited about learning, so don’t be afraid to ask for help.”

One of the challenges of this initiative has been bringing the school and community together to integrate community expertise with the school’s learning goals. Jones explains,

“Bringing the two worlds together is one of the biggest challenges when you’re working with community members. If you go to larger organizations, they’re used to coming in and knowing how teachers want a lesson taught. Somebody who is a gardener, or who owns a farm, or who does lobstering, they’re not always thinking of learning goals. So how can we open that up so that community members can share their wonderful expertise, but do it in a way that teachers are using it to achieve learning goals and meet standards?”

Jones has found successful strategies in bringing teachers and community members together by first understanding the standards and thinking creatively about how to integrate community knowledge as well as including community members in those conversations so that everyone is on the same page. Jones also works directly with community members on their ideas for Outdoor Science Day and listens to the activities they have in mind in order to help them to frame their ideas in a way that is appropriate for students’ grade levels and learning goals.

In the future, Jones would like to see Cushing Community School build out more infrastructure to support outdoor learning. These spaces might include an outdoor classroom, certifying an area of their school grounds as wildlife habitat, or starting a composting program. However, she acknowledges that these are just her ideas, and it is crucial for the teachers at her school to take ownership and run with the ideas that they feel passionate about. 

ADDITIONAL RESOURCES

Cushing Community School Field Guide

<https://sites.google.com/rsu13.org/ccsfieldguide/home>

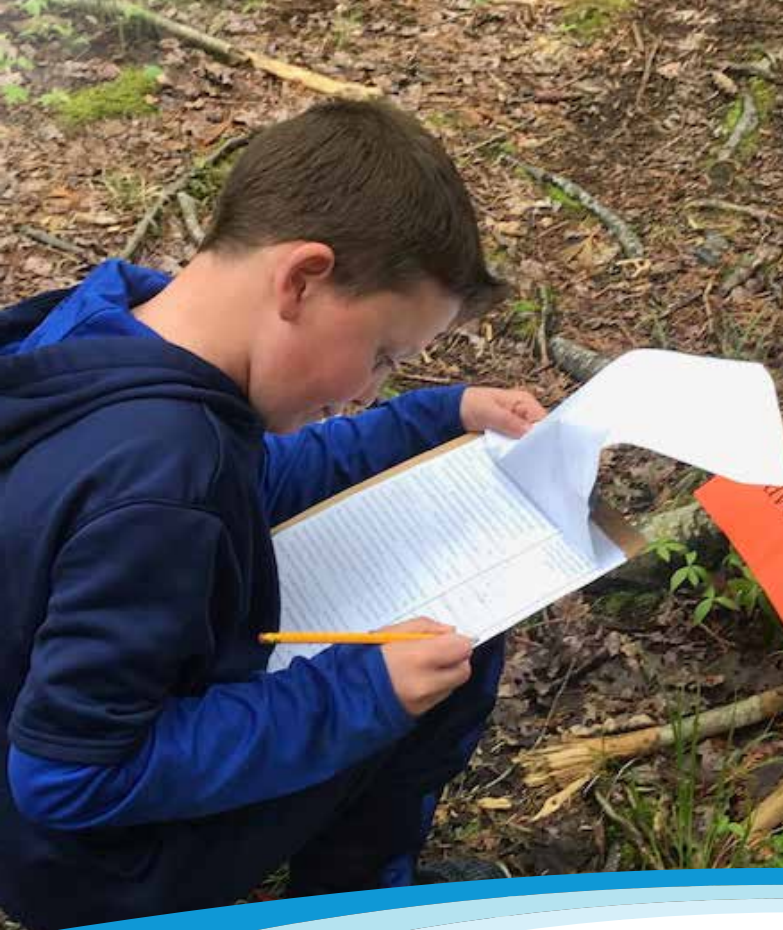
TOOLKIT

- ▶ Accessible resources on school grounds (nature trail, gardens, birdfeeders)
- ▶ Engaged community partners
- ▶ Supportive administration
- ▶ Teacher buy-in
- ▶ Clear connections to science standards

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HARPSWELL COMMUNITY SCHOOL CASE STUDY

Partnership with Harpswell Heritage Land
Trust, Cumberland County

An exemplar of a school/land trust partnership

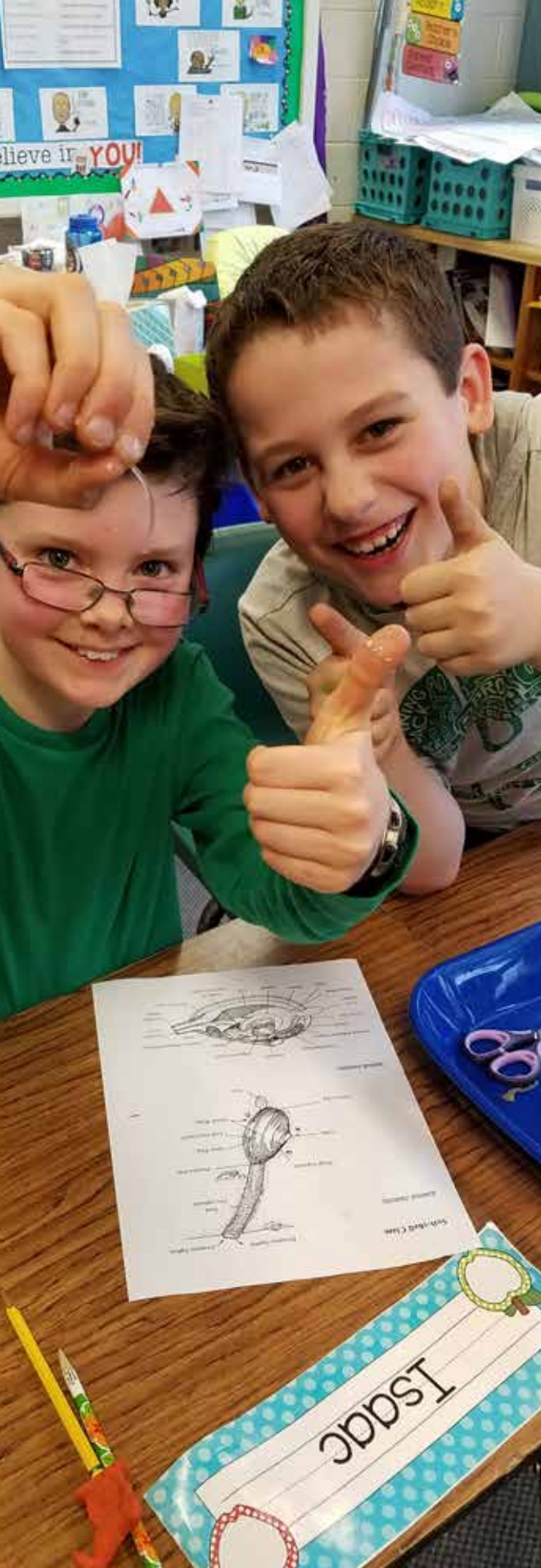
"I think that the highlight for me is that I get to see the whole class, no matter what their experience with being in nature, all get excited about going outside, even the kids who might have never done anything very fun outside."

—BETH POMERLEAU, kindergarten teacher

PROJECT BACKGROUND

Harpwell Heritage Land Trust (HHLT) hired Julia McLeod as an outreach coordinator to focus on connecting with people of all ages in the Harpswell community. In reaching out to teachers at Harpswell Community School (HCS), the local elementary school to discover where she could be the most helpful, she found that teachers wanted to do more science at the school but were not sure how. "There was a process of getting a foot in the door, a process of teachers getting to know me and trust that I will be doing something helpful," shares McLeod when she reflects back to the beginning of her partnership with HCS. McLeod started small, with afterschool programs once a week that her students dubbed "Nature Camp," building enthusiasm which led to more in-school programming.

McLeod created a series of lesson plans for each grade, drawing from past experiences; Projects Wet, Wild, and Learning Tree; other land trust lesson plans; and input from Cathance River Education Alliance. From these resources, she was able to form a "menu" of lessons that matched science standards with in-class or field trip possibilities for each grade level. "My interests were something that was Harpswell-based, focused on this place, what makes it interesting and special, so kids get a learning experience tied to the town they live in. Because that's our ultimate goal: we want kids to grow up with a strong emotional connection to this place." And so the relationship flourished and developed to the point that every student at HCS experiences Harpswell-based science lessons.



HCS students dissect a clam.

THE PROGRAM

One of the highlights of the HCS-HHLT collaboration is the year-long field trip series and lessons focused around Harpswell trails and preserves for the third grade. Two years ago, a high school student collaborated with HHLT and created a guidebook for 10 preserves and trails in Harpswell. This guidebook, along with lessons aligned to the Next Generation Science Standards, form the foundation of the Junior Ranger Program which focuses on topics ranging from biodiversity to invasive species. Each third grader is provided a copy of the guidebook and goes on nine field trips to sites in the book. It has expanded not only the students' knowledge of the surrounding area, but also that of their teachers and parents. The school embraced the opportunity to include the book in their curriculum, and funds from the school and HHLT cover the printing costs for the students to each have their own copy.

Another third grade project focuses on raising and releasing endangered Atlantic salmon. Working with McLeod, third grade teacher Megan Phillips acquires eggs from Atlantic Salmon Federation and works to tie the project into science learning standards. Students ask questions like, "Is the water quality healthy for the salmon?" and "What animals are present in the area where we release the babies and are they a threat?"

All grades in the K-5 school are involved in some type of programming, and their science and environmental knowledge builds from year to year. "It's not just out exploring—that's part of it—but also learning vocabulary. As they mature, their skills as a scientist mature. By second grade they are actually recording data," relates Phillips. Fourth graders are captivated by dissecting clams in their class. "There are so many parts to a clam you don't see from the shell," recounts one rising fifth grader. Older children in fifth grade do a unit on invasive species where students and community volunteers work together in the field to identify and remove problematic species.

While Harpswell has a wealth of offsite nature trails and preserves that are used in programming, most of McLeod's work actually occurs in a small patch of woods behind the school. This helps ensure that students across all grades experience science lessons connected to their outdoor environment, without the hassle and expense of always lining up bus transportation. Because of the work



HCS students on a field trip to a local preserve in Harpswell.

with HHLT, teachers find that both they and their students have a greater appreciation and use of the natural spaces on their school grounds. One teacher explains, “We use our grounds more because of the programs, even during recess the kids want to be out in our woods.” They have even developed their own outdoor classroom space to help facilitate learning.

BENEFITS

Because of this collaboration with HHLT, teachers at HCS are teaching more science and are more confident with taking students outside. “I don’t have all the science knowledge...I’ve learned that you don’t have to know it all. It’s OK to go out into the woods and have questions about salamanders and say ‘I don’t know, let’s research that,’” explains kindergarten teacher Beth Pomerleau. All teachers agreed that prior to the collaboration, science curriculum at HCS was lacking. This collaboration has increased both the amount of science as well as the quality. HCS principal Anita Hopkins agrees that teaching science through the local environment and the collaboration with HHLT is now “just a part of the culture; it is what we do.”

Other benefits include increased engagement, especially for students who may struggle in a traditional classroom setting. Fifth grade teacher Abby Svenson explained that she had a student who struggled academically,

but after a field trip to Chewonki, “...the other students in the class saw another side to him, saw him being successful. That really resonated with him, so anytime that Julia comes, he perks up and tries.”

These programs and field trips also foster a greater community connection. Students bring their families back to preserves they visit on field trips. On a regular basis, parents and children of all ages pop into the classroom to visit the eggs and baby salmon, volunteer on field trips, and become involved in what their children are learning. One parent explains, “For [my daughter] and all the kids, they all love science and it’s mainly due to Miss Julia and the teachers for bringing that out. I’d never expected them to be so aware of science and enjoying science and enjoying nature.”

PRO TIP ►

“Take advantage of what’s around you. We are lucky with our fields and woods, but every school has some sort of natural resources close by to take advantage of. Driving down the road five minutes counts. Don’t let preconceived notions about doing something big and flashy get in your way of doing something simple but great.”


—BETH POMERLEAU, kindergarten teacher

LESSONS LEARNED & NEXT STEPS

One of the most important elements that allows this collaboration to succeed is having a dedicated partner to maintain the relationship between HHLT and HCS. McLeod provides a much-needed support for outdoor activities because teachers often find it challenging to take a class outside by themselves and also plan lessons. Her position also strengthens the community outreach of HHLT, an organization that has expressed a sincere desire to keep this partnership going and has had consistent funding from Holbrook Community Foundation for her position.

The biggest challenge faced in this type of programming is finding the time. While McLeod suggests reaching out to administration to find support in making time for these programs, it is not just finding the time but also finding a good time when the students are fresh and will behave better. “For a program outside, I don’t do less than 45 minutes...And making sure the kids are fresh enough that you don’t have a disastrous time outside. Especially for the younger grades,

I really see a difference between going out at 9:30 and going out at 2:30.” To overcome this challenge, McLeod and the teachers at HCS have developed strategies to support positive behavior in the outdoor environment. They prepare the students by giving them appropriate notice when a program is going to occur so they can transition successfully and setting expectations beforehand to maintain a respectful learning environment.

In the future, both McLeod and the HCS teachers expressed a desire to continue and strengthen the partnership. One teacher mentioned continuing to work together to develop an even more intentional and progressive continuum across grade spans. Third grade teacher Phillips explains, “Reading and writing is all mapped out, but science is still fairly new, even after five years of looking at it with Julia helping us to get it where it is now. I can only imagine that it is going to keep getting better.” 

ADDITIONAL RESOURCES ❖

Harpswell Heritage Land Trust

<https://hhlmaine.org/>

Article on Junior Rangers guidebook development

<http://bit.ly/JuniorRangersArticle>

TOOLKIT ✓

- ▶ Accessible, local natural resources (trails, woods, shoreline)
- ▶ Strong local partnership (HHLT)
- ▶ Consistent funding (Holbrook Community Foundation)
- ▶ Age-appropriate lesson planning
- ▶ Supportive administration
- ▶ Strong school culture of environmental programs
- ▶ Parental enthusiasm and support

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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.



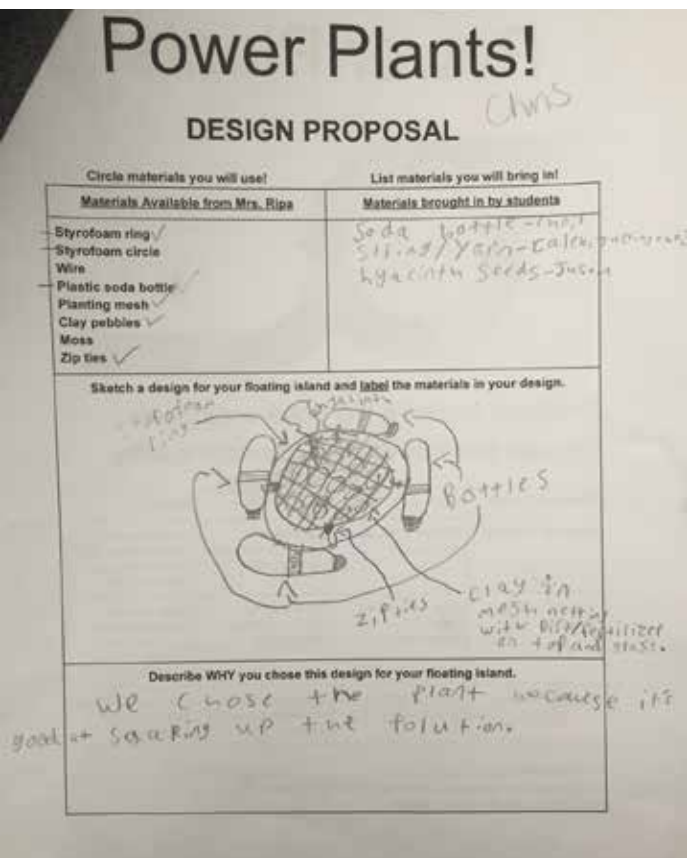
THE PROGRAM

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



Students created design proposal drawings and prototypes of floating islands.

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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COMPOSTING CASE STUDY

Houlton Southside School, Aroostook County
An exemplar of *building student and
community stewardship*

*“The students beg for a turn to do it, I mean, who wants to
take out garbage?”*

—DEBORAH MELVIN, third-grade teacher

PROJECT BACKGROUND

Around twenty years ago, Deborah Melvin, an elementary school teacher, took advantage of a workshop held by the local soil and water conservation district. Today, she is still implementing the composting practices she learned while she continues to refine her methods. All third-grade students at Houlton Southside School are involved in the composting program. They learn what composting is and how to compost leftover school lunch food items. Students from previous years teach the new students how to collect, weigh, and record data from each lunch. The class reads and investigates other composting projects and examines composting data from around the world. They summarize and analyze the data from Houlton Southside each term and share information with the school board. Students discuss the environmental impact of the school and think about how composting can impact the world and the future. Although Melvin has worked at several schools since starting her composting program, she brings it with her to each new school, if possible. And even after two decades of composting experience, she is still experimenting and learning along with her students: “You can make it really sophisticated or you can make it as simple as possible. We try to make it as simple as possible, but it’s an ongoing process.”



Students collaborate with custodial and cafeteria staff in a school-wide composting initiative.

THE PROGRAM

The classroom is a blur of motion as students take turns sorting photos of food items into “compostable” or “not compostable” piles. It’s the beginning of the school year and students are learning which items are compostable through this sorting game. Each year, Melvin asks her past students, now fourth graders, to return to her class and give her new students a presentation before launching the program. This process reinforces the leadership skills her students learned through their composting project. Melvin said, “It really acknowledges the kids who have done the program before and really excelled at it and then the new students

get to see that they were able to do it and it’s not a big deal.”

After the initial training, students place a five-gallon bucket in the cafeteria. Every day, students and cafeteria staff put scraps of food in the bucket. One third grader wears gloves and helps the other students sort their food into compost and trash. The student records the weight of the scraps before taking the compost outside. Cafeteria staff also contribute to the composting process by setting aside food scraps from meal preparation. Custodian Gary Joslyn said, “We have a lot of fun with our composting... everyone gets into it.”

In the classroom, students explore the composting process up close. Using a small model composter with three sections, students place food scraps (an apple core, a banana peel) in the first section, school paper in the second, and a Styrofoam cup in the third. Students observe the three bins daily and observe that the apple cores and banana peels are gone within a month. The papers take a little longer, but the Styrofoam cup does not change. In fact, Melvin has been using the same Styrofoam cup for this demonstration for the past twenty years. Students also have the opportunity to hypothesize and test out different types of bins and equipment for the best composting. Students constantly ask questions about the process and engage in scientific inquiry. They observe how the composting rate decreases during the winter and how during the colder months the temperature of the compost pile is still warm because of the biological process that is occurring.

Students analyze the yearly data collected over the extensive span of time Melvin has been running this program. They compute the total amount of garbage diverted and how much money the district saves by composting. This year, Melvin reported that over 2400 pounds of food waste was diverted, which, at 33 cents per pound, saved the district around \$800! In fact, the cost savings is a strategy Melvin uses to get support within her school. She explains,



A variety of composting systems at Houlton Southside.

“When I first moved to this building, that’s how I got the janitor on board. He would ask, ‘Why are you doing this?’ And so I said, ‘Because we all should be doing it, you have grandchildren too.’ But as soon as I said it saves the district money, he was on board. And he did it; he would put the bucket out for other grades and take the bucket out himself.”

Students are expected to communicate their knowledge to diverse audiences such as the school board, 4-H groups, and next year’s students. By presenting their findings students build confidence and communication skills. Every year, Melvin is asked to bring some of her vermicomposting worms and a poster to a children’s fair and, alongside her students, shares the story of composting.

BENEFITS

The aim of this program is to instill a life-long passion for stewardship of natural resources in the students. Students develop life skills and responsibility by participating in activities such as guiding other students to compost correctly and taking care of the compost bins and the worms. Weighing the waste teaches students the skills of reading a scale and estimating quantities based on the density of the contents, not solely on the volume. The students are

invested in the project and often bring that passion home. If parents approach Melvin with an interest in starting vermicomposting at home, she helps provide them with the right materials: the container, worms, a sprayer, and directions. Over the years, Melvin has noticed that more and more families are composting at home because it simply makes economic sense. The student presentations to the community have also influenced other groups and spread knowledge about composting beyond the classroom.

LESSONS LEARNED & NEXT STEPS

Melvin noted that the program is constantly undergoing changes and adjustments as she tries new equipment, works with new students, and teaches at different schools. By being selective in what goes into the compost bins, Melvin has avoided rodent and most bug


PRO TIP ▶

Have students educate each other on the process. This builds ownership over the project, student confidence and expertise.

issues that can challenge composting programs. No meat or dairy goes into the compost, and they stopped composting bread due to its susceptibility to mold. “We put leaves over the compost, it calms down the flies,” one student explained. If smell becomes a problem, Melvin has found that sprinkling lime will neutralize the odor. But there is always room for innovation and experimentation: Melvin would like to experiment with different means of aeration including inserting pipes that have been drilled with holes to increase circulation.

Next year, the third grade will be partnering with the fourth grade to expand the composting program. The local high school has also expressed interest in a similar program, although the larger scale of the school poses some challenges. With over 600 students, the interested faculty require more support from administration in organizing

staff to assist with the emptying of the compost. “It’s just something that one teacher and a couple of kids can’t do [on that scale]. Whereas here, with one grade and a couple of staff, you can do it,” Melvin explained.

Melvin attributes her success to finding outside resources and funding. Her funding sources include the Natural Resources Council of Maine (NRCM), the local soil and water conservation district, as well as local grants. Although Melvin is hesitant to ask for extra work from the staff, she has found that once they see the student excitement and interest, the passion of the students is contagious. 

ADDITIONAL RESOURCES

Maine DEP Composting for Schools Handbook
<http://bit.ly/DEPcompostingHandbook>

TOOLKIT

- ▶ An engaging community-oriented project
- ▶ Independent funding (NRCM, SWCD)
- ▶ Student collaboration and peer-to-peer instruction
- ▶ A curious and adaptive attitude
- ▶ Supportive staff
- ▶ A message that resonates with different audiences (saving money, better soil)

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COURTYARD CASE STUDY

South Portland High School, Cumberland County
An exemplar of utilizing school space

“Having seen what it was like before, just full of rocks and grey, I never would have thought it would get to this point. I’m really happy it was finished earlier than expected and that I was a part of making that happen.”

—South Portland High School junior

PROJECT BACKGROUND

When the new South Portland High School was built it included a center courtyard visible from windows in most of the classrooms. At the old school, teachers maintained a small food garden in the front yard which they used to teach students about food and food justice issues. The courtyard at the new school offered an opportunity for this garden and potential expansion, but due to lack of funding the project floundered. According to various teachers, the courtyard looked like a prison yard, and was full of mulch and rocks. But some still saw a hint of potential. With the support of administration and other teachers, a student and staff committee formed to brainstorm alternatives and build something greater. Collaboration with groups, such as the Portland Trails School Ground Greening Coalition, provided support including a stipend for work on the courtyard and resources to create a plan so that students could get outside and use the space. The collaboration paid off, and currently, the courtyard has different areas dedicated to art, a rain garden, and a mental-illness awareness garden. The courtyard continues to grow as individuals with new ideas and passions become involved.



A rain garden in the courtyard.

THE PROGRAM

As she walked around the courtyard, Tania Ferrante, a teacher at South Portland High School, passionately described one project after another, “This project is called the Yellow Tulip Project. It was started by a student in Maine after losing her two best friends to suicide. Each yellow tulip represents mental illness, and as you can see, one tulip in five is yellow.” In one day students planted over 400 tulip bulbs. To celebrate the first blooming of the Yellow Tulip Project in May, students filled the courtyard and the chorus sang. Windows surrounding the courtyard overlooked the proceedings, which allowed all students to be a part of the event and raised awareness for both the event and the courtyard. One teacher noted that, increasingly, social issues are synonymous with environmental issues, so the pairing of green space with social awareness is logical. Other uses of the courtyard range from student initiatives to classroom rain gardens, but everywhere you look, student involvement is evident.

Ferrante’s ecology class designed and planted a rain garden and learned about its benefits, as well as runoff and biodiversity.

Students were responsible for choosing which plants to include and then planting them. One student recounted, “We planted everything out there. Everything including those big trees.” In future years, the ecology class will maintain the space and continue to use it as a learning tool. The art class has a designated area to create and display works. Encouraging additional teachers to hold classes in the space will expose more students to the courtyard and may inspire other areas of expansion.

Students have appreciated seeing their work blossom, from inception of the garden to planting to maintenance. Beyond the plants, the courtyard and these projects provide much needed in-person social activity time. One student said, “It’s my perspective that humans are social creatures and active creatures, and this is a great way to do that. Also doing something educational that benefitted the class and the people around us; it could spark something. Like, other schools could do something like this if they had the space.”



A school-wide event for the "Yellow Tulip Project."

BENEFITS

The courtyard provides a space for learning, contemplation, and a connection to nature within the school. Since students have been involved in every step of the courtyard's ongoing creation, they have a strong sense of buy-in. The project has provided them with agency, ownership and connection to their school and learning. Simply asking students about their hopes for the future of this space led to an enthusiastic discussion of different ideas ranging from a gazebo to a hot tub to simply eating more lunches and holding more classes outside. Although students only attend this school for four years, their work in the courtyard provides a sense of permanence and they hope to come back to see how their work has lasted. As one student noted, "Student input is very important because this is going to be here for future students." By participating in the creation of the courtyard, students were able to participate in environmental action practices, such as identifying and investigating a locally relevant issue, planning and taking action on establishing green spaces, and understanding societal values and principles. In addition, the courtyard brought together the community in collaborating to raise funding, assemble plants, volunteer time, and hold community events in this space. The impacts of this project will continue to grow as more students and community members participate and use the space.

SUPPORT & PARTNERSHIPS

The entire school was involved in planning the courtyard. Starting with a student and staff committee, the planning process expanded to a survey of the entire school to solicit input about their vision for the courtyard. Ferrante also collaborated with the principal, custodians, police, and community members who might have a stake in the process or ideas and concerns about the final product. Since the conception of the project, a new principal, superintendent, custodial staff and head of buildings and grounds have joined the staff at South Portland High School. Throughout these changes, Ferrante maintained a steady stream of

PRO TIP ►


"Find other people who have done it; I talked a lot to people in Falmouth who had already done what I wanted to do. Find groups to meet with that are supportive (Portland Trails); communicate as much as possible with everyone who will be involved; and find a mix of students, staff, and community members to support you. It can be very overwhelming and challenging so have staff members who are supportive and can be a sounding board to remind you of how it is going well when you are down and have a vision to keep going back to if things are hard."

—TANIA FERRANTE, science teacher

communication and outreach to coordinate with the new groups to keep people engaged and informed. Thanks to these efforts and the support of these groups, the project was able to continue and progress more quickly than most expected.

The partnerships formed with other organizations and individuals provided additional support, without which the project might not have succeeded. The Portland Trails School Ground Greening Coalition was the first to provide support for the project. They provided the funds that allowed Ferrante to dedicate her time to the project and also provided the architectural designers when the initial design proved to be prohibitively expensive. Parents were involved in the planning and coordination of the space, local businesses donated funds to make this project happen, and other companies encouraged employees to volunteer. For Earth Day, volunteers worked with the students for a week to expand the gardens. Additional support and funding came from the school board, fundraising, and remaining funds from the construction of the school. Ferrante attributes the design of the new courtyard as one of the greatest strengths of the program, "For example, this Tulip Project would not have happened without this other design."

LESSONS LEARNED & NEXT STEPS

Creation of the project, finding adequate funding, and following through on plans, placed a great deal of pressure on Ferrante, who spearheaded the project. Without her work which ranged from finding an architect, to redesigning plans to fit a smaller budget, to finding adequate funding from local businesses, and identifying other partnerships, this project would not have been possible. As the benefits of the space became clear, an enthusiastic and willing administration also sped up the process. And as the gardens and individual projects continue to grow and develop, students and teachers will build on these firm relationships. Future plans include a food garden to connect to learning about food justice, issues surrounding food, and where food comes from. Additionally, encouraging students and teachers to make use of the space from the beginning of the school year will be important in continuing the connection of the students to the space and following through on its great potential. 

ADDITIONAL RESOURCES ❖

Community Partners for the SPHS Courtyard Project
<http://sphscourtyardproject.weebly.com/supporters.html>
Portland Trails School Ground Greening Coalition
<https://greeningschoolgrounds.wordpress.com>
Seed Money grant opportunities for gardens
<https://seedmoney.org/>

TOOLKIT ✓

- ▶ School ground space with lots of potential
- ▶ Local partnerships (architects, Portland Trails)
- ▶ Student voice and ownership
- ▶ Supportive administration

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ECO-POND & ORCHARD CASE STUDY

Indian Township School, Washington County
An exemplar of Science and Engineering
Practice Integration

“If you look at the direction a lot of science learning is heading towards, it’s science-based inquiry, project-based learning. All their methods are really design school, so what better way to learn the content of earth science than to set it up as a design school project where research influences the design to assess the needs.”

—JAROD FARN-GUILLETTE, science teacher

PROJECT BACKGROUND

A design experiment turned into reality: creating a school pond. The Eco-Pond project began as a thought experiment and evolved into a project that showed students how will and dedication can yield tangible results. Jarod Farn-Guillette, a science teacher at Indian Township School, started the year with a challenge question: “What if we had a pond that could be used as a living classroom and laboratory?” According to Farn-Guillette, the students didn’t believe it could happen. “So we started on paper with research on the physical needs, what goes into it, then what are the biological needs of a pond.” Farn-Guillette structures his science class as a design studio, drawing on his experience as a landscape architect, and integrating the Next Generation Science Standards science and engineering practices. The students designed the pond themselves and learned valuable skills: researching and analyzing the biological needs of the pond; the Passamaquoddy names of species in the pond; and the ecosystem services, such as food and medicine, that would have traditionally been received from plants and animals living in and around the pond.

Farn-Guillette was not deterred by his students’ initial hesitation about the project coming to fruition. He approached the principal, school board, the Passamaquoddy Tribal Council and Tribal Chief with his students’ presentations and designs and gained their enthusiastic support. The project started with a question and evolved into a project that involved the entire community.



Students work to plant trees in the school orchard.

THE PROGRAM

From the first design stages to the physical digging of the pond, students took ownership of the project every step of the way. Students went through each stage of the design: idea conceptualization, research, design iteration, modeling, and developing a final product. Students applied lessons and learning to develop models of the Eco-Pond which started with hand-drawn depictions, to scale, and evolved into 3D-printed models. Farn-Guillette integrated earth science standards and science and engineering practices to guide this process. Finally, students hand-dug the perimeter of the pond and a community member finished digging with an excavator. The result is a two-and-a-half-meter deep pond that is completely of the students' own design and creation.

The Eco-Pond project fits into the larger picture of outdoor and experiential learning at Indian Township School. Other student-driven projects and outdoor learning spaces include a Three Sisters Garden, a traditional indigenous method of growing corn, beans and squash

together. The school also recently created an orchard, with support from ReTreeUS, a nonprofit organization that plants school orchards in Maine. All of these spaces operate together to teach food production, provide an outdoor learning space, and further food sovereignty in the community. The use of native and indigenous varieties of plants such as flint corn, elderberries, and sweetgrass in the school gardens, orchard, and Eco-Pond tie in with local indigenous knowledge of the Passamaquoddy. Brian Giles, Indian Township special education teacher and FoodCorps supervisor, shared, "There was an orchard there before the school and it was a mainstay for food security. So, when we talked about getting a new orchard, the whole community was excited."

BENEFITS

Students learned how to be a driver of a project and follow it through to the end while learning practical skills and being exposed to careers in construction, design, and landscape architecture. Giles said, “One of the things we always try to work on with our students is how do you create a goal and make a plan logistically and how do you follow that plan through to the end. And a lot of students don’t get the experience of that kind of accomplishment until adulthood, especially not on this scale.”

Further, students with behavioral issues or who didn’t normally connect with a classroom environment in school had the opportunity to take ownership and responsibility and apply themselves in different ways through hands-on learning. It was “a total transformation,” one teacher explained. One student who was often difficult inside the classroom became “responsible, he was mature, he was polite” while working on the Eco-Pond project and took a leadership role with the other students.

Additionally, the food grown is now used by the school cafeteria and is also open to the community. Giles explains,

“Anyone can come in and take the harvest from any of the gardens. We’re living in a food desert, so there is food insecurity, even though there are a lot of resources available, but that often isn’t enough. The closest grocery store is about 10 miles away. With lack of transportation and lack of financial resources, it can be tough for some families. So, if they help themselves to the garden, they are welcome to it and it reduces waste.”

SUPPORT & PARTNERSHIPS

This project would not have been possible without a supportive administration, from both the school and the town. The Tribal Chief has long supported initiatives to promote food

sovereignty and the school board, principal, and Tribal Council all supported the project as beneficial for the students’ learning and for the community. The community embraced the project and volunteered time and resources because they too could see the value for the students. Wade Lola of the Tribal Council helped dig the pond and Tribal Housing installed a fence provided by the Tribal Chief.

Other support came from statewide organizations that support environmental learning. ReTreeUS is a nonprofit project dedicated to promoting an environmentally sustainable, socially just food system. They plant orchards with schools in Maine and brought in 28 fruit trees and 60 fruiting and nut shrubs for the orchard at Indian Township School. The school also participates in the FoodCorps AmeriCorps program, and a FoodCorps member serves at the school to connect students with healthy food. This nutritional expertise and additional engaged staff helped support the community and food-related projects, like the orchard.

LESSONS LEARNED & NEXT STEPS

One of the largest obstacles the teachers involved in this project faced was lack of time. “People are far too busy, teachers are far too busy...and their feet are held to the fire to make sure they meet the standards-based assessments and teaching to the tests,” said Giles. The Eco-Pond project

PRO TIP >


When making models in a science and engineering project, upcycle materials such as pizza boxes, scrap paper, and scrap wood. This not only encourages a reusing/recycling mindset, but it also puts students on an even playing field and reduces pressure on families to have to purchase potentially expensive materials.

was a way to link science and engineering practices and standards to an engaging, and dynamic community-based environmental learning project. Farn-Guillette explains, “What I like about the NGSS is that it involves a lot of engineering and design into the curriculum, which I see as an opportunity to do more than reading/writing/memorizing. And our students especially seem to enjoy more tangible, tactile experiences.”

The teachers involved were able to combine their own expertise in landscape architecture and gardening with the expertise of community and organizational partners to make this project happen. Although they were not able to achieve all their goals and objectives in the first year, there are plans for further integration with science learning standards through soil testing, ecology studies, etc.

For the students, it was difficult to conceptualize a project so large and slow-moving. Giles explained, “For the pond, a huge hurdle to overcome with the kids is to acknowledge that it is a slow process, you have to be patient.” It was an important lesson in how

an engineering project occurs in the real world and students were incredibly proud of having accomplished so much.

This project succeeded because of the complete support of the school and town administration and no roadblocks. All involved brought boundless enthusiasm for the project. Future plans for the pond include landscaping around the perimeter, benches for contemplation, and security cameras and lighting to keep the orchard and Eco-Pond safe. While the students were realistic in their understanding that this space ran the risk of being vandalized, they pushed to create a space of repose and mindfulness for the community, “That was really a driver behind the pond, that the students wanted to make something for their community,” said Farn-Guillette. 

ADDITIONAL RESOURCES

FoodCorps: Indian Township Partnership

http://bit.ly/FoodCorps_IndianTownship

RetreeUS Indian Township Article

http://bit.ly/Retree_IndianTownship

TOOLKIT

- ▶ An engaging local resource and issue (food sovereignty)
- ▶ Community support
- ▶ Administration support
- ▶ Student and teacher collaboration
- ▶ Partnerships with other organizations (FoodCorps, ReTreeUS)
- ▶ Strong connection to standards and science and engineering practices

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SUSTAINABLE SEAS CASE STUDY

Bath Middle School, Sagadahoc County

An exemplar of extended interdisciplinary learning

"It surprises you how many things are out there...it's crazy because they're taking over and there's nothing to kill them off."

—Bath Middle School seventh grader

PROJECT BACKGROUND

A marine invasion of epic proportions - what better way to engage middle schoolers? The Sustainable Seas project arose from a clear local need as an invasive species, the green crab, overwhelms the coast of Maine. Monica Wright, a science teacher from Bath Middle School, recognized this issue and its potential to engage middle schoolers. She turned to the local Kennebec Estuary Land Trust, building on an existing connection to form a partnership in order to address and study this issue with her students. She also engaged other community partners, such as the Gulf of Maine Research Institute (GMRI), and collaborated with her peer teachers in math and English language arts (ELA) to create an extended interdisciplinary project.

During the Sustainable Seas project, students learned about marine fisheries and how they have changed over time. They started their investigations with a case study about marine invasive species and conducted species surveys. Students entered their findings on the state-wide database, Vital Signs, which is supported through GMRI. They studied the population of the invasive green crab and asked questions, such as "Are there more male or female crabs at our study sites?" "What is the relationship between water temperature and green crab populations?" and "How might climate change impact populations of the green crab?" Learning was extended to connect students' experiences with literature about fisheries and sustainability, and work with mathematical models predicting populations.



Students learn about commercial fishing gear.

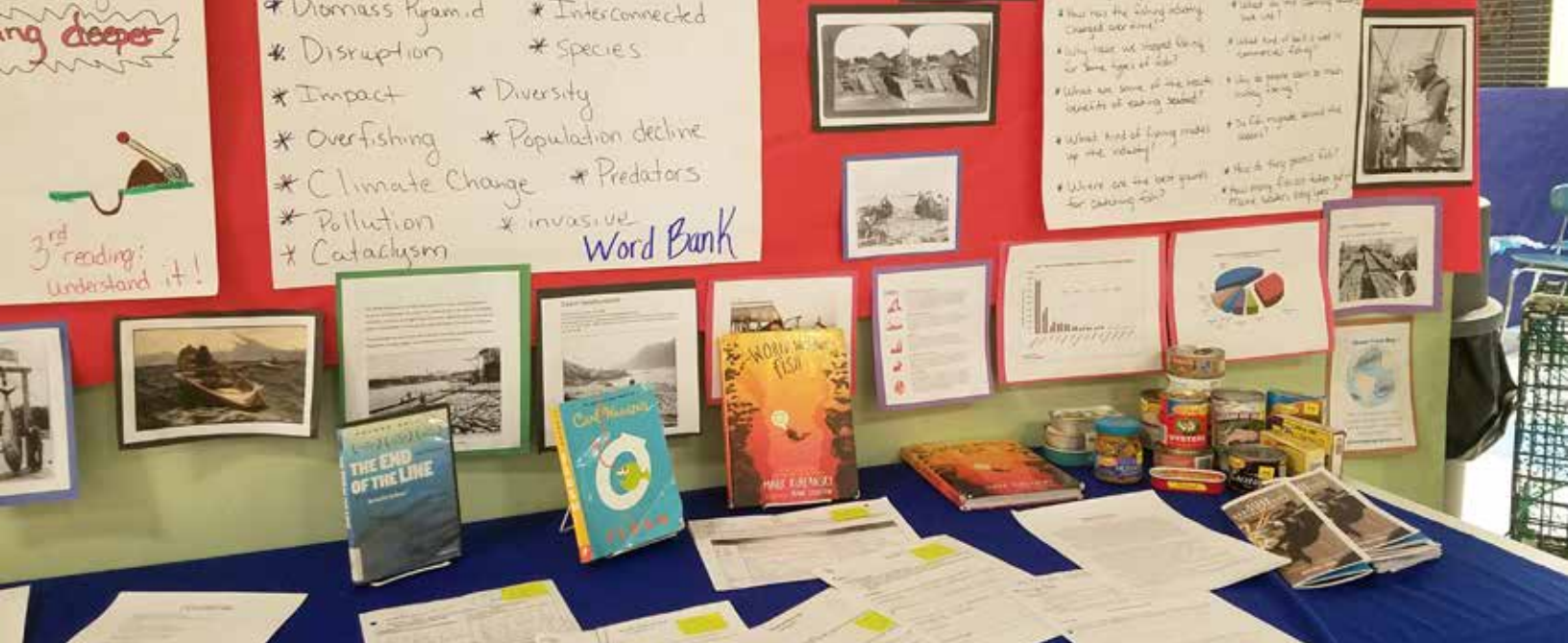
THE PROGRAM

Popham Beach in Phippsburg, Maine was crowded with students. Some waded into the water at low tide and collected traps set to lure green crabs, removing and counting them. Students were given the choice to actually touch the crabs, an opportunity some responded to with enthusiasm while others hesitated...until later. Some experiments entailed painting the backs of the crabs and releasing them. Those recaptured were then counted and students were able to extrapolate total population sizes from the data. Other students used quadrats to count crabs in the water, counting all of the crabs within

a one-meter square. The students completed this second task in teams, with one student lifting rocks and other debris and another student tracking the number of crabs. Later in the week, another group of 7th graders visited a second field site at Reid State Park to conduct the same data collection protocol so that data could be compared between the two locations later on in their classes. Kennebec Estuary Land Trust played an integral role in helping to develop a data collection and sampling protocol with Wright and organizing chaperones who could offer scientific expertise and guide students in their work.

When students returned to class, they expected to leave crabs behind and start a new unit. But the crabs stayed and the learning continued. Using the data they collected in the field, students applied their experiences to their work in math, ELA, and science classes. Reading material in ELA connected to invasive species and the health of the oceans as students read *Flush* by Carl Hiaasen and *A World Without Fish* by Mark Kurlansky. In math class, students applied their data to identify trends over time, extrapolated total populations from samples, and explored other correlations that interested them. One student noted, "I liked [this project] mixing with math and science and ELA because it was just me focusing on one thing. So, I could learn something in science class and then write about it in ELA. It just made me think of different ways this data could be used."

Students' learning culminated in a community celebration which honored the students and their work. Posters explained the students' research and participants sampled dishes featuring green crab as an ingredient. Furthering the scientific communication of this project, students' work was published in Gulf of Maine Research Institute's journal, *Findings from the Field*, Maine's first journal of scientific research produced by middle school students. Talking about the program even a year later, students recount with pride catching the crabs and expound on their fond memories that are interlaced with scientific learning. According to



Student work on display at a community celebration of learning.

one student, “My favorite part was just doing it. You just can’t replace hands-on learning and actually going and doing experiments on the water’s edge.” The truth of her statement is reflected in how, more than a year later, students were able to explain the processes used, including quadrats and population studies.

BENEFITS

This program allowed students to work at different paces and explore a local problem using scientific inquiry at a variety of levels. The Next Generation Science Standards science practices including Asking Questions, Planning and Carrying Out Investigations, and Analyzing and Interpreting Data were used regularly during this project. Wright explained, “It is an exemplar project of science practices. It is the epitome of what schools should aim for that want to get at the NGSS practices...”

This project also fostered teamwork and collaboration between the students, teachers, and community partners that were essential to making it a success. The structure of the project, with its local connection, outside collaborators/experts, and an authentic audience allowed students to take ownership of the work and to feel like they were contributing to a greater good and importance.

SUPPORT & PARTNERSHIPS

Bath Middle School has a culture of supporting large-scale, interdisciplinary projects, especially those rooted in the local environment, and its status as an “Expeditionary Learning” school is a testament to this. Bath Middle School principal, Brandon Ward, explained the benefits of this type of learning, “Anytime you can get kids doing work in their local community that is relevant and meaningful to them you get students who are more passionate and more invested in their learning.” The Sustainable Seas project is part of the larger school culture of connecting students with their environment in meaningful ways. Students visit both Chewonki

PRO TIP ▶

Use student photographers to document your project. The Sustainable Seas project enlisted two students during each field visit to be dedicated photographers. This had a dual benefit of giving students responsibility for a special job and removing the burden of taking photographs from the teacher. Students love seeing photographs of themselves and it reminds them that they went outside and did something important.


and the Ecology School throughout their middle school experience for extended environmental programming that is connected to the work being done in the classroom. BMS has dedicated funding for these projects in the school budget, but also relies on scholarships and grants, as well as financial and in-kind support from community partners. Partners include Kennebec Estuary Land Trust, who contributed field work support and lessons on clamming; the Gulf of Maine Research Institute, who provided Vital Signs and published *Findings from the Field*; and local artists who helped design art pieces using fishnet.

LESSONS LEARNED & NEXT STEPS

This project relied on having easy access to natural resources and field sites that were accessible for all students. Knowledgeable chaperones who also were able to connect with the kids was an essential element. In addition, Wright ensured that she made the most of the

field site visits by ensuring that students were prepared with advance knowledge of protocols. “Everything I do in the field we practice before we go out because I can’t afford to go out in the field more than once. We would practice the whole process in our school yard of putting the quadrat down, using dead crabs, making sure students could identify different things, and filling out the forms.”

This program also required dedication from the teachers who devoted time over the course of several months to one project. One of the challenges of an interdisciplinary project like this is having common planning time in order to collaborate with other teachers.

In thinking about the future, Wright said, “What I really like is that it’s a long-term ecological study that people can tap into. At some point this study is going to run out of steam, so what’s next? Because I think going to the coast is super important for our community.” 

ADDITIONAL RESOURCES ❖

Times Record Article on Sustainable Seas Project
http://bit.ly/TimesRecord_SustainableSeas
Findings From the Field June edition
http://bit.ly/FindingsfromtheField_June

TOOLKIT ✓

- ▶ An engaging local problem (green crab invasion)
- ▶ Local partnerships (GMRI, KELT, Chewonki, etc.)
- ▶ Student collaboration
- ▶ Teacher collaboration (science, math, ELA)
- ▶ Transportation to accessible field sites
- ▶ Supportive administration

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