



Abstract

The coast of Maine provides our students with views of rocky beaches, sea birds and the beautiful ocean, but not many students get to see the fish, sea turtles and whales which live in the Gulf of Maine. Even fewer understand that their actions on land can have an impact on the animals in the Atlantic Ocean. BRRRR (Belfast Refuse Reduce Reuse Recycle) is a group of dedicated third, fourth and fifth graders who volunteer their time to reduce waste in the school to protect the ocean. With funding from the NOAA Planet Stewards Project, our group focused on reducing waste by raising awareness about, and access to, reusables in school and home lunches. Students gathered data about cafeteria waste, learned about the impacts of plastic on the ocean and experienced positive choices students can make to reduce waste. Finally, they educated their school community and held a Zero Waste Lunch Campaign. Refuse Plastic- Save the Seas was designed to encourage a love of the ocean and an understanding of how simple choices can help our ocean friends. We can all be ocean heroes!

Introduction

A healthy ocean is important to the tourism and fishing industries and the enjoyment of all Mainers. On my daily walks I see plastic of all types on the roads, along sidewalks, even on our school grounds and our city park. Much of this waste ends up in the ocean, where it degrades into smaller and smaller particles, posing a threat to all marine wildlife (Le Guern, 2019). The garbage that makes it to the Belfast City, Maine, transfer station is sent to an incinerator. When plastic is incinerated it releases CO² (Center for International Environmental Law [CIEL], 2019), contributing to climate change and ocean acidification. Incineration also creates a toxic ash, which must be landfilled (Connett, 2013). Clearly, our students could make a big impact on the health of our community and the ocean by using less plastic. Learning to use less plastic is a valuable habit which can be practiced over a lifetime and is an action even young children can take. Research shows that environmental education boosts academic skills, knowledge gains, community engagement and

leadership. Furthermore, environmental education increases environmentally-friendly behavior in students (Ardoin, 2018). Educating a small group of students about environmental issues had a big outcome for our entire school.

The Process

BRRRR students meet weekly during lunch to learn about the issue of waste and how to help the ocean. Our school projects for this year included encouraging students to reduce cafeteria waste by bringing zero waste lunches to school and hosting an ocean celebration for the entire school to promote stewardship.

After learning about the effects of plastic on the ocean and ways to reduce waste, BRRRR students set out to raise awareness and educate their peers about how to tackle this problem. Students collected, measured and recorded the cafeteria lunch waste. Students used the data as a baseline and analyzed the data after each zero-waste lunch (ZWL). With the help of NOAA Planet Stewards funding, stainless steel water bottles were purchased for K-1 students to ensure our youngest students could choose reusable bottles. BRRRR students made videos, posters, announcements and presentations to the entire school to promote ZWLs. Student volunteers helped to coordinate the ZWLs and actively took part in the cafeteria. Although this project was done at the elementary level, it could be adapted for any grade.

Desired Outcome(s)/ Specific Effects of Project

- Created a Sustainability Committee involving a variety of staff and faculty.
- Reduced the cafeteria use of plastic dressing cups and lids by 100%.
- Switched from single-serve one-use breakfast cereals to bulk cereals served in reusable bowls.
- Raised awareness about problems of plastic through posters and announcements.
- Measured trash from one lunch to get baseline data. Had 5 Zero Waste Lunch days to try for no waste.
- Instituted school-wide marker recycling program.
- Created a website about our campaign to reduce single-use plastic in our school.
- Held World Oceans Day Celebration.

Learn-Create-Educate-Make a Difference

The model developed for the BRRRR group uses lunchtimes to provide a time for interested students to meet. Most of the teaching was done in a very short time, but true student understanding comes from discussions and from working on their projects with feedback from teachers and peers.

Learn

In order to understand the issue, students explored the effects of plastic pollution, lunch waste and each of the four Rs, with an emphasis on *refusing* single-use items, as it is the action most beneficial to the environment. Plastic pollution resources for every grade are readily available online. The sources used for this project were the Washed Ashore Integrated Arts Curriculum (NOAA, 2017) and the Marine Debris Monitoring Toolkit for Educators (NOAA, 2017). Students learned the harmful impacts of marine debris, and the benefits to ocean life if we reduce the debris.



Figure 1. Ms. Demers checks in with student helpers.

Photo Credit: Tish Manning



Figure 3. Students were excited to use reusable napkins.

Photo Credit: Tish Manning



Figure 2. Third grader separating food from trash at the baseline waste audit.

Photo Credit: Tish Manning

Create – Educate

The next step is to connect the issue to the students. Students looked at their own school and noticed factors contributing to the use of plastic. Students were encouraged to design their own response to these local factors.

Students also watched inspiring videos. They saw other young people making a difference for the ocean or people taking a creative approach to raising awareness about plastic pollution. These videos motivated the students to get involved and to think creatively about the problem.

Students work on projects during recess or club time, at home or during our few weekend work sessions. Student work is reviewed to include 3 components: 1) a statement of the issue; 2) information, examples or effects of the issue; 3) an action which kids can take. BRRRR students work to communicate positive and empowering messages of change, connecting science and data with local action.

Make a Difference – Zero Waste Lunch Project

Presenting to the entire school, BRRRR students explained what Zero Waste Lunches were and why they mattered. Fourth grade teacher, Dana Bierwas, created flyers to explain the project to families, the purpose of the water bottles and how to pack a ZWL. BRRRR student videos and messages were shared with the school via emails to teachers, and announcements on the school Facebook page before each ZWL. Bierwas created a BRRRR website which all families could access to learn about the group's mission and campaigns. A local news station featured the campaign on the evening news.

Gathering Data – Determining Next Steps

Partnering with Malia Demers, our Food Corps service representative, we planned and coordinated our data collection process. To establish a baseline, Demers worked with all third graders to collect waste from one lunch day in the cafeteria. After sorting the waste into categories, each type of waste was then measured and recorded. BRRRR students analyzed the results, and focused on two waste streams to target: trash and food waste.

After learning about the effects of plastic and food waste, and gathering data about the waste generated at our own lunch, students were ready to lead the way. They created a variety of educational materials including:

- posters showing what kids can do to help the ocean
- jingles to encourage reusables
- videos demonstrating why and how to pack a ZWL
- why to skip using straws
- the meaning of the 4 Rs
- negative effects of food waste on the climate

Cafeteria Set Up

A cloth napkin drive in the community secured a cloth napkin for each student and most were handmade. On ZWL days all students were given a cloth napkin. Bins of clean napkins replaced the paper napkin dispenser. Students separated waste into the following categories: 1.) dirty napkins, 2.) liquid milk, 3.) milk cartons, 4.) food waste, 5.) paper products, 6.) recyclables, 7.) recyclable plastic, 8.) nonrecyclable drink containers, 9.) waste. Two 4th grade boys were taught how to wash, dry, and then fold the napkins for the next lunch. Students assisted with waste separation, and measured and recorded it after each lunch. Many students outside of BRRRR were eager to participate in the data collection and to volunteer to assist with ZWLs.

Results

After each ZWL, students studied the results, and brainstormed ways to improve the outcome for the next one. Early on, single-use plastic drink containers became a target for waste reduction. One strategy the students came up with was to count and publish the exact number of juice boxes after each lunch to bring the number down. Another was to create a giant bar graph composed of the actual containers collected. We did not meet our goal for containers, but we did see that when we had ZWLs for 2 days in a row, the older students remembered to bring their reusable bottles to lunch. This indicates that regular reinforcement is necessary to establish the habit of waste reduction behaviors. The students speculated that it might be harder for K-3 students to pack their own lunches.

Another waste reduction target was to reduce trash from school lunches by 50%. By recycling the paper waste we reduced the amount of trash by at least 90%. It was a clear illustration of the power of recycling to reduce waste.

Additionally, single-serve breakfast cereals were eliminated and replaced with bulk cereal served in reusable bowls, and the cafeteria use of plastic condiment cups was reduced 100%, by simply placing any desired condiments directly on student lunches. These changes affect all lunches and breakfasts, and are a huge benefit to our environment.

There are two relevant Next Generation Science Standards performance expectations (NGSS, 2013) for this project.

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth’s resources and environment.

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

Students were able to investigate solutions to a problem caused by human activities that have had major effects on the ocean. They learned that individuals and communities can do things to help protect Earth’s resources and environments. Students also learned about energy and fossil fuel resources and how their use affects the environment in many ways. This project allowed students to investigate ways to reduce the waste coming from the school and to see positive behavior change.

**Table 1. CASS Zero Waste Lunch Data
Total Waste For Each Category**

Date	Compost (lbs)	Trash (lbs)	Milk Cartons Recycled (lbs)	Juice Pouches (count)
1/3/19	10.38	10.26	N/A	N/A
1/31/19	21.36	11.46	N/A	N/A
2/28/19	27.72	9.96	N/A	8
4/30/19	25	14	N/A	11
6/4/19	24	1.24	6.2	8
6/5/19	23.32	.78	6.8	12

Figure 4. After pausing to consider how our waste causes problems for animals in the ocean, students and staff pass through garlands of waste, then enter a hallway lined with trash dumped on school property, eventually finding the “clean” ocean with art, information and activities.

Photo Credit: Malia Demers





Figure 5. Students used visuals to raise awareness about our lunch waste.

Photo Credit: Tish Manning



Figure 6. The entire school collected used markers for recycling – diverting 82 pounds of plastic from the incinerator.

Photo Credit: Tish Manning



Figure 7. Fifth graders handing out Maine seaweed samples to celebrate the ocean.

Photo Credit: Tish Manning

asking them to imagine how it feels to have to live in marine debris. After passing through the “dirty ocean” classes emerged into a clean ocean, decked with ocean-themed artwork and lights, where they could touch and taste seaweed, learn about ways to help the ocean and finally, make a pledge to help it. At the World Oceans Day event many students waited in line to be able to make an ocean pledge, and first and second graders began asking if they could join BRRRR.

Go Team!

A big part of the success of the project was building a team of stakeholders. A Sustainability Committee, including the principal, was created and met regularly. Kitchen and custodial staff support were critical, and their input influenced all decisions. Our art teacher guided all students to create meaningful ocean-themed artwork, and our school librarians curated ocean books and transformed the library for our Oceans Day. Community and parent volunteers mentored students to create artwork from discarded cardboard to decorate the halls.

Conclusion

This project was unique in that these young students volunteered their time to learn and make a difference in their community. The students raised awareness about plastic pollution and zero waste lunches, and became advocates for change. The following year Zero Waste Lunches continued weekly until the pandemic. Students learned they can create an ocean of change.

Supporting Documents

Student Project Suggestions and Guidelines https://docs.google.com/document/d/1BeVCu7snoGElqytIeKU3hH0vju-qFNAYuCBWU8_kIuc/edit?usp=sharing

Plastic Waste Survey and Follow-Up https://docs.google.com/document/d/1106V3scXX672ECIk0Zz02WuHtq6fv_Hrmi0G-Xr_PJE/edit?usp=sharing

Celebrate

BRRRR students helped plan and run our World Oceans Day celebration. Packaging and container waste from our school population was carefully collected and cleaned and then strung to create garlands hanging across the entryway into the “ocean” hallway.

Trash cleaned up off the school grounds, including bottles, an old hose and a broken shovel, was strewn around the hallway entrance. Students wrote a script to introduce each class into the hallway showing the impacts of marine debris on the ocean, and

References

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Also see <https://naaee.org/eepro/research/eeworks/student-outcomes>

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About the Author

Tish Manning has been teaching for 25 years at the elementary and middle school level. She has taught in Puerto Rico and Hawaii, but has spent most of her teaching years in Maine. She led a group of middle and high school students, parents and teachers to the Amazon rainforest to study rainforest ecology in the late 1990's. She has dedicated the last 5 years to helping students learn how to protect the ocean. Her work earned the New England Aquarium's School Group award for Ocean Stewardship in 2019. She has received two NOAA Planet Stewards Project awards. She can be reached at tgmanning31@gmail.com.



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