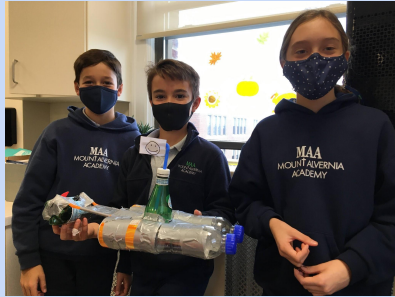


Plastic Extractinators

Using energy to clean up plastic in water

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Following the guidelines of the Massachusetts State Challenge, Grade 6 students designed and created Plastic Extractorators water vehicles made from recycled materials.

Working in groups of 3, first they made a battery powered circuit with a motor and a switch. They then had to waterproof their circuit using electrical tape. The students then designed and built water vehicles that used the motor circuit to propel itself through the water, and lots of duct tape.

The Plastic Extractinator vehicles had to be able to collect small bits of plastic from water as it moved through the water. They used recycled plastic to create something that would clean up plastic from the environment. Double win for the environment.

The students also had lessons in the making of plastics, their types, uses, recyclability and the dangers of plastics in Water Environment. They now understand the slogan Reduce, Reuse, Recycle in a very real sense.

Goals of Plastic Extractinator Projects



The goals of this project were...

- To learn about plastics, where they come from, types, how they are used, advantages and disadvantages and their ability to be recycled
- To understand the problems with plastics, both macro and micro in water environments
- To make and waterproof electrical circuits with a motor and a switch
- To design and create a working model of a water vehicle that will extract plastic from water and to problem solve and change vehicle as necessary using good engineering practices
- To successfully test vehicle in water and pick up plastic
- To work together as a team, collaborating on design and construction

Students Collected Plastic Material



Rory- We worked with duct tape, plastic, a battery and mesh, The type of material that we had to use was plastic and duct tape. The team brought in a milk jug, yogurt container, and a plastic water container. Gretchen- The materials we used were plastic, duct tape, washers, and mesh. We brang in a plastic water bottle, two plastic containers, a small plastic water bottle, and duct tape. (Our school provided the mesh and washers.)

Daniel - Our team had to work with duck tape and recyclable plastics (water bottles, plastic mesh, etc.). Our team brought in plastic bottles, plastic mesh, and duck tape.

Andre -There were so many materials we could have used for our boat, but we chose the sturdiest and strongest for our boat. We used plastic bottles, soda cans, mesh, straws, a battery, and duct tape for our boat. Part of the reason we used these materials are that they are all recyclable and by reusing them we are helping the environment.

Students Design Plastic Extractonators

Caroline - Our design progress was relatively easy. We had two side bottles and one main one held together with duct tape. The main one had the motor, switch, and the other electronics needed for it to work. The propeller came out of the top of the bottle and was surrounded by duct tape to keep water from coming in. The design process did not have many problems and our boat looked very similar to our drawings.

Kayla- My teams design process went smoothly. First we got a sketch book. There were many excellent designs but once my team came up with the "unicorn boat" idea we all loved it and were all in. We were super eager and determined to make this boat the best of our abilities.

Taylor- Our design process was overall an organized experience. We first began to each design a sketch and then pass it around the table and add to it, at the end we layed out the sketches and decided what one we wanted to do. After that we decided who would bring in what recyclable materials. After days and classes of working on our boats we came to an end. It looked very nice. It was built with one big clorox bin in the middle with two water bottles on each side. Inside the big clorox container we placed a scopper and mesh at the end so the plastic would stay in the boat and the water would exit. We taped them together with white and black duck tape to keep it



Students Create Plastic Extractors



Finn -We made the electric circuit by having a propeller and a port with 2 cables connected to it. One cable connected to the battery while the other connected to the switch. The switch was connected to the battery as well. We waterproofed it by putting electrical tape where the connections were. We also put the circuit in a little bottle.

Elias- To make the propeller spin or twirl we had to connect the wires from the switch to the battery and then to the motor. It was probably similar to others but what we did was get a water bottle and attached it to the back of the boat. Then, we cut a hole in the back and fit the motor and battery in the water bottle. We fixed the propeller in the hole and put the switch at the cap and taped it in.

Diana- My team used plastic bottles, lots of duct tape, batteries, nets, a motor, and a switch. The plastic bottles were the main part of the boat which was used to hold the nets and in it, it held the batteries and engine. The nets were to catch the plastic.

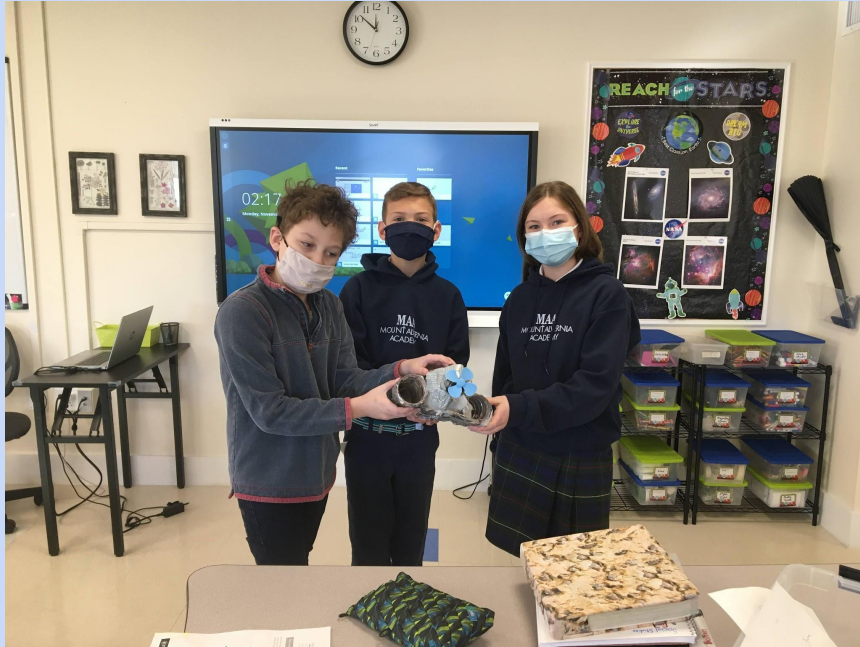
Finished Products

Victor-My team used plastic bottles, lots of duct tape, mesh, batteries, and a motor. We made the body of our boat out of plastic water bottles and scraps and enveloped all of the boat in tons of duct tape. We cut holes in the front and back so that the water could travel through easily and put mesh in the back so that the plastic would stay in the boat. I made the circuit for the engine with electrical tape, wires, a battery, a switch, a motor, and a propeller. I brought in two water bottles, the duct tape, and the batteries.

Andre- Our design was meant to be like one of a catamaran.
We Used to plastic bottles and put them about 6.5 inches away
from each other. To connect them we used duct tape and at the
end of the catamaran we put mesh. later that we connected the
motor. We never had many problems that we didn't fix. The



Finished Product



Reid- We had one milk carton and taped one other plastic bottle to one side and one to the other side. This process was difficult because one side was always heavier than the other. We had to add weights to the lighter side so we could balance it so it wouldn't tip over.

Rex- The design process was three and a half water bottles, the one in the back had the electrical work and the one in the front had the filter and the scooper, the side ones were for floatation. It was difficult to put everything together and put everything in the right spot.

Problems- the scooper was too high so it couldn't
Aryan- What we added was the area on the top where we would keep the battery from getting wet. We had a circular tube at the top with a small hole on the side to let the wires through and the motor taped on the back

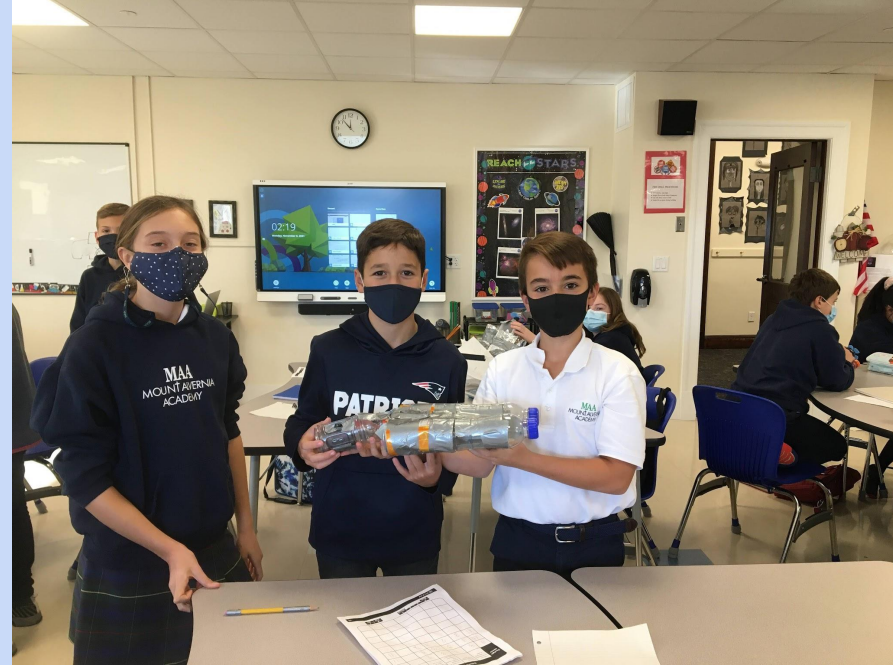
Finished Products

Taylor- After days and classes of working on our boats we came to an end. It looked very nice. It was built with one big clorox bin in the middle with two water bottles on each side. Inside the big clorox container we placed a scopper and mesh at the end so the plastic would stay in the boat and the water would exit. We taped them together with white and black duck tape to keep it simple, we then put the motor in the small plastic water bottle and placed it inside the clorox container. When we went to test it we realized that the boat was floating too high and not collecting enough water so we decided to boot weight in to hold the boat down and it worked! To decorate the boat we added a rubber duck on top and made small stick figures to put on top of the boat as well.



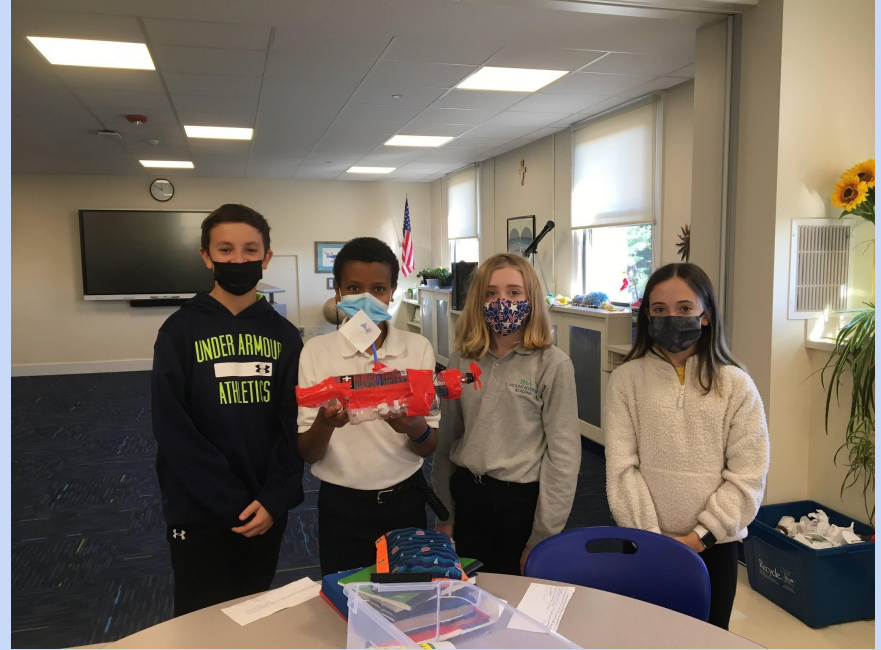
Finished Product

Audrey- The design was three plastic bottles one full one in the middle and the other two on the sides were cut in half. We stuck the propellor through a hole we cut in the back and taped all the bottles together. It was not very difficult but it took a lot of time and patience. Some of the problems we encountered were that the wires kept on breaking when we tried to build the motor and the propeller wouldn't start when we pressed the switch to start it. When we tested it the first few times, the boat drove in circles and barely picked up any trash so we added weights which lowered it and balanced it so that it drove well and picked up trash.



Finished Products

Andre- Our design was meant to be like one of a catamaran. We Used to plastic bottles and put them about 6.5 inches away from each other. To connect them we used duct tape and at the end of the catamaran we put mesh, later that we connected the motor. We never had many problems that we didn't fix. The propeller got stuck but we made a bigger hole and it was fine. Also our duct tape got wet, but we made it double sided to fix it.



Aryan- We took 4 bottles and took two and taped them together then we took two other water bottles and taped them to the back to make it float since the tape on the first to bottles was to heavy so it would sink. We put the motor battery on the top taped around with duct tape so it wouldn't get wet. Then we powered the motor and cut to holes in the front of the bottle so the plastic will go in, then we cut two holes in the back and taped the mesh so the water would go out and the plastic would stay in.

Problems



Ethan- We had two problems. The first problem was that we needed to find a way to connect the motor to the main part. We solved this by putting it in a small bottle and connected it to the body. The second problem was the scooper was too high above the water. We solved this by adding weights in it.

Daniel - When we first tested our boat in the water, the motor was not spinning fast enough. Another problem was that the boat was not balanced, so we had to add weights.

Sarah- It took a few tries, but we made it work out. Our biggest problem was that too much water was getting into the boat. We had to redo the whole duck tape process when we realized some problems. We got very frustrated but as a team, we did very well.

Testing the Extractinator





Results



Students gained an understanding of where plastic comes from, uses, recyclability and dangers of build up in the environment, especially the ocean.

Students learned about electrical energy. They constructed a circuit with a battery, motor and switch and waterproofed it.

Energized by their motor circuit, students designed and constructed water vehicles to pick up plastic from water, made from recycled plastic containers.

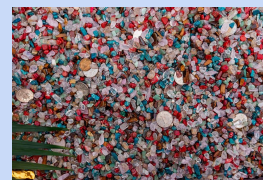
Student's Plastic Extractors successfully collected plastic from water.

Students learned to work as a design and construction team. They collaborated throughout the project.

Students learned that the engineering process involves design, construct, test, evaluate and redo until you are successful.



Favorite Part



Joseph- My favorite part of the project was when our team finally put our boat on the water. This part was my favorite because the satisfaction that I felt when I saw it succeed, that feeling made me feel that all of the hard work was worth it.

Krisztina- My favorite part of the project was when our boat finally worked. Good points for working was a team and sharing ideas. The bad points was that we sometimes didn't always agree.

Madeleine- Some good points of the project were being able to work with other people and not having to do everything all by yourself. At some points one person would hold the boat, another would hold the attachment, and a third would connect them. It made everything much easier. Some bad points were when we had trouble balancing the weight without sinking the boat. We got very frustrated.

Gretchen- Working as a team was very fun. We got to share our ideas and opinions on the boat. Working as a team helped us work faster, and more efficient.

Taylor - In my opinion this project was very fun in many different ways but my overall favorite part was when we put it in the water and it worked. Everyone on my team was so happy that all our hard work paid off. I also enjoyed being able to work with my teammates because this was one of the first times we got to do a "normal group project" after covid.

Mateo Lozano - My favorite part of the project was that we got to use motors and batteries in our boat.



Thank You NEED!

Kayla- Creating the vehicle was such a fun experience for me. I'm so grateful that I got to make this vehicle because it was so much fun. We came to one problem though. But everyone makes mistakes. My team's problem in particular was that when we put our boat in the tub of water, the boat spun in circles and squirted water everywhere. This had an easy fix. We just moved the motor! I had such a fun time being an engineer. This project definitely inspired me. This project taught me that hard work pays off in the end. This project definitely applies to that statement.