# Scituate Middle School **Engineering** a **Better Future**

2017-2018

Advisor: Amanda Donahue



#### **Energy Expo**

**Goals:** To educate the community about alternative forms of energy.

**Activities:** Students researched alternative forms and energy and created posters to display their information. Students also designed and built prototypes to demonstrate how these alternative sources of energy produce electricity. Students presented their projects during a district-wide STEAM night on April 5th where parents and students in grades K-12 were able to walk around and explore the different energy sources. Students will conduct another Energy Expo on May 1st during Water Festival.

**Energy Content:** Students used the "Intermediate Energy Infobook" to research different alternative energy sources as well as conducting their own independent online research. Students explored how each energy source works and how it impacts the environment.

**Student Leadership:** Each type of alternative energy had its own station for STEAM night and each one was run by one of our club members.

**Community:** Over 300 parents and students attended STEAM night.

**Evaluation:** Students were able to present information about their energy source and field questions from parents.



### **After School Program**

**Goals:** To educate students in 1st, 2nd, and 3rd grade about energy.

Activities: The High School NEED club organized a 10-week after-school NEED program for each of the Elementary schools in our district. Two of our club members helped at the North Scituate Elementary School for the duration of the program. Students helped run different NEED activities and worked with the students to make videos about saving energy.

**Energy Content:** Students used NEED materials to teach the kids about the forms and sources of energy, how a basic motor works, and about the concepts of energy efficiency and conservation.

**Student Leadership:** Jules and Grace volunteered to help every Tuesday after school for 10 weeks until the program ended. They helped run the NEED stations and helped the students make their energy videos.

**Community:** Jules and Grace worked with 30 elementary school students after school. Parents were able to see their children's hard work at the district-wide STEAM night.

**Evaluation:** Students used what they learned to create a video about energy for the NEED film festival during STEAM Night.



### **Understanding Wind Energy**

**Goals:** 1. To understand how a wind turbine works, 2. To understand the concept of energy efficiency, 3. To measure how much energy our turbines produced.

**Activities:** Students designed, built, and tested different wind turbine blades to see how much weight they could lift and how much power they could produce.

**Energy Content:** Students used the "Wind For Schools" guide and researched the structure of a wind turbine before designing and building their own.

**Student Leadership:** We completed this activity as a club, but Gabi was responsible for showcasing our turbine during our Energy Expo.

**Community:** Students were able to use the turbine during STEAM night to explain how wind energy works. Local community members are interested in wind energy due to the new wind farm off the coast of Block Island.



**Evaluation:** Students were able to evaluate their designs by comparing which turbines lifted the most weight and whose design produced the most power.



#### **Snap Circuits**

Goals: To understand how electrical circuits work.

**Activities:** Students used the Snap Circuit kits to explore different electrical circuits and discover how some forms of alternative energy produce electricity.



**Energy Content:** Students followed the Snap Circuit guide and read through their energy booklet. We learned about short circuits and positive and negative charges.

**Student Leadership:** Students worked together to complete their circuits. Brayden was able to make his own circuits without the guide and helped students troubleshoot.

**Community:** We showed off some of our Snap Circuits during the STEAM Night event.

**Evaluation:** Students were able to create and troubleshoot their own circuits without the help of the guide.





### **Garden and Greenhouse**

Goals: To grow food locally and reduce the use of fossil fuels in the transportation of food.

**Activities:** We harvested over 45 pounds of onions and potatoes during the fall with the High School NEED club. We will clean out the garden beds after April vacation and plant more crops for next year's harvest. We are currently preparing for our Spring plant sale by growing flowers and vegetables in the greenhouse.

**Energy Content:** We learned about Taterthon from the Scituate High School NEED club and learned how much energy is used to transport our food. By growing food locally we can reduce our use of fossil fuels.

**Student Leadership:** Each group of students was responsible for harvesting a different crop. Michael was our onion harvesting expert. He could spot an onion even through the weeds.



**Community:** The onions and potatoes were donated to the local food bank. We hope that more students and teachers can enjoy the outdoor garden space once we finish our spring planting.

**Evaluation:** We had a successful growing season and many students were involved in the harvest. We were able to teach more people about the importance of growing food locally.



#### **Worm Composting**

Goals: To learn how to compost with worms and improve our worm bins.

Activities: We needed to restart our worm bins from the previous year after suffering some minor setbacks. We collected all the good soil for our garden using the High School NEED Club's soil sorter and we made new bedding for the worms. We added all the coffee grounds we had collected from K-cups throughout the year.

**Energy Content:** Students were able to see that by composting our waste, we are reducing the amount of waste that needs to go to the landfill. This reduces the use of fossil fuels for transportation of garbage and provides our garden with some needed nutrients.



**Student Leadership:** Returning NEED club members taught our new members how to use the soil sorter. We spent the next club meeting cleaning out the worm bins and making new bedding. Students suggested creating a larger composting area outside to accommodate food scraps from the lunch room. This may turn into a new student-led project.

**Community:** The nutrient-rich soil created by the worms will help our school garden and our fall harvest will be donated to the local food bank.





The coffee grounds that we collected from our K-cups will help feed our worms.

#### **Reducing Water Waste**

**Goals:** 1. To build a device that will reduce the amount of water wasted in our classroom sink, 2. To learn about how energy use impacts our water quality

**Activities:** In an attempt to reduce the amount of water wasted in our classroom's fountain sink, students designed, built, and tested a device to concentrate the sink's water and reduce the amount of water waste. Devices were made with recycled materials.

**Energy Content:** We learned how much freshwater there is on Earth and how it can be polluted. Cleaning and pumping the water requires energy, usually from fossil fuels. We also learned that alternative forms of energy are less likely to pollute the water.

**Student Leadership:** Students worked in engineering teams to design and build their devices.

**Community:** Devices were kept on the classroom sink and used throughout the school day to reduce water waste. The devices were very helpful when filling watering cans for our greenhouse projects. We hope to give devices to other teachers with fountain sinks in their classrooms.

**Evaluation:** Students tested their designs in the classroom sink and measured the flow rate of the water. The best designs have withstood the test of time and are still being used!



#### **Student-led Project: K-cups**

Goals: To reduce waste going to the landfill and to bring awareness to the issue of plastic waste

**Activities:** We collected used K-cups from both the middle and high school teachers' rooms. We clean out the K-cups and feed the coffee grounds to our worms. We recycle the plastic or reuse them as planters or for crafts. The NEED club was also able to donate reusable K-cups to each of the teachers rooms.

**Energy Content:** By finding a use for every part of the used K-cup, we can reduce our waste and even make something great from it. The used coffee grounds are a valuable food source for our worms.



**Student Leadership:** Each week, members of the NEED club collect the K-cups and count them.

**Community:** By collecting the K-cups we make the teachers more aware of just how much plastic waste they are accumulating. This year we expanded our K-cup collecting to the guidance suite. We hope to encourage teachers to use the reusable K-cups that we provided.

Evaluation: Since September we have collected over 822 K-cups.





#### **Student-led Project: Aquaponics**

**Goals:** To build an aquaponics system for our school greenhouse and encourage local farming to reduce the transportation of food.

**Activities:** Patrick researched and designed an aquaponics system for the school and presented his ideas to the club. Our next steps are to seek professional advice and raise money for the project.

**Energy Content:** We researched the how long our current fossil fuel reserves will last us if we do not reduce our dependence on them.

**Student Leadership:** Patrick has done the majority of the research and planning for this project, but will receive help from the other club members in the next stages of the project.

**Community:** It is our hope that by producing more food in our greenhouse, we can work with the cafeteria staff to provide students with a locally grown lunch and show students the importance of growing and buying food locally.

Evaluation: We're still learning!



"We are trying to get an aquaponics system into the greenhouse, and we are thinking a vertical design would be best. It would have a screen to block fruit and seeds from blocking the pump, and it would save space. Aquaponics is a branch of farming that combines hydroponics, farming with only water, and aquaculture, the raising, growing, and selling of commercial seafood. We would most likely grow tilapia for fish, and cabbage and other veggies that could be used in the cafeteria at lunch, in order to reduce transportation cost of food." -Patrick By: Patrick B.

#### **Student-led Project:**

Goals: To reduce our plastic waste

Activities: Brayden researched different methods of recycling plastic and found a possible method for us to become a plastic recycling center. He presented his findings to the club and taught students how to separate different types of plastic based on their different properties.

**Energy Content:** We researched how plastic is made from fossil fuels and how it is recycled. We also researched different types of biodegradable plastic and tried to make our own using canola oil, cornstarch, and water.

**Student Leadership:** Brayden is now looking into the cost of creating a plastic shredder.

## **Community:** We hope to make the school community more aware of the problem of plastic waste. When we do build our own shredder, we plan to share it with the art classes to help increase interest in recycling and make cool new things from recycled plastic.

#### **Plastic Shredder**

#### Shred that plastic!

Bigger plastic objects are chopped into smaller flakes using the shredding machine. Shredded plastic is easier to store, wash, melt, sell and use in the other machines or processes.

#### Build the shredder >

e can switch to

but it will be a large challenge







M. N. STREET

Students tried to use an online animation platform to create a video about biodegradable plastics.



By: Brayden G.

#### **Student-led Project: Fundraising**

Goals: To raise money to support the NEED club and all our amazing ideas.

**Activities:** We used some of the K-cups we cleaned as planters. We also painted some of the K-cups and used them to make various crafts. We plan to sell our succulents and our K-cup crafts at the school plant sale.

**Energy Content:** Reducing our waste is one of the best ways to reduce our energy waste. By finding a new use for our K-cups we can reduce waste while raising money to support our future plans!

**Student Leadership:** Brooklyn and Jaelynn researched succulent care to make sure that our plants grow well. They also showed the club some of their craft ideas for the K-cups. We all worked together to clean and paint the K-cups.

**Community:** We hope to show the community that you can reuse materials to create cool new things while also reducing waste.

**Evaluation:** We have 100 K-cup planters for sale during our Spring Plant Sale.







By: Brooklyn C. and Jaelynn F.

#### Scituate Middle School NEED Club



But we believe we can do it.

