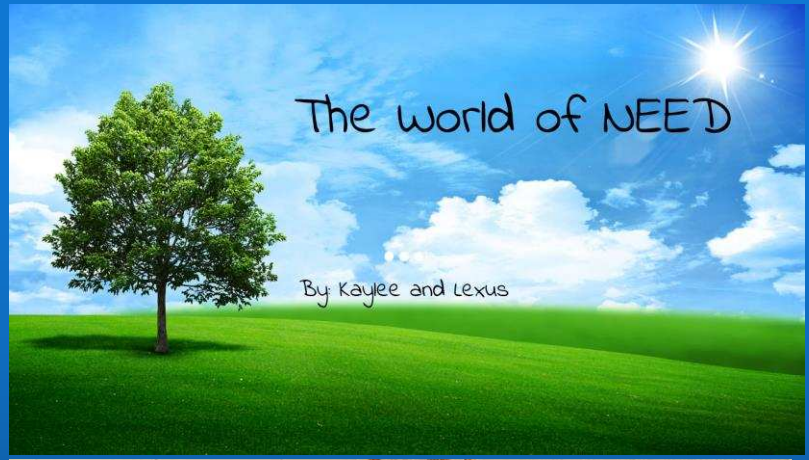
School Name: Scituate High school

Project Title: Scituate High school NEED Project

Advisors Name: Shannon Donovan

Summary: This year, our project focused on a variety of outreach programs. We did outreach to the elementary schools by helping provide materials and inforation to the teachers leading activities during the new STEAM enrichment time. Our team helped out at the annual water festival to help kids see that our individual actions make a big difference. Recently we had the third graders come on a field trip to us to learn more about food production and to start plants that they are now planing in their school garden. We invented a new game and used it in our outreach events at the school course selection fair and at the robotics tournament hosted at our school. We assisted with a teacher workshop to share how we use some NEED materials to teach younger students. We also spent a lot of time working on videos and researching a plastics recycling system. We made a new facebook page for our club to share some of our work. Our engineering classes also spent a lot of time learning about energy and applying what they learned to different design projects.



Activity 1: Plant Sale, School Gardens, and Local Food Production

Goal: To reduce energy waste by encouraging more local food production.

Activity and Tasks: We helped start plants, did transplants, raised chickens, volunteered at the plant sale, donated plants to school gardens at 5 different schools and to the YMCA of Greater Providence. We hosted a field trip for grade 3 at North Scituate to teach them about growing food, soil, and plant nutrients.

Energy Content and Activities: We talked with kids about saving energy by reducing fossil fuels used in transporting food and building community food systems to be more resilient. We planted seeds and did transplants. We volunteered at the plant sale and worked in the school garden.

Student Leadership: FFA club members stepped up and led the way on greenhouse management and chicken care: Xen, Trinity, Eric Tyler, Meadow. Kaylee and Janessa volunteered with the third grade workshops.

Evaluation: We reached hundreds of community members through our plant sale and plant donations. We had 42 third graders visit and plant. They are now working on their own school garden.

Activity 1 (cont.): Plant Sale, School Gardens, and Local Food Production

Activity 2: Social Media Outreach

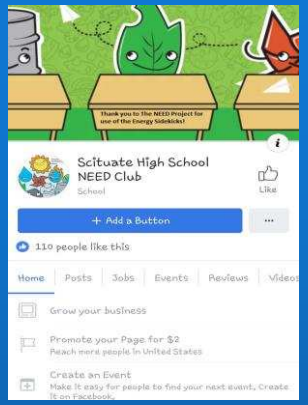
Goal: Build community online to share information about the importance of reducing energy use, and generating renewable energy

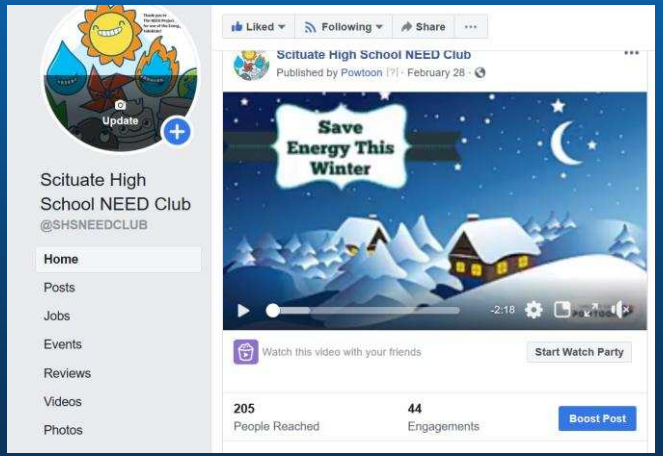
Activity and Tasks: We created a facebook page that informs people how to reduce their carbon footprint, save energy, and improve the environment. We wrote to NEED to get permission to use the Sidekicks to help build brand recognition.

Energy Content and Activities: Wrote a post about what the NEED project is and stands for, shared a video about saving energy during the winter etc. We posted pictures of us at different activities that we did.

Student Leadership: Kaylee and Lexus, our team leaders created the facebook page https://www.facebook.com/SHSNEEDCLUB/ to post about energy saving tips, ways to recycle, and overall environmental awareness.

Evaluation: The page continues to grow in the number of people reached.





Activity 3: Energy Video Production

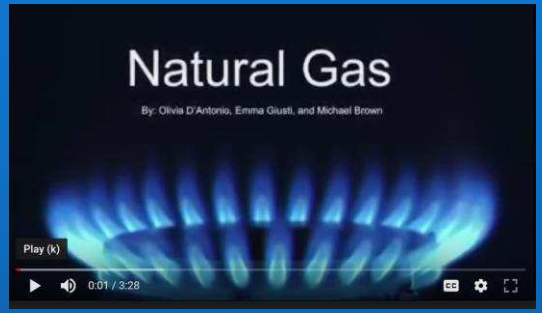
Goal: To learn about forms of energy and create a video to teach others about them

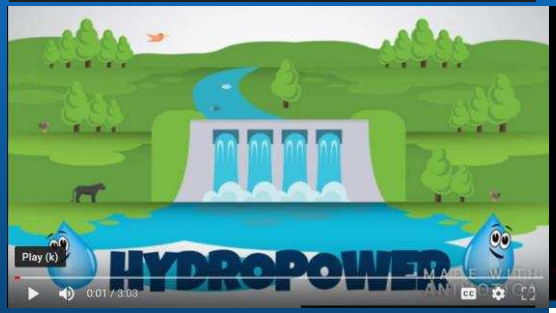
Activity and Tasks: We divided into small teams and divided up the list of energy sources. We did research about the source and put together videos. Our teacher then sent the videos to a teacher at another school to show them to younger students

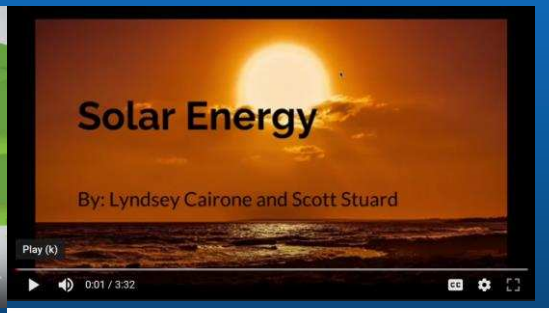
Energy Content and Activities: We started with the NEED Forms and Sources activity and did our own research from there. Some groups used materials from the NEED website (guides and power points and animations)

Student Leadership: Each team led their own video production.

Evaluation: The class voted the hydropower animation made by Lauryn's groups as most effective.







Activity 4: Elementary NEED Activity Supports

Goal: To help STEAM enrichment teachers lead NEED activities at our elementary schools.

Activity and Tasks: Some of our elementary schools added a STEAM enrichment time to the school day this year, and Ms. Donovan got them to agree to do NEED with the third grades. So, we helped make simpler versions or the science of energy kits for these teachers to use in their short lessons since they had not been to teache training before. We sorted our NEED materials and made up smaller versions of the stations.

Energy Content and Activities: We had to review the science of energu kit to strategise the best activities to send for thie short sessions.

Student Leadership: Lexus and Kaylee had to make sure that all the teachers had what they needed to do the activities.

Evaluation: The students enjoyed the activities and we got the teachers permission to go to training. The students and teachers enjoyed it and benefited enough that they will let us do this again next year.

Activity 5: Energy Pictionary - A new NEED Game for Outreach

Goal: To let more people know about NEED and the work that we do on Energy Education.

Activity and Tasks: We reviewed the different games and icebreakers from NEED to come up with an idea for a booth at a couple of school events as we are trying to tell more people about our club and increase interest in joining. In the end we invented our own version of Pictionary using different energy terms. It was a way to get people to come to our table and talk with us while doing a fun activity.

Energy Content and Activities: We invented an energy game and used it to talk to students and parents at two school events.

Student Leadership: Kaylee and Lexus led the game creation and hosted the table. Ashton also helped host the table at the course selection event.

Evaluation: Hundreds of people attended the event and saw our display. Dozens played the game and talked with us.

Activity 6: Workshop Assistants

Goal: To help teach teachers about NEED resources

Activity and Tasks: We helped with workshop set up and delivery and with cleanup. We shared stories with the teachers about what our club does to encourage them to start clubs at their schools too.

Energy Content and Activities: We helped teachers with building generators

Student Leadership: Kaylee took the lead on this event helping Ms. Donovan run the workshop.

Evaluation: The teachers appreciated the workshop and seemed excited to take the information back to their schools. Ms. Donovan also gave them polls to do before and after.

Activity 7: Water Festival, May 2018

Goal: Teach kids that they can have a big impact with the choices that they make.

Activity and Tasks: Our team members led games to teach about protecting our watershed by keeping trash and chemical waste off the ground so it doesn't get in the water. Members of our middle school NEED team showed their energy posters to teach the third graders at the festival about forms and sources of energy.

Energy Content and Activities: We met with NRICD to learn the games. Ms. Donahue led the younger group in the creation of posters about forms and sources. NEED.org was one of the resources used in the poster project.

Student Leadership: Lexus, Patrick, Jules

Evaluation: Almost 300 third graders attended and participated in these activities.

Activity 8: Engineering - Plastic Reuse

Goal: Build a machine to slich up plastic, melt it , and extrude filament for the 3D printer

Activity and Tasks: Kaylee spent a lot of time researching this and creating a presentation. We are now looking for a partner to work with that could help us actually build the device since it is a little beyone our current skill level.

Energy Content and Activities: Recyling plastic instead of making new plastic saves energy. Kaylee researched different types of plastics that we could use in this way to make our own filament for 3D printing to build useful objects.

Student Leadership: Kaylee led this whole effort.

Evaluation: This is ongoing.

Activity 9: Food Waste Reduction

Goal: To reduce energy waste by reducing food waste

Activity and Tasks: Mrs. Stormonts grade 9 English class decided to apply our learning to study food waste at our school and in our community.

Energy Content and Activities: We took a field tripto the landfill to learn about the waste stream and ask about food waste collection around the state. What we learned was shocking. We then started collecting food waste from the school kitchen and set up a schedule to collect it and compost it. The amount quickly overran our capacity since we can't yet build a large compost bin because of the field construction project. So, rs. Stormont brought the compost home until our initial data collection ended. After the construction we will build a big bin and start our food waste collection again,

Student Leadership: We made a schedule for students to collect the waste from the kitchen, feed it to the worms, and washe and return the bucket.

Evaluation: We learned that we could save hundreds of pounds of food waste from going into the landfill and that this would make compost for our school garden.

Methane collection

Composting yard waste

Workers fixing our recycling mistakes

Recycling Museum

Scrap wood grinder

The road up to the active part of the landfill and a new wind turbine

Activity 10: Investigating Recycling

Goal: Improve recycling at SHS

Activity and Tasks: Mr. Goffe and his team have taken on the task of evaluating participation in recycling at our school with the goal of increasing our recycling rate and reducing waste.

Energy Content and Activities: The team wrote to the facilities manager to gather data. They also went around the building to see what rooms need bins and what bins need labels to show what materials can be placed in them. This project will continue into next year as we try to increase recyceling in our school.

Student Leadership: Alexandria S. and Colleen N. asked Mr. G to help them tackle this problem.

Evaluation: We have just begun our data collection and survey.

Activity 11: Circuits, Fuel Cells, and Photovoltaics

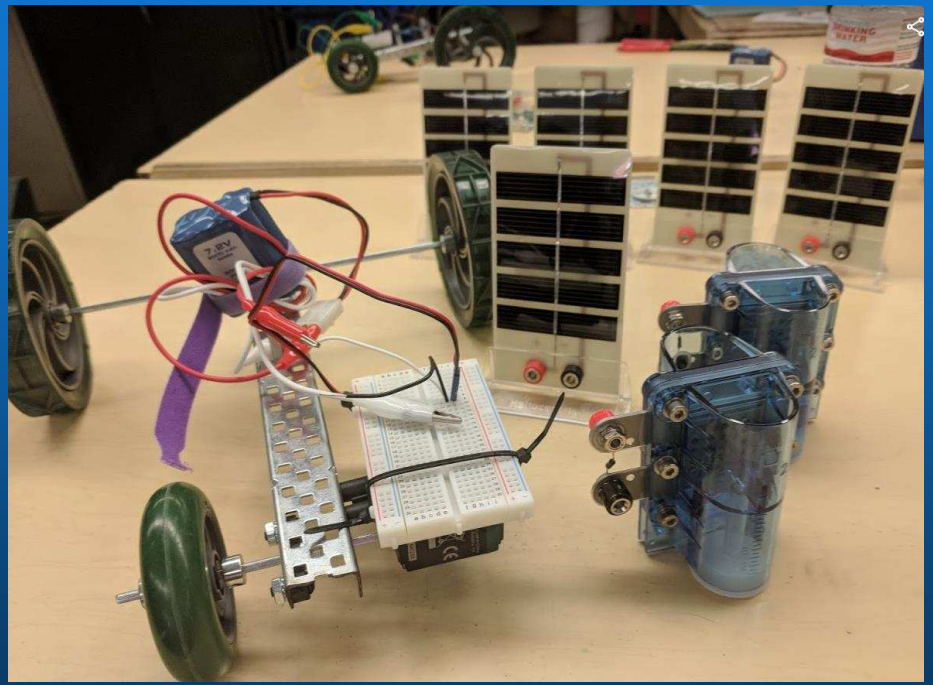
Goal: To learn about different circuit arrangements, fuel cells, and photovoltaics.

Activity and Tasks: Our class had to build small cars with VEX parts. We had three ways to power them, with photovoltics, a fuel cell, or a battery.

Energy Content and Activities: We learned how to use the multimeter and measured output form the devices. Because of the voltage requirements of the cars that we build, only the battery worked. When the car wheel was lifted off the ground, it would spin with the fuel cell, but once the load increased it would not run. The cars ran find with the 9V battery. We used the NEED books on fuel cells and photovoltaics for background information.

Student Leadership: Each team had to show responsibility and time management to get their building and testing done on time.

Evaluation: All the teams successfully completed their builds.



Activity 12: Calculating R-Value

Goal: To learn how to calculate R-value of a wall to aid in design decisions

Activity and Tasks: This was a PLTW activity where we studied thermodynamics, heat transfer, and learned how to calculate R-Value using this equation:

R-Value

Thermal Resistance of a Material

The measure of a material's ability to resist heat

The higher the R-value, the higher the resistance

$$R = \frac{1}{U} \qquad U = \frac{P}{A\Delta T}$$

Bulk R-value =

R-value $_{Object\ 1}$ + R-value $_{Object\ 2}$ + … = Total R-Value

The top of a 3/16-inch thick acrylic testing box is covered with an unknown ½-inch insulation material (black). The dimensions of the box are 10 inch × 10 inch on each side. The sides and are wrapped with a control insulating material (blue) so that almost all heat loss is through the 10 inch × 10 inch unknown insulating material on the top of the box (assume no heat is lost from the bottom or sides of the box). Determine the thermal conductivity for the insulating material if a 25 W bulb is used to heat the box. You may assume the only heat loss from the box occurs through the 10 × 10 test area. The bulb maintains the inside temperature at 10 °C higher than the outside temperature.