

RUBE GOLDBERG MACHINES

FORCE, MOTION, & SIMPLE MACHINES

After completing their in-depth study of recycling culminating with a multi-media Public Service Announcement, the 2nd graders began a unit on Force, Motion & Simple Machines. They first investigated pushes and pulls, the most basic forces that affect an object. Students headed outdoors to search for objects that push or pull. When they returned to the classroom, they shared their findings making a comprehensive list. People push a door to open it, or pull a door to close it. People push a stroller, pull a wagon behind them, push someone on the swings, pull flowers to pick them, or push a button to turn something on. Objects that push or pull can be found everywhere!

This led the class to a discussion about how force and motion occur in the world around us all the time. Pushes and pulls are two types of work that are considered a force. Motion is how and where an object moves because of a push or pull. The students were eager to learn more. During Daily Reading Centers, students read informational texts about Force, Motion, & Simple Machines providing them with a deeper understanding of these concepts. They excitedly discovered that everything in the universe moves. It might only be a small amount of movement and very, very slow, but movement does happen. The Earth is constantly moving around the Sun, and the Sun is moving around our galaxy. Everything is in motion!

During the next science lab, students were challenged to construct a marshmallow blaster with a partner. Teams were given card stock, tape, scissors, and, of course, marshmallows. They experimented with the materials to create a design that blasted marshmallows the farthest. Students discovered the factors that affect force through the design process. Each team took turns blasting their marshmallows measuring and recording the distance traveled. After three rounds of blasting, students discussed which design worked the best and why. They found that group three's marshmallow blaster propelled it furthest. The marshmallow blaster from group three went the farthest traveling 25 centimeters in its final trial. When we discussed as a class why group three's marshmallow traveled the furthest students stated that group three's marshmallow followed the guidelines outlined in the activity the best. Their marshmallow was snug inside their tube and did not have much room to move inside their tube. They discussed how blasting a marshmallow is "work", a force that is applied to an object and moves it. They brainstormed what makes work easier and all agreed that machines make work easier.



Aria, Eli, Sarina, & Kai experiment with the design of their Marshmallow Blasters.



Oren, Eitan, & Tony use a wedge to lift a large bucket of water at the Brooklyn Navy Yard.

To further study machines and their impact on our community, the class visited the Building 92 at the Brooklyn Navy Yard for their Ingenious Inventions tour. At the museum we studied simple machines and their impact on our community in accordance with our essential question this unit "How does inventions and machines effect how we live?" We used this interest to explore how inventions and machines have changed how we live. At the Brooklyn Navy Yard we studied simple machines and how they work. Students explored technological innovation through the lens of the Yard's history and accomplishments. They learned about pioneering iron and steam shipbuilding, advancing radio technology and developing medical anesthetics at the Naval Hospital. After many hands-on activities such as lifting a bucket of water with a lever or pulley and screwing legs on a table, students developed a greater understanding of how simple machines can make work easier and faster! Our students really enjoyed using pulleys to lift heavy objects and how much easier it made the task of lifting the bucket of sand. The trip further fueled the 2nd graders' interest in inventions and how machines have transformed the way they live.

During their next Science Lab, small groups visited six stations spending 20 minutes at each. At the Clever Levers Station, they experimented with levers and discovered how they make lifting a load easier. At the Incline Plane Station, students compared the amount of force it takes to lift a load and to drag that load to the same height up an inclined plane. They investigated how a wheel and axle make moving something easier at one Station and how a pulley can make lifting an object easier at another. They also explored wedges and screws identifying the difference between a nail and screw. The students were quickly becoming Simple Machine experts.

Students questioned what a machine that is made more than one simple machine is called. Through research, they learned that a compound machine is a machine with one or more simple machines working together to make work easier. Teams collected examples of compound machines found in their classroom and shared them with the class.

The class discussion shifted to how inventors use simple or compound machines in inventions. Students

were intrigued by a video presentation about accidental inventions they watched on their iPads and were eager to learn more! They researched inventions that changed the world- the telephone, airplane, car and computer. Students were surprised to discover that the Internet was only invented in 1989- 25 years ago! During their Technology Block with Morah Pinki, students researched accidental inventions. They then created a PowerPoint presentation to share the accidental invention's impact on the world. They combined research, information and images to make a multi-media presentation.

Next, the students watched videos of Rube Goldberg Machines. They were fascinated by the complex machines created to do something simple, like turning off the lights. They soon learned that Rube Goldberg is a cartoonist that created elaborate ways to do simple things. He drew contraptions that make simple tasks into difficult and complicated ones to poke fun at the world's love of technology. As the culminating task for the unit, teams were challenged to design and construct a Rube Goldberg inspired machine to accomplish a simple task.

The students were excited to begin and immediately began planning. Students split into three groups and brainstormed what environmentally friendly Rube Goldberg machine they would design. Next, groups chose



Samantha, Tony, & Elmira select found materials to use to construct their machines.

names for their machines. One team decided they would construct a machine that would water a plant and named their machine "The Water Blaster." Another team decided that their machine would water a plant as well and named their machine "Food Waterfall." The third group decided that their machine would recycle a can and named their machine "Can Trasher."

The groups then worked with Morah Sarah and Morah Elizabeth to select which simple machines they would include in their Rube Goldberg machines. Students enjoyed constructing ramps, pulleys, levers, wheel and axels and wedges. After many trials and problem solving, the students were very pleased when the multiple parts of their machine successfully worked together. As a final step, students filmed their machines with an iPad using iMovie.

STUDENTS ARE LEARNING

NYS.SCI.PS.5.1a

Observe and describe the position of an object relative to another object (over, under, on top of, next to).

NYS.SCI.PS.5.1:

Identify a force as push or a pull.

NYS.SCI.PS.5.1b, c:

Demonstrate how the position or direction of an object can be changed by pushing or pulling (forces and motion):

- Change the direction of objects by pushing and pulling using blocks, ramps, cars, and balls.
- Inclined plane

NYS.SCI.PS.5.2a:

Observe and describe how the force of gravity can affect objects through air, liquids, and solids.

CC.SCI.PS.4.1a:

Observe, identify, and describe a variety of forms of energy: Sound, Heat, Chemical, and Mechanical.

CC.SCI.PS.4.2a, b:

Identify the evidence for energy transformations and how humans use these energy transformations: Heat to light, chemical to electrical, electrical to sound, etc.

CC.SCI.PS.4.1b, c, d:

Observe and describe how heat is conducted and can be transferred from one place to another.

CC.ELA.W.7:

Conduct short research projects that build knowledge about a topic.

CC.ELA.2.7W

With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.

CC.TECH.D.6:

Designs a solution or product, taking into account needs and solution or product, taking into account needs and constraints (e.g., cost, time, trade-offs, properties of materials, safety, aesthetics).

NYS.NA-VA.K-4.1:

Understanding and Applying Media, Techniques, and Processes.



Emanuel, Aria, & Emma figure out how to get multiple machines to work together.