

STEAM Subject: Engineering
Lab: Balloon Powered Cars

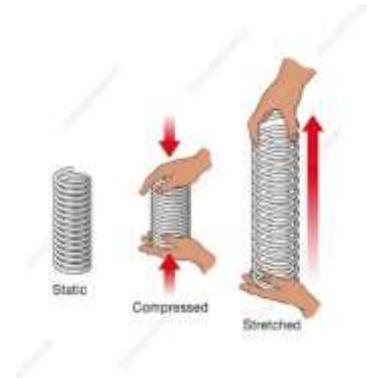
Learning objective: Students will learn how to harness air to power their own homemade cars!

Grades: 5th-8th

ENGAGE:

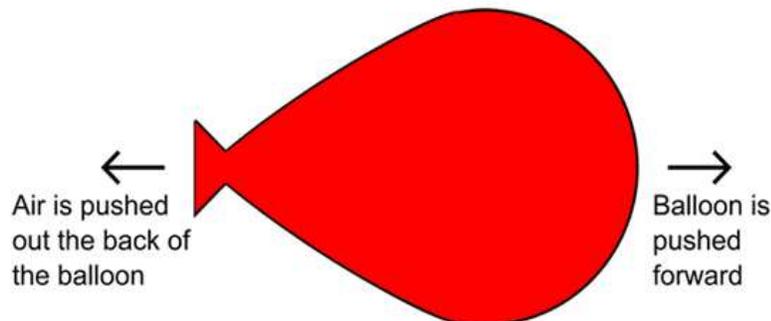
Ask students the following questions:

- What is potential energy?
 - Energy that an object has because of its position, nature, or because of the arrangement of its parts.
 - Example: a “spring” stores potential energy when it’s pushed down or stretched.



Source: Science Photo

- What is kinetic energy?
 - Energy of mass in motion.
 - Example: when you push down a spring and release it, it bounces up and down, releasing kinetic energy.
- What is force?
 - Applied action towards any object for physical change or movement.
- What is air pressure?
 - the force by air on any surface in contact with it.
- What is friction?
 - Amount of resistance that one surface or object encounters when moving over another surface or object.
- What is Newton’s Third Law of Motion?
 - For every reaction there is an equal and opposite reaction.
 - For a balloon: When air is stored in a balloon and then suddenly released the following happens (example of Newton’s 3rd law):



Source: Science Buddies

**EXPLORE:
Balloon Powered Car Activity**

Materials needed per student:

- Balloon
- Recycled plastic bottle
- 4 plastic bottle caps
- Wooden dowels or skewers
- 4 plastic straws (3 for powering car, 1 for axles)
- 2 rubber bands
- Scissors*
- Hammer*
- Screwdriver*
- 1/16" Screw
- Glue sticks (if necessary)
- Marker



All images by EIS Engineering Instructor Justin Joyce.

**Safety precaution- denotes tools that should be used only with adult supervision*

Directions:

1. Cut two holes in bottle and ensure at least (3) straws can fit in



2. Prepare car axle supports by cutting one of the straws in half (makes two axle supports)
3. Prep for axle support placement by marking location of axles on bottle and using a standard screwdriver for creating holes for straw axle supports to go through



4. Axles and wheels

- Insert wooden dowels/skewers for axles through the straw axle supports. If needed, carefully cut dowels/skewers approximately 1-2 inches longer than straws. Separate wooden dowels/skewers and set aside for Step 6.

5. Create holes in bottle caps for axles to go through to allow free rotation, use a hammer and a 1/16" screw (**Adult supervision required**). Position the screw over the center of the bottle cap. Lightly tap the top of the screw with a hammer to start an initial opening and then use fingers to slowly twist the screw through the other side of the bottle cap. Repeat for a total of 4 bottle cap wheels.



6. Connecting wheels to axles

- Insert wooden axles through the bottle cap wheels on one side of the car and insert through straw axle supports. Attach remaining wheels to the other side of the axles. If wheels are too loose, secure using glue.



7. Attaching balloon to straw launcher

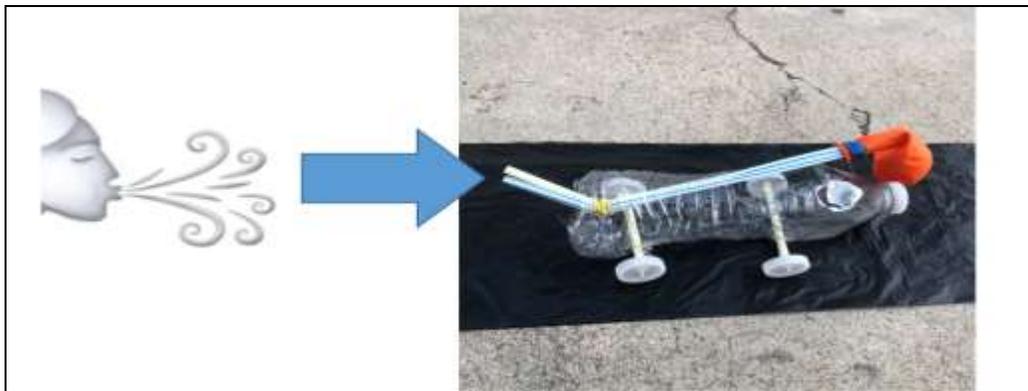
- Grab the remaining 3 straws and arrange them side by side
- Attach balloon to one end of the grouped straws
- Use a rubber band to secure the bottom end of the attached balloon
- Use the other rubber band to secure the open end of the grouped straws



8. Insert balloon/straw launcher through holes in plastic bottle to complete car



9. Test car by providing blowing air through balloon/straw launcher to create potential energy



Discussion:

Have students observe how changes in air pressure in the balloon effect how far the car travels. Does changing the amount of air in the balloon change how far the car travels? What impact does the surface the car runs on have on the distance it travels? Have students try to power the car on both smooth and rough surfaces.

EXPLAIN:

Review STEAM vocabulary:

- **Potential Energy:** energy that an object has because of its position or nature or because of the arrangement of its parts
- **Kinetic Energy:** energy of mass in motion
- **Force:** applied action towards any object for physical change or movement
- **Air Pressure:** the force by air on any surface in contact with it
- **Friction:** amount of resistance that one surface or object encounters when moving over another surface or object
- **Newton's Third Law of Motion:** for every reaction there is an equal and opposite reaction

EVALUATE:

Have students think about how we could use alternative forms of energy to power our daily lives (transportation, homes, electricity)? Example: How can we use the power of wind to power objects? What role does **force** have on how we get things to move? Example: Think of how a strong push/pull affects how far/fast an object moves.

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