Rubber Band-Powered Car

In this activity, students will design and construct a car powered by rubber bands.

<table>
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<tr>
<th>Grade Level</th>
<th>6 - 12</th>
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<tbody>
<tr>
<td>Activity Time</td>
<td>2 - 4 hours, depending on level of guidance</td>
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<tr>
<td>Preparation Time</td>
<td>30 minutes</td>
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<tr>
<td>Grouping</td>
<td>Individual or pairs</td>
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Objective

As a result of this activity students will be able to:

- Understand the concept of tension and how it related to stored energy
- Use the engineering design process to solve a problem

Materials

Per Class:

- Wheels (poker chips, cardboard circles, toy wooden wheels, CDs, plastic lids, etc.)
- Rubber bands of different strengths and sizes
- Axles (skewers, pencils, etc.)
- Cylinders (drinking straws, thread spools, etc.)
- Body (foam board, cardboard, plastic scraps, craft sticks, etc.)
- Engineering Design Process handout (from the K’NEX Prosthetic Hand activity)
- Any additional random materials

- Scotch tape
- Hole punches
- Scissors
- Measuring tape
- Duct tape
- Glue guns
- Glue sticks

Directions

1. Explain to students that today they will need to design and construct a car that only uses the power of rubber bands to propel their car.

2. Constraints:
   - The car can be powered by no more than 3 rubber bands.
   - The car must travel at least 5 feet.
   - The car may not have any human energy inputs (e.g., pushing).
   - Only the materials provided can be used in the construction of the car.
Rubber Band-Powered Car

- The car must have at least three wheels. Wheels are defined as anything that are round and go around.

3. Use the measuring tape to mark start and end lines that are 5 feet apart.

4. Give students several options in selecting the rubber bands that they will use to power their cars.

5. Help lead your students through the engineering design process by guiding them through a step-by-step approach: Refer to the Engineering Design Process handout.

6. Keep an eye out for groups who are having a difficult time understanding how to get their wheels to turn while maintaining a stable connection with the body of the car. You may need to help students brainstorm ways to solve this problem (such as inserting the axle into a straw).

7. As an added element to this challenge, you could have each group test a certain variable in the car design – for example, does it make a difference if you use bigger wheels vs. smaller wheels, etc.

8. The trick of this challenge is to attach the rubber band to the axle and to the body of the car, then wind up the axle so the rubber band has tension. This can be a difficult challenge, even for older students. The following are ideas to help the students recognize how to use the rubber bands as stored energy:
   - Take apart a toy car powered by rubber bands so the students can see how the backwards motion of the wheels creates tension in the rubber bands.
   - Build in time for research on the internet or in books.
   - Build a model ahead of time to demonstrate how a rubber band can be wound around the axle to store energy and then release it.

**Hint:** Wheels need to be glued to the axle and the axle must turn freely inside a cylinder. One part of the rubber band should be secured to the frame while the other end is wrapped around the axle (not the cylinder). The students will have to roll the car backward, or turn the wheels back by hand, to store energy in the rubber band.

Discussion Questions

- How did you create tension in the rubber band?
- What type of energy is stored in the rubber band once there is tension in it?
  
  Potential energy.

- What type of energy is this transferred to once the tension in the rubber band is released?
  
  Kinetic energy, or physical movement.

- What elements of the car did you redesign after testing your first model?