

## Elementary Trades and ADST Projects at Home

**Project:** Elastic Band Car

**Time required:** ½ hour to 1 hour

**Theme:** ADST, STEM, Physics.

This activity is a great introduction to Physics concepts like elastic potential energy [https://www.ducksters.com/science/physics/potential\\_energy.php](https://www.ducksters.com/science/physics/potential_energy.php) and can be used as a lead up to the Skills Canada Gravity Vehicle Challenge.

<http://skillsbc.ca/PDFProvincialScope2013/JrGravityCar13.pdf>

**Grades:** K-3 as adult demonstration, 4-7 as adult guided activity

### Tools and Materials:

#### Tools:

- Safety glasses (recommended throughout car construction and testing)
- Hot glue gun
- Hammer and 2 ¼" common nail or drill with 1/8" twist bit
- Pliers
- Scissors
- Ruler



#### Materials:

- 2-Popsicle sticks
- 1- Straw
- 1-Barbecue skewer
- 4-Bottle caps
- 1 to 2-Elastic bands

### Procedure:

1. Gather your tools and materials (above).

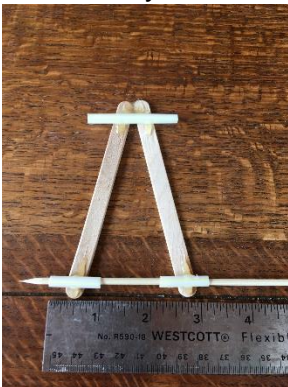
2. Create your car frame by gluing two Popsicle sticks in a V. The front of your car will be the point of the V.



3. Add axle housings to your car frame by cutting 1-2" piece and 2-1" pieces of straw.



Next, glue the 2" piece to the front and the 2-1" pieces to the back arms of your car frame. Using your barbecue skewer to ensure straightness of two 1" straws can be helpful. Also, ensure the straws are all glued to one side as this will be the bottom of your finished car.



4. Add axles to your car by first cutting off 1" to 1 1/2" from the pointed end of your barbecue skewer, and save for a later step. Next, cut the remaining skewer in half with your scissors. You may find it easier to score the skewer with your scissors before breaking it and sliding each axle through your axle housings.



5. Add wheels to your car by using your hammer and nail to safely punch a hole through the center of each bottle cap while holding with pliers. Or hold with pliers and drill a hole through the center of each cap with drill and 1/8" twist bit before sliding over axle ends and adding glue.

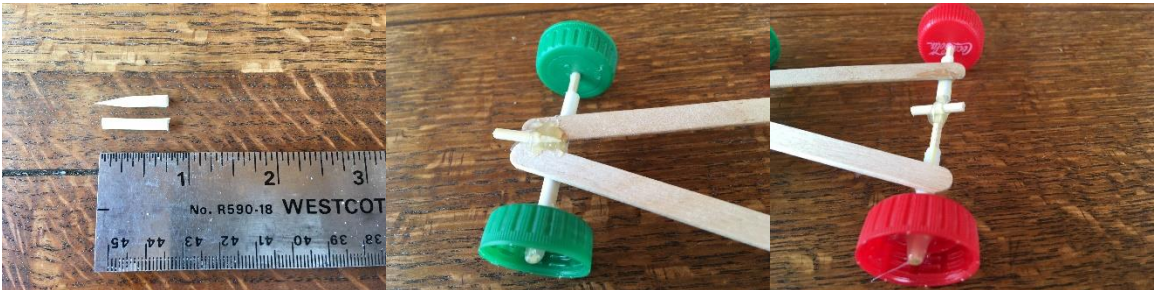


Be careful not to poke yourself with your skewer by using your pliers to assist. You may want to trim any extra skewer from the front axle at this point and check to see that there is no glue interfering with the axle housings.



We found that the bottle caps facing out, with the open threaded portion out, worked well. We also held the caps while glue was drying to ensure the wheels stayed straight.

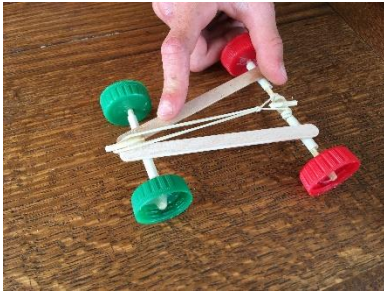
6. Finish your car by adding elastic band(s) to power your creation. Start by cutting the leftover small pointed end of your skewer in half.



The pointed piece should be glued, like a horn, to the front of your car on top of the frame with the point buried in glue. The other piece should be balanced and glued to the center of your rear axle to act as an anchor for your elastic band(s).



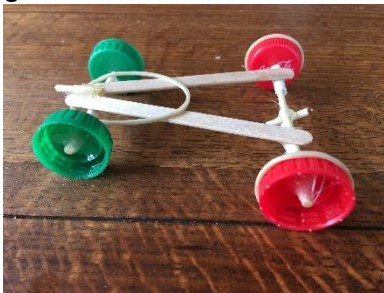
Finish by hooking elastic band(s) over the front horn and rear axle anchor.



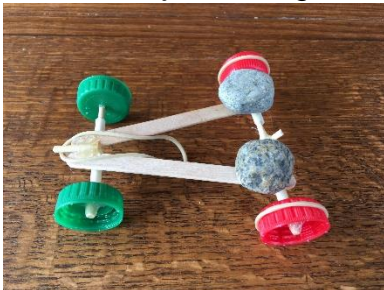
Now, wind your rear wheels backwards so your elastic band is wound around your rear axle and release in a safe direction.

### Troubleshooting

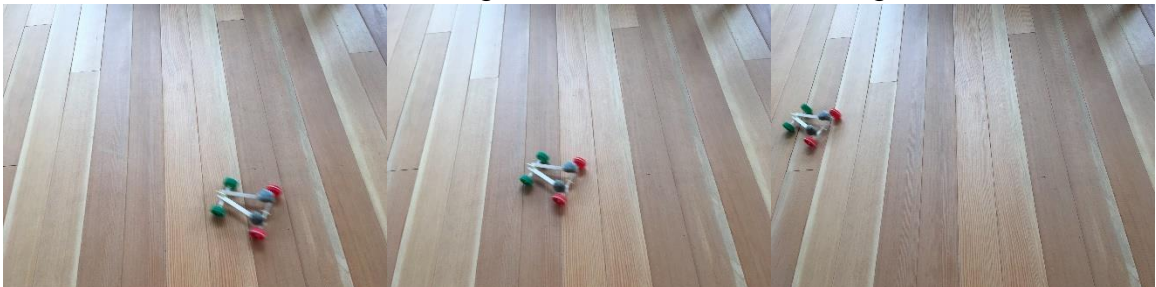
- If your rear axle spins but your car doesn't move it may be too light or the rear wheels don't have the traction they require. Try adding an elastic band, tape or glue to each rear wheel for more traction.



- If the wheels still spin, try adding some weight to your car. We found two rocks that added just the right amount of weight to improve traction.



- If your rear axle doesn't spin, try winding your elastic band around your rear axle more, or check to see there is no glue around the axle housings.



## The Physics behind this Technology

When you stretch a rubber band it stores potential energy. You can attach your rubber band to a simple machine—a wheel and axle—to build a simple rubber band–powered car. In real cars, gasoline's chemical energy or the electrical energy in a battery is converted to kinetic energy of the moving car.

<https://www.scientificamerican.com/article/build-a-rubber-band-powered-car/>

Visit [https://www.ducksters.com/science/physics/potential\\_energy.php](https://www.ducksters.com/science/physics/potential_energy.php) for further exploration of elastic potential energy.

## **Extensions:**

- Repurpose cds by gluing unused or scratched cds to your bottle cap wheels and compare the performance. Do bigger wheels help your car go faster or farther, and why?
- Make a new elastic band car with cds by visiting <https://www.youtube.com/watch?v=ssAdZJXoUP0> and compare the performance of the two models.
- Have other family members experiment by building different elastic band cars and have a fun competition. Which cars performed best, and why?

## **Assessment:**

### Discussion questions and challenges:

1. What were some of the variables that affected the performance of your car?
2. How did you solve any troubles your car may have had?
3. Can you predict how far your car will travel if you count the number of times you wind your wheels?
4. Can you explain how elastic potential energy was demonstrated in this activity?
5. What other important Physics concepts did you learn about?
6. What other examples of elastic potential energy can you think of?

Discuss these questions and explore the relevant physics concepts involved by visiting <https://www.scientificamerican.com/article/build-a-rubber-band-powered-car/> and [https://www.ducksters.com/science/physics/potential\\_energy.php](https://www.ducksters.com/science/physics/potential_energy.php). Visit <https://curriculum.gov.bc.ca/curriculum/adst> to make connections with ADST curriculum.

## **Resources and Links:**

<https://www.youtube.com/watch?v=9xhEXDrMMLg> (rubber band car video)

<https://www.wikihow.com/Make-a-Rubber-Band-Car> (rubber band car with cds)

<https://www.scientificamerican.com/article/build-a-rubber-band-powered-car/> (Physics resource)

[https://www.ducksters.com/science/physics/potential\\_energy.php](https://www.ducksters.com/science/physics/potential_energy.php) (Physics resource)

<http://skillsbc.ca/PDFProvincialScope2013/JrGravityCar13.pdf> (Gravity vehicle challenge)

<https://curriculum.gov.bc.ca/curriculum/adst> (ADST curriculum)