Newton’s Scooter
Description

• **Title:** Newton’s Laws of Motion Taught with Self-propelled Vehicles

• **Audience:** 8\(^{th}\) grade

• **Goal:** Design a self-propelled car; win the race.
Learning Goals

• Calculating speed

• **Newton’s 3rd Law**...

• Making and evaluating hypotheses

• Engineering design cycle
The lesson will take 7 class hours over 5 days.

**Day 1** - Lesson 1: 1 hour. A short lesson covering Speed and Velocity.

**Day 2** - Lesson 2: 1 hour. Cumulative lesson that demonstrates Newton’s third law of motion.

**Day 3** - Project: 1 hour. Project description and division into groups.

**Day 4** - Project: 2 hours. The second day will be two hours and students should have completed their initial attempt, and begun plotting their second attempt.

**Day 5** - Project: 2 hours. The third day contains one hour for modifications, documentation, and compilation of the homework. The second hour the students will present their work to the class, then we will review, and the final race will be hosted. Prizes and handshakes follow.
Calculating Speed

• Rate = Distance over Time \( R = \frac{D}{T} \)

Record Measurements
Partner 1: Time 1 ___________
Partner 2: Time 4 ___________

Calculations
Fill in the equation to use: \( \text{Rate} = \)
Partner 1: Rate 1 ___________
Partner 2: Rate 4 ___________

Find the Average Rate
Average Rate =

What fluid is moving within the vortex cannon?

What are two reasons why the rate changes in each sample?

The average human runs 4.5 meter/s (10 mph). Which is faster, this vortex or a human? Why?
Newton’s Laws

Warmup - Lionel Messi Physics

Describe using physics vocabulary the actions you see from Messi.

Vocab -

1st Law

2nd Law

3rd Law

Superman video

The plane is falling very fast already. The force pulling the plane down is ____________. The force pushing the plane up is ____________. Given that both forces are constant, this means the acceleration is (constant/changing). The object is accelerating (upward/downward) because the (upward/downward) force is stronger. We know this is true since the velocity is changing from a positive, downward velocity to _____ velocity. Draw a diagram of the two forces.
The Project