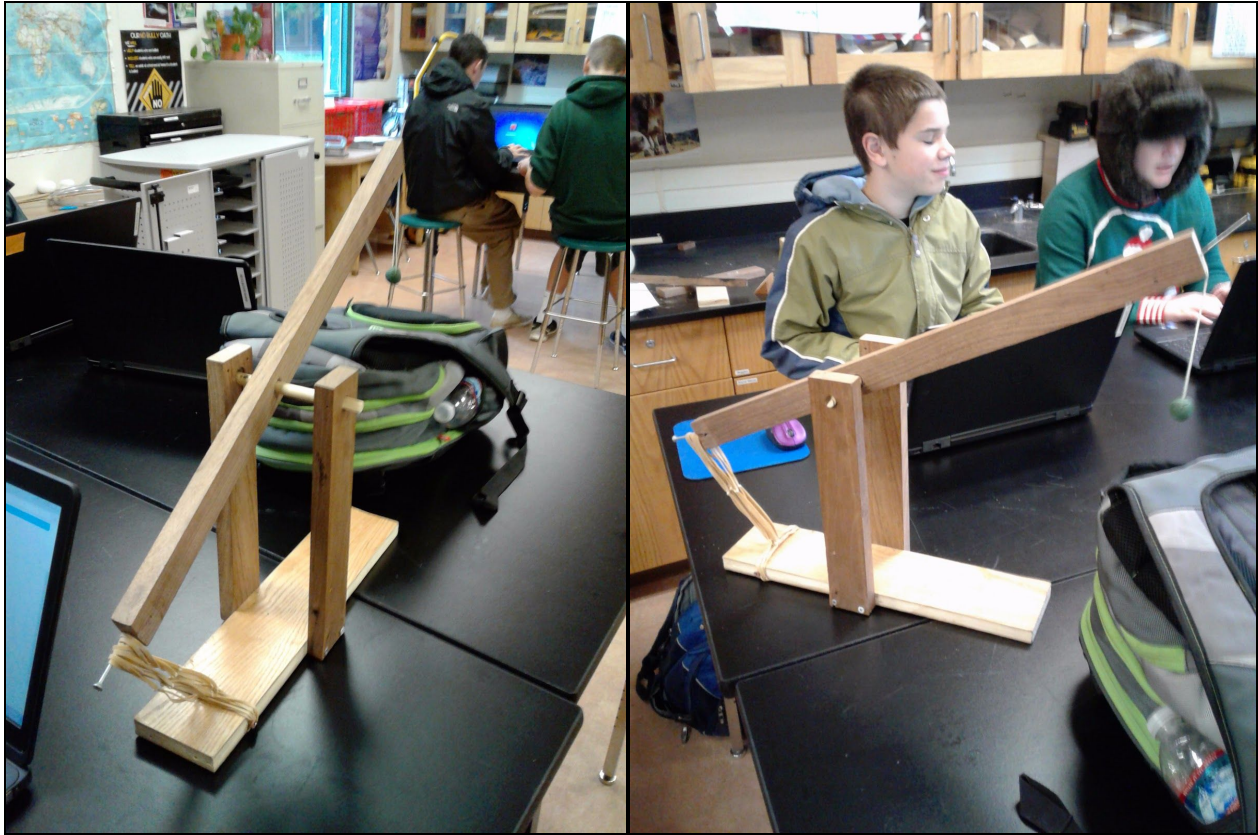Proof of Efficacy Document

       The goal was to make a catapult or trebuchet that was smaller than a cubic meter using classroom materials. Some modifications we made include making the arm length longer to increase torque and adding more rubber bands to increase spring potential energy, and thus increase arm force when released, which increases torque as well. The science theory is that increasing the torque should increase the distance the projectile travels.

These are the measurements we collected:

- Horizontal distance: about 22 meters (about 72 feet)
- Time in air: about 3.2 seconds
- Horizontal velocity: 6.875 m/s (about 15 mph)
- Vertical velocity: About 15.68 m/s (about 35 mph)
- Total velocity: About 17.1 m/s (about 38mph)
- Release angle of projectile: about 66°
- Spring constant: 93 N/m
- Spring potential energy: 8.6 Joules
- Kinetic energy of the projectile: About 1.5 Joules
- Percent of energy converted: 17%
- Vertical distance: about 25 meters (about 82 feet)

One reason our trebuchet is so good is because it can launch a 10 gram projectile over 70 feet.