**Catapults**

**5th grade**

Resources:

<http://doitandhow.com/2011/10/01/craft-stick-catapult/>

Benchmarks:

* “I can work individually, with a partner, and as a team to test a scientific concept, change a variable, and record the experimental outcome.”
* “I can use the engineering design cycle to develop a solution with a predictable outcome.”

Materials: (per group)

-10 craft sticks

-4 Rubber bands

-1 Bottle cap

-double sided sticky tape

-small items to be used as projectiles

Initial Discussion:

1. Begin the lesson by talking about catapults. See if students can explain what a catapult is and if they have an idea of when they were first used.
2. Explain that a catapult is a mechanical device used to launch a projectile. Tell students that the ancient Greeks were the first to invent the catapult. It was originally designed as a way to improve on the shortcomings of the crossbow by providing for greater range and power.
3. Explain how catapults were especially used in medieval times during sieges as fortified walls became common.
4. You could either show them pictures of catapults and/or show videos of some modern catapults.

Procedure:

1. Give each pair 10 craft sticks, four rubber bands, one bottle cap, and two pieces of double-sided tape.
2. Stack eight of the craft sticks on top of each other. Put a rubber band around each end to keep the craft sticks in place.
3. Stack the remaining two craft sticks on top of each other and use a rubber band around one end to keep them in place. Do not secure the other end.
4. Take the stack of eight craft sticks and place it perpendicular to the stack of two craft sticks. Place the stack of eight craft sticks in between the two sticks by sliding it through the end not secured by a rubber band.
5. Take the remaining rubber band and use it in a crisscross pattern to keep the stack of eight craft sticks in place between the two other craft sticks.
6. Use the double-sided tape to secure the bottle cap to the end of the top craft stick.
7. Once each pair is done making their catapult, check their design and make sure it looks like the picture below. Then give the group objects to launch. Each pair should receive, one mini M&M, one regular M&M, and one marble. Each pair should also receive a measuring tape. *\*Ask students to form a hypothesis as to which object will be launched the furthest.*
8. Have each group launch each item (the mini M&M, the regular M&M, and the marble) three times. The students will measure and record the distance after each launch. *\*Discuss with the students if their results match their beginning hypothesis.*
9. Next, have each pair take the bottle cap and attach it halfway down the top craft stick. *\*Ask the students how changing the location of the bottle cap will change anything. If so, what?*
10. Have them repeat step 8. Have them compare the launch distances between each case (with the bottle cap at the middle or the end of the craft stick) and discuss why this difference arises.

