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# SPOON CATAPULT

***A WVU Extension Service STEMCARE Lesson***

**Audience:**

Grades K-5

**Time:**

55 to 60 minutes

15 minutes to read "Michael Recycle" and review engineering design process;
25 minutes to design, construct and test catapult;
15 to 20 minutes of discussion, reflection, redesign and improvement of design.

**Materials:**

*For each student:* 7 craft sticks; 5 to 6 rubber bands; plastic spoon; 5 marshmallows or other small, soft object to launch

**Vocabulary:**

Prototype, lever, fulcrum, pivot

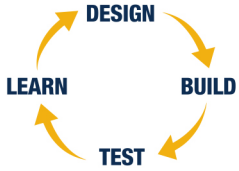
**Goal:**

*Use the engineering design process to create and test a catapult.*

## Introductory Activity

Display the WVU STEMCARE video (https://youtu.be/R8RArRvv1Pk). Explain how everyday items can be used to make useful machines and that today we are going to use a spoon and some common items to make a catapult. Review the engineering design process.

**THE ENGINEERING DESIGN PROCESS**

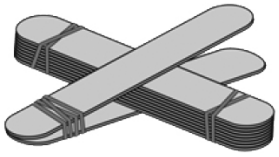



*Source: http://www.thunderboltkids.co.za/Grade5/03-energy-and-change/chapter3.html*

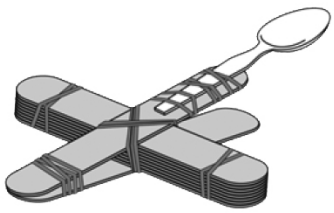
## Core Learning Activity: Create a Catapult

Students will create a catapult that can launch a marshmallow or craft pompom. There are many different ways to make a catapult using these materials. Here is one possible design that you may use as a prototype or demonstration.

1. Stack five craft sticks together and tightly twist a rubber band around each end.
2. Stack two craft sticks together and wrap a rubber band around only one end. Make sure that it is wrapped very tightly.
3. Build a lever by opening the two craft sticks from the opposite end of the rubber band and slide the stack of five to eight craft sticks between the two sticks (see image to the right). This will create a fulcrum (pivoting point) that will allow us to shoot the marshmallow.



4. Twist another rubber band in a cross to hold the catapult together (see image below).



5. Slide the stack down toward the bottom as close to the rubber band in step 2 as possible without breaking.
6. Place a plastic spoon on the open end of the craft stick and rubber band the spoon to the craft stick to secure it. The spoon will serve as a launching platform.
7. Place a small, soft object, like a marshmallow or pompom, in the spoon.
8. Push down on the top craft stick or spoon and release to launch your object.

*— continued —*

## Safety Precautions

Make sure you use caution when launching. Do not launch objects toward individual's eyes or face.

## Reimagine and Redesign

*THINK ABOUT IT:*
How could you improve your prototype? Draw a new design to incorporate your idea.

Disassemble the catapult prototype and build your new design. Retest and compare the results with the prototype. Is the new design an improvement? Repeat the redesign process as time allows.

## Extension

The best part of this activity is that it can easily be modified to test different catapult designs or scientific parameters (highest shot, longest shot, most accurate, etc.). If students are unsure what to change, encourage them to test the position of the fulcrum. Move the position of the stack of five to eight craft sticks relative to the fulcrum point to see if it changes how far or how high the marshmallow travels.

## Background: The Science Behind A Marshmallow Catapult

A catapult is a device that is used to throw or hurl a projectile a great distance. In this activity, the catapult created is a lever propped up by a fulcrum or pivoting point. When a rubber band is stretched, energy is stored in it. This stored energy can do work once released.

When the catapult is used to launch a marshmallow, potential energy (or stored energy) is transformed into kinetic energy (the energy of motion). Tension is created when the spoon is pulled back. This energy is then stored in the stretched band and craft sticks. At this point, the spoon and the marshmallow have their highest potential energy. When the spoon is let go, the potential energy is converted into kinetic energy, which shoots the marshmallow across the room. The farther the marshmallow is from the fulcrum, the more the catapult magnifies the force. The larger the force, the farther the marshmallow goes.

## Resources

"Energy and Movement." Thunderbolt Kids. Accessed November 16, 2020. http://www.thunderboltkids.co.za/Grade5/03-energy-and-change/chapter3.html.

Patterson, Ellie, and Alexandra Colombo. "Michael Recycle." San Diego, CA: IDW, 2019.

## West Virginia Next Generation Standards

- S.K.GS.1 Forces and Interactions: Pushes and Pulls – Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object.
- S.K.GS.2 Forces and Interactions: Pushes and Pulls – Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.
- S.3.GS.1 Forces and Interactions – Plan and conduct an investigation to compare the effects of balanced and unbalanced forces on the motion of an object.
- 4-PS3-4 Energy – Apply scientific ideas to design, test and refine a device that converts energy from one form to another.
- S.K-2-ETS.1 Engineering Design – Ask questions, make observations and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- 3-5-ETS1-1 Engineering Design – Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost.

**WVU STEMCARE Spoon Catapult Demonstration Video: https://youtu.be/R8RArRvv1Pk**



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