



POPSICLE STICK CATAPULT

Grade Level: 3rd

Duration: 2-3 Class Periods

PROJECT DESCRIPTION

In this hands-on STEM project, students will use the provided materials to design, construct, and test their own popsicle stick catapults. Students will explore the principles of physics for objects in motion; learning about concepts such as force, velocity, acceleration, and gravity as they design and build their own catapults.

STEM & ACADEMIC CONCEPTS



SCIENCE



ENGINEERING



MATH

OBJECTIVES

- Students will need to use their creativity and problem-solving skills to design a catapult and understand the force that will be used to launch the projectile.
- Students will engage in the engineering process to build a catapult, test their catapults to see how far they can launch their projectiles and determine if changes to design are needed.

MATERIALS

- Popsicle sticks (8)
- Rubber bands (at least 5)
- Glue
- Plastic bottle cap
- Aluminum Foil/Cotton ball
- Small open area (One square meter will do. It should be a sturdy, flat surface such as a table or floor.)
- Markers to decorate your popsicle sticks

STANDARDS



SCIENCE

- 3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- 3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion



ENGINEERING

- 3.ETS1.1 Design a solution to a real-world problem that includes specified criteria for constraints.
- 3.ETS1.2 Apply evidence or research to support a design solution.



MATH

- 3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units: whole numbers, halves, or quarters.



VOCABULARY

- Catapult: A device that uses elastic energy to launch objects. A slingshot is an example of a catapult device.
- Distance: The length of space between two points. For example, the distance from your hand to your nose is about 20 centimeters.
- Force: A push or pull that can change the motion of an object
- Motion: The act of moving or changing position.
- Projectile: An object that is thrown or launched into the air.
- Velocity: The speed and direction of an object's motion.

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ENGINEERING -MATH



Engage (Duration: 15 minutes)

- Begin by asking students about different household items that can be used to make a catapult. Show them a video or picture of catapults in action.



Reflection Exercise: Facilitate a brief class discussion on the key concepts of project and learning outcomes. Ask students to share their observations and thoughts about how the project will work.



Explore (Duration: 25 minutes)

- Divide students into small groups.
- Distribute the materials to each group.
- Encourage students to discuss and consider the materials' properties and how they can be utilized to create a catapult.



Reflection Exercise: Instruct students to brainstorm and list ideas on how catapults work and color/design popsicle sticks using markers.



Explain (Duration: 40 minutes)

- Gather the students together to begin step-by-step popsicle stick catapult project.
- Discuss the basic principles of motion, force, and velocity involved in how a catapult functions.
- Explain how the distance of projectile is a result of the force applied when using catapult.



Reflection Exercise: Each group will present their catapult, test and measure distance projectile traveled. Allow each group to test at least twice and record results to compare.



Elaborate (Duration: 15 minutes)

- Gather students to see which group has the longest distance, have an individual from group explain their process in launching projectile from catapult.
- Encourage students to discuss modifications to their designs to improve the distance traveled.
- Have groups make modifications as needed and allow time for multiple test runs and record results.



Reflection Exercise: Write a paragraph reflecting on the test results of your balloon-powered car. What changes did you make? Did it affect the performance? Why or why not?

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Evaluate (Duration: 15 minutes)

- Regroup students and facilitate a class discussion about the challenges, successes, and failures encountered during the activity.
- Ask students to reflect on what they learned about motion, forces, and velocity through this hands-on experience.
- Provide an opportunity for students to share their observations, ask questions, and discuss their future ideas for improving their designs.



Reflection Exercise: Complete "Check for Understanding" Worksheet



Conclusion: The balloon-powered car lesson plan engages students in an exciting and interactive exploration of motion, force, and energy.

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CHECK FOR UNDERSTANDING

NAME:



1. How does a catapult work?

2. What is motion?

3. Are force and velocity the same? Explain why or why not.

4. What is the furthest distance your group's projectile traveled?