

**5-E Lesson Plan Paper Rockets**  
**A Structured Inquiry Lesson**  
**Kristy Maxwell Sattler**  
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**TOPIC OF FOCUS:** Kinetic Energy of Paper Rockets

**GRADE LEVEL:** Class of 25 6<sup>th</sup> Grade On-Level Students

**TIME:** 1-2 class periods

**NGSS:**

**MS-PS3** Construct and interpret graphical displays of data to describe the relationships  
-1. of kinetic energy to the mass of an object and to the speed of an object.

**TN STATE CURRICULUM STANDARDS:**

**6.PS3: Energy 3)** Analyze and interpret data to show the relationship between kinetic energy and the mass of an object in motion and its speed.

**LEARNING OBJECTIVES:**

- Students will work in pairs to construct three different sized small flying rockets out of paper and propel them by blowing air through a straw.
- Students will record and analyze data on the launches of all three rockets to determine the relationship between the kinetic energy to the mass of each rocket launched.

**ENGAGE:**

- Introduce the *NASA Knows! (Grades 5-8)* article [What is a Rocket?](#)
- Students need to answer the following quick questions in their table groups on the white boards:
  - How does a rocket engine work?
  - Why does a rocket work?
  - When were rockets invented?
  - How does NASA use rockets?
  - How will NASA use rockets in the future?
- Discuss table group answers as a whole group.

**EXPLORE:**

- Divide students into pairs, and distribute materials/tools lists to each pair.
- Have each pair collect necessary items and begin building their first paper rocket.
- Distribute instructions to build rockets and the Paper Rocket Test sheets (**Formative Assessment**) to each pair.
- Instruct students to measure the mass of the first rocket before testing.

- Distribute straws to each pair, and instruct pairs to test the first rocket by launching it three times and recording the distance it flew in centimeters on the test sheet.
- Students need to average the distance the first rocket flew and make notes about observations made during the test flights.
- Each pair needs to build a new and improved 2<sup>nd</sup> rocket of a different size and repeat the same process for the 2<sup>nd</sup> rocket.
- After testing of the 2<sup>nd</sup> rocket is complete, the student pairs need to build a new and improved 3<sup>rd</sup> rocket of a different size and repeat the same process for the 3<sup>rd</sup> rocket.

**EXPLAIN:**

- Once testing is complete, student pairs need to analyze the data collected from the test sheet and create a graph that displays the results of each rocket in (mass and distance).

**ELABORATE/EXTEND:**

- Have student pairs try to determine a way to test how high the rockets fly.
- Have students write out their plan in steps.
- Have students do one test run of three trials measuring the height. Make sure the students subtract the height from which the rocket is launched from the altitude reached.
- Have students watch the following video clip of the [Apollo 11 Launch](#) in which both altitude and velocity were both being tracked.

**EVALUATE:**

- Students need to answer the following discussion questions (**Summative Assessment**), referring to the following animation as needed for explanation of how mass affects kinetic energy: [Energy Skate Park](#).
  - What makes one rocket perform better than another?
  - How did the mass of the rockets affect the distance the rockets traveled?
  - Did the larger rockets require more force (blown into the straw)?
  - Did the placement of the fins affect the stability of the rocket?
  - What would happen if you placed the rocket fins near the rocket's nose?
  - Are rocket fins necessary in outer space?

**Materials Needed:**

- Scrap bond paper
- Cellophane tape
- Scissors
- Pencils
- Milkshake straw
- Metric ruler/ metersticks
- Masking tape
- laptops

**Resources and Handouts:**

- How to Build a Paper Rocket instruction sheet
- Paper Rocket Test Report sheet

**REFERENCES:**

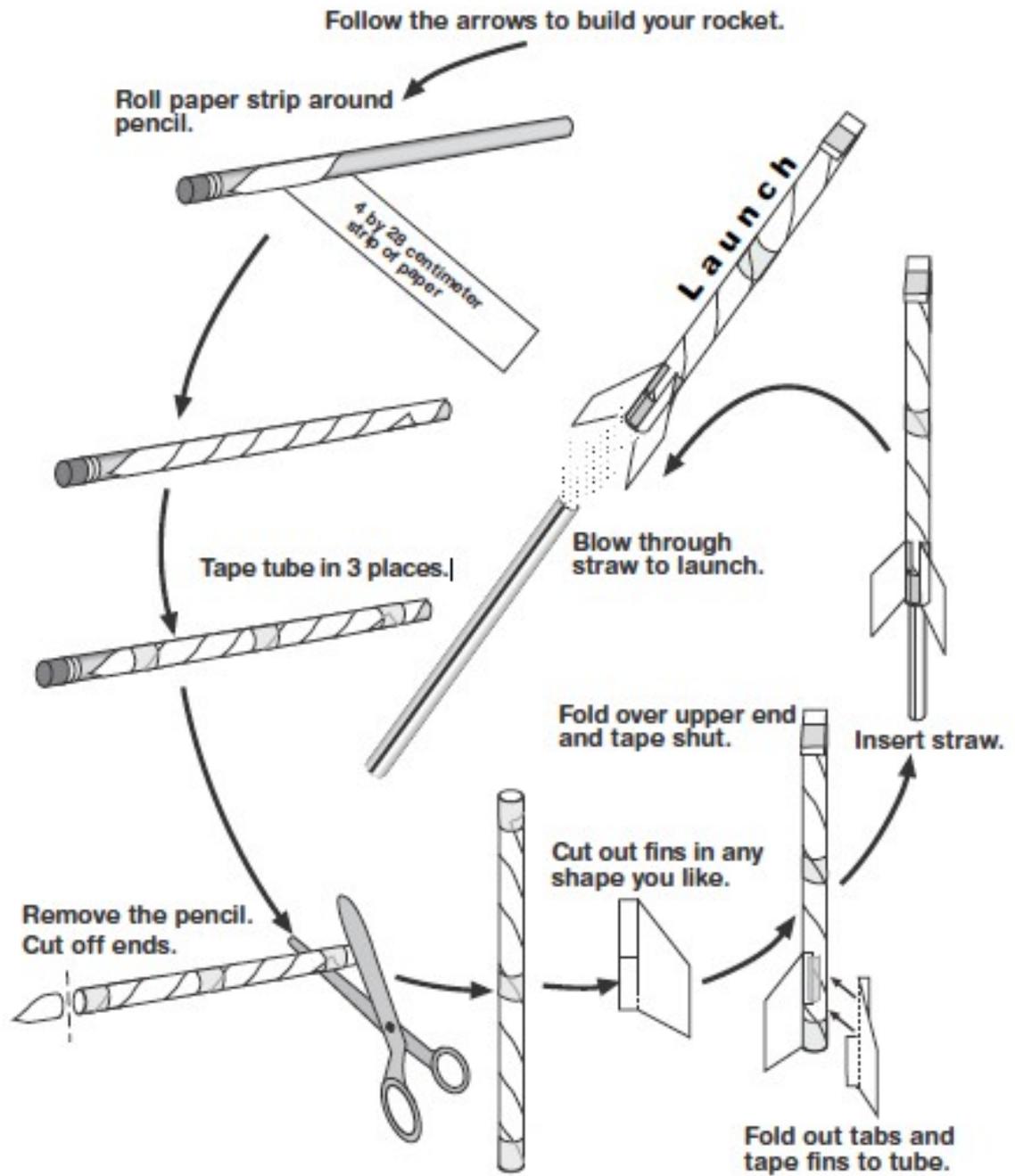
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# How to Build a Paper Rocket



# Paper Rocket Test Report

Names: \_\_\_\_\_  
\_\_\_\_\_

1. Launch your rocket three times. How far did it fly each time? What is the average distance your rocket flew? Write your answer in the spaces below.
2. Build and fly a rocket of a new design. Before flying it, predict how far it will go. Fly the rocket three times and average the distances. What is the difference between your prediction and actual average distance?
3. Build a third rocket and repeat step 2.
4. On the back of this paper, write a short paragraph describing each rocket you built and how it flew. Draw pictures of the rockets you constructed.

## Rocket 1

Make notes about the flights here.

How far did it fly in inches (centimeters)? 1. _____ 2. _____ 3. _____	
Mass _____ g	
Average distance in inches (centimeters)? _____	

## Rocket 2

Make notes about the flights here.

Predict how many inches (centimeters) your rocket will fly. Mass _____ g	
How far did it fly in inches (centimeters)? 1. _____ 2. _____ 3. _____	
Average distance? _____	
Difference between your prediction and the average distance? _____	

## Rocket 3

Make notes about the flights here.

Predict how many inches (centimeters) your rocket will fly. Mass _____ g	
How far did it fly in inches (centimeters)? 1. _____ 2. _____ 3. _____	
Average distance? _____	
Difference between your prediction and the average distance? _____	

