



4. Nose Weight

Build Knowledge

INTRODUCTION

What Students Do in this Activity

In this activity, students continue to explore their straw rockets. They experiment with how adding weight to the rockets' noses affects their performance. Students continue to test their rockets systematically and explore the concept of well-designed or fair tests.

Objectives

Students will:

- Systematically test how changing the nose weight of a rocket affects flight distance and performance
- Explore the notion of a well-designed or fair test
- Identify variables that affect test performance

Time

30–40 minutes

Materials

For the teacher:

- Square-ruled chart paper or whiteboard
- 2 different rubber balls
- 2 straws (7.5 mm diameter)
- 1 ball of clay
- 1 wooden peg
- Cellophane tape
- Markers

A-Ha

A higher nose weight results in a decreased range because the weight slows the acceleration of the rocket ($\text{acceleration} = \text{force} / \text{mass}$). However, nose weight can help to stabilize the rocket and increase its range because the nose weight offsets any tumbling motion.

For each team:

- 1 retractable tape measure
- 1 ball of clay
- 1 wooden peg
- 1 copy of **Nose Weight Results, Reproducible Master 7**

For each student:

- Change to 1 straw
- Protective goggles
- The gallon-sized resealable plastic bag containing the student's rockets and launcher from the previous activity
- Science notebook (see Introduction, page ix, for more information)

Preparation for the Activity

Make two straw rockets of different lengths. Poke one straw about 5 mm into a piece of clay. Pull it out and use a peg to tamp the clay farther into the straw before folding the straw over.

Make a tally sheet, labeled like the one shown below, on a piece of square-ruled chart paper or a whiteboard.

Which rocket flew the farthest?

		Results
		Predictions
No weight	Weight	

CLASSROOM ACTIVITY

Presenting the Activity – Whole Group

1. Gather students for a group discussion.
2. Pass around the two example rockets you made (see *Preparation for the Activity*) for students to examine.

Ask students to note the similarities and differences between the two rockets. If students do not notice both differences, direct their attention to the noses of the rockets.



Teacher Tip:

You may wish to refer to the list of variables students made in Activity 1.

3. **Ask students if they think it would be a good test (also known as a fair test or a well-designed test) of how weight impacts flight performance using these two rockets.**

If students do not recognize that there is more than one variable in each rocket, you may need to help them reach that conclusion. Ask them, “*Would they perform similarly if I removed the weight from the noses?*”

Based on their experimentation in the previous activity, students should recognize that the length of a rocket affects performance. Therefore, trying to determine how nose weight affects performance using two rockets of different lengths would not make sense.

Here is another way to help students understand the concept of fair testing:

- Ask students to imagine trying to test how bouncy a ball is.
- Hold two different balls in the air, one higher than the other and ask, “*If I drop these balls now, will you be able to determine which ball is bouncier?*”

Students should recognize that the different heights from which the ball is to be dropped will affect how much the ball bounces.

4. **Stress with students the importance of making sure that their test will give information only about how nose weight affects performance.**

In a well-designed test, only one aspect of the test (variable) is changed. In the case of the rockets, the two rockets should have all of the same characteristics except one. For this activity, the variable that changes is the weight on the nose of the rocket.

Reinforce this concept by asking students what the variable was in the previous set of tests they carried out. Students should recognize that the variable was straw length.

Have the rockets students created in the previous activity available for observation as needed.

5. **As a class, discuss how students think the added weight will affect flight distance and accuracy.**

Keep track of students’ predictions about flight distance on the tally sheet you created in *Preparation for the Activity*.

Facilitating Student Exploration – Teams

6. **Have students break into their teams and give each team an area in which they can work.**

Remind students that it is their job to explore how the weight on the nose of a straw rocket affects its flight distance and accuracy.

NOSE WEIGHT RESULTS

My name: _____

Team name: _____

Nose Weight	Launcher's Name	Distance			Notes
		Trial 1	Trial 2	Trial 3	
Yes					
Yes					
Yes					
Yes					
No					
No					
No					
No					