QuickView

Students vary the mass of the nose cone to investigate the effect on the rocket's range.

Content Areas

Primary: Science
Secondary: Math; technology; language arts

Standards Addressed

NSTA 5-8
Students develop abilities necessary to do scientific inquiry.

- Students identify questions that can be measured through scientific inquiry.
- Students use appropriate tools and techniques to gather, analyze, and interpret data.
- Students think critically and logically to make the relationships between evidence and explanations.
- Students communicate scientific procedures and explanations.

NCTM 6-8
Students develop and evaluate inferences and predictions that are based on data.

ITEEA 6-9
Students develop abilities to assess the impact of products and systems.

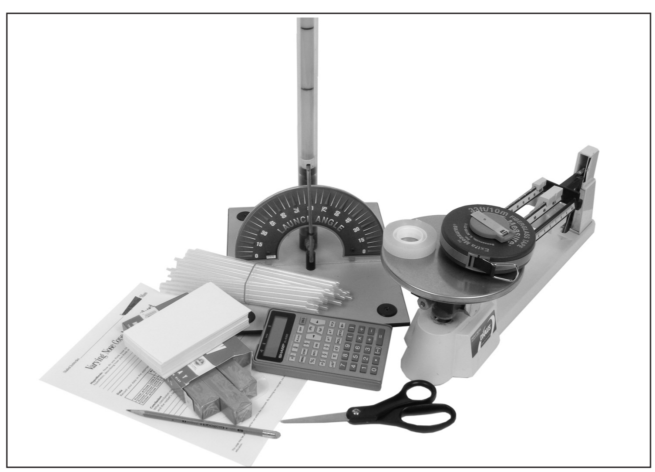
Students learn to design and use instruments to gather data.

Vocabulary

- average
- control
- diameter
- hypothesis
- mass
- nose cone
- variable

Materials

- Pitsco Straw Rocket Launcher
- Precision Straws
- Index cards
- Modeling clay
- Ruler or measuring tape
- Scissors
- Transparent tape
- Pencil
- Calculator
- "Varying Nose Cone Mass Data Sheet"
- Scales or balance



Time Required

45-90 minutes (will vary with class size)

Procedure

In this activity the student will use one rocket, but will change out the nose cone three times. If the clay cannot be easily removed from the straw, try cleaning it out with a toothpick or something similar. If that does not work, the student may have to construct a new rocket.

1 Locate the "Varying Nose Cone Mass Data Sheet" and write a hypothesis stating how you think variations in the nose cone mass will affect the rocket's range.

Middle school students should understand hypotheses. However, you may wish to explain that a hypothesis is a prediction based on prior knowledge or experience.

2 Following the given design constraints, construct one straw rocket of your choice, except for the nose cone. You will design three varying nose cones for this rocket.

3 The first nose cone design must be created from a ball of clay one centimeter in diameter. It may have whatever shape you choose. Measure the mass of this clay ball and record it.

This diameter only has to be for the nose cone when it is in the shape of a ball. After that, the student may shape the nose cone to their discretion.

4 Create two more nose cones, one from a ball with a diameter of one and a half centimeters and another with a diameter of two centimeters. These should be the same shape as the first design. Measure and record the mass of these clay balls.

You should point out to students the differences between controls and variables. In this experiment the variable is the nose cone mass and the controls are the fins and body length.

5 Place the smallest nose cone onto the straw rocket body you created in Step 2. Slip the rocket over the launch tube.

6 Adjust the launch tube and rocket to the trajectory angle of 45 degrees.

7 Raise the launch rod to the fifth calibration line.

Count calibration lines by starting at the top of the launch rod.

8 To launch, release the launch rod so that it falls to the bottom of the cylinder.

9 Measure the rocket's range using the measuring tape.

Procedure continued

10 Record the rocket's range on the "Varying Nose Cone Mass Data Sheet".

11 Repeat Steps 5-10 twice more for the smallest nose cone and three times each for the other two nose cones.

12 Complete the data sheet, including calculating the average range for each nose cone.

13 Analyze the data generated from the launches and write a conclusion explaining how the difference in nose cone mass affects the rocket's range. Also explain why you think the nose cone that achieved the greatest range did so.

Conclusions should be supported by data.

QuickView

Vary the mass of the nose cone to investigate the effect on the rocket's range.

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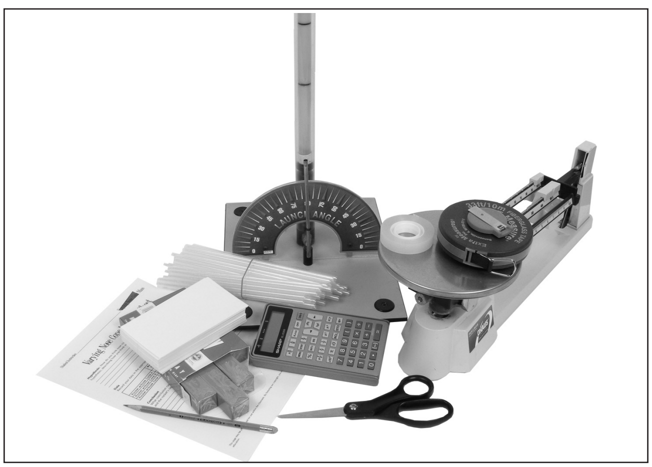

Procedure

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2 Following the given design constraints, construct one straw rocket of your choice, except for the nose cone. You will design three varying nose cones for this rocket.

3 The first nose cone design must be created from a ball of clay one centimeter in diameter. It may have whatever shape you choose. Measure the mass of this clay ball and record it.

4 Create two more nose cones, one from a ball with a diameter of one and a half centimeters and another with a diameter of two centimeters. These should be the same shape as the first design. Measure and record the mass of these clay balls.

5 Place the smallest nose cone onto the straw rocket body you created in Step 2. Slip the rocket over the launch tube.

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Varying Nose Cone Mass Data Sheet

Hypothesis: How do you think nose cone mass will affect the straw rocket? Record your hypothesis; describe how you think nose cone mass will affect the rocket's range. ______________

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Data

Record your data in the appropriate area of the table below.

	Nose Cone Diameter	Nose Cone Mass	Launch 1 Range	Launch 2 Range	Launch 3 Range	Average Range
Rocket w/Nose Cone A						
Rocket w/Nose Cone B						
Rocket w/Nose Cone C						

Conclusion

What conclusion can you make about the relationship between the nose cone mass and the rocket's range? Why did the nose cone with the greatest range do so well? ___________________

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