



Parachutes are a Drag: Engineering Design

Time: 50 Minutes

Skill Level: Beginning (age 9-11), Intermediate (age 12-14)

Background

What is Science Inquiry?

Children are natural scientists. From a very early age they explore the world, ask questions and seek answers. This journey of exploration and discovery is Science Inquiry. Science Inquiry helps young people understand their environment, solve problems and gain knowledge about scientific ideas and processes. In this activity students will use the engineering cycle to design a parachute to carry "cargo" safely to the ground.

Science and Engineering Practices Youth Should Become Familiar With Are:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Obtaining, evaluating, and communicating information

FYI- Originally parachutes were shaped like an umbrella or half of a balloon. Today there are rectangular and triangular styles as well, for different uses. Parachutes are light weight and large. The large area traps air during the fall. The trapped air creates an upwards push that works against gravity. The bigger the area of the parachute the more air friction, also called drag, there is. A paratrooper's parachutes is 10 meters (about 33 feet) in diameter. If the paratrooper wants to also drop a vehicle to the ground a parachute of over 30 meters in diameter would be needed, or more than one parachute may be used with heavy objects.

A simple engineering design cycle consists of six steps:

1. State the Problem
2. Generate Ideas
3. Select a Solution
4. Build the Item
5. Evaluate
6. Present Results

Help the students use these steps to address the engineering challenge .

Watch the Video: <http://oregon.4h.oregonstate.edu/science-engineering-and-technology>

Materials List:

Large paper coffee filters
String (light weight string or thread works best)
Scotch tape
Scissors
Paper clips
Tape measure
Metal washers for weights

Discuss...What do students know about how parachutes work? Use the FYI section information to explain the engineering cycle. Discuss what can be varied in the design: length of string, number of strings, number of parachutes for a single load, weight of load. Select a design challenge that the groups agree upon for the parachutes.

Predict...Generate Ideas. Select a Solution.

Experience “What to Do”- What is the plan for the investigation?

Show students how to do the following: (1) Cut 4 lengths of string 18” long. (2) Tape the 4 strings to the outside edge of the coffee filter. These pieces of string need to be the same length. (3) Gather the strings together at the lower end and tie them into a knot. Check to see that they are still the same length. (4) Unfold one end of the paper clip and twist it around the knot. (5) Hang washers from the other end of the paper clip. (6) Find a location to safely drop the parachutes, preferably a stairway or balcony. This is the basic design. How can the parachute be modified for different results?

Share ...Each parachute displays different drop (air friction, drag) characteristics; encourage the students to share their results and discuss what they would like to change for their next drop test. Encourage the students to record their results.

Reflect ...Analyze and interpret the data and results. Discuss among the group.

Help the students develop questions of their own. Some example questions may be: How fast would it fall with three strings vs. four? How would you measure a change? Would adding more weight make a difference? Would more than one parachute make a difference? Would a larger parachute have different results? Does the color of the parachute make a difference?

Generalize ...to real world examples. Construct explanations.

If a student made more than one change in a parachute to test its drop characteristics, how would they know what change made the difference?

Apply ...outside the classroom or club meeting.

Where else do you see parachutes being used? How would you apply this learning experience or questioning process to other areas of your life?

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Agriculture Sciences & Natural Resources, Family & Community Health, 4-H Youth, Forestry & Natural Resources, and Extension Sea Grant programs. Oregon State University Extension Service offers its programs and materials equally to all people.