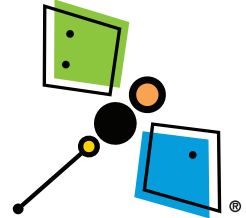


DragonflyTV: GPS Activity 3

Fly Boys



iExplora!
Albuquerque, NM
www.explora.us



Balloon Fiesta

We're Andrew and Alex, and we live in one of the coolest cities, or should we say hottest? We live in Albuquerque, New Mexico, home of one of the biggest hot air balloon festivals anywhere. We hope to get up in one of those giant balloons someday, but until then, we're doing some investigating on a smaller scale. We visited our favorite science hangout, Explora, to find out: How big does a hot air balloon need to be to lift things off the ground?

We decided to make our own balloons out of tissue paper. Real hot air balloons have to carry weight in their gondolas, so we also experimented with 3 different sized tissue balloons to figure out how much each balloon could carry. We figured out the mass of each balloon by weighing the balloon and a gondola that we fashioned out of a small pie tin, and then experimented with how many pennies each balloon could lift off the ground. We collected data and graphed our results.





Icebreaker

Explore convection and unlock the secrets of why hot air balloons rise!



15 minutes

DragonflyTV Skill: Experimenting

Guide your kids as they

- 1) Fill the tank or pitcher with tap water.
- 2) Obtain two small glass bottles with narrow mouths. Tie a long string around the neck of each small glass bottle.
- 3) Fill one of the small glass bottles with hot water. Color this hot water with red food coloring.
- 4) Fill the second small glass bottle with ice water (strain to remove ice). Color this cold water with blue food coloring.
- 5) Use the strings to carefully lower the bottles of red and blue water into the tank. Keep the bottles upright as you lower them and let them come to rest on the bottom. You can let go of the strings at this point.
- 6) Watch what is going on inside the tank. What do you notice? How does each color of water behave?
- 7) After 5 minutes or so, when it seems like nothing new is happening, carefully add some ice to the water in the tank, trying not to mix or disturb the water.
- 8) Make some more observations. What is happening now?

▶ You'll need:

- a clear tank or large pitcher
- 2 small glass bottles with narrow mouths (such as dropper bottles with the droppers removed)
- string and scissors
- tap water, hot water, ice water, and ice
- red and blue food coloring

DFTV Science Helper

Help students see the connection between this activity and hot air balloons. The red water represents warm air, and the blue water represents cold air. The two colors of water have slightly different densities. Gravity sorts out the two densities, with the more dense cold water sinking below the less dense red water. With balloons, the cold air outside the balloon sinks below the warm air inside the balloon, pushing the balloon up into the air.



For another convection activity like this one, surf to pbskidsgo.org/dragonflytv/superdoit/index.html



Investigation Airplane Wings

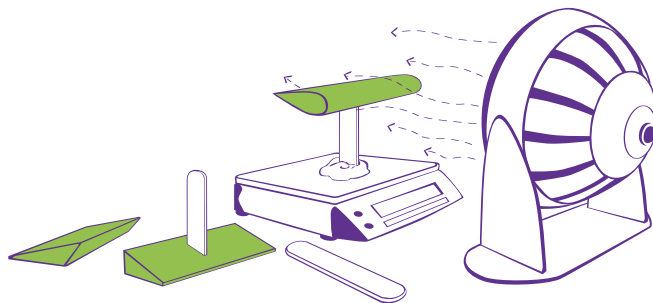


1 hour or more (this activity can be adjusted to take more or less time by varying the number of shapes and sizes tested)

When we want to fly, most of us choose an airplane instead of a hot air balloon. How do planes fly?

Guide your kids as they

- 1) Cut airplane wing models out of Styrofoam. Cut several different shapes of about the same size and weight.



- 2) Mount a wing model on a craft stick by pushing one end of the stick into the center of the wing. (See image above.)
- 3) Use modeling clay to mount the other end of the craft stick on the pan of the digital scale.
- 4) Record the mass of the wing assembly. Hint: Use grams instead of ounces.
- 5) Place the digital scale with the mounted wing in front of the box fan. You may want to place the scale on some books to raise it somewhat so that the wing is positioned near the center of the fan.
- 6) Turn on the fan and observe what happens to the "weight" of the wing.
- 7) If your fan has different speed settings, try them. Is lift related to how fast the air is flowing?
- 8) Try other wing shapes. What wing creates the most lift?
- 9) Make several wings that are the same basic shape but different sizes. Test their lift as described above. Is there a relationship between size and lift?

▶ You'll need:

- blocks of Styrofoam
- a Styrofoam cutter (available at craft stores)
- craft or popsicle sticks
- modeling clay
- a digital scale capable of measuring in grams
- a box fan

DFTV Science Helper

Daniel Bernoulli discovered that air exerts less pressure on a surface the faster it moves. This principle is helpful in airplane wing design. If the wing is designed with the right shape, the air flowing over the top of the wing will move faster than the air below the wing. This results in less pressure on top of the wing compared to the bottom of the wing, which gives the wing lift. Look at some photos of real airplanes as you try to design wing shapes for testing.

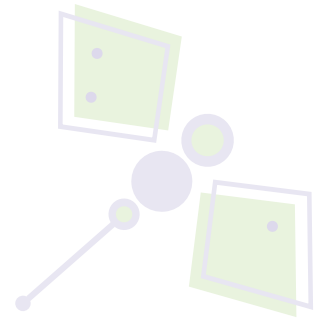


DFTV Kids Synthesize Data and Analysis

Organize your data as you compare wing shapes and sizes. You might make a chart that looks like this one:

Wing shape (trace or sketch)	Wing size	Mass (g) fan off	Mass (g) fan on

What is more important for lift, wing shape or wing size? How do you know?



Keep Exploring!

Obtain a toy pinwheel or construct a simple propeller from cardboard, plastic, or other lightweight materials. Mount the pinwheel or propeller on the digital scale just as you did the model airplane wings. Place the pinwheel in front of the fan, and measure its "weight" when it is still and when it is spinning. How does its apparent weight change?