

Lesson 4: Winging It

A Study of Birds and the Principles of Flight

Overview: Students over the course of several classes will participate in several experiments meant to explain how birds utilize various types of flight using form and techniques.

Objectives (1-3): - Students will be able to recognize the various forms of flight utilized by birds and to understand the principles behind flight itself. Students will also be able to recognize the benefits inherent in each flight form.

Key Concepts: Flight, Wing Shape, Adaptation, Evolution, Bernoulli's Principle
Subjects: Science, Biology, Ecology
Duration: 3 class periods (120 minutes)
Setting: In the classroom with an outdoor field trip at the end.
Season: Mid/Late Spring, Early/Mid Fall
Interdisciplinary Connections
Frameworks:

Environmental Education @ the Cove River Site, and other coastal Connecticut settings.



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Introduction (background): Many bird experts have identified four types of flight found in birds. These four types are flapping, soaring, gliding and hovering. As the names indicate, these types of flight are different in the number of times that the bird moves the wings up and down during flight. All birds may use different types of flight to take off and land as well as in the air. These flying patterns may look totally different than the pattern of distance flying that the bird might use. A flapping bird can move its wings up and down in a repeated pattern with little time between beats. Most perching birds are flappers. These include robins, starlings and other common birds. A soaring bird can use its wings only occasionally with several minutes between beats. Soaring birds are also champions at using thermals to travel up and down within air columns, rising with warm air and descending with cold air. Many of these birds are birds of prey such as eagles, hawks and vultures. Gliding birds can use their wings by rarely flapping their wings except when taking off or landing. Many sea birds such as albatrosses fit in this category. These birds spend hours riding currents of air without a single wing beat. The hummingbirds and a few others represent hovering birds. Hummingbirds are true hoverers whereas other birds may use a flying pattern referred to as kiting. Time between wing beats for these birds is measured in milliseconds and instead of the up and down wing pattern of most birds, these birds use a modified figure 8 pattern. Some birds do not fly at all. There are scientific principals involved with flight.

Materials: The materials required for this lesson include:

- Pictures of various birds in flight (these can be obtained easily on the internet)
- Paper Airplane Experiment
 - Different varieties of 8.5 x 11 paper
 - Instructions to make the paper airplanes
- Air Pressure Experiment (each for every group you use)
 - Strip of notebook paper or newspaper, about 2 inches wide and 10 inches long
 - Hardcover book
 - Paper clips
 - Electric Fan

Preparation / Set Up (if necessary):

Make sure to have multiple copies of the airplane selections that you prepared a head of time.

Engagement (Opening or Essential

Question: What makes it possible for birds and other objects to fly?

What body characteristics allow birds to fly?

What do flying birds look like? If humans had the same body structures and weight as birds, what type of bird would we be? How could you prove this? There are flightless birds such as ostriches, rheas, emus and cassowaries. Give some reasons why these birds cannot fly using the facts given above. Penguins also cannot fly. What characteristics prove this fact?

Exploration:

Split the class into groups, from there; have them perform the following experiment:

1. Make an airfoil (wing) by placing one end of the strip of paper between the pages of the book so that the other end hangs over the top. Move the book swiftly through the air, or blow across the top of the strip of paper. It flutters upward
2. Hold the book in the breeze of an electric fan so the air blows over the top of the paper
3. Take the strip of paper out of the book. Grasp one end of the paper and set it against your chin, just below your mouth. Hold it in place with your thumb and blow over the top of the strip. The paper rises. Try the same thing after you have fastened a paper clip on the end of the strip. See how many paperclips you can lift in this way.

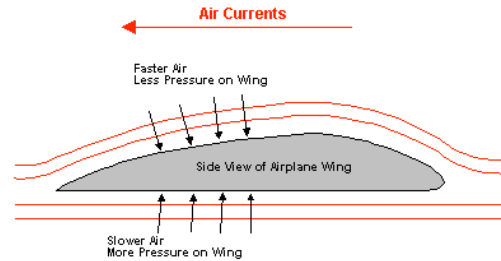
After they finish with the experiment have them perform the following:

4. Draw a sketch of an imaginary bird that represents each type of flight. Accurately use shape, length and width of the wings.
5. Construct a paper airplane that has the ability to fly using different wing shapes and write a descriptive paragraph about the flight pattern.
6. Allow each student to fly their favorite model for the class to see, have the class evaluate which model did the best and from there

Explain:

When birds fly, they are making use of Bernoulli's principle, this states: that an increase in the velocity of any fluid is always accompanied by a decrease in pressure. Air is a fluid. If you can cause the air to move rapidly on one side of a surface, the pressure on that side of the surface is less than that on its other side.

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Elaborate:

Take the class to the Cove River Site, from there have them watch and take note in a journal of the various forms of flight utilized by the birds that are present.

Evaluate:

Ask the students to turn in their notes from the field trip. Each student should then write a brief follow up with the following:

- Ask your students to take their observations from their own planes and to find a bird that they think flies like one of their models.
- Ask them to provide their reasons

Supplementary materials:

Templates for Paper Airplanes:

<http://www.funpaperairplanes.com/Plane%20Downloads.html>

Birds in Flight pictures:

<http://www.gregscott.com/rwscott/rwscott.htm>