

Birds Of Flight Exploration

Grade level: 6-8

Unit of study: Biology, physics, evolution

MI Grade Level Content Expectations:

- Inquiry Process

S.IP.03.11 Make purposeful observation of the natural world using the appropriate senses.

S.IA.03.12 Share ideas about science through purposeful conversation in collaborative groups.

S.IA.03.13 Communicate and present findings of observations and investigations.

- Life Science: Organization of Living Things, Evolution, Ecosystems

L.EV.03.12 Relate characteristics and functions of observable body parts to the ability of animals to live in their environment (sharp teeth, claws, color, body coverings).

L.EV.04.22 Identify how variations in physical characteristics of individual organisms give them an advantage for survival and reproduction.

Key concepts: Bird flight adaptations, physics of flight

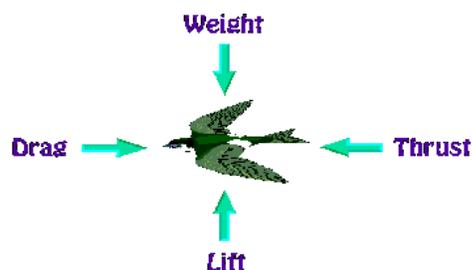
Resources & Materials needed:

Birds of Flight Exploration Worksheet
Magnifying glasses
Bird beak/bone
Feathers
Binoculars
Pencils
Clipboards

Abstract: In this activity students will be able to connect their knowledge of the physics of flight to the physiological mechanics which make flight possible for birds. They will become familiar with adaptations birds have developed which make flight possible and will be allowed to explore the sanctuary grounds to observe these adaptations first hand. Students will be able to apply their physics knowledge to explain how birds are able to fly.

Big Ideas: Birds have developed several adaptations which aid them in flight. The most important adaptation is the wing. Bird's wings enable them to create both lift and thrust. Flapping of the wings provides the upward and forward thrust needed for flight. Flapping counteracts the forces of weight and drag allowing the bird to gain or maintain height while taking off or flying. Wings of birds have strong contoured flight feathers with an airfoil shape like that of an airplane wing. This creates an area of high pressure below the wing and an area of low pressure above the wing giving the bird lift while gliding. The vanes of each feather have barbules that connect each individual vane giving feathers the strength needed to hold the airfoil shape while in flight. By tilting their wings forward or backward birds can control their lift and speed. Birds have hollow bones and a beak instead of teeth to reduce weight therefore requiring less thrust and energy to fly. The majority of a bird's body is covered in contour feathers which streamline it for flight and reduce the effects of drag.

Figure 1: Forces in Flight

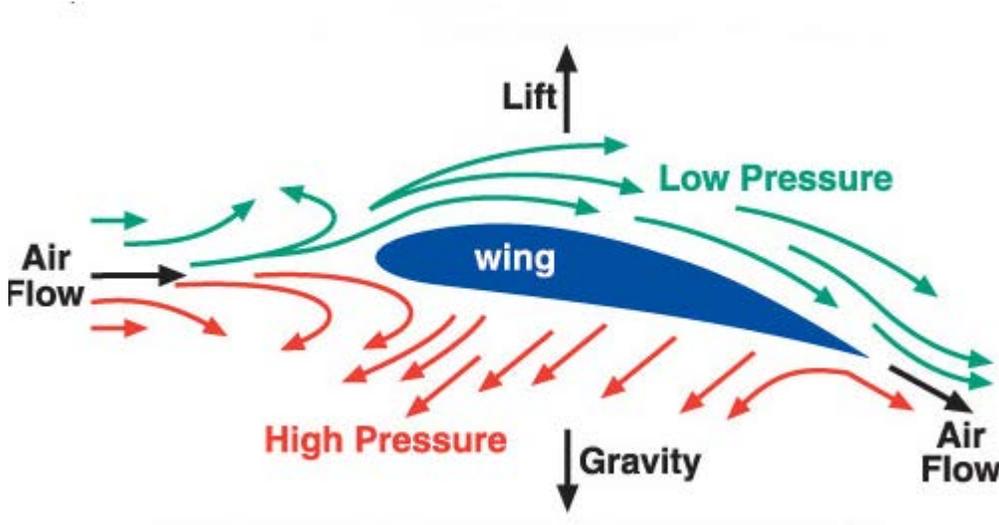


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Created by Education Intern, Sean Morgan, Summer 2013
Contact Kara Haas, karahaas@msu.edu, 269-671-2181

Figure 2: Principles of an Airfoil



Further information can be found at:

<http://www.earthlife.net/birds/flight.html>

http://en.wikipedia.org/wiki/Bird_flight

http://ocw.mit.edu/courses/materials-science-and-engineering/3-a26-freshman-seminar-the-nature-of-engineering-fall-2005/projects/flight_of_brdv2ed.pdf

Kellogg Bird Sanctuary Activities

Procedure

Introduction: Bird Flight Adaptations (Sanctuary will provide examples and volunteer tour guide at request)

1. Set up bird flight adaptation learning stations around the auditorium of the bird sanctuary.
 - a. Wing station: Use the wing span chart hanging in the auditorium and a wing example. Explain how a bird's wing is shaped like an airfoil and functions similar to the wing of an

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airplane. Explain flapping, gliding, and soaring making sure to include the physics connection.

- b. Feather station: Use flight feathers and contour feathers for examples. Explain the functions each feather serves and how they aid in flight. Have students examine feathers with magnifying glasses to observe the barbules and explain their function.
 - c. Beak/bone station: Use the goose beak/skull replica and bird bones as examples. Explain how birds have adapted to become lighter in order to make flight easier. They do not have any teeth but a beak instead and have hollow bones.
2. At each station ask students to investigate the examples provided and ask how they think they may be adaptations to help birds fly. Utilize "Think, Pair, Share", have students individually think about the question and then pair up with a nearby neighbor to discuss their ideas. Ask for pairs to then share out with the whole class.
 3. Use ideas that have been shared to help explain the function each adaptation serves for flight.

Main Activity: Flight Exploration

1. Instruct students to pair up with another student to complete the activity. Pass out clipboards, pencils, binoculars and the flight exploration worksheet.
2. Explain to students they will be allowed to explore the Kellogg Bird Sanctuary with their partner to complete the activity.
3. The first question of the worksheet can be completed using the wing span chart in the auditorium.
4. Ask students to meet at the picnic tables by the research building after completing the activity.

Conclusion: Waterfowl Feeding

1. Instruct students to gather up and sit in one large circle.
2. Ask each pair to share out their favorite question from the activity. Have them explain the observations and answers they found to answer it.
3. After sharing is complete ask physics, flight, or bird trivia questions.

4. If a pair of students answers it correctly give them a bucket of corn and dismiss them to feed the waterfowl for the remainder of the trip.

Name:

Kellogg Bird Sanctuary: Birds of Flight Exploration

1. Find the bird wingspan poster in the auditorium. Which bird's wingspan is closest to your arm span? Why are they able to fly but you are not?

2. Find a bird feather. Examine it and draw a picture.

3. Name a characteristic of the feather you noticed which would be valuable to flight and why:

4. Find a bird doing each of the following and put a check under witnessed next to it once you have. Then give a brief explanation of the physics behind it.

	Witnessed	Physics
Flapping		
Gliding		
Soaring		

5. Draw a picture of your favorite bird in flight. Draw and label arrows with the forces acting upon the bird in flight. Make sure to include the terms thrust, lift, weight, and drag.