Flights of Fantasy Grade 6

Newton's Laws, Flight, Flying Animals

FIELD EXPERIENCE CURRICULUM

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Introduction

How is natural flight possible? Birds, insects, and some mammals fly, but how? During the *Flights of Fantasy Curricula Experience,* students will explore Newton's 3 Laws of Motion and apply their understanding in the context of natural flight. Students will have the opportunity to experiment, to perform, to collaborate, to inquire and to play with aspects of Newton's Laws as they relate to birds, bees, and flying squirrels. Furthermore, this inter-curricular hands-on series of lessons will have students as architects of flight, designing airplanes and ornithopters.

How to Use this Resource

The Flights of Fantasy Curriculum Package has 3 Components:

Part 1. Classroom Beginnings: Recommended for use in the classroom prior to the Flights of Fantasy Field Experience.
Part 2. The Flights of Fantasy Field Experience Curriculum: A facilitated curricular experience.
Part 3. Classroom Culminations: Recommended for use in the classroom following the Field Experience.

Flights of Fantasy Grade 6: Content & Curricular Competencies

Science	Newton's 3 Laws of Motion Effects of balanced and unbalanced forces in daily activities Force of Gravity	Demonstrate a sustained curiosity about a scientific topic or problem of personal interest Make observations in familiar or unfamiliar contexts Identify questions to answer or problems to solve through scientific inquiry Make predictions about the findings of their inquiry Contribute to care for self, others, and community through personal or collaborative approaches Co-operatively design projects Transfer and apply learning to new situations
Applied Design, Skills, and Technology	Techniques for using images, sounds, and text to communicate information, settings, ideas, and story structure	Identify and use appropriate tools, technologies, and materials for production Select, and as needed learn about, appropriate tools and technologies to extend their capability to complete a task
Physical Education	Participate in different types of physical activities, including individual and dual activities, rhythmic activities, and games	Develop and apply a variety of movement concepts and strategies in different physical activities Develop and demonstrate safety, fair play, and leadership in physical activities

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About the Flights of Fantasy Field Experience

During the *Flights of Fantasy Field Experience*, connections will be made between Newton's Laws and principles of flight. Students will have the opportunity to relate their learning through the reenactment of different wing and flight adaptations associated with different local animals. The experience will culminate in the construction of various paper airplanes which will be showcased and flown during our Paper Airplane Olympics.

Field Experience Goals

During the Flights of Fantasy Field Experience, students will:

- To apply and integrate Newton's Laws of Motions with principles of natural flight
- To work collaboratively and safely in the outdoor classroom

Day at a Glance

9:30-9:45	Site Introduction & Welcome
9:45-10:00	Let it Fly: Introduction to Principles of Flight
10:00-10:45	Frisbee Tag: Demonstration of Newton's 3rd Law
10:45-11:00	Snack
11:00-12:00	Stations: Flying Animals / Paper Airplane Olympics
12:00-12:30	Lunch
12:30-1:30	Stations: Flying Animals / Paper Airplane Olympics
1:30-2:00	Closing Circle: Sharing Student Learning

Lessons in this Resources

The Flights of Fantasy Field Experience has 5 activities. These activities will be facilitated for teachers by teachers, onsite at the OLC. They are as follows:

Important Vocabulary
Lesson 1: Let it Fly - Introduction to Principles of Flight
Lesson 2: Frisbee Tag
Lesson 3: Flying Animals and their Flight Adaptations
Lesson 4: Paper Airplane Olympics
Lesson 5: Closing the Circle

Flights of Fantasy Grade 6

Newton's Laws, Flight, and Flying Animals

Activity 1: Let it Fly- Introduction to Principles of Flight (15 Minutes)

Purpose

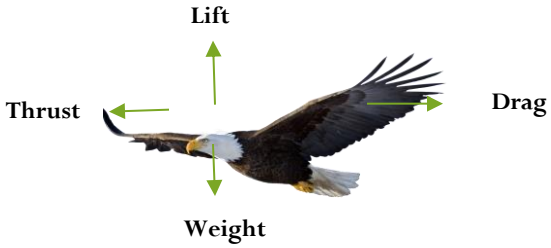
- To introduce key concepts and learning goals of the day

Materials

- 1 Balloon
- 1 Set of Newton's Laws of Motion Cards (Printed and laminated on cardstock).
- A real birds wing
- Bird Costume: Large Wooden Wings, Goggles, Helmet
- Skateboard (optional)

Procedure:

1. Present the concept of flight, using a pair of wooden wings, helmet and goggles. Stand up on a boulder or picnic table.
2. Tell the students you are going to try to break the OLC record by flying around the buildings, out over the lake, and then return to a perfect two point landing right back in front of the landing point. Jump off the rock and land on the ground saying you are back.
3. Discuss: Why can't humans fly? Answers: No feathers, too heavy, bones too solid.
4. Share this interesting fact: in order for humans to have the right kind of muscle mass to be able to move a set of wings at the right kind of pressure, we would need a chest 13 times bigger.
5. Ask students if they know which force keeps us here on the ground? *Gravity.*
6. In order to defy gravity (and the WEIGHT OF THE OBJECT) and to fly, what is needed?
    a. LIFT: Keeps the object from falling to the ground.
    b. THRUST: Keeps the object moving forward (with birds, this is generated by the musculature of the bird's flapping wing, for an airplane, it is the propeller).
    c. DRAG: The force which opposes the forward motion; it is friction between the object and the air



7. Ask students if they have ever heard of Sir Isaac Newton and his 3 Laws of Motion? Invite them to share what they know.
8. Then fill in the blanks or remind students what Newton's 3 Laws are by handing out 3 cards with Newton's Laws written on them. Have students read them aloud.
9. Newton's Third Law of Motion states that for every action, there is an equal and opposite reaction. This is another way of saying you can't exert a force without something to push against. The concept is easily demonstrated with a simple latex balloon.
10. Blow air into the balloon, but don't tie it off. Then release the balloon. The balloon is made of an elastic material and it wants to contract. Therefore air is forced backward through the nozzle of the balloon. Pushing this air backward causes the balloon to be pushed forward and travel very rapidly across the room.
11. Another relatable demonstration can be provided with a skateboard. Invite a student up to demonstrate a forward movement on a skateboard. Then ask, how do you make it go forward? (Answer: Push backwards).
12. Relate this to a wing (if possible, have a wing as a prop), which deflects air downward, much the same as the balloon ejects air. In this case, the equal and opposite reaction is the lift force or difference in air pressure above and below the wing. Therefore the lift produced by the wing can be accounted for by Newton's Third Law of Motion.

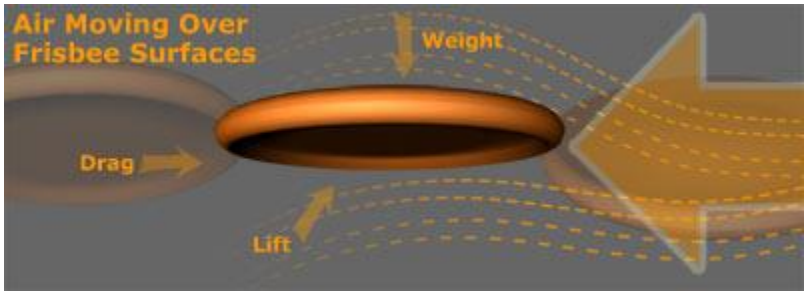
Activity 2: Frisbee Tag & /or Balance Challenge (45 Minutes)

Background
Frisbees can fly. One of the reasons they can fly is Newton's Third Law which states that for every action there is an equal and opposite reaction. The Frisbee forces air down (action) and the air forces the Frisbee upward (reaction). The air is deflected downward by the Frisbee's tilt, or angle of attack and air is forced upward creating lift.

Summary
Tag Frisbee is played like tag with the addition of a Frisbee.

Recommended Number of Players
Between 4 and 30

Location: Field



Materials

- Frisbee
- 15 Pinies

Set Up
No prior set up required

How to Play

1. Divide up into two teams.
2. Hand out pinies to one team.
3. One team is "It." (These 2 Teams will also work together during the Stations).
4. The non-it's start with the Frisbee and throw back and forth between team mates trying to keep the Frisbee from the "It's."
5. If an "It" team member catches the Frisbee, the whole team switches from "It" to the non-it's.
6. Play continues until everyone is tired or moves on to another game.

Winner: Non-competitive

Additional Activity: Partner Balance Challenge Game (Newton's 3rd Law)

Materials: None

Procedure

1. The game is played by standing facing your partner about two feet apart (your fingertips should reach your opponents chest).
2. Your hands must always remain upright with palms facing out and you may only touch your opponent on their hands.
3. The object of the game is to push your opponent off balance or to move your hands back so that your opponent will fall off balance.
4. Allow students to play a few rounds in groups. Follow this exploration with group discussion questions such as:
    a. What are two ways to create an unbalanced force in this game?
    b. How does Newton's 3rd Law or action-reaction pairs relate to what you're doing now?

Activity 3: Flying Animals and their Flight Adaptations (1 Hour)

Part 1: Wings and Things (20 Minutes)

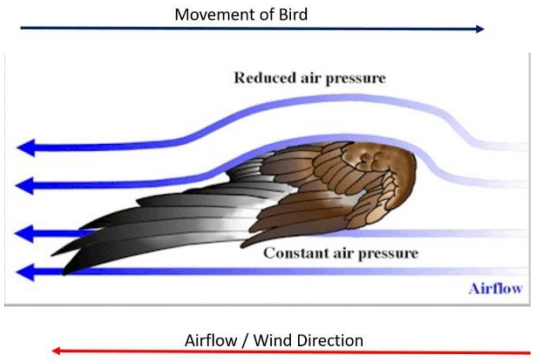
Introduction

This lesson is an opportunity for students to think critically about natural flight through up-close analysis of natural specimens used for flight.

Location: Indoors

Materials

- Examples of wings
- Examples of pollen and seeds
- Microscopes
- Magnifying glasses



Bernouli's Principle

Procedure

1. Discuss: What flies? Answers- birds, insects, mammals (bats, flying squirrels, etc.), plants (pollen, seeds, etc.)
2. Show examples of wings, feathers, insect wings and bats. Discuss how different things, such as thick fat wings are good for short distances while long thin wings are good for speed and broad flat wings are good for gliding. (What is down also good for? Insulation.)
3. Discuss Bernouli's Principle – The wings are designed to catch air pressure. Low air pressure on the top and high air pressure on the bottom. High air pressure lifts the wings and the way that birds etc. move their wings, allows them to dive, slow down (drag) and maneuver.
4. Compare birds and airplanes (Flaps, drag, raise, etc.)

Part 2: The Flying Game (30 Minutes)

Location: Outside / Playing Field

Materials

- 2 Pairs of Wooden Wings
- A variety of obstacle course materials

1. Line the students up in two lines – one with the large wings of a gliding bird (i.e. hawk, vulture) and the other group with the smaller wings of a forest bird (i.e. blue jay, cardinal, grosbeak).
2. Each group has to maneuver around a series of obstacles in a relay (passing wings off to the next person when they finish the relay).
3. The group with the gliding wings have to stretch out their wings and aren't allowed to flap. The group with the smaller wings have to flap constantly. (Usually the group with the smaller wings wins.
4. Discuss which wing type was easier to use. Were the smaller wings easier to run with and did they move faster? Did the large wings catch the air and slow the running down? What kind of birds would use each kind of wing? Would the little wings be beneficial way up high? Would the big wings get in the way in the forest?
5. Share the following facts:
   a. Warm airflows rising off the earth allow large birds to soar and circle around.
   b. Vultures are one of the only birds that can smell, warm air that they glide on brings up smell of the rotting meat they eat.

Activity 4: Station Rotation – Paper Airplane Olympics (1 Hour)

Purpose

This activity gives students the opportunity to integrate what they've learned about different wing shapes and flight.

Location: Inside & Outside

Materials

- Paper
- Airplane templates: http://www.funpaperairplanes.com/
- Hoola Hoop
- Webbing (to delineate the fly zone)
- A recording of the Olympic theme song & speaker
- Olympic torch

Procedure

1. Invite students to make two paper airplanes of different designs.
2. Handout Templates and paper.
3. Delineate a fly zone for practicing.
4. Let them practice for a while with the airplanes then have a paper airplane Olympics:
   a. Accuracy contest: Can they fly it through a hoop held by the leader?
   b. Distance contest: The farthest wins.
   c. Glide contest: The person with the most time in the air wins.
5. Discuss what designs work best for each event? (ie. Broad, flat works best for gliding, long and thin for distance etc.)

Activity 5: Closing Circle (30 Minutes)

Summary
This is a reflection activity where students have an opportunity to share a special experience from the day.

Materials

- 1 Earth Ball

Location: Field or Indoors

Procedure

1. Invite students to either stand or sit in a circle.
2. Retell the story of the day back to students.
3. Give students a moment to reflect back on the day and choose one special memory or learning experience they would like to share with the group.
4. With the Earth ball in hand, tell students that the person with the Earth ball is the only one who gets to speak. The ball begins with the teacher. Tell students that after they share their special learning experience with the group, they can roll the ball back to the teacher who then rolls the ball to the next student who is ready to share.
5. The Earth ball should begin and end with the teacher.
6. Once all students have had an opportunity to share with the group, the teacher, holding the earth ball, can close the circle.

Sources

The Alabama Learning Exchange: https://alex.state.al.us/lesson_view.php?id=34563

Frisbee Games for Kids: https://www.care.com/c/stories/3970/15-frisbee-games-for-kids/

Fun Paper Airplanes: http://www.funpaperairplanes.com

Gratitude

Special gratitude and appreciation to the Camp Kawartha Environmental Education Team.

https://campkawartha.ca/environmental-education-centre/