

Flights of Fantasy Grade 6

Newton's Laws, Flight, Flying Animals



CLASSROOM CULMINATIONS LEARNING PACKAGE

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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 Classroom Culminations

The *Flights of Fantasy Classroom Culminations* Learning Package is intended to support the learning from both the related Classroom Beginnings and Field Experience Curriculum Packages. In this resource, teachers have the option to integrate science with Language Arts in the implementation of a class novel study (*Freak the Mighty*), and too further enhance student's understanding of the relationship between Newton's Laws of Motion and flight, through the building of ornithopters.

Lessons in this Resources

The Flights of Fantasy Classroom Culminations learning package has 2 activities. They are as follows:

Lesson 1: Novel Study: *Freak the Mighty*

Lesson 2: Ornithopters

Lesson 3: Flight Competition

Lesson 1: Novel Study: *Freak the Mighty*

Courage comes in all sizes. This inspirational novel about two unexpected heroes—a tiny Einstein in leg braces (who builds ornithopters) and a timid, adolescent giant—teaches a tough but tender lesson about life. The book presents the theme of courage, the skill of analyzing conflicts, and the use of imaginative language. A lesson on Ornithopters is included below.

Freak the Mighty: A 20 Day Unit Plan

<http://englishunitplans.com/wp-content/uploads/2014/02/Freak-the-Mighty-Unit-Plan.pdf>

Freak the Mighty: Lesson Plan and Student Worksheets

<https://www.scholastic.com/content/dam/teachers/lesson-plans/migrated-featured-files/freak-the-mighty-storia-tg.pdf>



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Lesson 2 – Ornithopters

Introduction

The word Ornithopter is derived from the Greek words *Ornithos* (bird) and *pteron* (wing). We depart from the questions '*Which animals are able to fly?*'; '*What flying machine do we know?*' and '*What is the difference between an aeroplane and a bird?*'. Children can be asked this while they look at images of a bird, a plane and a flying ornithopter.

Background

The crankshaft mechanism is widely used in machines to convert a reciprocating motion into a circular motion, or visa versa. For example, the combustion engine burns fuel and releases energy in the form of high pressure, which in turn causes the piston to move up and down. This mechanism can be used to rotate the wheels of a car or the rotors of a propeller.

Initially children need to be introduced to the terminology used: crank, lever and shaft. Encourage them to consider where they have encountered the crank mechanism before. Many will recognize it on the wheels of a locomotive, like Thomas the Tame Engine and the Hogwarts Express in Harry Potter.

Materials

- Cereal Boxes
- Steel wire
- Straws
- Cellophane tape
- Decorating supplies (i.e. markers, glitter glue, feathers, etc).
- Wire Cutters
- Printouts of Ornithopter Template
http://www.dwengo.org/sites/default/files/addFiles/ornitopter_sjabloon_0.pdf

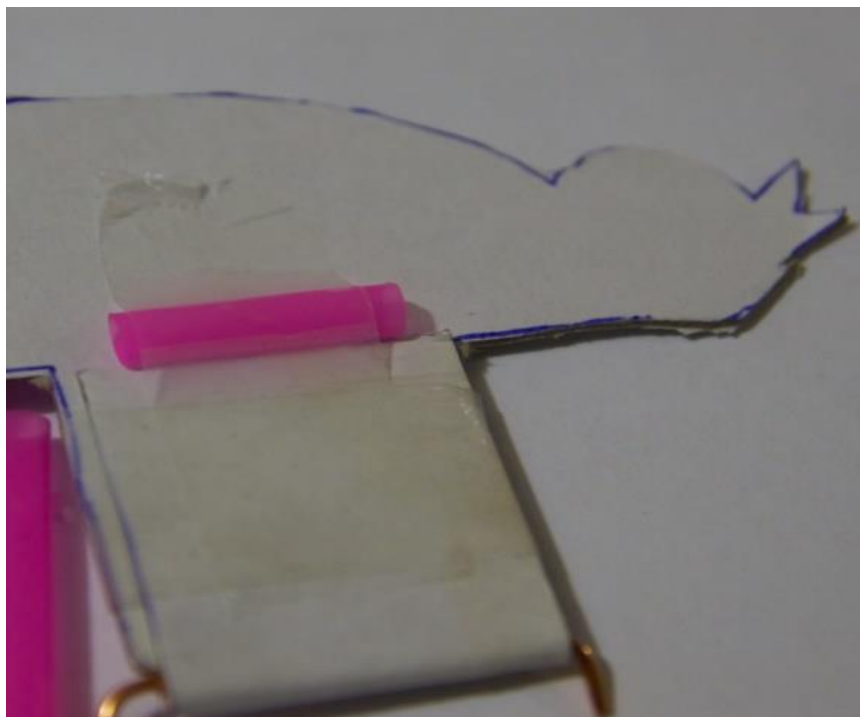
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Procedure to Build an Ornithopter

This ornithopter is a cardboard bird with two wings. Both the body and wings are cut out of the thin cardboard (i.e. cereal box). In order to stimulate the children's creativity, students can be encouraged to design their own bird. Ensure that the base is 4 cm by 6 cm, as on the template.

1. Each child receives 1m steel wire. They are instructed to cut the wire and shape it to fit the sizes on the template.
2. Have students cut out the shapes on the template and then trace the bird body and wings onto the cardboard.
3. Once pieces are cut from the cardboard the ornithopter is ready for construction. This means each child has: 2 cardboard wings, the cardboard bird with base, one steel wire lever and crank, and two wire cranks with wing supports.
4. Make the two conductors for the cranks and wing support from a drinking straw. These are attached to both sides of the cardboard bird. The lever with crank is fitted to the bottom of the base.

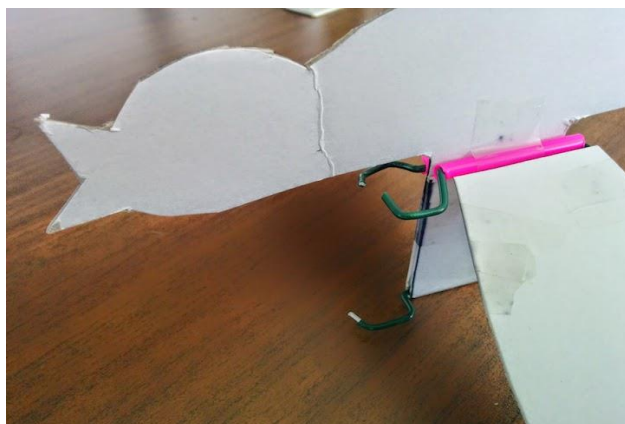


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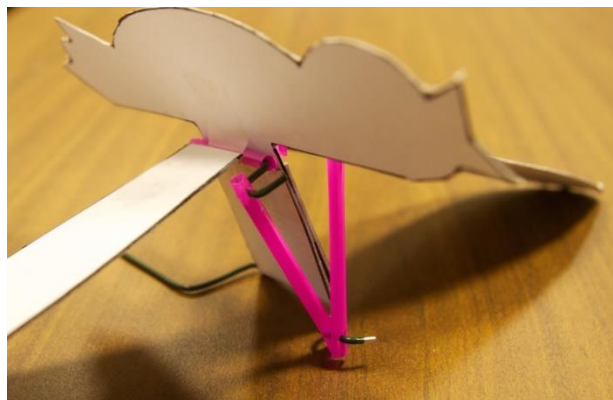
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Procedure (continued)

5. The two cranks with wing support are slid into place in the conductors (straws) that were previously attached to the bird. Then bend the steel wires so that they carry the cardboard wings, which can now be added. If everything has gone according to plan, your mechanism will now look like the image.



6. In order to allow the wings to move up and down, the shafts are connected to the cranks. The length of the shafts is key to success: if they are too short, the mechanism will not work! Let the children determine the ideal length. Some will use the trial and error method, while others will reason according to their foreseen wing positions.



Evaluation

It is useful for the children to study each other's ornithopters in group and contemplate questions such as 'whose wings work in a synchronous way' or 'how was the length of the shafts determined'.

Let it fly!

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Lesson 2: Flight Competition

Introduction

The following competition will not be based on the distance the ornithopters can fly, but on the highest flapping rate.

Materials

- Student built ornithopters
- Stop watches
- Prizes (optional)

Procedure

1. Divide students into small groups based on the number of stop watches available.
2. Give each group a stopwatch, a pencil and flashcard. These will be used to record results.
3. Tell students that the winner of this competition will have the ornithopter with the highest flapping rate.
4. The flapping rate is determined by the number of times they can wind their crank, divided by the number of seconds the wings flap.
5. Once each group has had sufficient time to calculate their individual flapping rates, survey the crowd to determine who has the highest rate. Determine the winner and give the winner a small prize.

Teaches scientific measurement skills and math applications.

Sources

Dwengo's Build your Own Ornithopter: <http://www.dwengo.org/node/119>

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Freak the Mighty: Lesson Plan and Student Worksheets

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