

RESOURCE LIBRARY  
ACTIVITY : 45 MINS

## Pterosaur Glider Experiment

Students alter gliders in controlled experiments to simulate how certain characteristics affect pterosaurs' flight.

### GRADES

2 - 5

### SUBJECTS

*Biology, Geology*

### CONTENTS

2 Videos, 4 Images, 3 PDFs

## OVERVIEW

Students alter gliders in controlled experiments to simulate how certain characteristics affect pterosaurs' flight.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/pterosaur-glider-experiment/>

## Program



## DIRECTIONS

1. Have students describe pterosaur characteristics.

Show students the video “Flying Monsters: An Introduction.” While they watch, have students write words that come to mind. Ask students to share their words and what they found interesting about these creatures. Students might point out their head shapes or head crests. Explain that certain characteristics of these pterosaurs—in particular their ability to fly—probably helped them survive along with dinosaurs for millions of years. Pterosaurs were the first vertebrates to fly. Over millions of years their flying abilities changed along with the shape of their bodies, including their wings and their head shapes. Explain that these changes over time are called adaptations.

## **2. Compare powered flight and gliding.**

Watch the video in Step 1 one more time, having students think of words to describe pterosaur flight. Students might describe wings flapping fast or slow, or graceful gliding. Ask: *What does gliding look like?* (wings are almost still; pterosaur is soaring) *What does powered flight look like?* (wings are flapping or moving fast) Next, watch the film clip “Quetzalcoatlus.” Ask students to identify the type of flight. Explain that this huge pterosaur glided in the air, and also used powered flight. Explain that in this activity, students will explore how one characteristic of pterosaurs' bodies may have affected their ability to fly.

## **3. Explore head crests.**

Show the Pterosaur Gallery, which includes pictures of the four pterosaurs featured in the film *Flying Monsters 3D: Darwinopterus, Dimorphodon, Tapejara, and Quetzalcoatlus*. Talk about the shapes of the head and head crests. Ask: *How are they similar? How are they different?* Explain that pterosaurs' bodies were altered through time, and these adaptations helped them to survive. Scientists think that their head shapes made a difference in pterosaurs' flying and steering.

## **4. Prepare for the investigation.**

Explain to students that they will test the flight of two gliders. Their objective will be to observe how adding a change like a head crest affects flight. Divide students into groups of three, assigning students the roles of glider thrower, measurer, and recorder. Distribute the Glider Instructions worksheet, and have each group first create Glider 1 and Glider 2 using the

templates. Prepare an area where each group has about 20 feet of space to lay out a straight line of string where they will launch the gliders. Choose a level space and avoid windy locations.

### **5. Conduct the experiment.**

Distribute one set of the worksheets Glider Investigation and Glider Observations per group. Have the recorder read the instructions out loud and use the Glider Observations worksheet to record the observations their group makes. Explain that each thrower should aim to fly the glider along the string, using the same amount of throwing power each time. Ask students to practice several times. Tell them that when they are ready, they should throw the glider in the same way for each of the trials. Have the measurer practice measuring in centimeters the distance from where the glider hits the ground straight to the string, so that the meter stick or tape measure is perpendicular to the string. Have the group follow the instructions to enter their data in the Glider Observations worksheet, tally averages, and summarize descriptions. Let students know that the differences in glider flight may be slight, so they should look carefully for differences.

### **6. Analyze and discuss the results.**

Thinking about the averages and descriptions, have students answer the questions on the Glider Observations worksheet to draw conclusions about the differences in flight performance. Discuss the results as a class, and tally on the board all groups' results. Ask: *Which groups found there was a difference in the two gliders' flight? Which did not? Were there differences in the average measurements, in the descriptions, or both?* Discuss also the need for each group's two gliders to be the same, the throwing style to be the same, and the challenges in making sure this was the case. The head crest needed to be the only variable to make results of the investigation useful. Explain that scientists often repeat trials again and again to identify even the slightest differences or patterns.

### **7. Make connections with pterosaur study.**

Ask students to think about the findings in their experiments. Ask: *Do you think head crests helped pterosaurs fly straighter?* Students can base their conclusions on their groups' results

or the results of the class as a whole. Explain that many paleontologists believe that head shape and head crests did contribute to pterosaurs' improved flying abilities. Paleontologists use models and simulations to help determine these abilities.

## Informal Assessment

Check groups' completed observation sheets to make sure students were thorough in their measurement, averaging, and descriptions. If students were able to vary only the head crest while throwing with the same form and intensity each time, students would see that the glider with the crest does fly straighter than the glider without the crest. Students might or might not conclude that having an additional head-crest shape makes a difference in the flight performance, but their conclusion should be based on their observations or the results for the class overall.

## Extending the Learning

If possible, show students the film *Flying Monsters 3D*. Have them listen and watch for more information about different pterosaurs' characteristics. Ask them to think about how these pterosaurs adapted, or changed over time, helping them to survive for millions of years. After the film, have them design their own imaginary pterosaur and label three to five of its adaptations.

## OBJECTIVES

## Subjects & Disciplines

**Biology**

**Earth Science**

- Geology

## Learning Objectives

Students will:

- compare gliding and powered flight
- compare characteristics of pterosaurs
- create and adapt two glider models, observe flight, and record results
- compare the results of glider tests and draw conclusions about pterosaur adaptations

# Teaching Approach

- Learning-for-use

# Teaching Methods

- Discovery learning
- Hands-on learning

# Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Creativity and Innovation
- Critical Thinking Skills
  - Applying

# National Standards, Principles, and Practices

## NATIONAL SCIENCE EDUCATION STANDARDS

- **(5-8) Standard A-2:**

Understandings about scientific inquiry

- **(5-8) Standard B-2:**

Motions and forces

- **(5-8) Standard C-5:**

Diversity and adaptations of organisms

- **(K-4) Standard A-2:**

Understanding about scientific inquiry

- **(K-4) Standard B-2:**

Position and motion of objects

- **(K-4) Standard C-1:**

The characteristics of organisms

## **Preparation**

### **What You'll Need**

#### **MATERIALS YOU PROVIDE**

- Calculators
- Centimeter tape measure
- Meter sticks
- Pencils
- Scissors
- Transparent tape

#### **REQUIRED TECHNOLOGY**

- Internet Access: Required
- Tech Setup: 1 computer per classroom, Projector, Speakers

#### **PHYSICAL SPACE**

- Classroom
- Outdoor recreation space

#### **SETUP**

Open space for glider launching

#### **GROUPING**

- Large-group instruction

## **BACKGROUND & VOCABULARY**

### **Background Information**

The four pterosaurs—*Dimorphodon*, *Darwinopterus*, *Tapejara*, and *Quetzalcoatlus*—lived on Earth from 200 million years ago to 65 million years ago. The earliest of these, *Dimorphodon*, had no head crest and short wings. The latest of these pterosaurs, *Quetzalcoatlus*, had a head crest and very long wingspan, which some estimate was as high as 14 meters (46 feet). The long skull/head crest, and the long wingspan, probably enabled the later pterosaurs to be more effective gliders than the earlier pterosaurs.

## Prior Knowledge

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## Recommended Prior Activities

- None

## Vocabulary

Term	Part of Speech	Definition
adaptation	noun	a modification of an organism or its parts that makes it more fit for existence. An adaptation is passed from generation to generation.
observation	noun	something that is learned from watching and measuring an object or pattern.
variable	noun	piece of data that can change.

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### For Further Exploration

#### Websites

- [National Geographic Entertainment: Flying Monsters 3D](#)

