NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
ACTIVITY : 45 MINS

Adaptations: Changes Through Time

Students watch a video of a gliding lizard to examine characteristics that enable flight. They record in chart form characteristics and abilities of four pterosaurs to see how these animals adapted to survive over millions of years.

GRADES

6 - 8

SUBJECTS

Biology, Geology

CONTENTS

4 Videos, 4 Images, 1 Link, 2 PDFs

OVERVIEW

Students watch a video of a gliding lizard to examine characteristics that enable flight. They record in chart form characteristics and abilities of four pterosaurs to see how these animals adapted to survive over millions of years.

For the complete activity with media resources, visit:
http://www.nationalgeographic.org/activity/adaptations-changes-through-time/

Program

DIRECTIONS

1. Build background about species on Earth.

Define *vertebrates* and *invertebrates*. Ask students to give examples of each. Have them think about which is the larger number of species on Earth. Break the class into two groups and have a brainstorming race. For two minutes, one team lists as many vertebrates as they can, while the other team lists invertebrates. It's possible that the vertebrate list will be longer than the invertebrate list, since it may be a more familiar category.

2. Discuss why reptiles may have taken flight.

Explain that invertebrates are actually the larger group, by far. One group of invertebrates, insects, is the largest group of animals on the planet, with more than one million named species. Ninety-five percent of Earth's species are insects. Some scientists estimate that there are 10 quintillion (10,000,000,000,000,000,000) individual insects alive today. Accurate numbers of species from 220 million years ago are not known, but we do know from fossil evidence that there was an abundance of flying insects. Ask: *What would all of these insects mean for reptiles on the ground?* (a potential food source) *If the reptiles want to eat insects, how might they do it?* (jump, climb trees, try to fly)

3. Introduce pterosaur adaptations.

Most scientists believe that reptiles climbed trees to hunt insects. Around 215 million years ago, pterosaurs were one reptile species that developed membranes between their limbs and torso, allowing them to leap and glide. Show the video clip "Flying Monsters: From Reptiles to Pterosaurs." Ask students to describe this present-day lizard's ability to move from one place to another. Explain to students that the lizard's membranes are an example of an adaptation, a body part that changes over time and through many generations, helping a species survive. The ancestor of early pterosaurs also gradually adapted over time, gaining the ability to fly. Over millions of years, its wings improved, the bodies changed, and these animals called pterosaurs took to the skies.

4. Compare characteristics of two pterosaur species.

Project two images of pterosaurs: the *Dimorphodon*, one of the earliest known pterosaurs, and the *Quetzalcoatlus*, one of the last existing pterosaurs. In small groups, have students list observations of the differences between the two pterosaurs based on the two images. Students will see long or short tails, wide or long skulls, and short or long necks. Project the *Flying Monsters* movie site. Have students find more information to add to the lists.

5. Discuss what animals need to thrive.

Discuss the significance of the abbreviation *mya*, meaning millions of years ago. Explain that by examining these two animals, students are seeing two extremes of an evolutionary process: from 200 mya to 65 mya. Ask: *What does* Dimorphodon*, or any animal, need to do to thrive?* (avoid predators, hunt for food, find mates, and reproduce successfully) Explain to students that the individual with a particular body feature or behavior thrived and had healthy offspring. Ask: *If this is the case, what happens to the next generation?* (They are more likely to have the characteristics of their parents.) *What do we see after this happened over millions of years?* (Over millions of years and reproductive cycles, this process resulted in new adaptations.)

6. Have students analyze two more pterosaurs' characteristics.
Have each small group work at a computer. Give each student the worksheet Pterosaurs: Adaptations Through Time. Have students enter information about the two pterosaurs already discussed in their charts. Then have groups view the additional videos and images at their own pace to find descriptive information about the other two pterosaurs and enter it into their charts.

7. Have students summarize the pterosaurs' changes over time.
Have students use the contents of their charts to analyze pterosaur adaptations over time. Prompt them with the following questions:

- *Over millions of years, these and other pterosaur species evolved. How would you summarize these pterosaurs' physical changes over time?*
- *What were the later pterosaurs able to do better than the earlier pterosaurs?*

Modification

For step 6, advanced students can create a larger chart and include research on more pterosaurs, listing them in chronological order according to fossil age. Suggestions include *Eudimorphodon*, *Rhamphorynchus*, *Pteranodon*, and *Pterodactylus*.

Informal Assessment

See the answer key for suggested student responses. For summary questions, make sure students recognize that based on the four pterosaur species studied in this activity, pterosaurs became larger, stronger, and able to travel farther distances. They developed adaptations that enabled them to become better flyers and hunters.

OBJECTIVES

Subjects & Disciplines

Biology

Earth Science

- Geology

Learning Objectives

Students will:

- describe how pterosaurs changed over time
- explain why and how pterosaurs had to adapt to survive
- explain how adaptations help a species survive

Teaching Approach

- Learning-for-use

Teaching Methods

- Brainstorming
- Discussions
- Multimedia instruction
- Visual instruction

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Media Literacy
- Critical Thinking Skills

- Analyzing
- Understanding

National Standards, Principles, and Practices

NATIONAL SCIENCE EDUCATION STANDARDS

• **(5-8) Standard C-2:**
Reproduction and heredity
• **(5-8) Standard C-5:**
Diversity and adaptations of organisms

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Paper
- Pencils
- Pens

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per small group, Projector, Speakers
- Plug-Ins: Flash

PHYSICAL SPACE

- Classroom
- Computer lab

GROUPING

- Large-group instruction

BACKGROUND & VOCABULARY

Background Information

Pterosaurs were flying reptiles that may have evolved from insect-seeking lizards. Fossil evidence of pterosaurs dates from 215 million years ago (mya) through 65 mya. During their 150 million year existence, these animals changed drastically in size, body, shape, and flying ability.

Prior Knowledge

[]

Recommended Prior Activities

- Observations and Hypotheses

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.
evolution	*noun*	change in heritable traits of a population over time.
invertebrate	*noun*	animal without a spine.
paleontologist	*noun*	person who studies fossils and life from early geologic periods.
paleontology	*noun*	the study of fossils and life from early geologic periods.
vertebrate	*noun*	organism with a backbone or spine.

For Further Exploration

Websites

- National Geographic Entertainment: Flying Monsters 3D