



# Dinosaurs: Warm-Blooded Birds or Cold-Blooded Reptiles? Lesson Plan

**Grade Level:** 6-8

**Curriculum Focus:** Life Science

**Lesson Duration:** Two class periods

## **Student Objectives**

- Learn about a controversy among scientists over whether dinosaurs were similar to warm-blooded birds or cold-blooded reptiles.
- Discover why our understanding of dinosaurs is still evolving.

## **Materials**

- Discovery School video on *unitedstreaming: When Dinosaurs Ruled: South America*  
Search for this video by using the video title (or a portion of it) as the keyword.

Selected clips that support this lesson plan:

- Not a Bird or a Dinosaur: A Flying Reptile
  - Santana Formation: Fossils of Flying Creatures
  - Wingspan of Thirty Feet: How Could They Fly?
- Internet access
- Print resources about dinosaurs

## **Procedures**

1. Tell students that there is much information about dinosaurs, but as scientists continue to learn about these creatures, they modify their understanding of them. Take a few minutes to find out from students what they believe to be true about dinosaurs. To help focus the discussion, you may ask the following questions:
  - When did dinosaurs live?
  - Did they all live at the same time?
  - What did they eat?
  - On which continents did they live?
  - What animals alive today are most closely associated with or related to dinosaurs?

Write students' responses on a sheet of newsprint. They may mention that there were many kinds of dinosaurs, that some ate other dinosaurs while others ate plants, and that dinosaurs became extinct a long time ago.

2. Explain that a major scientific controversy about dinosaurs is whether they were reptiles or birds. A related issue is whether dinosaurs were cold-blooded or warm-blooded. The body temperature of a cold-blooded animal, such as a reptile, is dependent on the temperature of its environment; a warm-blooded animal, such as a bird, can generate heat and moderate its own temperature. In this lesson, students will follow the debates of scientists who are trying to determine how to categorize dinosaurs. Learning how dinosaurs regulated their body temperatures will help scientists determine which type of animal dinosaurs most closely resembled. Tell students that today they will trace the work of scientists who are working on these issues.
3. Before students begin their research, they should review the steps of the scientific process and become familiar with the scientific words that describe how animals regulate their body temperatures. Students must be familiar with the terms listed below. Make these terms and their definitions available to students, on the overhead or as a handout.
  - **endothermic:** This scientific term describes warm-blooded animals that can generate heat within their body to regulate their body temperatures. Birds and mammals are endothermic. Scientists use the term "homeothermic" to describe the ability of some types of animals to maintain their body temperatures.
  - **ectothermic:** This scientific term describes cold-blooded animals that rely on the environment to regulate their body temperatures; if it is warm, the animal is warm, and if it is cold, the animal is cold. Reptiles are ectothermic. Scientists use the term "poikilothermic" to describe the condition of having a fluctuating internal body temperature.
4. Divide students into two groups. Have one group take the position that dinosaurs were endothermic, and have the second group take the position that dinosaurs were ectothermic. Each group must do the following:
  - Research the scientific evidence supporting the group's position. Students should include what scientists know about the dinosaurs' environments and physical features that support the position.
  - Based on their research, students should work together to write a paragraph explaining the evidence supporting their position, as well as information that might make their position less plausible.
5. The Web sites listed below provide the information students need to complete the activity.

### **Endothermic**

- <http://www.ucmp.berkeley.edu/diapsids/dinosaur.html>
- <http://www.ucmp.berkeley.edu/diapsids/avians.html>
- <http://www.ucmp.berkeley.edu/diapsids/saurischia/theropoda.html>
- <http://www.ucmp.berkeley.edu/diapsids/saurischia/dromaeosauridae.html>
- <http://www.ucmp.berkeley.edu/diapsids/endothermy.html>

### Ectothermic

- <http://www.ucmp.berkeley.edu/diapsids/dinosaur.html>
- <http://www.ucmp.berkeley.edu/diapsids/dinofr.html>
- <http://www.ucmp.berkeley.edu/diapsids/dinodiscoveriesna.html>
- <http://www.ucmp.berkeley.edu/diapsids/ectothermy.html>

6. Give students time in class to complete their research and write their paragraphs. During the next class period, have each group present its findings. Then discuss the reasons that scientists are having trouble resolving this controversy. Issues to discuss include the following:
  - Many kinds of dinosaurs had a variety of characteristics, making it difficult to develop a theory that applies to all of them.
  - It is possible that the structure of dinosaurs was different from both reptiles and birds, making it difficult to use these animals as bases of comparison.
  - It is possible that dinosaurs were at first ectothermic, and then they evolved into endothermic creatures.
7. Share with students the summary found at the following Web site:  
<http://www.ucmp.berkeley.edu/diapsids/summarythermy.html> Help students understand that scientists cannot always draw decisive conclusions about complex issues; they often reevaluate their findings when new information arises.
8. Review the list of ideas about dinosaurs that students generated at the beginning of the lesson. Ask students if their ideas about dinosaurs have changed. If so, have them explain the reasons for those changes.

### Assessment

Use the following three-point rubric to evaluate students' work during this lesson.

- **3 points:** Students developed a clear, thoughtful hypothesis; showed strong research skills; drew logical conclusions from the research; and participated actively in class discussions.
- **2 points:** Students developed a workable hypothesis; showed on-grade research skills; drew some conclusions from the research; and participated somewhat actively in class discussions.
- **1 point:** Students had difficulty developing a workable hypothesis; showed below-average research skills; had difficulty drawing conclusions from the research; and did not participate in class discussions.

### Vocabulary

#### ectothermic

**Definition:** The scientific term for cold-blooded animals, which rely on the environment to regulate their body temperature

**Context:** Reptiles are ectothermic animals.

### **endothermic**

**Definition:** The scientific term for warm-blooded animals, which can generate heat within their bodies to regulate their body temperatures

**Context:** Birds and mammals are endothermic animals.

### **homeothermic**

**Definition:** The ability to maintain a constant internal body temperature

**Context:** A homeothermic animal can live in cold climates and still maintain a constant body temperature.

### **hypothesis**

**Definition:** A prediction or an educated guess based on previous knowledge or experimentation

**Context:** After developing a hypothesis, scientists design an experiment to test their ideas.

### **poikilothermic**

**Definition:** Having an internal body temperature that changes depending on the conditions in the environment

**Context:** A poikilothermic animal's body temperature depends on its environment.

## **Academic Standards**

### **National Academy of Sciences**

The National Science Education Standards provide guidelines for teaching science as well as a coherent vision of what it means to be scientifically literate for students in grades K-12. To view the standards, visit <http://books.nap.edu>.

This lesson plan addresses the following science standards:

- Science as Inquiry: Understandings about scientific inquiry
- Life Science: Structure and function in living things; Regulation and behavior

### **Mid-continent Research for Education and Learning (McREL)**

McREL's Content Knowledge: A Compendium of Standards and Benchmarks for K-12 Education addresses 14 content areas. To view the standards and benchmarks, visit link:

<http://www.mcrel.org/compendium/browse.asp>

This lesson plan addresses the following national standards:

- Science – Life Sciences: Understands the structure and function of cells and organisms, Understands biological evolution and the diversity of life; Nature of Science: Understands the nature of scientific knowledge
- Language Arts – Writing: Uses the general skills and strategies of the writing process, Gathers and uses information for research purposes

## **Support Materials**

Develop custom worksheets, educational puzzles, online quizzes, and more with the free teaching tools offered on the [DiscoverySchool.com](http://DiscoverySchool.com) Web site. Create and print support materials, or save them to a Custom Classroom account for future use. To learn more, visit

- <http://school.discovery.com/teachingtools/teachingtools.html>