

## Assignment Discovery Online Curriculum

**Lesson title:**

What's New with Dinosaurs?

**Grade level:**

6-8

**Subject area:**

Life Science

**Duration:**

Two class periods

**Objectives:**

Students will do the following:

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

**Materials:**

- 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 fascinating 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, 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 down students' responses on a sheet of newsprint. They may mention that there are 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. Warm-blooded animals can generate heat and moderate their own temperatures. The body temperature of a cold-blooded animal is dependent on the

temperature of its environment. In this lesson, students will follow the debates of scientists who are trying to determine how to categorize dinosaurs. As students probably know, reptiles are cold-blooded, while birds are warm-blooded. 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, either on the overhead or as a handout.
  - **endothermic:** The scientific term describing 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 certain types of animals to maintain their body temperatures.
  - **ectothermic:** The scientific term describing 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**

General information:

<http://www.ucmp.berkeley.edu/diapsids/dinosaur.html>

Information supporting the theory that dinosaurs were endothermic:  
<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**

General information:

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

Hypotheses supporting the theory that dinosaurs were ectothermic:

<http://www.ucmp.berkeley.edu/diapsids/ectothermy.html>

6. Give students time in class to complete their research and write their group 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:
  - There were many kinds of dinosaurs with 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 ectothermic at first but then 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 even scientists can't always draw decisive conclusions about complex issues and that they reevaluate their findings in light of new information.

8. Review the list of ideas about dinosaurs that students generated at the beginning of the lesson. Ask students whether their ideas about dinosaurs have changed. If so, have them explain the reasons for those changes.

### **Discussion Questions:**

1. What surprised you about the controversy of whether dinosaurs are ectothermic or endothermic? Did you think that most scientific information is more straightforward? Give reasons to support your ideas.
2. Based on what you learned during this lesson, do you think birds may have evolved from dinosaurs? Give reasons to support your ideas.

3. Which kind of animal do you think has the best chance to survive<sup>^</sup>ectothermic or endothermic? What evidence do you have to support your ideas?

**Evaluation:**

Use the following three-point rubric to evaluate how well students developed hypotheses, conducted research, drew conclusions from their research, and participated in class discussions.

**Three points:** developed a clear, thoughtful hypothesis; showed strong research skills; drew logical conclusions from the research; and participated actively in class discussions.

**Two points:** developed a workable hypothesis; showed on-grade research skills; drew some conclusions from the research; and participated somewhat actively in class discussions.

**One point:** 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.

**Extension:**

**Were Dinosaurs Birds?**

Using the Web sites given in the lesson, ask each student to make a poster illustrating whether dinosaurs were actually birds. Students can list the characteristics thought to be closely linked to birds, draw pictures of dinosaur fossils and birds that feature similarities, or make a timeline of research findings that suggest that dinosaurs were birds. If time permits, have students present their posters to the class.

**Suggested Reading**

*Dinosaur Ghosts: The Mystery of Coelophysis*

J. Lynett Gillette. Dial Books for Young Readers, 1997.

At a site in New Mexico in 1947, hundreds of fossil remains of Coelophysis, a small dinosaur about the size of a dog, were found in one place. This book examines the mystery of these dinosaurs, what they looked like, how they lived, and how they came to be buried together. Illustrations and photographs help tell the story.

*A Dinosaur Named Sue: The Story of the Colossal Fossil, the World's Most Complete T. Rex*

Pat Relf. Scholastic, 2000.

For many of us, the Tyrannosaurus Rex is the dinosaur that, more than any other, captures the essence of these amazing creatures. The 1990 discovery in South Dakota of the most complete T. Rex skeleton is most significant fossil find of the 20th century. This book documents the discovery of the fossil and the work it took to put it together. One chapter discusses what the life of the T. Rex was like, and another explores what can be learned from this exciting find.

**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 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:**

This lesson adheres to the National Science Education Standards for students in grades 5-8:

- Life Science

**Credit:**

Marilyn Fenichel, a freelance writer and curriculum developer.

This lesson was developed in consultation with Mary Cahill, a middle school science teacher.

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