

## Lesson Nine

# Competing Hypotheses of Dinosaur Extinction: Argumentation from Evidence

### Background

There have been many **mass extinctions** throughout Earth history. One occurred at the end of the Paleozoic Era 251 million years ago when nearly 95% of plant and animal life in the seas disappeared. Another mass extinction may be happening today. Evidence from the fossil record shows that, on average, only 10–100 species become extinct per year (normal, background extinction rate) however, some estimates show that current rates of extinction are as high as 27,000 species per year!

Probably the most famous mass extinction happened 66 million years ago when the **non-avian dinosaurs** disappeared. Many other plants and animals became extinct at the same time. Whatever triggered the extinction of the non-avian dinosaurs also caused the death of nearly 70% of all the other species on Earth.

What caused this mass extinction? Clues can be found in the rocks that date from 66 million years ago.

Our classroom of scientists will engage in the practices of professional scientists, including **ASKING QUESTIONS** and **ENGAGING IN ARGUMENT FROM EVIDENCE**.

### LEARNING TARGETS

At the end of the lesson, I will be able to:

- use evidence to **construct an explanation** for the cause(s) of dinosaur extinction, *and* present my explanation to my peers,
- **argue** for and defend a hypothesis for dinosaur extinction,
- **ask questions** about and **evaluate** the causal hypotheses of other groups,
- and describe the evidence for both **sudden and gradual changes** at the Cretaceous-Paleogene mass extinction boundary.

**Part 1**

1. In your group, brainstorm everything you have heard about the reasons the (non-avian) dinosaurs went extinct at ~66 million years ago. We will call these the potential causes of dinosaur extinction.

2. In the box above, put a star (\*) next to the causes that would be classified as SUDDEN causes of extinction. Put a circle (o) next to the GRADUAL causes of extinction.
3. Put a box around the extinction cause that your group selected to work with. List below at least 3 pieces of evidence that would support your theory of why the dinosaurs went extinct.

Evidence that would support our hypothesis:

4. Turn your causal statement and supporting evidence into a hypothesis. A hypothesis must be supported by evidence. A hypothesis statement includes the cause of extinction and the evidence that would support your hypothesis. Your hypothesis should be in the format of an “if..., then...” statement. Example: “If [causal statement] explained the non-avian dinosaur extinction, then scientists would find [3 pieces of evidence].”

Our group's hypothesis:

**Part 2**

Your job is to sort through the actual scientific **EVIDENCE** to propose a **HYPOTHESIS** to explain the extinction of the dinosaurs. Your hypothesis must be supported by evidence. At the same time, all evidence does not support just one hypothesis. Some pieces of evidence will not be used. Some pieces of evidence contradict one another. Sometimes, the same evidence can support very different hypotheses. Some pieces of evidence may be more conclusive than others. It is up to you to come up with a hypothesis that makes sense and is well supported by the evidence.

1. Carefully read each evidence card you are given.
2. Organize the evidence cards into groups that seem to be related to each other.
3. In your group, decide on a cause of dinosaur extinction that you think is supported by the evidence. Turn your causal statement into a hypothesis and write your hypothesis below. **Remember** a hypothesis includes pieces of evidence that would support the causal statement (see #4 above for a reminder on writing hypothesis statements).

Our group's hypothesis:

4. List below ALL the pieces of evidence that SUPPORT your cause for dinosaur extinction.

5. Is your group's hypothesis a gradual or sudden explanation for dinosaur extinction? Circle below and defend your choice.

Our hypothesis is a GRADUAL/SUDDEN explanation for dinosaur extinction. (Circle your answer) because...

6. List below ALL the pieces of evidence that CONTRADICT your cause for dinosaur extinction.

7. Write a hypothesis that explains the evidence that contradicts your hypothesis. We will call. This is an ALTERNATIVE HYPOTHESIS.

Alternative Hypothesis Statement:

Pieces of Evidence Supporting this Alternative Hypothesis:

8. When scientists engage in ARGUMENTATION, they use COUNTERARGUMENTS to support their hypothesis from the criticism of other research teams. Using the alternative hypothesis you wrote, how would you defend your original hypothesis from criticism from

other research teams? Brainstorm counterarguments that support your original hypothesis. Remember to only use as evidence the cards that you were given.

*\* You will present your hypothesis to the class, be prepared to argue for your hypothesis to be accepted by your peers as the best explanation for dinosaur extinction given the provided evidence.*

Counterarguments that support our original hypothesis for non-avian dinosaur extinction:

**Reflection**

9. Does the evidence we examined as a class today support a single causal hypothesis for dinosaur extinction? Use evidence to support your answer.

10. Does the combined evidence support a gradual cause or a sudden cause for non-avian dinosaur extinction? Circle your choice and use evidence to support your answer.

The combined evidence we examined predominantly supports a GRADUAL/SUDDEN cause of non-avian dinosaur extinction because...