

Appendix 1. Questions used to assess hypothetico-deductive thinking skills

Question 1 (“The triceratops question”)

The Hell Creek rock formation in Eastern Montana contains abundant fossils of dinosaurs. This rock formation is important to paleontologists because the rocks in this area contain fossils from before, during, and after the extinction of dinosaurs 65 million years ago. As with all undisturbed rock layers, the rocks layers at the bottom of the Hell Creek formation are the oldest, and the rock layers at the top are the youngest. Jack Horner at Montana State University has systematically collected dinosaur fossils from throughout the Hell Creek Formation. This collection contains fossilized bones from all of the animals living in Montana 65 to 70 million years ago.

Paleontologists have longer wondered what caused most dinosaur species to go extinct 65 million years ago. Two hypotheses include:

Hypothesis 1: A meteor impact caused most dinosaur species to go extinct

Hypothesis 2: Increasing competition with mammals caused most dinosaurs to go extinct.

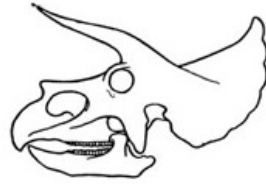
How would you use the fossils found in the Hell Creek formation to test each hypothesis?

Question 2 (“The asteroid question”)

As discussed in the previous question, the Hell Creek rock formation in Eastern Montana contains abundant dinosaur fossils, including many skeletons of Triceratops and Torosaurus, two similar-looking dinosaurs that have skulls with three horns and a broad bony shield (see figure below). There are two main distinctions between Triceratops and Torosaurus. The skull of a Torosaurus is longer and has holes in the upper part of the bony shield (see figure below). There has been debate among paleontologists whether Triceratops and Torosaurus are two different species or whether they are the same species. Two specific hypotheses have been proposed:

Hypothesis 1. Triceratops and Torosaurus are two distinct species.

Hypothesis 2. A “Torosaurus” is an adult Triceratops, or, equivalently, a “Triceratops” is a juvenile Torosaurus.



Triceratops



Torosaurus

How would you use fossils from the Hell Creek Formation to test these hypotheses?

