SN IN HIGH SCHOOLS

February 4, 2017

Dino Doomsday

Article-Based Questions

Directions: After reading the article "Devastation detectives," answer these questions:

1. **Scientists have evidence that an extraterrestrial event changed the landscape of Earth about 66 million years ago. Explain the event and its effects.**

2. **What other landscape-changing event may have contributed to the dinosaur extinction? How did it impact the environment?**

3. **What element has been found in the layers of earth that mark the boundary between the Cretaceous and Paleogene periods? Why is that element significant?**

4. **Imagine that you were a dinosaur standing on Earth during the Chicxulub impact. Assuming you weren't close enough to be immediately physically injured, describe what aftereffects you might have experienced.**

5. **Clay Tabor and his colleagues at the National Center for Atmospheric Research in Boulder, Colo., assembled a computer simulation of the climatic consequences associated with the Chicxulub impact. What did the simulation show?**

6. **Paleontologist Gerta Keller said that "Deccan volcanism is vastly more dangerous to life on Earth than an impact." What evidence could be used to support this statement?**

7. **Based on the evidence presented, what do you think caused the mass extinction of the dinosaurs? Explain your answer.**

SN EDUCATOR GUIDE February 4, 2017

Dino Doomsday

Responses to Article-Based Observation

1. **Scientists have evidence that an extraterrestrial event changed the landscape of Earth about 66 million years ago. Explain the event and its effects.** Possible student response: A space rock crashed into Earth and created the Chicxulub crater (approximately 180 kilometers wide) near what is currently the country of Mexico. Scientists believe that this impact caused mountains to form within minutes and tsunami waves to bury plants and animals in rubble.

2. **What other landscape-changing event may have contributed to the dinosaur extinction? How did it impact the environment?** Possible student response: Evidence suggests that super-volcanic eruptions near what is now India may have acidified the oceans and destabilized ecosystems. The impact of Chicxulub may have boosted the eruptions.

3. **What element has been found in the layers of earth that mark the boundary between the Cretaceous and Paleogene periods? Why is that element significant?** Possible student response: Luis and Walter Alvarez discovered iridium along this boundary in 1980. Iridium is rare in the Earth's crust but abundant in space rocks. This discovery fostered the idea that a significant impact from an asteroid or comet occurred between the Cretaceous and Paleogene periods and may have contributed to a mass extinction around that time.

4. **Imagine that you were a dinosaur standing on Earth during the Chicxulub impact. Assuming you weren't close enough to be immediately physically injured, describe what aftereffects you might have experienced.** Possible student response: The ground would be shaking under my feet. Rocks start to pop up as the ground churns. There are ashes and soot flying everywhere causing fires to start when hot ash hits grasses. The sky grows darker and darker, and soon I can't see anything around me. I see a wave of water the height of a tall mountain.

5. **Clay Tabor and his colleagues at the National Center for Atmospheric Research in Boulder, Colo., assembled a computer simulation of the climatic consequences associated with the Chicxulub impact. What did the simulation show?** Possible student response: The simulation showed that no light reached any part of Earth's surface for two years causing average temperatures to drop by some 16 degrees Celsius. Areas around the equatorial Pacific experienced bigger drops than polar regions and coastal areas felt less impact than inland areas. It took about six years for sunlight levels to return to normal. For about two years after that, temperatures continued to rise above pre-impact levels, probably because the carbon dioxide levels in the atmosphere were higher and created a "warming blanket" around the planet.

6. **Paleontologist Gerta Keller said that "Deccan volcanism is vastly more dangerous to life on Earth than an impact." What evidence could be used to support this statement?**
   Possible student response: Deccan volcanic eruptions near India spewed more than 1.3 million cubic kilometers of molten rock and debris. The volcanic activity started 250,000 years before the impact and continued for about 500,000 years after. Volcanic activity releases mercury into the environment that weakens the plankton population, which is the foundation of marine food chains. Carbon dioxide levels in the atmosphere also increased due to volcanic eruption, contributing to climate change and ocean acidification.

7. **Based on the evidence presented, what do you think caused the mass extinction of the dinosaurs? Explain your answer.** Possible student response: The "double doomsday" or combination of the Chicxulub impact and Deccan volcanism is supported by some researchers. Sierra Petersen, a geochemist at the University of Michigan, argues that either event alone would have caused some extinction, but a mass extinction was likely caused by a combination. The physics does not readily support the "double doomsday" scenario, so some scientists support the impact scenario alone.