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TEACHER GUIDE

EARTH'S LANDSCAPES
GRADES 3-5

COMMON MISCONCEPTIONS

- **The Earth is unchanging. Earth is the same today as it always has been.**
  Earth's landscapes are dynamic and can change quickly or over long periods of time.

- **Any changes to the Earth were sudden.**
  Although some changes to the Earth are sudden, like volcanic eruptions or earthquakes, smaller changes take place over long periods of time and can build up to make big changes to the landscape (like the Grand Canyon).

- **Materials that are moved by erosion just disappear.**
  Materials moved by erosion are deposited elsewhere, and form layers which build up to become new landforms.

- **Weathering and erosion have the same effect in all environments.**
  As the environment changes over time, the rates of erosion and deposition are affected. For example, a river may dry up due to a change in climate, which means sediments are no longer eroded or deposited by the water.

CHANGES TO EARTH'S LANDSCAPES

Although it may seem static during our lifetime in many places, Earth is constantly changing, as it has been throughout its history. The landscape we see today may be different tomorrow, or in thousands of years from now. Changes that happen quickly - such as earthquakes, floods, tsunamis, and volcanic eruptions - create obvious and sometimes catastrophic changes to the landscape. If you don't live somewhere that is affected by these events, you may feel like Earth doesn't change. However, the slower and less obvious changes occur constantly around us. The processes of weathering, erosion, and deposition continuously break down rock and move it to new locations. Both wind and water play roles in these processes.

ROCK LAYERS

On Earth, when sedimentary rock layers form, more recent layers form on top of older layers. As long as the layers are not disturbed (overturned by earthquakes or faulting, or interjected with layers of volcanic rock) they represent a timeline from most recent at the top and oldest at the bottom. At this level, students are just being introduced to this concept, known as the Law of Superposition. Rather than complicate their understanding by discussing disturbances, focus is on the record of time that can be observed by studying the rock layers and the fossils they might contain.

Rock layers can help us understand the history of a landscape. If fossils from sea creatures are found in rock layers in a desert, there is evidence that the landscape was once very different. But how could an ocean once exist where a desert is now? Throughout Earth's history, the land we recognize today has moved slowly around the globe due to plate tectonics. Climate has fluctuated naturally over vast periods of history, leading to more or less water in our oceans. Because of these factors, there were times in Earth's history when portions of the land we know today to be desert or plains were actually covered by the sea. Over time, the water receded and climate shifted, leading to the landscapes we know today.

RELATIVE AND ABSOLUTE DATING

At this level, when we are talking about Earth's vast history, we are largely focusing on relative dating. Students can understand that the marine fossils found in the video, which are about 15 million years old, are much more recent than the dinosaurs (65-225 million years ago). The video also mentions radiocarbon dating, also sometimes called carbon-14 dating. This is a method which uses the breakdown of carbon isotopes to determine an "absolute" (within a margin of error) age of an object (fossil, artifact) containing carbon. Students may have heard about this, but it is more important that they gain an understanding of relative dating based on rock layer position at this point in their learning.

IMPORTANCE OF PHYSICAL EVIDENCE IN SCIENCE

Science by nature relies on evidence to support ideas. Different scientists study the same evidence, or other related evidence, and explain how they think this evidence supports their explanation. Then other scientists look at their arguments (how they have interpreted the evidence) and agree or disagree based on how they themselves interpret the evidence. When many scientists agree, an explanation becomes stronger. When scientists disagree, they return to the evidence to try to learn more or they try to find more evidence to support their claims.