Lesson Plan

3-5 CONSTRUCTING DESTRUCTION

Essential Questions:

1. How do constructive and destructive forces impact land and animals?
2. What role does water play in the formation of surface features?

GSE Standards:

- **S3E1**: Obtain, evaluate, and communicate information about the physical attributes of rocks and soils.
- **S4E3**: Obtain, evaluate, and communicate information to demonstrate the water cycle.
- **S5E1**: Obtain, evaluate, and communicate information to identify surface features on the Earth caused by constructive and/or destructive processes.

NGSS Standards:

- **4-ESS2-1**: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- **5-ESS2-1**: Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.

Materials:

- Tin pans or paint trays
- Dry sand
- Wet sand
- Pebbles
- Large rocks
- Small water bottles with holes poked in the lid
- Toy animals, trees, or buildings

Vocabulary:

- Constructive
- Destructive
- Erosion
- Weathering
- Deposition
- Geosphere
- Hydrosphere
- Water Cycle
- Watershed

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Background:

- Watersheds: A watershed is where all the rivers and precipitation collect and flow, typically towards an ocean or lake.
  - Watersheds can range in size and are easily impacted by runoff, where the water picks up chemicals and pollution as it travels through the watershed.
- Water Cycle: The water cycle connects all bodies of water on our planet to the atmosphere, and is a continuous cycle of evaporation, condensation, and precipitation.
  - Precipitation comes in many forms, from rain to snow, hail to sleet. These can all cause weathering and erosion of various landforms.
  - As water evaporates, minerals, salts, and other sediments can be left behind, causing changes to the landforms.
- Constructive Forces: Constructive forces are processes that add to the surface of the Earth, sometimes taking place over millions of years. Typically split into one of two categories, either fast or slow processes.
  - An example of a fast process is the hardening of lava into rock changing a landscape.
  - An example of a slow process is the formation of Hawaiian Islands by volcanic activity.
- **Destructive Forces:** Destructive forces are processes that break down land such as weathering and erosion. Much like constructive forces, there are both quick and slow destructive forces.
  - An example of a fast process is the damage caused by tsunamis or earthquakes.
  - An example of a slow process is the slow weathering away of rocks by wind or water.

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Background:

- Weathering: The breaking down of rocks, minerals, and sand by water, ice, wind, or other factors. This can drastically change a landscape, although often it is a slow process.
  - There are several different categories of weathering, such as physical and chemical processes.
- Erosion: The process of rocks, minerals, and sand being removed from one location and deposited in another.
  - Erosion is distinct from weathering because it involves movement of the sediment.
- Deposition: The process of dropping off broken-down rock in a new location. Deposition marks the end of erosion and can result in the formation of new landforms.
- Our universe is made up of the following spheres.
  - **Geosphere**: Contains all the rocks, soil, and nonliving matter.
  - **Hydrosphere**: Contains all the water.
  - **Biosphere**: Contains all the living organisms.
  - **Atmosphere**: Contains all the air.
- These spheres are all interconnected with each other.
- Land features change constantly due to the weathering, erosion, and deposition of sediment, especially due to the water cycle processes.
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Lesson Structure:

1. Ask students to identify the difference between a constructive and destructive force, giving examples of each. Review the background information and vocabulary terms with students, highlighting how water can impact a watershed.
2. In small groups, challenge students to create a watershed in their pans using the sand, pebbles, and rocks that will demonstrate the most amount of erosion possible. If available, add in small figures to represent animals, trees, and buildings.
3. To test their model, fill small bottles with water and have them mimic a rain shower by sprinkling water onto their models. Observe results.
4. Next, have students mimic a flood by pouring water directly on the top of their model.
5. For the next stage, have students redesign their watershed pans to model the least amount of erosion possible.
6. Repeat steps 3 and 4, making sure to record their results again.

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Evaluate:

1. Students' models should demonstrate a clear understanding of how the physical attributes of rocks and soil experience weathering and erosion due to water.
2. Ask students to identify the stages of the water cycle in their models. Discuss what would happen to the water next.
3. Discuss with students what happened to their landforms. Have them share their strategies for preventing erosion.
4. Have students compare and contrast the different properties of rocks vs sand in preventing or enabling erosion.

Extend:

1. To help familiarize students with the vocabulary words, create a matching game or flashcards.
2. Demonstrate the impacts of an earthquake or tsunami by shaking the pans, or mimicking a large wave with the water in the pan after the rain or flood.
3. To further model the water cycle, have students set the pans in the water in a sunny place, and record how long it takes for the water to evaporate.
4. Have students research how constructive forces can create entire island chains, by beginning with this video from Physics Girl.