EDUCATION
GEORGIA AQUARIUM

Lesson Plan
6 SEDIMENTATION STATION

Essential Questions:

1. How does the process of sedimentation and deposition shape the world we live in?
2. How does human activity impact the surface of the Earth?
3. How can we minimize our impact?

GSE Standards:

- **S6E5.e**: Develop a model to demonstrate how natural processes (weathering, erosion, and deposition) and human activity change rocks and the surface of the Earth.
- **S6E6.b**: Design and evaluate solutions for sustaining the quality and supply of natural resources such as water, soil, and air.

NGSS Standards:

- **MS-ESS2-1**: Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- **MS-ESS3-3**: Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Materials:

- Clear container/jar with watertight lid (1 per student)
- Water
- Small rocks, gravel, sand, leaves, sticks, and other sediments
- Food dye
- Observation log (printed)

Vocabulary:

- Sediment
- Sedimentation & Deposition
- Erosion
- Weathering
- Suspension (in water)
- Pollutant

Lesson Plan
6 SEDIMENTATION STATION

Background:

Sedimentation, Deposition, and the Water Cycle

- Sediment: Naturally occurring material that has been broken down and moved to a different location through processes like erosion, weathering, or gravity. They can be transported by wind, water, or ice and are usually deposited in river beds, streams, beaches, and the bottoms of lakes and rivers.
  - Fluvial sediment: Transported by water (ex. rivers)
  - Aeolian sediment: Transported by wind (ex. deserts and sand dunes)
  - Glacial sediment: Transported by ice (ex. glacial moraine deposits - piles of rock and soil left behind by glaciers as they move)
- Erosion: The action of surface processes that removes soil, rock, or dissolved matter from one location on the Earth's crust and transports it to another location. Erosion is distinct from weathering as it involves motion.
- Weathering: The breaking down/dissolving of rocks and minerals on the surface of the Earth. This process does not need motion to break down material.
- Sedimentation: The deposition of sediments from a state of suspension in fluid. Effectively, this is the process of existing material settling from suspension due to gravity.
- **Deposition:** The process of adding materials/matter to a surface. (Ex. waves/water depositing new sediment to beaches/lake shores).
- **Sedimentary Cycles:** A type of biochemical cycle in which various essential elements and chemicals move through the stages of dry solid to broken down components in water.
- **Essential Elements:** The basic components necessary for living organisms on Earth to survive. They include carbon, oxygen, hydrogen, nitrogen, and sulfur. Other essential elements include minerals like calcium, phosphorus, potassium, sodium, and magnesium.
  - These elements flow through the water cycle and can move through these systems via sedimentation and deposition.

Lesson Plan
6 SEDIMENTATION STATION

Background:

- Water Cycle: The continuous movement of water between Earth's atmosphere, land, and oceans.
- Pollutants: Any substance that is harmful to living organisms and the environment.

Natural Cycles vs. Human Impacts

- Typically, sediment begins as a larger structure/object that is broken down over time to smaller, more transportable forms of matter. As rocks are eroded and weathered by time and the elements, the smaller pieces (sediment) travel far and wide by land, water, or air. Without human interference, these sediments will continue their cycle or become settled under new materials/matter or at the bottom of a body of water unless disturbed.
- These processes are responsible for the formation of natural landmarks like the Grand Canyon - where we are able to witness both the result of erosion as well as sedimentary rock! Sedimentary rock is formed when minerals and organic particles settle and eventually are cemented together.
- We can tell a lot about the history of the Earth by investigating sedimentary rock, as it can tell us about what ancient environments, climates, and life forms looked like in ages past. Each layer offers a glimpse as to what prehistoric environments offered through the preservation of fossilized animals and plant life.
- These processes are still hard at work today, but they look very different when compared to the past. We can see the real-time effect of erosion and sedimentation as they move and work against our structures and populations.
- Wind and water are also capable of transporting other substances - like inorganic/man-made materials like chemicals, plastics, litter, and any variety of human by-product.

Lesson Plan
6 SEDIMENTATION STATION

Background:

- Human populations are responsible for altering the structures and landscape of the surface of the Earth, which can disrupt naturally occurring paths and cycles.
- By redistributing soil/earth for construction - there is a possibility to introduce a different sediment into the system that might not typically exist there resulting in an altered ecosystem.
- Additionally, clearcutting of trees and removal of plant life allows for greater erosion impacts from water and wind.
- Another important factor to keep in mind is the presence of chemicals and pollutants in the water system and soil. Whether the chemicals are introduced unintentionally (through spills or accidents) or through improper handling of toxic substances - these chemicals thoroughly saturate the earth and water they come into contact with.
- Harmful chemicals that travel via wind or water can take days to weeks to evaporate only if they reside on the surface of the water/earth.
- By being mindful of the proper disposal methods for objects and chemicals that could have a harmful impact on the ecosystem, we can reduce the initial presence of these pollutants. By recycling appropriate materials to keep them out of the environment, we can also work to minimize our impact.

Lesson Plan
6 SEDIMENTATION STATION

Lesson Structure:

1. Begin by making sure each student has a clear, see-through container or jar that has a watertight lid. Or, students could work in pairs with one jar for the pair.
2. Either collect an assortment of sediments for students to make their jar with or take students outside and have them collect a variety of sediments to partially fill their jar. They should not fill the jar more than about halfway or 3/4 of the way full. They could use small rocks, gravel, sand, soil, leaves, grass, or sticks as some choices for their sediments. Once they have chosen their sediments, fill their jars with water and seal the container with the lid. Ensure that no insects/bugs get collected!
3. Have students shake up their jars and document their observations on their log for round 1 every 5 minutes as the jar settles.
4. Students should see heavier objects like rocks settle first, followed by heavier organic matter, and then the smallest particles like sand/soil and the lightest organic matter settle on the top.
5. Once the jar is settled, add a few drops of food dye to mimic a harmful liquid pollutant and repeat step 4 and log observations on their log for round 2.

EDUCATION
GEORGIA AQUARIUM

Lesson Plan
6 SEDIMENTATION STATION

Evaluate:

1. Students should be able to explain why certain sediments sank to the bottom faster than others based on their weight and density.
2. Ask students to consider why the food dye was able to permeate the entire jar and sediment and not just the water.
    a. This is also where students are asked to consider how harmful pollutants work through the water cycle and move through the earth.
3. Have students compare how different human activities could affect this process and how it could affect the local ecosystem.

Extend:

1. To help familiarize students with the vocabulary words, make flashcards with definitions and images to visualize the processes.
2. An alternate activity could be students using either pieces of paper, larger/smaller objects, or obstacles for their container to demonstrate how sediments settle alongside obstacles (foam/beads/etc).
3. Research/learn about local or popular examples of sedimentation (ex. the Grand Canyon) and discuss events that contribute to the different layers.
4. Learn more about responsible ways to dispose of common pollutants and hazardous waste from the Environmental Protection Agency. https://www.epa.gov/hw

Lesson Plan
6 SEDIMENTATION STATION

ROUND 1: SEDIMENTATION STATION OBSERVATION LOG NO FOOD DYE	
5 mins	
10 mins	
15 mins	
20 mins	

EDUCATION
GEORGIA AQUARIUM

Lesson Plan

3-5 CONSTRUCTING DESTRUCTION

ROUND 2: SEDIMENTATION STATION OBSERVATION LOG WITH FOOD DYE	
5 mins	
10 mins	
15 mins	
20 mins	