Sedimental Journeys

Objectives: Participants will learn what sand is, where it comes from, some of the different properties of sand, and human use of sand. They will also make observations about different sand minerals.

Time needed: 10-15 minutes

Target age: General Public

Materials needed:
- assortment of small items, some of which are made of sand, some of which are not (Examples include glass votive, sand paper, emery board, 'sand-colored' felt, asphalt shingle, 'pearl' beads, mollusk shell, lava soap, paper, plastic, etc.)
- assortment of sand samples from around the world (ours are in small Petri dishes with lids hot glued on)
- sheet with sand grain size illustration, sorting illustration, rounding illustration
- small plastic sea turtle
- magnifying glass/hand lens
- light and dark surfaces (paper will do)
- magnet
- vinegar
- pipette

Description: Although most people know sand when they see it, when asked to explain what sand is, they find themselves at a loss. This first activity is designed to give participants a better understanding of what makes sand, sand. Participants are shown the assemblage of items, some of which are made of sand, some of which are not. They are asked to sort the items into groups that are made of sand and groups that are not. This should encourage some critical thinking about the nature of sand, however, discussion should wait until participants are finished sorting. After participants have finished their sorting, they are asked to define 'sand', and then discuss the definition using the grain-size illustration. Each item should be discussed and correctly placed. If applicable, items can be compared to the grain size chart. The glass votive can lead into a discussion of different sand minerals, and the shell and the 'pearls' can lead into a discussion of mineral cycling. Other topics of discussion should include human uses of sand and sources of sand and other earth materials (petroleum > plastic, wood > paper). This next activity is an exploration of the characteristics, properties, and sources of sand, and it can lead into discussions of more complex processes such as mineral cycling and ocean acidification. Participants are shown a small plastic sea turtle in a Petri dish of sand (the presenter should know where the sand came from but should not reveal this information). An imaginary scenario is introduced, in which this 'sea turtle hatchling' was rescued from the beach. It is now time to return the hatchling to the beach from which it came, but due to a paperwork mishap, the beach is unknown. Participants are tasked with matching the sand that was transported with the hatchling to known sand samples. Even with a number (~20) of sand samples, this task is easily accomplished even by very young participants, so they will get more out of the activity if the presenter leads them through a series of questions asking them to make observations about the samples – Is the turtle's sand light or dark? Then eliminate the dark sand from the group. Can you find a sample that is mostly shell and coral? Is the turtle's sand like that sample? Look at the grain size. Are there samples that

have obviously different grain sizes? The magnifying lens and the light and dark surfaces can be used to better examine the samples. Once participants have eliminated all but three or four samples, they should be asked to match a known sample to the turtle's sand. The last few sand samples that look very similar might be from beaches that are very distant from each other, while beaches that are closer in proximity might have sand that is obviously different. Discussion should include sand sources, sand mineral composition and properties – some of the sand samples might have enough metal to show obvious movement when a magnet is passed under the Petri dish; the effect of a couple of drops of vinegar in a dish of calcium sand can be compared to vinegar in silica sand.

Extensions:

- The vinegar demo can lead to a discussion of the calcium buffering system and ocean acidification.
- Discussion might include a more in-depth look at sediment transport, erosion, beach nourishment, and social, economic, legal, political, and engineering perspectives on sand use.
- Discussion might include sediment as a pollutant and its impact on waterways.

Standards:

National Science Education Standards:

Unifying Concepts and Processes – Systems, order, and organization; Evidence, models, and explanation; Change, constancy, and measurement

K-4

Science as Inquiry – Understandings about scientific inquiry
Physical Science – Properties of objects and materials; Position and motion of objects
Earth and Space Science – Properties of earth materials; Changes in earth and sky
Science and Technology – Abilities to distinguish between natural objects and objects made by man
Science in Personal and Social Perspectives – Types of resources

5-8

Science as Inquiry – Understandings about scientific inquiry
Physical Science – Properties and changes of properties in matter
Science in Personal and Social Perspectives – Populations, resources, and environments

9-12

Science as Inquiry – Understandings about scientific inquiry
Physical Science – Structure and properties of matter
Earth and Space Science – Geochemical cycles
Science in Personal and Social Perspectives – Natural resources

Ocean Literacy: Essential Principles and Fundamental Concepts:

1. *The Earth has one big ocean with many features.* – g. The ocean is connected to major lakes, watersheds and waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments and pollutants from watersheds to estuaries and to the ocean.
2. *The ocean and life in the ocean shape the features of the Earth.* – a. Many earth materials and geochemical sysles originate in the ocean. . . . Ocean life laid down the vast volume of siliceous and carbonate rocks.; c. Erosion – the wearing away of rock, soil and other biotic and abiotic earth materials – occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.; d. Sand consists of tiny bits of animals, plants, rocks, and minerals. Most beach sand is eroded from land sources and carried to the coast by rivers, but sand is also eroded from coastal sources by surf. Sand is redistributed by waves and coastal currents seasonally.

Extensions Standards:

NSES:

K-4

Science in Personal and Social Perspectives – Science and technology in local challenges

9-12

Physical Science – Chemical reactions; Interactions of energy and matter

Science in Personal and Social Perspectives – Environmental quality; Science and technology in local, national, and global challenges