SAND SHAKE (1 Hour)

SIEMENS STEM DAY | Science Technology Engineering Math

Addresses NGSS
Level of Difficulty: 2
Grade Range: K-2

OVERVIEW

In this activity, students experiment with sand and hair dryers to observe how wind, sand, and barriers interact to form sand dunes.

Topic: **Earth Science**

Real-World Science Topics

- An exploration of wind deposition
- An exploration of Earth's landforms

Objective

Students will gain an understanding of forces and materials that shape the surface of Earth to produce landforms such as sand dunes

NGSS Three-Dimensions

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Developing and Using Models • Develop a model to represent patterns in the natural world	**ESS2.A: Earth Materials and Systems** • Wind and water can change the shape of the land.	**Stability and Change** • Things may change slowly or rapidly.

Materials Needed for Activity

- Several large images of sand dunes
- pencils
- drawing paper
- sand
- hair dryer or fan
- variety of objects used to create a barrier to the wind: blocks, rocks, leafy branches, jars, cardboard boxes, etc.

SIEMENS | Foundation Discovery EDUCATION
www.siemensstemday.com

How does wind move sand?

When wind blows across the surface of sand, it causes particles of sand to "leap" forward over short lengths along t ground. This process is called saltation. When the sand particles collide with one another, they can rise up into the a and be swept away by the air current. If the wind dies down slightly, the particle will fall back to the ground. In this process, the sand particle may cause new particles of sand to rise into the air. Thus, many sand particles moving through the air over a surface of sand can continually sweep new particles into the air. In deserts, this phenomenon can result in a sandstorm.

How do sand dunes form?

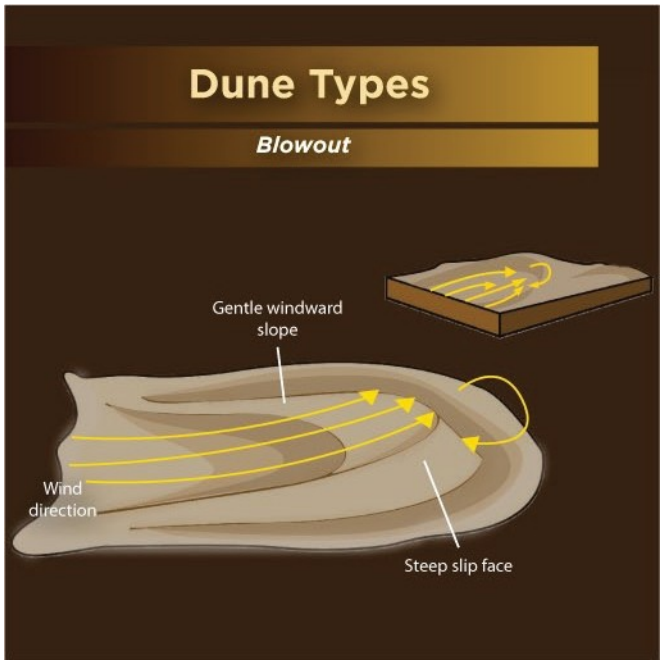
Sand dunes form when wind picks up particles of sand, transports them through the air, and then deposits the sand onto the ground in a new location. The lifting and transport of particles is called erosion, and the scattering of particles onto a new location is called deposition. The sand is deposited on the ground when the wind slows to a stop, or if the wind strikes a barrier and loses energy. In southern Colorado, these conditions exist a the Great Sand Dunes National Park and Preserve. Sand from the bed of an ancient lake is carried from southwest t northeast by a consistent wind that blows toward the Sangre de Cristo Mountains. During storms, an opposing winc blows from the mountains toward the lake, causing the sand dunes to develop vertically. These dunes are the tallest North America.

For images of these spectacular dunes,
visit: http://www.nps.gov/grsa/naturescience/sanddunes.htm.

Key Vocabulary

dune: a hill of sand built by wind
saltation: a term to describe the "leaping" like movement of sand carried in air or water
deposition: the depositing of Earth's particles, such as sand or rock, into a new location by means of wind or water
erosion: the lifting and transport of Earth's particles, such as sand or rock, by natural forces such as wind, water, and gravity

1. **Warm-up Activity:** Introduce the lesson by showing the class several images of sand dunes. Have students sketch the images of the dunes on plain paper. Drawing the images might help students recognize the patterns and shapes of the dunes. Discuss the patterns and shapes of the dunes. Most of us recognize that dunes have a gentle slope on one side and a steep slope on the other. Have students brainstorm other landforms that are similar to sand dunes.



2. Have students consider how sand dunes form and share any experiences they have had with dunes. What forces might cause the dunes to form? How does this process happen? What other factors could influence the shape of a dune?

3. Next, model the equipment setup for the class, as shown below:

Figure 1: Equipment Setup

(This experiment can be conducted outside on a smooth surface with a hair dryer used on the "low" setting. If electrical outlets are not available, students can use small portable fans.)

4. Divide students into pairs and distribute Student Handouts. Demonstrate how to create a source of sand, a source of wind, and a barrier to block the wind. Explain to students that they will use the wind from the fan to blow the sand toward the barrier. (It is a good idea to demonstrate this for students.) They should occasionally turn the fan off to observe the sand patterns/formations. Have students record observations and draw a sketch of the dunes that form on the Student Handouts.

5. Have students observe the effects of different barriers, different wind speeds, and combinations of both factors on the sand dune formation. As students work, circulate throughout the groups observing and supporting their efforts. Because students are encouraged to investigate a variety of sand/wind/barrier conditions, teams will observe a range of results in the challenge. Encourage students to observe the initial conditions for each investigation carefully (how strong is the wind source, how far away is the sand from the barrier, what kind of barrier did you use, and so on). Students may want to sketch their equipment setup for each investigation.

6. **Wrap-up Activity:** As a class, circulate around the work area to observe the results of all the teams. Have members of each team explain why they think the dunes formed. Explain that the wind picks up and carries loose particles of sand as it blows. This is called erosion. When the wind dies down or strikes a barrier, the sand falls to the ground, or deposits, in a new location. This process is called deposition. Have students think about other landforms that are formed by erosion and deposition and the effects that this can have on a landscape

Extension Activity

Using the Internet, have students identify various types of dunes. Different shapes and patterns develop depending on the characteristics of the materials and forces involved. The Internet provides extensive visual resources for dunes including diagrams, images from space, and photographs of dunes across the globe.

Students might develop a "dune identification chart" that represents the variety of dunes globally.

Sources

National Science Teachers Association

http://nsta.org

National Council of Teachers of Mathematics

http://standards.nctm.org/document

National Educational Technology Standards

http://cnets.iste.org/currstands/cstands-netss.html

Great Sand Dunes National Park and Preserve

http://www.nps.gov/grsa/naturescience/sanddunes.htm

Name:

Date:

In your own words, explain how sand dunes form.

In the space below, draw the arrangement of sand, wind, and barrier that created dunes. Include an arrow to represent the direction the wind was blowing, the dune formed, and the barrier.