

**The Learning Lab**  
**Science Skills on Wheels**  
**Lesson Plan**  
**Teacher's Name:** Rasheeda Murphy

<b>Title:</b> Soil Erosion Whose Mountain can Withstand the Test?	<b>Objectives:</b> The students will be able to: <ul style="list-style-type: none"><li>• Identify variables that influence the rate of change as they pertain to erosion.</li><li>• Understand that erosion can be caused by nature and can also be caused by humans</li><li>• Understand that the environment is constantly changing</li><li>• Design and build what they believe to be the strongest mountain possible through group consensus and using the assigned materials.</li></ul>
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<b>PA Standards Addressed:</b>		
3.2.4.A	3.5.4.A	3.5.4.B
3.8.4.A	3.8.4.B	3.8.4.C

**Relevance of Lesson:**  
This lesson deals with the rate of change. It will give students a hands-on experience manipulating and controlling some of the variables in one type of change, soil erosion. This lesson also addresses the environmental concerns with erosion such as loss of top soil, siltation and eutrophication, and the loss of buffer zones to prevent storm damage.

**Instructional Materials:**

- Plastic storage bins large enough for four students to work in at the same time
- Rocks (50lb bag)
- Water
- Building plan sheets (white sheets of paper/construction paper)
- Non-Latex gloves
- Potting soil (50lb bag)
- Sand (50 lb bag)
- Watering can
- Beakers to hold the contents @ each table
- Safety goggles

This lab is intended for students to work in collaborative groups of four.

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**Instructional Procedure (with time frames indicated):**

**Pre-activity:**

- The classroom teacher can discuss certain mountains with the students. He/she can also show the students pictures of mountains and ask the students to brainstorm ideas on how tall mountains typically are, and what they are made of. The classroom teacher can also discuss with the students why and how mountains are able to maintain their pointed tall shape.

**Entry:**

- Brief introduction of instructor. Welcome to Learning Lab. Students will be told the name of the instructor of the hour, the purpose of the The Learning Lab. (1min.)
- Student will watch the Safety Video (3 min)
- Students will be asked by the instructor if they have ever seen a mountain? Then they will be charged with, "Who can build the strongest mountain?" Expected response is that each student / group of students believes that they can build the strongest mountain. **(1 min, 5 min total)**

**Instructional Time:**

- Students will review the key terms for the lesson: **(2 min.)**
  1. *Erosion*: The wearing away of land surface by wind or water, intensified by land-clearing practices related to farming, residential or industrial development, road building, or logging.
  2. *Agriculture*: the work of raising crops or livestock (farming)
  3. *Deforestation*: destruction of forests from an area
  4. *Drought*: an extended period without rain or other precipitation

After students learn the definition of erosion, they will learn about some of the natural and man made causes of it: **(2min.)**

- - Natural factors:*
    - Heavy rains on loose soil
    - Drought
    - Steep slopes
    - Changing winds
  - Human factors:*
    - Deforestation
    - Intensive farming
    - Housing development
    - Building roads
- Students will discuss some of the careers associated with erosion:  
**United States Department of Agriculture (USDA):** Conservation of environmental resources that are an integral part of farming is a major goal of USDA

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**Environmental Consulting:** *firms are hired to make sure companies are following environmental laws and regulations*

**U.S. Geologic Survey (USGS):** *science organization that focuses on biology, geography, geology, and water; dedicated to the study of the landscape, our natural resources, and the natural hazards that threaten us*

**(1min)**

- Students will be asked to identify the Wissahickon Creek in Philadelphia, PA after being shown a video of the creek during a heavy rain event.
- Students will see photos of best management practices at a construction site.
- Students will also see the erosive effect that natural disasters such as Hurricane Katrina had on the Mississippi River's shoreline and the Chandeleur Islands east of New Orleans.
- The students will be charged again with, who can build a mountain able to with stand the instructor's erosion test?
- Each table will be given a blank sheet a paper titled, "Building Plan". On the sheet of paper the students will work in a group of four to draw a picture of what their mountain will look like. The instructor will walk around and tell the students that the mountains that they build should look like the mountains they are drawing on their building plans. The instructor will give the students time to complete their building plans then he/she will move the class into the actual lab activity.
- The students will be asked to write a hypothesis about their mountain. They are to guess how the mountain will stand up to the erosion test given the materials that are available to them.

**(15 min. /25 min. total)**

**Lab Activity:**

- Students will be reminded of lab rules
  - Do not play with the materials on the tables.
  - Do not throw the rocks.
  - Do not pass materials from one table to another.
  - Keep your hands out of your mouths.
  - At the end of the lab wipe your hands with a hand wipe.
- At this point in the lab, the instructor will instruct the students to put their safety goggles on, and then put on the gloves provided.
- \*All of the materials are arranged at each station before the students board the lab. The instructor will have prepared five stations in the following matter:
  - Station 1 – will have three beakers. One beaker of sand, one of rocks and the last of potting soil.
  - Station 2 - will have three large beakers of sand.
  - Station 3 – will have three large beakers of dirt.
  - Station 4 – will have three large beakers of rocks
  - Station 5 - will have three beakers. One beaker of sand, one of rocks and the last of potting soil.
- Once the students have on their safety goggles and gloves, the instructor will let the students build the mountains they designed on their building plans. The instructor will walk around making sure the students stay on task, and are working toward their goals.
- The students will have 4 minutes to complete the mountain building activity. A timer will ALARM once time is up.

**(10 min. / 35 min. total)**

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**Closure:**

- The Erosion Test
    - Once the mountains have been built, the instructor will test each station's mountain by pouring water over the mountain for 10 seconds to see how the mountain withstands erosion.
    - The students will then see slides of the Grand Canyon and be asked to identify the landform. They will then see additional pictures of the features of the Grand Canyon.
- (3 min. / 38 min. total)**

**Assessment:**

- Why did some mountains erode more than others?
  - Can people change the erosion rate of a real mountain?
  - How did your mountains change during the erosion?
  - How did they stay the same?
- (5 min. / 40 min. total)**

**Sources:**

- <http://www.col-ed.org/cur/sci/sci141.txt>
- Oceanography in the 21<sup>st</sup> Century - An Online Textbook by Robert Stewart
- <http://www.umich.edu/news/Releases/2004/Oct04/delta.html>
- Photos of the Grand Canyon
- Video of the Wissahickon Creek during a heavy rain storm

**Information for Classroom Instructors:**

- Students can ponder over the following question at a later time.
  - What other materials could you use to build a mountain that can withstand erosion?
- Teachers may allow students to build a mountain with the materials they suggest to see if those mountains can withstand erosion.
- The students are excited by working through manipulating variables. Manipulating variables is a main part of the scientific method.