

Rocks Weather

Created by: Debra McKey (Mountain Vista Middle School); Valerie Duncan (Upper Lake Middle School); Stacy Holland (Terrace Middle School); and, Sandra Cornell (Terrace Middle School)

Science Content Standards: Grade 6, 2.0 — *Students know* that topography is reshaped by the weathering of rock and soil and by the transportation and deposition of sediment.

Lesson Concept: Weathering is a process where large particles are broken into smaller particles.

Conceptual Flow:

- » Through weathering, erosion, and deposition of materials, Earth's surface is constantly changing.
 - Large rocks can become smaller rocks through the processes of weathering, including wind, and abrasion.
 - Weathering is a process where large particles are broken into smaller particles.
 - Abrasion occurs when sediments rub or objects forcefully collide with rocks.
 - Wind blowing sand acts as an abrasive to anything in its path.
 - Water expands and contracts (freezing and thawing) resulting in the breaking down of rocks.
 - Sand is a result of rocks being broken down.
 - Large rocks are broken and become smaller rocks and eventually sand.
 - Water can dissolve some chemicals in rocks.
 - Erosion occurs through wind transport, water, and ice transport.

Teacher Background:

Over long periods of time, many changes have occurred in Earth's surface features. Atmospheric constituents (mostly water, oxygen, and carbon dioxide) have interacted with minerals and rocks at Earth's surface, weakening them and breaking them down through a process called chemical weathering. Physical processes, such as the growth of plants, the release of pressure as overlying material is eroded, and the repeated freezing and thawing of water in cracks, have also helped to break down rocks. Fragments are transported downslope by wind, water, and ice. Gravity by itself moves material by way of landslides and slumps (called mass wasting). The ultimate destination of most of the products of weathering is the ocean. These products arrive in the form of marine sediment deposits. In time the mountains are laid low, the rivers change their courses and disappear, and lakes and seas expand or dry up. Eventually sediments, which have found their way to the oceans along continental margins, are

compacted and changed to rock, then uplifted by continental collision or subducted and melted under the crust. New mountains are formed, and the cycle (called the geologic cycle) begins anew. Each cycle takes tens of millions of years. (Excerpted from the *Science Framework for California Public Schools: Kindergarten Through Grade Twelve*.)

Materials Needed for the Lesson:

Teacher Materials

- A large piece of sandstone (chunk)
- Small pieces of sandstone (crushed)
- Sand
- Locate in the science textbook examples of weathering (or locate pictures from which you can make transparencies), such as abrasion, ice wedging, land slides, mud slides, plant roots, wave and stream tumbling, chemical

Student Hands-on Materials

For each student OR for each group of 3-4 students

- 7 sugar cubes
- 1 container of sand with lid
- 10 rocks
- Plastic bowl
- Water dropper

Student Handouts

- “Rock On”
- Pages in science textbook that show pictures of weathering (process of breaking large pieces of rock into smaller pieces)

5E Lesson: Rocks Weather

Teacher Does	Student Does	Concept
<p><u>ENGAGE:</u></p> <p>Show students a large piece of sandstone, small pieces, and then sand.</p> <ul style="list-style-type: none"> ▶ <i>How does this large piece of stone become these smaller pieces and then even become sand?</i> ▶ <i>Talk to your partner and share one idea with the class.</i> <p>Transition to explore activities: Distribute 2 sugar cubes per student.</p> <ul style="list-style-type: none"> ▶ <i>Let's pretend that these two sugar cubes are two rocks like these (point to rocks).</i> <p>Have students rub the two cubes together.</p> <ul style="list-style-type: none"> ▶ <i>Describe what just happened.</i> ▶ <i>These big cubes are broken down into smaller things.</i> ▶ <i>How does this happen in nature? Discuss with a partner.</i> ▶ <i>Today we are going to explore some activities that will show ways nature can break down rocks.</i> 	<p>Expected Student Response (ESR): Rocks rub together and pieces break off. Someone takes a hammer and breaks them.</p> <p>ESR: They are breaking up.</p> <p>ESR: Rocks are broken by hitting each other.</p>	<p>Large rocks are broken and become smaller rocks and eventually sand.</p>
<p><u>EXPLORE:</u></p> <p>Distribute Student Handout, "Rock On".</p> <ul style="list-style-type: none"> ▶ <i>Distribute to each student 1 container of sand and 1 sugar cube.</i> ▶ <i>Put sugar cube into the container. Make sure cap is on tight. You will shake the container for 30 seconds. Go.</i> <p>Have students stop at 30 seconds.</p> <ul style="list-style-type: none"> ▶ <i>Draw what you see on your handout.</i> <p>Time for another 30 seconds.</p> <p>Have students empty contents of containers into a separate plastic bowl, saving the cube for future study or reference.</p> <p>Have students put some rocks into their container (approximately 10). Distribute another sugar cube to each student. Shake for 30 seconds. Time.</p>	<p>Put sugar in the container, make sure lid is tight and shake for 30 seconds. Take cube out, observe and draw picture of cube. Write verbal observation.</p> <p>Repeat process for 30 more seconds. Record observations.</p> <p>Empty container and save the cube. In a bowl.</p> <p>Put rocks into container and put in sugar cube.</p> <p>Shake for 30 seconds. Take cube out and draw picture; describe.</p>	<p>Water can dissolve some chemicals in rocks.</p> <p>Abrasion occurs when sediments rub or objects forcefully collide with rocks.</p>

Teacher Does	Student Does	Concept
<p>▶ <i>Draw what the sugar cube looks like.</i> Then time for another 30 seconds.</p> <p>Have students empty their containers.</p> <p>Using the lids of their containers have students stack 3 sugar cubes.</p> <p>▶ <i>Everyone will drop 30 drops of water on top (in the center) of the sugar cubes.</i></p> <p>▶ <i>Record observations.</i></p> <p>▶ <i>#1– If the sugar cubes are rocks and they were in sandstorms, what would happen to the rocks?</i></p> <p>▶ <i>#2 – If the sugar cubes are rocks, when would this occur in nature, when in nature would rocks be colliding together?</i></p> <p>▶ <i>#3 – Sugar cubes represent certain types of rocks.</i></p> <p>▶ <i>If the sugar cube is a rock and the water is the rain, how would rain affect some kinds of rocks over a long period of time? Why might rain affect some rocks and not others?</i></p> <p>▶ <i>Water reacts differently with different things so minerals that react with water will break down and those that do not react with water will not break down.</i></p>	<p>Shake for another 30 seconds. Draw and describe.</p> <p>Empty container.</p> <p>Stack 3 sugar cubes onto lid of container. Drop 30 drops of water into the center of the top cube.</p> <p>Record observations.</p> <p>ESR: They will change shape. They will get dirty. They will get smaller.</p> <p>ESR: Earthquakes, when floods roll rocks, landslides.</p> <p>ESR: A lot of water will break rocks or melt rocks. Soft rocks will break down faster than hard rocks.</p>	
<p><u>EXPLAIN:</u></p> <p>▶ <i>All these are processes of weathering.</i> Go back to the sand, small rocks, and large rocks from original teacher demonstration.</p> <p>▶ <i>How does this large piece of stone become these smaller pieces and then even becomes sand?</i></p> <p>Collect papers.</p> <p>Make explicit the difference between weathering and erosion. Weathering is the process of breaking rocks, breaking large pieces to small pieces which may be done thru the following processes: abrasion, ice wedging, land slides, mud slides, plant roots, wave and stream tumbling, chemical.</p>	<p>Independently, on a sheet of paper make a picture and/or explain how a large rock can become sand.</p>	<p>Large rocks can become smaller rocks through the processes of weathering, including wind, and abrasion.</p>

Teacher Does	Student Does	Concept
<p>Erosion is the transport of those materials. Deposition is the placing of materials. Get out textbooks and look on pages that have examples of weathering or show overheads.</p> <p>▶ <i>Here are some other examples of weathering. What are they?</i></p>	<p>ESR: roots, animals, freezing</p>	
<p><u>EXTEND:</u></p> <p>Freezing and thawing are also examples of weathering. Freeze some sugar cubes in a shallow dish of water, then thaw. Repeat this for a couple of days. Make observations.</p> <p>Lichen is made of alga and fungus and can chemically weather rocks. Have students conduct research on lichens and report their findings to the class.</p>		

Input Question: Here are some other examples of weathering. What are they? (in Explain section)

Process Question: Why might rain affect some rocks and not others? (in Explore section)

Output Question: If the sugar cube is a rock and the water is the rain, how would rain affect some kinds of rocks over a long period of time? (in Explore section)

STUDENT HANDOUT

“Rock On”

#1 Sand Blown by the Wind	#2 Can Rocks Help to Break Rocks?	#3 Can Water Help to Break Rocks?
<p>30 seconds Draw what the sugar cube looks like:</p> <p>Written description:</p>	<p>30 seconds Draw what the sugar cube looks like:</p> <p>Written description:</p>	<p>30 drops of water Draw what the sugar cube looks like:</p> <p>Written description:</p>
<p>60 seconds Draw what the sugar cube looks like:</p> <p>Written description:</p>	<p>60 seconds Draw what the sugar cube looks like:</p> <p>Written description:</p>	