

**ITQ ARTS AND SCIENCE INTEGRATION  
GRADE 4  
DANCE AND EARTH SCIENCE**

**Break it Down - Weathering  
Lesson #1**

Teach FOSS California, Grade 4, Solid Earth, Investigation 5, "Landforms", Part 1, *Weathering*.

**CONTENT STANDARDS**

**Dance Grade 4**

- 1.3** Demonstrate increased range and use of space, time, and force/energy concepts (e.g., pulse/accents, melt/collapse, weak/strong).

**Earth Science Grade 4**

- ES5b** Students know natural processes, including freezing and thawing and the growth of roots, cause rocks to break down into smaller pieces.

**ESSENTIAL QUESTIONS** (*Questions students might ask about the topic*)

- What is physical and chemical weathering and how can I show weathering through movement?

**OBJECTIVES & STUDENT OUTCOMES** (*Students will be able to.....*)

- distinguish between physical and chemical weathering.
- demonstrate weathering using appropriate movement.

**ASSESSMENT** (*Various strategies to evaluate effectiveness of instruction and student learning*)

- **Feedback for Teacher**
  - Student response to inquiry
  - Student performance
  - "Performance Checklist – Weathering" (attached)
- **Feedback for Student**
  - Feedback from teacher
  - Performance
  - "Performance Checklist – Weathering" (attached)

**WORDS TO KNOW**

**Dance**

- **Force/Energy:** An element of dance characterized by the release of potential energy into kinetic energy. It utilizes body weight and reveals the effects of gravity on the body (e.g., sustained, percussive, suspended, swinging, and collapsing).
- **Jazz Dance:** Dance marked by movement isolations. It is an outgrowth of African-American ragtime, spirituals, blues, work songs, etc. and is considered an American dance style.
- **Shape:** The positioning of the body in space: curved, straight, angular, twisted, symmetrical, etc.

**Science**

- **Acid:** A substance that geologists use to identify rocks that contain calcite.
- **Chemical weathering:** The process by which the minerals in a rock change due to chemicals in water and air. Chemical weathering can change rocks and cause them to break apart.
- **Physical weathering:** The process by which rocks are broken down by breaking and banging.
- **Weathering:** The process by which larger rocks are cracked and broken over time to form smaller rocks.

## MATERIALS

- 4 pieces each of 4' square fabric: one light blue, two green, one red
- Illustration #1, Scarf Color Key for "Physical Weathering" and "Chemical Weathering" (attached)
- 4 signs with yarn that will hang around the neck, two labeled "I am roots", one labeled "I am ice", one labeled "I am acid rain"
- "Performance Checklist – Weathering" (attached)
- Video Camera
- CD Player and music
- Science notebooks (1/student)

## RESOURCES

- Internet
  - [http://www.classzone.com/books/earth\\_science/terc/content/visualizations/es1201/es1201page01.cfm?chapter\\_no=visu](http://www.classzone.com/books/earth_science/terc/content/visualizations/es1201/es1201page01.cfm?chapter_no=visu)
  - <http://marimillerphoto.com/chemical.html>
  - <http://marimillerphoto.com/mechanical.html>

## PREPARATION

- Teach FOSS California, Grade 4, Solid Earth, Investigation 5, "Landforms", Part 1, *Weathering*.
- Have students prepare a science notebook. For all three lessons, students will prepare notes on weathering, erosion, and deposition choreographies, and compile instruction sheets, photographs, illustrations and other related materials from investigation 5, parts 1, 2 and 3.
- Have pieces of fabric ready (light blue represents ice, red represents acid, green represents roots)
- Have music and player ready
- Have plenty of space to move freely and safely

## WARM UP *(Engage students, access prior learning, review, hook or activity to focus the student for learning)*

(10 minutes)

- *Say/Ask: Today we are going to talk about **weathering**. What do you know about **weathering** and the effect it has on rocks? [Accept student responses.]*
- *Say: **Weathering** takes place as rocks are broken down into smaller and smaller pieces. These pieces break off from the rock, fall, and land near the base of the larger rock. These broken pieces remain next to one another.*
- Review **shape**. Ask students to create **shapes** with jagged and smooth edges. Point out the different kinds of shapes as students make them (e.g., curved, straight, geometric, symmetrical, etc.).
- Teach a sharp movement **jazz** combination:
  - Drop head to the right (beat 1)
  - Drop head to the left (beat 2)
  - Lunge to the right striking right arm (bent at elbow) to the side (beat 3)
  - Lunge to the left with striking left arm (beat 4)
  - Deep lunge right placing hands on knees (beat 5)
  - Deep lunge right leaving hands on knees (beat 6)
  - Tuck and sit (beats 7 & 8)
    - Lunging to the left, tuck the right leg left behind the left. Lower the hips to the floor using momentum to sit onto the right hip.
  - Finish in a small, low shape.
- From a standing position, rehearse several times, the entire eight beat **Jazz** combination ending in a shape.

## MODELING *(Presentation of new material, demonstration of the process, direct instruction)*

(25 minutes)

- Post vocabulary **physical weathering** and **chemical weathering**.
- *Say: Both **physical** and **chemical weathering** takes place on the outer surface of the rock. Both processes work to break rocks down into smaller pieces.*
- *Say: Let's discuss **physical weathering** first.*

- *Ask: What kinds of processes cause **physical weathering**? [Accept student responses.]*
- *Say: When ice and tree roots get into the cracks of rocks, they apply a strong force that cracks the rock and breaks it into smaller pieces. These tiny pieces fall away from the larger rock. This is called **physical weathering**.*
- Arrange students in three groups. Ask each to create a group shape to depict a large rock.
  - *Say: Your group represents a large rock that is slowly being **weathered**.*
  - Select one student that will be **weathered**. Only one student at a time will perform the Jazz combination and break off from the group shape. The other students will remain in the frozen shape.
  - Repeat with another student breaking off while everyone else remains in a frozen shape.
- *Say: Now we are going to show **physical weathering** of rocks by freezing water (ice) and by roots, both of which slowly break rocks apart by getting into the cracks of rocks and slowly forcing the crack apart until pieces of the rock break off.*
- Student pair exercise:
  - Partner A will press their hands together fingers pointing down to signify a crack in a rock by pressing fingers tightly together, but leaving a space where the palms meet.
  - Partner B will move their hands slowly like flowing water, along the person's arms until their hands come together. With their fingertips, reach into their partner's hands and with force; push their partner's hands apart.
  - *Say: This is how frozen water (ice), and roots work to break rocks apart. [Using the hand motions above] continue to say water flows into the cracks of rocks, freezes, expands and forces pieces of the rock apart and small pieces to break off. Roots from a plant squeeze their way through cracks in the rock, forcing small pieces to break off.*
  - Switch roles and repeat the exercise.
- Ask group one to create a group shape to represent a rock.
- Point out to the class that spaces between body parts (between fingers, arm and torso, neck and shoulder, bend in the knee or hip) represent cracks in the rock.
- *Say: I will place this tag around my neck to show that I am ice. I am going to walk around the room and with a light blue scarf. I will mimic the movement of water moving into a crack, freezing and expanding sharply to make the rock crack. I will take eight beats to **weather** one of you until you break off from the rock. During those eight beats that student will do the **Jazz** combination.*
  - Teacher Note: Start the movement of the scarf close to the student's head (two beats), move to the arms (two beats), to the legs (two beats) and end close to the floor (two beats).
  - The movement you use with the scarf is pull (beat one) and snap (beat two).
  - *Say: This movement represents the freezing and expanding of the water into ice that cracks the rock. Freeze and expand, freeze and expand.*
  - Repeat until three students have **weathered**.
  - Remind students that unless they are touched with the scarf, they are to remain frozen in the rock shape.
  - Repeat exercise with group two and the green scarf.
    - *Say: I will place this tag around my neck to show that I am roots. I am going to walk around the room and with a green scarf. I will mimic the movement of roots moving into a crack, growing and expanding to make the rock crack. I will take eight beats to **weather** one of you until you break off from the rock.*
    - *During those eight beats that student will do the **Jazz** combination.*
    - While describing what you will do, take the scarf and roll it into a ball while holding onto one of the corners. Begin to pull the scarf with strong energy making it lengthen slowly until it snaps.
    - *Say: When the scarf snaps, the force on the crack causes it to break. Eventually pieces of rock will fall off. This process is still called **physical weathering**.*
- Introduce **chemical weathering**.
- *Say: Chemicals found in the air and water can cause rocks to break down. The rocks look like they get smaller and smaller. The minerals in the rock actually change into something new. When soft stones such as limestone come in contact with an acid (vinegar is a mild acid), a gas is created. When the vinegar/water mixture evaporates, new crystals form on the rock.*
- *Ask: What is acid rain? [Accept student answers.]*

- Call on group three.
- Identify two students from group three to be the **acid rain** and a **weathering** agent.
  - Student A will hold the red scarf to represent **acid rain**.
  - Student B will use either the blue or green scarf to show **physical weathering**.
- *Say: **Acid rain** happens when chemicals in the air mix with rain. When the rain falls on certain types of rocks, a chemical reaction happens forming new substances that are softer than the original rock. Crystals form on the rock. Then, the rock breaks down, getting smaller and smaller and pieces of it break off. Cracks formed in the rock will allow **physical weathering** to more easily break them apart.*
  - Prompt student A to wave the red scarf to mimic **acid rain** over the rock shape.
  - *Say: Rain when it falls, covers the entire rock.* (Student A rains on the rock with the red scarf.)
  - Prompt the students in the rock shape to slowly change shape to show the rock being softened and weakened (the students in the rock shape should very slowly melt their shapes). Allow very little movement. Students should not change level much. Prompt students to show crystals being formed on the rock by creating a “bump” with their hands or body.
  - *Say: Now that the rock has been **chemically weathered** and weakened, what different weathering agents could force the rock to break?* [Ice or roots]
  - The student as the **acid rain** will stop and student B will use the green scarf to represent a seed that grows in a root that will **physically weather** one student.
  - Repeat exercise (**acid rain** and root **weathering** until three students have **weathered**).

**GUIDED PRACTICE** (*Application of knowledge, problem solving, corrective feedback*)  
(10 minutes).

- *Say: We are going to create part A of our dance about weathering called “break it down”. This will be the beginning of our three part dance on weathering.*
- Distribute a “**Physical Weathering – Frozen Water (Ice)** Dance Instruction Guide” and labeled tag to group one, a “**Physical Weathering – Roots** Dance Instruction Guide” and labeled tag to group two, and “**Chemical Weathering – Acid Rain** Dance Instruction Guide” and labeled tag to group three.
  - Remind group three that when a rock is **chemically weathered** by **acid rain**, the group shape will change slightly each time it is **weathered**.
- Assign one person in groups one and two to be the **weathering** agent. Assign two people in group three to be **weathering** agents (**acid rain** and **roots**).
- The rest of the members will form a rock shape.
- Give each group five minutes to organize and rehearse Part A their dance.
- Each group will perform one at a time while the rest of the class observes.
- Each dance will take approximately 30 seconds. Play music. When the group ceases movement and freezes, stop the music.
- Videotape each performance.

**DEBRIEF & REFLECT** (*Identify problems encountered, ask and answer questions, discuss solutions and learning that took place. Did students meet outcomes?*)  
(5 minutes)

- Record the following in your science notebooks:
  - *What kind of **force/energy** did we use to show **physical weathering**? **Chemical weathering**? [Strong energy]*
  - *How do ice, roots, and **acid rain** cause **weathering**? [Water expands when it freezes. Water in the cracks in rocks acts like wedges to force the sides apart and break rocks. Plants send roots into cracks and as they grow, they break rocks apart. Acid dissolves limestone and marble. This weakens the rock.]*
  - *How did dance help me understand the similarities and differences between **physical** and **chemical weathering**. [**Physical weathering** breaks rock into smaller pieces without changing nature of the rock itself. **Chemical weathering** breaks down rock by changing minerals in rocks into new materials.]*

**EXTENSION** (*Expectations created by the teacher that encourage students to participate in further research, make connections, and apply understanding and skills previously learned to personal*)

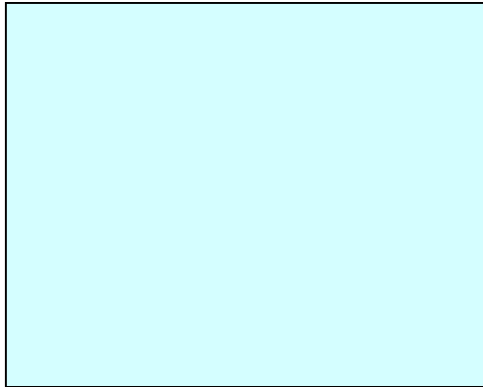
*experiences.)*

- Rehearse dances daily so that students have them memorized for lesson #2.
- In what kind of geographical regions would we find **physical** and **chemical weathering**?

### EXAMPLE OF A LARGE ROCK BROKEN INTO SMALLER AND SMALLER PIECES



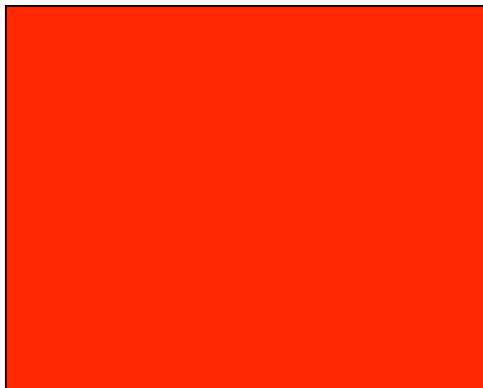
SCARF COLOR KEY



**ICE**



**ROOTS**



**ACID RAIN**