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Note: Lesson plan ideas and background information were adapted from the Utah Education Network to ensure accuracy and appropriate content and concepts for the fifth grade level.

### **Geological Features: How Weathering & Erosion Help Create Landforms**

**Abstract:** Throughout this lesson students will learn how the Earth's surface changes resulting in geological features and landforms. Students will do a read-a-loud on Thomas Locker's Mountain Dance. Then students will do a KWL on the board. Students will be required to record their responses on their provided worksheet. Students will create a landform made up of Plaster of Paris and place it in a freezer. The next day we will discuss the observed phenomena. Students will gain a better understanding of the landforms that have shaped the Earth's surface through the creation of landforms in the classroom and observations from a field trip. { See the following lesson plan for the field trip }.

**Grade Level: 5<sup>th</sup>**  
**Science Benchmark**

The Earth's surface is constantly changing. Some changes happen very slowly over long periods of time, such as weathering, erosion, and uplift. Other changes happen abruptly, such as landslides, volcanic eruptions, and earthquakes. All around us, we see the visible effects of the building up and breaking down of the Earth's surface.

**Utah State Core Curriculum Standard III:** Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.

**Objective 1:** Describe how weathering and erosion change Earth's surface.

#### **Intended Learning Outcomes**

Students will:

- a. Identify the objects, processes, or forces that weather and erode Earth's surface (e.g., ice, plants, animals, abrasion, gravity, water, wind).
- b. Describe how geological features (e.g., valleys, canyons, buttes, arches) are changed through erosion (e.g., waves, wind, glaciers, gravity, running water).
- c. Explain the relationship between time and specific geological changes.

**Objective 2:** Relate the building up and breaking down of Earth's surface over time to the various physical land features.

#### **Intended Learning Outcomes**

Students will:

- a. Identify specific geological features created by volcanoes, earthquakes, and uplift.

- b. Give examples of different landforms that are formed by volcanoes, earthquakes, and uplift (e.g., mountains, valleys, new lakes, canyons).

**Instructional time:** Day 1 of this lesson will take approximately 30-45 minutes. Day 2 of this lesson will take approximately 30 minutes.

### **Materials**

lab notebooks

1 Poster per table

Landform model should include:

Plaster of Paris

water balloons

paper cups or milk cartons

colored markers or paint

### **Possible Literary Connections**

Earthdance by Cynthia Pratt Nicholson

Earthquakes & Volcanoes by F. Watt

Eyewitness Earth by Susanna Van Rose

Icebergs & Glaciers by Seymour Simon

Mountain Dance by Thomas Locker

Moutains by Seymour Simon

### **Terminology from the Utah State Core Curriculum**

- arches- forms along a coast as wave erosion cuts through a headland
- butte- a flat-topped rock or hill formation with steep sides
- deposition- the natural process of laying down a deposit of something
- earthquake- a shaking or trembling of the earth that is volcanic or tectonic.
- erode –to wear away by the action of water, wind or glacial ice
- erosion –all the processes that cause rock to be carried away.
- fault-the result of the movement of rock along either side of a crack in the earth's crust.
- geography- the study of the Earth's surface
- glacier- a large, slow-moving mass of ice on the land
- uplift –when a portion of the earth's surface rises or lifts up
- volcano- a mountainous vent in the Earth's crust. {When a volcano erupts, it spews out lava, ashes, and hot gases from deep inside the Earth}.
- weathering –the processes that break rock into small particles

### **Teachers Background Information**

There is a process called weathering that is consistently changing Earth's surface. Chemical weathering, such as acid rain, eats away at certain types of rocks such as limestone, creating cracks and holes. Physical weathering is usually caused by extreme hot and cold temperatures. Water seeps into cracks in rocks, freezes, and expands, causing further breakdown of rocks. Biological weathering is caused by plants and animals which release acid forming chemicals that cause chemical weathering and

contributes to the breaking down of rocks and landforms. These weathering processes cause rocks and landforms to fragment, crack and break down. With the movement of water erosion carries away debris and soil.

Definitions of these key terms are found on the following websites

<http://www.enchantedlearning.com/geography/landforms/glossary.shtml>

[http://www.ge-at.iastate.edu/courses/Geol\\_100/old\\_files/glossary.v2.html](http://www.ge-at.iastate.edu/courses/Geol_100/old_files/glossary.v2.html)

### **Assessing Students' Prior Knowledge/Introduction**

1. Teachers will activate students' prior knowledge by conducting a KWL on all the ways the surface of the Earth can change. First one will ask students what they already **Know**; then students (collaborating as a classroom unit or within small groups) set goals together specifying what they **Want** to learn; and after reading students discuss what they have **Learned**. Students apply higher-order thinking strategies which help them construct meaning from what they read and help them monitor their progress toward their goals. A worksheet is given to every student that includes columns for each of these activities. Throughout the KWL students will be prompted to refer back to the literature book we read as a class. The terms: weathering, erosion, wind and the effect frozen water has on Earth's surface will be addressed and discussed.
2. During this interactive discussion students will identify what terms they are most familiar with.
3. To ensure students become familiar with the other key terms they will be required to do a scavenger hunt. See attached sheet titled Scavenger Hunt.
4. Students are required to complete the KWL on the worksheet provided to receive credit for this pre-assessment/introduction. See attached worksheet.

**Invitation to Learn:** Students' attention will be grasped by a read-a-loud on Thomas Locker's Mountain Dance. Throughout the read-a-loud the teacher will highlight the importance and influence weathering and erosion have on the earth's surface evident in the book. The teacher will help students understand this pertinent concept by analyzing illustrations and significant concepts through meaningful discussions.

### **Instructional Procedures**

1. Students will be assigned to work with their classmates sitting at their tables. Each group will research the key term(s) assigned to them on the Internet. They will record their findings on a poster. Groups will be required to share their poster with the class. Posters will be posted on the wall in the classroom.
2. Once students have built a foundation from learning the key terms they will build upon their prior knowledge by constructing their own landform with their classmates.
3. Students will be given step by step instructions.

Instructions will include the following:

- A) Fill water balloons 9 about 1 ½ inch in diameter)
- B) Mix Plaster of Paris (runny)
- C) Pour plaster into cups or milk cartons

- D) Quickly push balloon into plaster
  - E) Set aside to dry
  - F) When completely dry, peel off the milk carton
  - G) Color plaster landforms with markers or paint.
4. After landforms are completed students will be required to record a hypothesis based on their prior knowledge in their science journal about what will happen to the plaster landform when placed overnight in a freezer.
  5. Each table will vote and decide which responsible group member will take the landform home and place it in the freezer. If any one group fails to bring the landform back the following day their group will be required to observe another groups landform and/or use the model the teacher has created and brought back.
  6. Students will be required to record their observations in their science journals. They will evaluate their hypothesis compared to their observations.
  7. Each group will have about 5 minutes to discuss their observations and prepare to share their findings with the class.
- Closure:** We will have a class discussion on students' observations and possible explanations to the observed phenomena.
- Possible Extensions:** Students will record and look for evidence of weathering around their homes.

### **Assessment**

Students will be graded on their participation, quality and completion of their student worksheets (KWL etc).

**Formative:** Students will be graded on completion of their science journals/lab notebooks and assigned worksheets throughout the unit. See attached rubric for details.

**Summative:** Students will be graded their ability to use the knowledge learned from this unit and apply it to conduct their landform experiment. {See the following lesson plan for the experiment}.

### **Modifications & Accommodations**

Students with special needs will be evenly dispersed in different groups throughout this unit. They will be expected to collaboratively work with their assigned groups. All students are expected to continuously give their best effort. The students with special needs will be required to participate and do as much as they can on their science journals and student worksheets.

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Note: Lesson plan ideas and background information were adapted from the Utah Education Network to ensure accuracy and appropriate content and concepts for the fifth grade level.

### **Hypothesize How Geological Features Emerged: The Field Trip**

**Abstract:** Throughout this lesson students will see how the Earth's surface changes resulting in geological features and landforms by observing a local canyon. Students will be divided into 4 collaborative groups to make a hypothesis about how the geological features formed at the designated area based on their background knowledge from the previous lesson. Each group will be assigned one of the four designated areas in which they must record their hypothesis and observation of how the geological features evolved. Students will gain a better understanding of the landforms that have shaped the Earth's surface through the creation of landforms in the classroom and observations from a field trip.

**Grade Level: 5<sup>th</sup>**  
**Science Benchmark**

The Earth's surface is constantly changing. Some changes happen very slowly over long periods of time, such as weathering, erosion, and uplift. Other changes happen abruptly, such as landslides, volcanic eruptions, and earthquakes. All around us, we see the visible effects of the building up and breaking down of the Earth's surface.

**Utah State Core Curriculum Standard III:** Students will understand that volcanoes, earthquakes, uplift, weathering, and erosion reshape Earth's surface.

**Objective 1:** Describe how weathering and erosion change Earth's surface.

#### **Intended Learning Outcomes**

Students will:

- d. Identify the objects, processes, or forces that weather and erode Earth's surface (e.g., ice, plants, animals, abrasion, gravity, water, wind).
- e. Describe how geological features (e.g., valleys, canyons, buttes, arches) are changed through erosion (e.g., waves, wind, glaciers, gravity, running water).
- f. Explain the relationship between time and specific geological changes.

**Objective 2:** Relate the building up and breaking down of Earth's surface over time to the various physical land features.

#### **Intended Learning Outcomes**

Students will:

- c. Identify specific geological features created by volcanoes, earthquakes, and uplift.
- d. Give examples of different landforms that are formed by volcanoes, earthquakes, and uplift (e.g., mountains, valleys, new lakes, canyons).

**Objective 3:** Relate the building up and breaking down of Earth's surface over time to the various physical land features.

### **Intended Learning Outcomes**

Students will:

Explain how layers of exposed rock, such as those observed in the Grand Canyon, are the result of natural processes acting over long periods of time.

- a. Describe the role of deposition in the processes that change Earth's surface.
- b. Use a time line to identify the sequence and time required for building and breaking down of geologic features on Earth.
- c. Describe and justify how the surface of Earth would appear if there were no mountain uplift, weathering, or erosion.

**Instructional Time :** One day of science time for the field trip (be flexible in the amount of time available). 30 minutes for the following activity/lesson in the classroom.

### **Materials**

lab notebook  
transportation (the bus)  
parental permission slips

### **Possible Literary Connections**

Earthdance by Cynthia Pratt Nicholson  
Earthquakes & Volcanoes by F. Watt  
Eyewitness Earth by Susanna Van Rose  
Icebergs & Glaciers by Seymour Simon  
Mountain Dance by Thomas Locker  
Moutains by Seymour Simon

**Terminology from the Utah State Core Curriculum** (Prior Knowledge: Students will understand and recall the following definitions from the previous lesson).

- arches- forms along a coast as wave erosion cuts through a headland
- butte- a flat-topped rock or hill formation with steep sides
- deposition- the natural process of laying down a deposit of something
- earthquake- a shaking or trembling of the earth that is volcanic or tectonic.
- erode –to wear away by the action of water, wind or glacial ice
- erosion –all the processes that cause rock to be carried away.
- fault-the result of the movement of rock along either side of a crack in the earth's crust.
- geography- the study of the Earth's surface

- glacier- a large, slow-moving mass of ice on the land
- uplift –when a portion of the earth’s surface rises or lifts up
- volcano- a mountainous vent in the Earth's crust. {When a volcano erupts, it spews out lava, ashes, and hot gases from deep inside the Earth}.
- weathering –the processes that break rock into small particles

Definitions of these key terms are found on the following websites

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**Teacher’s Background Information** There is a process called weathering that is consistently changing Earth’s surface. Chemical weathering, such as acid rain, eats away at certain types of rocks such as limestone, creating cracks and holes. Physical weathering is usually caused by extreme hot and cold temperatures. Water seeps into cracks in rocks, freezes, and expands, causing further breakdown of rocks. Biological weathering is caused by plants and animals which release acid forming chemicals that cause chemical weathering and also contributes to the breaking down of rocks and landforms. These weathering processes cause rocks and landforms to fragment, crack and break down. With the movement of water erosion carries away debris and soil. See the attached printout from <http://www.slackpacker.com/igneous.html> which contains pertinent information on how geological features are formed. Note: students’ science text book should also contain examples and/or illustrations on how geological features are formed.

### **Assessing Students’ Prior Knowledge/Introduction**

1. Before proceeding with this lesson, students should have a great understanding about Standard III Objective 1 and Objective 2 before building upon the concepts outlined in Standard III Objective 3. This lesson builds upon those objectives which should now be considered students’ prior knowledge.
2. Teachers will activate students' prior knowledge by conducting a KWL on all the ways the surface of the Earth can change. First, one will ask students what they already **Know**; then students (collaborating as a classroom unit or within small groups) set goals together specifying what they **Want** to learn; and after reading students discuss what they have **Learned**. Students apply higher-order thinking strategies which help them construct meaning from what they read and help them monitor their progress toward their goals. A worksheet is given to every student that includes columns for each of these activities. Throughout the KWL students will be prompted to refer back to the literature book we read as a class. All of the key terms will be discussed to reinforce students understanding of the concepts learned in the previous lesson,
3. During this interactive discussion students will discuss how landforms emerge.

**Invitation to Learn:** Students’ will become engaged through a read-a-loud on Nicholson’s Earth Dance. Throughout the read-a-loud the teacher will highlight the

importance and influence weathering and erosion have on the earth's surface evident in the book. Students will see how landforms are created by observing pictures from this book. The teacher will help students understand this pertinent concept by analyzing illustrations and significant concepts through meaningful discussions.

### **Instructional Procedures**

1. Students will be handed out permission slips for the field trip one week prior to the field trip.
2. Students will be reminded classroom management rules and procedures apply even when we are not literally in the classroom.
3. Students will be divided into 4 collaborative groups to make a hypothesis about how the geological features formed at the designated area based on their background knowledge from the previous lesson. Each group will be assigned one of the four designated areas in which they must record their hypothesis and observation of how the geological features evolved. For example: If the canyon is made up of igneous rock formed by pressure, then the canyon was more likely formed by an earth quake because of igneous rock formed by pressure has different physical properties than igneous rock formed by lava and/or tectonic plate collision. Example 2: If this landform was created by a volcano then one would find various types of sedimentary and igneous rocks because they were formed by the heat of the lava and ash from the volcano.
4. Before students get out of the bus at the first stop the teacher must cover the informational sign with a piece of paper or poster which provides the history of how that geological feature formed.

NOTE: Canyons & national parks have informational stops describing the geological formation and how it evolved. For example in the Big Cottonwood Canyon in East Salt Lake County there is an informational sign for tourists or visitors at the mouth of canyon where Lake Bonneville formed. It briefly explains how it formed. Throughout this canyon there are informational signs about the ancient sea which formed over 700 million years ago and how a landform emerged as a u-shaped upper part of the canyon, carved by glaciers several million years ago. See attached printout from the [Utah Geological Survey](#) for teaching resources.

5. Students can draw details about their designated area, write and record a detailed description of the area or use a camera to take pictures and bring back to the school to study the following day.
6. Once students have finished observing the last stop they will be instructed to get back on the bus.
7. After we get back into the classroom each group of students will have Internet access to research their hypothesis.
8. We will conclude with a brief sharing about "What really happened".
9. Students will be required to complete their KWL worksheet for full credit for the field trip and the entire unit. See attached worksheet.

**Possible Extensions/Inquiry Project:** Students may conduct an experiment to prove their hypothesis about how the geological features of their designated area evolved. For example: Students may say they believed it was formed by a volcano or a glacier and create a model to explain their reasoning. (This idea could be extended and used for a science fair project!)

**Closure:** Instruct students to record in their journals what was the most interesting thing they learned today and why. Random students will be selected to share their answers.

### **Assessment**

Students will be graded on their participation, quality and completion of their student worksheets (KWL etc).

**Formative:** Students will be graded on completion of their science journals/lab notebooks and assigned worksheets throughout the unit. See attached rubric for details.

**Summative:** Students will be graded their ability to use the knowledge learned from this unit and apply it to conduct their landform experiment.

### **Modifications & Accommodations**

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