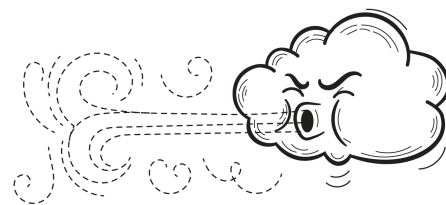


Lesson 7: Weathering and Erosion

☐ Getting Started

Have you ever seen a sidewalk crack after winter, or noticed how a stream slowly carves a path through the ground? Maybe you've watched waves reshape a beach or seen wind blow sand into small piles. At first, these changes might seem small, almost unnoticeable. But over time, they add up. The land around you is not as still as it looks. It is constantly being shaped and reshaped by powerful natural forces. In this lesson, you'll explore how water, wind, and ice work together to change Earth's surface. You'll investigate how rocks break apart, how materials move from one place to another, and how new land can actually be built. By the end of this lesson, you'll start to see the world differently, not as something fixed, but as something always changing.



Stuff You Need

- *Water: The Story of the Hydrosphere, Second Edition* by Lynne Z. Petkovic, M.Ed., J.D.
- a small shallow baking dish
- crayons, colored pencils, or markers
- eye dropper (kit)
- hair dryer
- ice cube
- pebbles (kit)
- plastic bag (kit)
- sand (kit)

Ideas to Think About

- How do natural forces break down, move, and deposit Earth materials to reshape the land?

Things to Know

- Water movements cause **weathering** and erosion, which change the land's surface features.
- **Mechanical weathering** is the process of breaking rocks into smaller pieces without changing what the rock is made of. This can happen when water freezes in cracks, roots grow into rocks, or rocks bump into each other.
- **Chemical weathering** is the process of breaking down rocks by changing their chemical makeup. This happens when water, acids, or oxygen react with minerals in the rock, forming new substances.
- **Erosion** is the process by which natural forces like wind, water, glaciers, and gravity move sediments from one place to another.

- **Deposition** is the process where moving water, wind, or ice drops sediments in a new location. This happens when the movement slows down and can no longer carry the materials.
- **Sediments** are small pieces of rock, soil, and organic material that are carried by natural forces like water, wind, ice, or gravity.

☐ Reading and Questions

Read Chapter 7 in the book *Water: The Story of the Hydrosphere*. Then, answer the questions.

1. What is erosion?

2. How is chemical weathering different from mechanical weathering?

3. How do weathering, erosion, and deposition work together to shape Earth's surface?

Activities

☐ Activity 1: Erosion and Weathering in Action

Take a walk outside after it rains, and you might notice something interesting. Small paths form in the dirt. Tiny rocks shift. Water flowing downhill carries bits of soil and sand from one place to another. It may not seem like much, but these small changes are part of powerful processes that are constantly shaping Earth's surface. Water movement plays a major role in this. As water flows, it can cause **weathering**, which is the breaking down of rocks. Sometimes this happens through **mechanical weathering**, where rocks are broken into smaller pieces without changing what

they're made of, like when water freezes in cracks and forces rocks apart. Other times, it happens through **chemical weathering**, where water, acids, or oxygen actually change the rock's composition.

Once rocks are broken down, the small pieces of rock, soil, and organic material, called **sediments**, don't just stay in place. They are often carried away by **erosion**, the process by which natural forces like wind, water, glaciers, and gravity move sediments from one place to another. Eventually, that movement slows down. When it does, those sediments are dropped in a new location. This process is called **deposition**, and it helps build new landforms such as riverbanks, beaches, and deltas, which are areas where sediment accumulates near river mouths. In this activity, you'll model how water, ice, and even wind can cause weathering, erosion, and deposition, and see how these forces work together to shape the land over time.

Procedure:

1. Prepare the Landscape: Fill the baking dish with a layer of sand to represent the land surface. Add some small pebbles to simulate rocks and other land features. Make sure not to use more than 1/2 of your kit's pebbles. You will need them in a future experiment.
2. Simulate Rainfall (Water Weathering & Erosion): Poke tiny holes in the sandwich bag with a needle or pin. Ask a parent for help if needed. Fill the bag with water and place it above the sand surface.
3. Observe Weathering: Allow the water to drip slowly from the holes onto the sand, simulating rainfall. If you want the rainfall to occur more quickly, gently squeeze the bag. Watch how the water seeps through and changes the surface. Note any changes in the shape of the land or the movement of the pebbles.
4. Simulate Erosion (Flowing Water): Use the eye dropper to add small amounts of water to specific areas of the sand. Observe how the water causes small channels or grooves to form, simulating erosion.
5. Ice Weathering (Melting and Movement): Place an ice cube on top of the sand. Let it sit and melt slowly. What happens to the sand as the ice melts? Does the water move sediment? Does the land change shape?
6. Wind Erosion: Use a hair dryer on a low, cool setting to gently blow across the sand. What happens to the sand? Do the pebbles move or stay in place? Where does the sand collect?

Now, complete your observations and answer the questions on the "Erosion and Weathering in Action" Activity Page.

☐ Activity 2: Investigating River Erosion with Data and Maps

Imagine you are flying over a winding river from high above. From the sky, the river doesn't move in a straight line—it curves and bends across the land. Some parts of the river are fast and powerful, while others are slow and calm. But here's the question:

Where is the land being worn away, and where is new land being built?

In this activity, you will act like a scientist analyzing maps and evidence to figure out how rivers shape the land through erosion and deposition.

Before you begin, watch the following short video to see how rivers move and shape the land. As you watch, think about:

- Where is the water moving fastest?
- Where does the river curve?
- Where do you see land being worn away?
- Where do you see sediment being deposited?



How Rivers Shape the Land

www.beyondthepage.com/link/13345/

Now, turn to your activity page titled "Investigating the River." Imagine you are a scientist studying Earth from above. As you look down at a winding river, you notice something interesting; its shape is constantly changing. The river bends and curves, carving into the land in some places while building it up in others. But these changes don't happen randomly. They follow patterns.

As you saw in the video, water moves faster in some parts of a river and slower in others. Fast-moving water can carry more sediment and wear away the land through erosion. When the water slows down, it can no longer carry as much sediment, so some of the sediment is dropped. This process is called **deposition**. Over time, erosion and deposition work together to shape the river and the land around it.

In this activity, you will analyze a river map and use evidence to figure out where erosion and deposition are happening and why. You will think like a scientist by observing patterns, making predictions, creating a model, and using what you know about water movement to explain how rivers shape Earth's surface over time. As you work, keep this big idea in mind: Moving water is one of the most powerful forces shaping the land and it is always changing it.

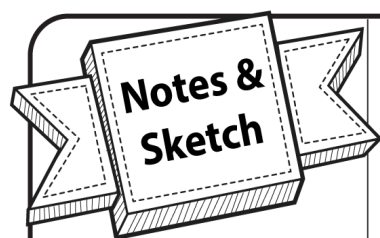
Wrapping Up

Today, you explored how powerful natural forces shape the land around us. You saw how rocks are broken down through weathering, how sediments are carried away by erosion, and how they are dropped in new places through deposition. Even though your model was small, these same processes are happening all over Earth, slowly changing mountains, rivers, and coastlines over time.

As you move into the next lesson, you'll begin to think about water in a different way. Water doesn't just shape the land; it can also be affected by human actions. You'll explore how water can become polluted, how it impacts ecosystems, and what we can do to protect one of Earth's most important resources.

Erosion and Weathering in Action

Directions: After completing the experiment, record your observations and sketch what happened to your sand landscape. Pay close attention to how water, wind, and ice changed the surface and how sediments moved.



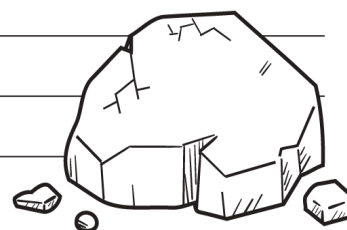
Use the space to the right to draw your landscape and label what happened.

Include labels such as:

- weathering
- erosion
- deposition
- sediments

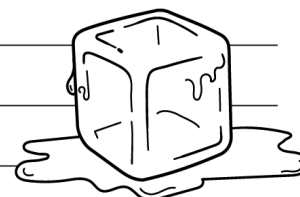
1. Observing Weathering

How did the land (sand or pebbles) break down during the activity?



2. Observing Erosion

How did water, wind, or melting ice move sediments from one place to another?



3. Observing Deposition

Where did the sediments end up? Describe what happened to the sediments as they stopped moving.

4. Comparing Forces

Which caused the most change to the land:

☐

Water

☐

Wind

☐

Ice

Explain your answer using evidence from your observations.



5. Vocabulary in Action

Use at least two vocabulary words (weathering, mechanical weathering, chemical weathering, erosion, deposition, sediments) to explain what happened in your model.

6. Think Like a Scientist

How does this small model help explain how Earth's surface changes over time in real life?



Investigating the River

Part 1: Understanding the River

Look at the river diagram below.

- What to notice:
- The river bends (called meanders)
 - The inside of bends
 - The outside of bends

Where would water be moving faster?
Where would it be slower?



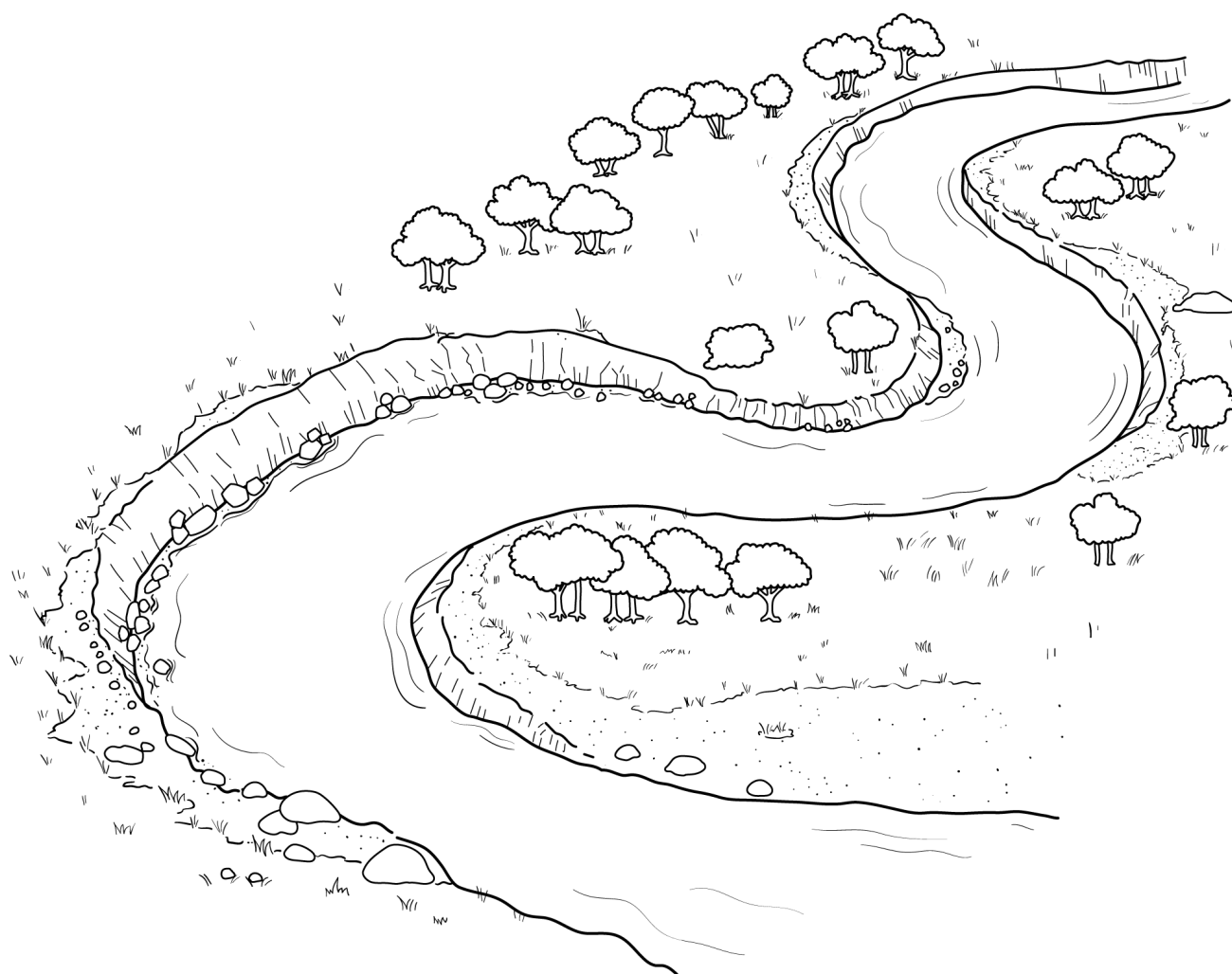
Part 2: Labeling Erosion and Deposition

Use your colored pencils to mark the diagram:

- Color the outside of each river bend RED → this is where erosion happens
- Color the inside of each river bend BLUE → this is where deposition



Faster-moving water on the outside = more erosion
Slower-moving water on the inside = more deposition



Part 3: Analyzing the Evidence

1. Where is erosion happening in the river system? _____

2. Where is deposition happening? _____

3. How does the speed of water affect erosion and deposition? _____

Part 4: Connecting to Real Life

4. What kinds of landforms might form from erosion? _____

5. What kinds of landforms might form from deposition? _____

Part 5: Think Like a Scientist

6. How does moving water change Earth's surface over time? _____

7. If the river continues to erode the outside of bends over many years, what might eventually happen to the shape of the river?

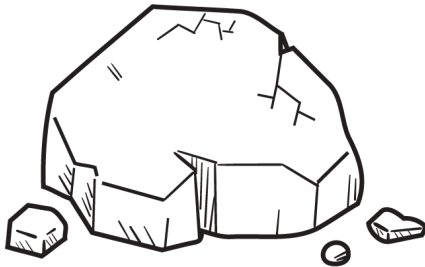
Modeling Earth's Changing Surface

Directions: Now it's your turn to think like a scientist and create a model. Draw a diagram on the following page that shows how Earth materials move through a continuous cycle.

STEP 1:

START WITH A ROCK

Draw a large rock or piece of land.



Label this:
Rock / Land Surface

STEP 2:

SHOW WEATHERING (BREAKING DOWN)

Draw arrows showing the rock breaking into smaller pieces.

You might add:

- Cracks forming
- Pieces breaking off
- Rain, ice, or wind acting on the rock

Label this: *Weathering*

STEP 3:

SHOW EROSION (MOVING SEDIMENTS)

Draw arrows showing the small pieces (sediments) being carried away.

You can draw:

- Water flowing
- Wind blowing
- Ice melting and moving material

Label this: *Erosion*

STEP 4:

SHOW DEPOSITION (DROPPING SEDIMENTS)

Draw where the sediments are dropped.

You might include:

- A riverbank
- A pile of sand
- A delta or flat area

Label this: *Deposition*

STEP 5:

SHOW THE CYCLE CONTINUES

Draw arrows from the deposited sediments back to land.

Add labels to show:

- What is causing the movement ?
- Where the process might happen in real life?

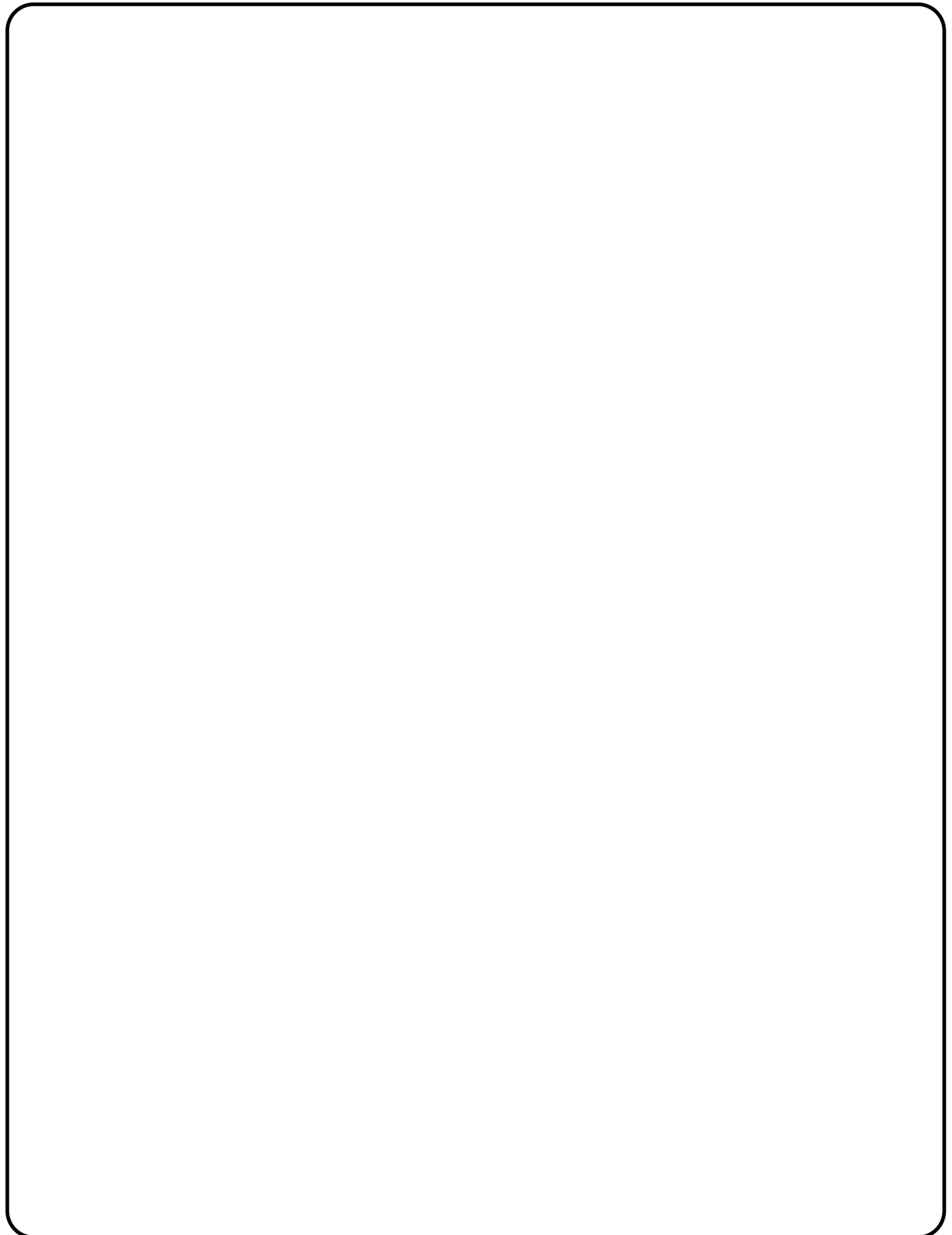
Add a note like:

"Over time, these materials can become part of new land and be weathered again."

GOAL:

Your diagram should show that:

- Earth materials are always moving
- The processes are connected
- The cycle repeats over time



Lesson 7: Weathering and Erosion

Getting Started

✿ Ideas to Think About

- How do natural forces break down, move, and deposit Earth materials to reshape the land?



Things to Know

- Water movements cause **weathering** and erosion, which change the land's surface features.
- **Mechanical weathering** is the process of breaking rocks into smaller pieces without changing what the rock is made of. This can happen when water freezes in cracks, roots grow into rocks, or rocks bump into each other.
- **Chemical weathering** is the process of breaking down rocks by changing their chemical makeup. This happens when water, acids, or oxygen react with minerals in the rock, forming new substances.
- **Erosion** is the process by which natural forces like wind, water, glaciers, and gravity move sediments from one place to another.
- **Deposition** is the process where moving water, wind, or ice drops sediments in a new location. This happens when the movement slows down and can no longer carry the materials.
- **Sediments** are small pieces of rock, soil, and organic material that are carried by natural forces like water, wind, ice, or gravity.

Reading and Questions

1. What is erosion?

Erosion is the movement of sediments and other weathered materials from one location to another by forces such as water, wind, ice, or gravity.

2. How is chemical weathering different from mechanical weathering?

Mechanical weathering breaks rocks into smaller pieces without changing what the rock is made of. Chemical weathering changes the rock itself by forming new substances through chemical reactions involving water, oxygen, or acids.

3. How do weathering, erosion, and deposition work together to shape Earth's surface?

Weathering breaks rocks into smaller pieces. Erosion moves those pieces to new locations. Deposition occurs when the moving materials are dropped and build up in a new place. Together, these processes continuously reshape Earth's surface by breaking down, moving, and rebuilding landforms.

⦿ Skills

- Construct an explanation based on evidence for how weathering, erosion, and deposition change Earth's surface over time. (MS-ESS2-2)
- Develop and use a model to describe how Earth materials move through the processes of weathering, erosion, and deposition. (MS-ESS2-1)
- Develop and use models to demonstrate how water, wind, and ice break down rocks and move sediments. (Science & Engineering Practice)
- Analyze and interpret observations from a model to identify where weathering, erosion, and deposition occur. (Science & Engineering Practice)

- Analyze and interpret patterns in river systems to determine where erosion and deposition are most likely to occur. (Science & Engineering Practice)
- Construct explanations to describe how the speed of water influences erosion and deposition in river systems. (Science & Engineering Practice)
- Construct an explanation based on evidence for how geoscience processes have changed the Earth's surface at varying time and spatial scales.
- Analyze evidence to explain observations, make inferences and predictions, and develop the relationship between evidence and explanation.
- Observe, collect, organize, and analyze data.
- Use oral and written language to communicate findings.

Introducing the Lesson

In this lesson, your child explores how Earth's surface is constantly changing through the processes of weathering, erosion, and deposition. She investigates how water, wind, and ice break down rocks, move sediments, and reshape landforms over time. Through hands-on modeling and analysis of river systems, she builds an understanding of how these processes work together and begins to see how small changes can lead to large-scale transformations of Earth's surface.

Activities

Activity 1: Erosion and Weathering in Action

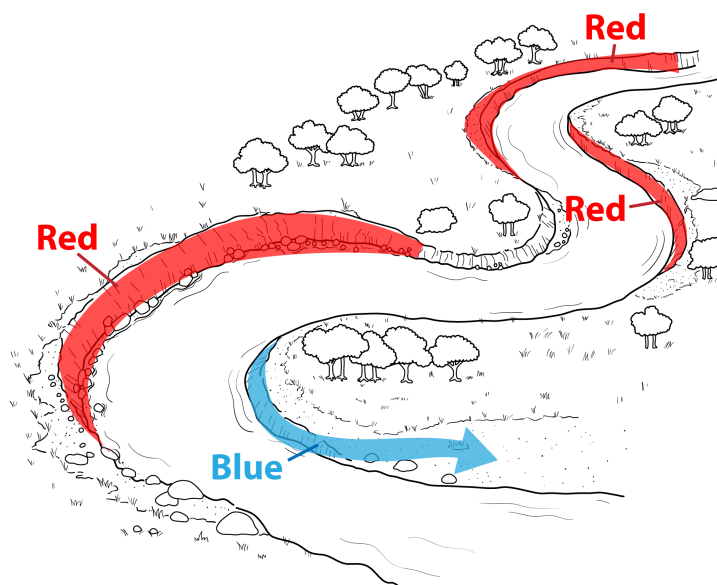
In this activity, your child explores how water, wind, and ice change Earth's surface through weathering, erosion, and deposition. She creates a simple model using sand and observes how materials break down, move, and settle in new places. As she works, she practices using key vocabulary and begins to understand how these same processes shape real landforms over time.

Answer Key:

1. The sand and pebbles were broken apart or shifted when water, wind, or ice acted on them. Water softened the sand, and the ice (as it melted) loosened materials. This is an example of mechanical weathering because the materials were broken into smaller pieces without changing what they are made of.
2. Water moved the sand and small pebbles from one place to another, forming small channels or grooves. Wind (hair dryer) may have blown sand across the surface. Melting ice also carried small particles as the water flowed. This movement of sediments is erosion.
3. The sediments settled in lower areas or where the water slowed down. Small piles or layers of sand formed. This is deposition, where sediments are dropped in a new location.
4. Answers will vary. Most students will say water caused the most change because it created channels and moved the most sediment. Explanation Example: Water caused the most change because it moved large amounts of sand and created visible pathways, while wind moved smaller particles and ice worked more slowly.
5. Answers should correctly use at least two vocabulary words. Example Response: Water caused weathering by breaking down the sand and pebbles. Then it caused erosion by moving the sediments to a new place where deposition occurred.
6. The model shows how Earth's surface can change over time as water, wind, and ice break down and move materials. Even though the model is small and fast, the same processes happen in nature over long periods of time, shaping landforms like rivers, valleys, and beaches.

Activity 2: Investigating River Erosion with Data and Maps

In this activity, your child analyzes a river diagram to understand how moving water shapes the land. She identifies where erosion and deposition occur and uses evidence from the map to explain how water speed affects these processes. Through this work, she strengthens her ability to interpret scientific diagrams and connect small-scale observations to how rivers change Earth's surface over time.

Answer Key:

1. Erosion is happening on the outside of the river bends, where the water is moving fastest and wearing away the land.
2. Deposition is happening on the inside of the river bends, where the water slows down and drops sediments.
3. Faster-moving water causes more erosion because it has more energy to carry sediments. Slower-moving water causes deposition because it cannot carry as much material and drops it.
4. Answer may include: Riverbanks being worn away, Valleys, Channels
5. Answers may include: Sandbars, Riverbanks building up, Deltas, Floodplains
6. Moving water changes Earth's surface by breaking down rock and soil (weathering), carrying sediments (erosion), and dropping them in new places (deposition). Over time, this shapes landforms like rivers, valleys, and deltas.
7. Over time, the river may become more curved (more pronounced meanders), or it may form a cutoff, creating an oxbow lake.

Modeling Earth's Changing Surface Answer Key**What a Complete Diagram Should Include:**

1. Starting Point: Rock / Land Surface. Expected: A drawing of a rock, cliff, mountain, or land surface labeled clearly.
2. Weathering (Breaking Down). Expected: Arrows showing the rock breaking into smaller pieces. May include rain, ice, or wind acting on the rock. Correct Idea: Rock is broken into smaller pieces without being moved yet
3. Erosion (Moving Sediments). Expected: Arrows showing sediments being carried away. Water (river), wind, or melting ice shown as the force. Correct Idea: Sediments are transported to a new location

4. Deposition (Dropping Sediments). Expected: Sediments settling or piling up. May show a riverbank, delta, or flat area. Correct Idea: Sediments are dropped when movement slows down
5. Cycle Arrows. Expected: Arrows connecting all steps. A loop showing the process repeats. Correct Idea: Earth materials are part of a continuous cycle

Wrapping Up

In this lesson, your child developed an understanding of how weathering, erosion, and deposition work together to shape Earth's surface. Through hands-on investigation and analysis of river systems, she connected small-scale models to real-world landforms and processes. In the next lesson, she will shift from how water shapes the land to how human activity impacts water quality, focusing on water pollution and its effects on ecosystems.

Questions to Discuss

- What is the difference between weathering, erosion, and deposition? (Answer: Weathering is the breaking down of rocks into smaller pieces. Erosion is the movement of those pieces (sediments) by water, wind, or ice. Deposition is when the sediments are dropped in a new location.)
- If a river suddenly started moving faster after a heavy rainstorm, how would that affect erosion and deposition? Explain your reasoning. (Answer: If the river moves faster, it would cause more erosion because the water has more energy to carry sediments. There would be less deposition in fast-moving areas because the water can hold onto the sediments longer. Deposition would happen farther downstream where the water slows down.)

Things to Review

- Review the difference between weathering, erosion, and deposition, and how each process changes Earth's surface.
- Review how water, wind, and ice work together to break down, move, and deposit sediments over time.