

Let It Sink In!

Earth's Systems

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Grade Level	6th – 7th Grade	**Time Frame**	160 minutes
Subject	Science	**Duration**	3 class periods

Essential Question

How do Earth’s materials cycle through living and nonliving components?

Summary

In this lesson, students will learn about the different stages in which a rock can exist due to natural causes or human impact. Students will construct models that illustrate how biochemical processes cycle through living and nonliving organisms.

Snapshot

Engage

Students justify and evaluate preconceived notions about rocks, and watch a clip of a natural disaster caused by rock transformation.

Explore

Students investigate different stresses that affect rock formation.

Explain

Students read an article to help construct explanations for the flow of the rock cycle.

Extend

Students research and create a model that shows the flow of different matter into and out of living and nonliving parts of the ecosystem.

Evaluate

Students assess and gather data from one another's work and use the information to answer the lesson’s essential question.

Standards

ACT College and Career Readiness Standards - Science (6-12)

IOD403: Translate information into a table, graph, or diagram

Oklahoma Academic Standards (6th Grade)

ESS2: Earth's Systems
6.ESS2.1 : Develop a model to describe the cycling of Earth's materials and the flow of energy that drives these processes within and among Earth's systems.
6.ESS2.1.1: All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems.This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produces chemical and physical changes in Earth's materials.

Oklahoma Academic Standards (6th Grade)

7.LS2.3 : Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.

Attachments

- Biogeochemical Cycles—Let It Sink In! - Spanish.docx
- Biogeochemical Cycles—Let It Sink In! - Spanish.pdf
- Biogeochemical Cycles—Let It Sink In!.docx
- Biogeochemical Cycles—Let It Sink In!.pdf
- Career Reflection—Let It Sink In!.docx
- Career Reflection—Let It Sink In!.pdf
- Careers Card Sort Solution—Let It Sink In!.docx
- Careers Card Sort Solution—Let It Sink In!.pdf
- Careers Card Sort—Let It Sink In!.docx
- Careers Card Sort—Let It Sink In!.pdf
- Lesson Slides—Let it Sink In.pptx
- Minerals, Rocks, and the Rock Cycle—Let It Sink In!.docx
- Minerals, Rocks, and the Rock Cycle—Let It Sink In!.pdf
- Rock Cycle—Let It Sink In! - Spanish.docx
- Rock Cycle—Let It Sink In! - Spanish.pdf
- Rock Cycle—Let It Sink In!.docx
- Rock Cycle—Let It Sink In!.pdf
- You're Stressing Me Out Lab Instructions—Let It Sink In! - Spanish.docx
- You're Stressing Me Out Lab Instructions—Let It Sink In! - Spanish.pdf
- You're Stressing Me Out Lab Instructions—Let It Sink In!.docx
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- You're Stressing Me Out Lab—Let It Sink In! - Spanish.pdf
- You're Stressing Me Out Lab—Let It Sink In!.docx
- You're Stressing Me Out Lab—Let It Sink In!.pdf

Materials

- Lesson Slides (attached)
- You're Stressing Me Out Lab Instructions (attached; one per student)
- You're Stressing Me Out Lab handout (attached; one per student)
- Minerals, Rocks, and the Rock Cycle handout (attached; one per student)
- Rock Cycle handout (attached; one per student)
- Biogeochemical Cycles handout (attached; one per student)
- Careers Card Sort (attached; one per student)

- Careers Card Sort Solution (attached)
- Internet-capable devices
- Career Reflection handout (attached; one half-page per student)
- Regular-size bars of Ivory soap (one per student)
- Copy paper (one sheet per group of three students)
- Glue sticks (one per group)
- Colored chalk (one set per group)
- Butcher paper (optional; one sheet per group)
- Markers (optional; one set per group)
- Highlighters (one per student)
- Scissors (one pair per group)

20 minutes

Engage

Use the attached **Lesson Slides** to follow along with the lesson. Display **slide 3** and read aloud the essential question:

> How do Earth's materials cycle through living and nonliving components?

Display **slide 4** and share the learning objectives.

Display **slide 5**. Invite students to participate in an Always, Sometimes or Never True activity. As you go through each statement on **slides 6–13**, have students give a thumbs up for always, thumbs to the side for sometimes, or thumbs down for never. Be sure to read each statement separately and call on different students to give their opinions on the statement.

- All rocks are hard.
- Rocks can change form.
- Rocks make up the entire Earth.
- All rocks are the same.
- It's hard to tell how rocks originated.
- Rocks and minerals are the same thing.
- Humans are the cause of rock formations.
- Minerals are not important to my life.

Optional Enhancement

To enhance the Always, Sometimes, or Never True activity, consider engaging students in a more robust discussion by splitting the room into three sections, one for each category.

Ask students to choose a section of the room to move to as you read each statement and, when there, discuss their reasoning with others who made the same choice. Have a spokesperson from each group share with the whole class. After representatives from all three sections have shared, students can decide whether they want to change sections based on the arguments presented.

Be sure to set rules before beginning classroom debates. Remember that you are acting as the moderator—don't provide thoughts on any viewpoints.

After wrapping up the Always, Sometimes, or Never True activity, show one or both video clips about sinkholes that have occurred in Oklahoma.

Clip 1 (**slide 14**): "Massive Oklahoma Sinkhole appears overnight"

Embedded video
https://youtube.com/watch?v=Pz6EFS1fu1A

Clip 2 (**slide 15**): "Weatherford building about to be swallowed by sinkhole"

Embedded video
https://youtube.com/watch?v=HCUthn8Z_KY

Write down any questions that students have after watching the clips.

20 minutes

Explore

Before beginning this portion of the lesson, gather the supplies for the lab.

Move to **slide 16** and distribute the **You're Stressing Me Out Lab Instructions** (attached) and the **You're Stressing Me Out Lab** handout (attached). Read the introduction aloud as a class to review the three types of stresses that the students will perform.

Move students into groups of three and give each group a bar of soap. Instruct students that each group member will demonstrate one of the three types of stressors. Before each demonstration, ask students how they can go about showing this particular stressor. After each demonstration, have students record their observations on their lab handouts. Move around the room to monitor students and clear up any potential misconceptions.

At the end of the activity, have students use compressional stress to take the small soap remains that they have left and smash them together. Tell students that this is how sedimentary rocks are formed.

Teacher's Note: Stress Test Tips

- Images that can help explain to students how to perform each stress, as well as additional activities, can be found in Teach Engineering's Soapy Stress Instructions.
- For an honors class, consider having students test the effects of the stressors on different brands of soap and compare that to what it could mean about the rate of change for different types of rocks.
- Make sure students do not rub their eyes and that they wash their hands before exiting the lab.
- Consider asking a local community leader, organization, or business to donate the soap.

Optional Lab Report

Consider asking students to write a lab report to reflect on their experience. The R.E.R.U.N. strategy can help students analyze and evaluate their findings. Be sure to go over the instructions and rubric to make sure students know what is expected of them.

40 minutes

Explain

Display **slide 17** and distribute the **Minerals, Rocks, and the Rock Cycle** handout (attached) and highlighters. Instruct students to read the article. As they read, direct students to highlight information about the rock cycle they deem to be important.

Supplemental Articles

If you would like to give students further options for their research, consider using the following articles:

Read about Rocks, Minerals and the Rock Cycle

The Rock Cycle

Move to **slide 18** and organize students into new groups of three. Invite students to complete the **Rock Cycle** handout (attached). Provide each group with one blank sheet of copy paper and a glue stick. Direct students to divide the three stages (igneous, sedimentary or metamorphic) of the rock amongst their group. Have students follow the directions on the handout to select and illustrate a type of rock that exists at their chosen stage and explain which processes must have occurred for the rock to be at that stage.

After each student has completed their section, have the group place their sections in the correct order of the rock cycle in a cyclical formation. Ask them to label each component of the cycle and draw arrows showing the direction in which it moves.

Optional Activity

After students complete this activity, consider playing one of the following songs to reinforce the rock cycle or to help students self-assess their group's cycle:

- "Rock Cycle Song" (**slide 19**)
- "We Will Rock You Song" (**slide 20**)

60 minutes

Extend

Distribute the **Biogeochemical Cycles** handout (attached). Organize students into groups of four. Go to **slide 21** and inform students they will learn about other essential materials that living and nonliving factors cycle through the environment. Assign each group one of the cycles listed below.

Biogeochemical Cycles:

- **water**
- **carbon**
- **nitrogen**

Invite students to research facts about at least three different stages of each cycle and what drives the movement to each part of the cycle. Make sure students cite where they are getting the information about the biogeochemical cycles. Emphasize the importance of students working together to research and delegate tasks for illustrating the cycle. Since this activity moves outside, be sure to constantly circle and monitor the students' progress.

Next, escort students outside, provide them with a set of colored chalk, and invite each group to draw their cycles on the pavement.

Teacher's Note: Research Resource

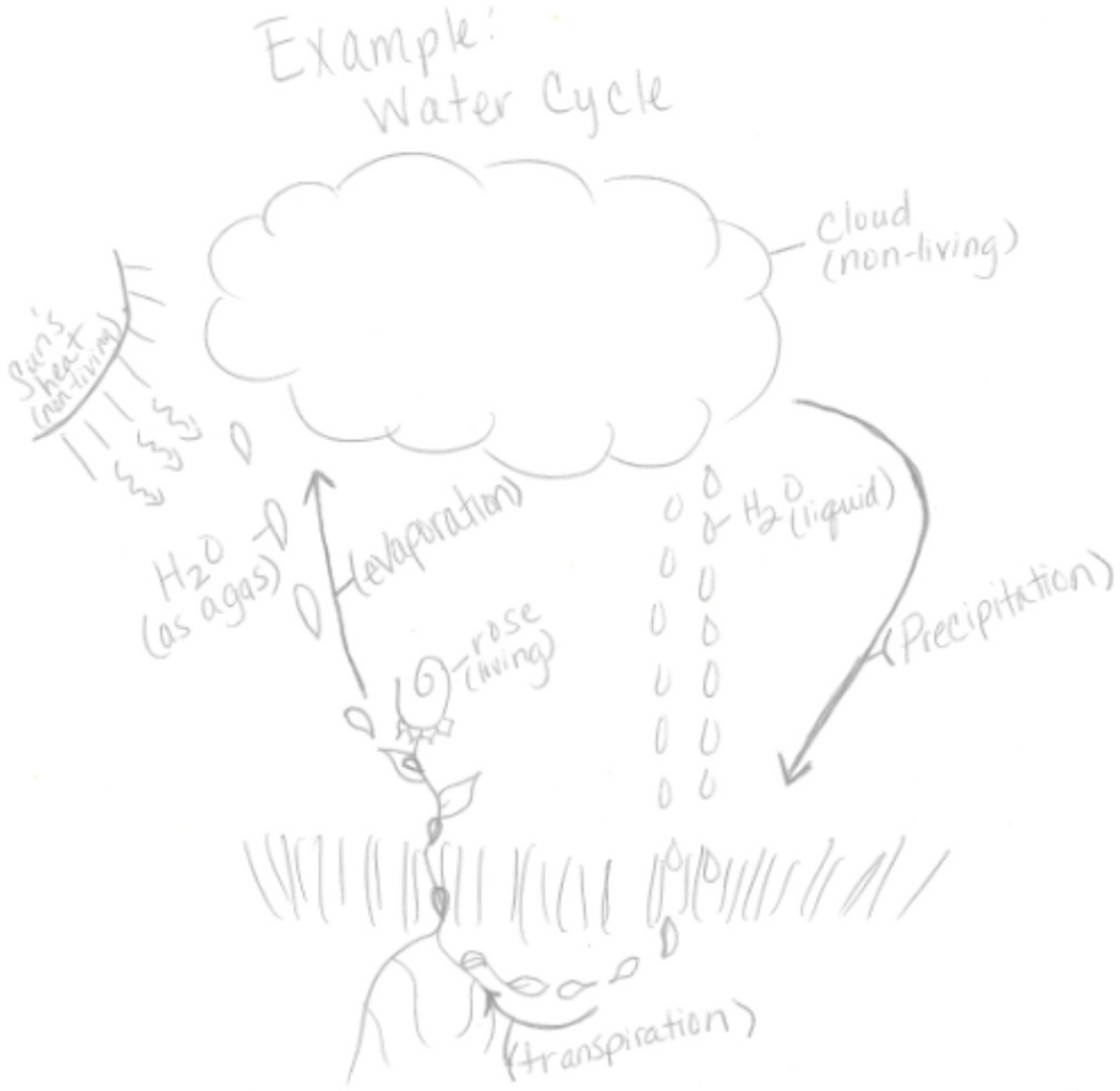
Encourage students to use keyword searches to locate research articles related to their assigned biogeochemical cycle. If students are unable to find an appropriate resource on their own, consider pointing them to the "Intro to Biogeochemical Cycles" article from Khan Academy.

Teacher's Note: Rainy Day Alternative

If weather does not permit, consider providing each group with a large sheet of chart or butcher paper and markers to illustrate their cycles and hang around the room.

Student Example

The image below shows an example of what a student sketch could look like.



Optional ICAP Activity

The following activity can be used to add a career exploration element to this lesson. Prior to the activity, review the Card Sort instructional strategy, and print and cut out the attached **Careers Card Sort** so that there are enough sets for eight groups of students (one set per group).

Display hidden **slide 22** and place students into eight groups. Pass out the Careers Card Sort handout to each group. Tell students the cards have information for five careers related to the rock cycle. Instruct students to sort the cards into the following categories:

- Career title
- Required education level
- Years of education needed
- Salary range

Tell students that the QR codes on each of the career title cards has a link with the information they need to complete the card sort. As each group finishes sorting, use the attached **Careers Card Sort Solution** to check student work. You can display the correct answers on hidden **slide 23** or use it to check each group's work yourself.

15 minutes

Evaluate

Move to **slide 24** and direct students to the second page of the Biogeochemical Cycles handout. Invite students to do a Gallery Walk to view the other groups' cycles. Ask them to gather data on the stages each group chose to illustrate and take notes on their **Biogeochemical Cycles** handouts. They should then evaluate this data and use the findings to draft an answer to the essential question (displayed again on **slide 25**):

> How do Earth's materials cycle through living and nonliving components?

Remind students to use vocabulary that they learned in this lesson to respond to the essential question.

Optional ICAP Activity

Pass out the **Career Reflection** handout (attached) to each student. Move to hidden **slide 26** and have students answer the questions on the Reflection handout. Direct students to choose the career that interests them the most from the choices in the Card Sort activity. Using the QR codes, have them research what the day-to-day job description is, and determine what postsecondary education options are available in their state for that certification/degree. (If one is not listed for their state, then students can look at a neighboring/different state.)

Note: For the Reflection handout, students can find the different postsecondary education options for each career by accessing the My Next Move website via the QR code in the Card Sort, and then clicking on the "Find Training" option in the "Education" section. From there, they can enter their zip code or state to search.

For the fourth quadrant, students may choose an occupation such as a farmer and their understanding of the impact of erosion on the soil.

Resources

- Emily B. (2012, October 29). *WE WILL ROCK YOU! (The rock cycle)* [Video]. YouTube. https://www.youtube.com/watch?v=r68iEwYdbh4
- Generation Genius. (2020, August 31). Read about rocks, minerals & the rock cycle: Science for grades 6–8. https://www.generationgenius.com/rocks-and-minerals-reading-material-grades-6-8/
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