Title for Lesson Plan: Physical and Chemical Weathering with Virtual Field Trip

Your Name:

Approximate (Amount of) Time Required for Lesson: 1 standard class period (1 Hour)

Grade Level/Subject(s):10th Grade Earth Science

Central Focus of the Learning Segment:

Students will observe outcrops in a virtual setting and describe examples of physical and chemical weathering.

Related Prior Learning:

Students are assumed to have covered physical and chemical weathering in middle school and the lesson prior.

Illinois Standards

(DCI) Earth’s Materials and Systems: 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 produce chemical and physical changes in Earth’s materials and living organisms. (MS-ESS2-1)

(DCI) The Roles of Water in Earth's Surface Processes: Water’s movements—both on the land and underground—cause weathering and erosion, which change the land’s surface features and create underground formations. (MS-ESS2-2)

(Crosscutting Concepts) Stability and Change: Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS2-5)

(Practices) Obtaining, evaluating, and communicating information, developing and using models.

(Performance Expectations) Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. (MS-ESS2-2.)

(Note: This is the one of the first lessons in the first unit of a high school earth science curriculum. The standards addressed here include middle school standards because it is common practice to review and develop these standards/concepts at the start of a high school earth science course.)

Materials/Instructional Resources

Access to laptops for all students and the internet

Whiteboard

Expo Markers

Website found here: <https://www.geology.illinois.edu/virtualfieldtrip/ilparks.html>

Virtual Field Trip Worksheet

Exit Slip

|  |  |
| --- | --- |
| Objectives  Students will analyze a virtual outcrop of their choice and determine the the time progression of weathering.  Students will model and support their explanations with outcrop sketches illustrating the processes and results of the investigations, connecting to their prior understanding of physical and chemical weathering.  Students will analyze photographs of rock outcroppings and will use evidence from these (as well as prior learning) to explain that the outcrops were shaped over long periods of time by physical and/or chemical weathering processes that have broken the rock and reduced the size of outcrops. | Assessment  Whiteboard illustrations of the before and after time progression of an outcrop in regards to physical or chemical weathering.  An exit slip will be a formal assessment of whether the students understand both physical and chemical weathering along with the weathering features on an outcrop. |

OPTIONAL: Key Vocabulary in Lesson:

Outcrop: a rock formation that is visible on the surface.

Repeat Vocabulary from last lesson:

Physical weathering: Rocks are being broken apart but are not changing

Chemical weathering: Processes that cause ***exposed*** rock to undergo chemical decomposition, which is the change of chemical and mineral composition of the rock

Instructional Strategies and Learning Tasks (Procedure)

**Introduction:**

Start the class by asking the class:

* What are some examples of chemical and physical weathering that were modeled in the last class?

*Italicized and underlined answers should be provided by the instructor at the end of discussion*

|  |  |
| --- | --- |
| **Physical Weathering** | **Chemical Weathering** |
| Glaciers | Dissolving with Acid |
| *Biological Weathering* | *Reacting with Oxygen* |
| Wind |  |
| Water - Cross Bedding, Ripple Marks, Ice Wedging |  |

Write these observations on the whiteboard in two separate charts, one for physical and one for chemical weathering, and try to elicit the response of glaciers. Now add Biological Weathering under physical weathering and Oxidation under chemical weathering.

Definitions read to class:

***Biological Weathering:*** *Plant roots can grow in cracks. The pressure of a confined growing root can be substantial. These pressures make cracks in the rocks larger, and, as roots grow, they can break rocks apart.*

***Reacting With Oxygen:*** *The reaction between rocks and oxygen is known as oxidation. One of the most common examples of oxidation is iron oxide, or rust.*

After the small review, ask students:

* Where do you think you will find glaciers today?(Anticipated Response:..Antarctica,The Ocean.)
* Would it make sense for glaciers to be located in Illinois? (Anticipated Response:..................No.) [but in the past, Illinois underwent a glacial period in the Pleistocene Epoch (2.58 Million Years Ago) that covered 90% of the state]

These glaciers melted and left behind huge lakes of water. The lakes of water were held together by glacial deposits and was easily eroded away. The glacial lake turned into a massive river system and eroded a large portion of land that is now a popular tourist destination; Matthiessen State Park and Starved Rock.

Pass out the Virtual Field Trip Worksheet.

**Learning Tasks/Activities:**

Have the students find someone they haven’t worked with yet in all the peer teaching sessions. The students can decide this among themselves. Once the new pairs are made, have each pair have AT LEAST one laptop (two is preferred for more individual interaction) and have them pull up the website: <https://www.geology.illinois.edu/virtualfieldtrip/ilparks.html> . The teacher should start the investigation with a question which is: How does weathering affect rock outcroppings like those in the pictures of the state park**?**

***DON'T ELICIT THIS RESPONSE YET: An example is in the Devil’s Paintbox where the students can see iron oxidation occurring in the outcrop. Since the entire lower dells area is mainly comprised of sandstone which doesn’t contain iron; My explanation would be that the water that is running through the porous sandstone contained traces of iron and oxidized when reaching the outcrop.***

Tell the class to click on the Matthiessen State Park side and to explore the park with their partners.

Before the student explore, show students how to interact with the application as there is a small learning curve. Walk around the class as students look at the outcrops and clear any miscommunications.

Students should choose one of the outcrops to represent on their whiteboard. On each whiteboard should be each groups’ before and after drawing, what they think the outcrop looked like before, and what the outcrop looks like now. Each board should also include an explanation of what each group believe happened in the outcrop. The pairs will go around and present their before and after sketches along with what weathering feature is present and what caused them. Groups that are in the audience should have a question or two regarding their presentation.

**Closure:**

Students will be given an exit slip to be completed INDIVIDUALLY. An exit slip with answers will be included as well incase students have any question. Please collect the exit slips as students leave class and remind them that it will be graded for accurateness.

Main ideas to be summarized at the end of the day: (write the first part on the board and try to elicit the answers)

Physical Weathering is….. Rocks are being broken apart but are not changing.

Chemical weathering is…..Processes that cause exposed rock to undergo chemical decomposition, which is the change of chemical and mineral composition of the rock.