

Lesson 5: The Rock Cycle: Making the Connection

Target Grade or Age Level

Sixth grade science

Scientific Processes Addressed

Defining operationally, formulating and testing hypotheses, constructing models

Scientific Concepts Addressed/Proposed PDE Academic Standards

- 3.2.7 Inquiry and Design
 - Apply process knowledge to make and interpret observations
 - Interpret data, formulate models, design models, and produce solutions
- 3.5.7 Earth Sciences
 - Describe earth features and processes
 - Describe the processes involved in the creation of geologic features (e.g. folding, faulting, volcanism, sedimentation) and that these processes are seen today (e.g. erosion, weathering crustal plate movement) are similar to those in the past
 - Explain how the rock cycle affected rock formations in the state of Pennsylvania

Instructional Objectives

- Students will formulate a hypothesis to determine if sedimentary, igneous and metamorphic rocks are related
- Students will define operationally the Rock Cycle via the Internet
- Students will construct a visual model, diagram, or song that illustrates how the Rock Cycle works

Materials Required

Internet access, computer lab, rock cycle chart, sheet for Web exploration (provided)

The “5 Es” Instructional Model

1. **Engage**—During the first day of instruction I will ask some of the students to read their two-sentence summaries of the excerpt from *The Big Rock* (in lesson 4). I will record the main ideas that they state on a brainstorming chart. Next, I will ask the students to recall the characteristics of sedimentary, igneous and metamorphic rocks (review of previously learned material). Now, I will pose a question to the students, “Are sedimentary, igneous and metamorphic rocks all related?” “Is there anyway to take a sedimentary rock and change it to a metamorphic rock?” After I have posed these questions, I will have the students talk to their neighbor to share their ideas. Then, I will give each student a web-exploration sheet that will be used during our activity set. The students will record their hypothesis on whether all rocks are related.
2. **Explore**—Students will be paired up after they finish writing their hypotheses. The class will proceed to the school’s computer laboratory and log on. They will go to the following website: <http://www.leo.lehigh.edu/envirosci/geology/rocks/rocks.html>.

Next, they will click on the link entitled “Are they all related?” This page has several links that the students will work through and gather information. I will tell the students to compare their hypothesis to what geologists and other scientists have found. The students will have the rest of the 1st class period of this lesson to complete and gather information. Students will be instructed to circle, underline main ideas and key words that they found. This will be used for a class discussion.

3. **Explain**—During the second day of instruction for this lesson. The students will share the information they gathered for each site. I will ask the students some questions to get them started such as: “Was your hypothesis correct? If not, explain why?” “Is there any information you found that discusses how sedimentary rocks can be changed into igneous rocks?” “What about changing sedimentary rocks to metamorphic rocks and vice versa?” Once the students have gathered these main concepts, I will help to define what they are:
 - a. Weathering—breakdown of sedimentary rocks into smaller sediments or pieces of rock
 - b. Crystallization—metamorphic rocks are melted by high heat and turns to magma. This magma forms into intrusive rocks that have crystal structures.
 - c. Melting of metamorphic rocks—metamorphic rocks are melted by high temperatures underground and turns into liquid magma.
 - d. Consolidation—magma is released thru volcanoes and becomes solid lava once it settles on the earth’s crust. Now it becomes an extrusive igneous rock.
 - e. Uplift and exposure—Plate movements underground force metamorphic rocks upward to the surface. These rocks are exposed to rain and wind and small pieces are broken off into sediments.
 - f. Lithification—All of the sediments are cemented and compacted together to form sedimentary rocks.

4. **Elaborate**—During the third and last day of instruction for this lesson the students will now engage in an individual project that will show some type of model that represents the rock cycle. The students will log on to the following website: <http://www.leo.lehigh.edu/envirosci/geology/rocks/rocks.html>. Here they will click on the link entitled “Activities with THE ROCK CYCLE”. The students will choose one activity from the following site: <http://proteacher.net/sarahw/Rocks2.htm> and the students must complete activity two on drawing their own diagram of the rock cycle. The students will submit these the day of their unit exam. They can use them to study from. They will complete this on loose-leaf or construction paper.

5. **Evaluation**—The following activities will be used to assess the students learning:
 - a. Web exploration—scored on the following rubric (hypothesis written, # of links used, key concepts found, summary of ideas)
 - b. Rock Cycle Activity—(clarity of project, concepts of rock cycle found within, neatness, spelling and grammar)

Rubric for Lesson 5—The Rock Cycle

Outstanding—Students completed task above and beyond expectation. Great examples and well-thought out explanations. Student demonstrated understanding at an advanced level.

Good—Student completed task and met expectation. Good example used and explanations were satisfactory. Student demonstrated understanding at a proficient level.

Fair—Student completed some parts of the task and was below expectation. Some evidence of examples are used, but explanations lacked depth and clarity. Student demonstrated understanding at a basic level.

Unsatisfactory—Student didn't complete tasks or minimally. Little to no examples used and explanations were minimal or none was given. Answers lack clarity and student demonstrated understanding at a limited level.

WEB EXPLORATION ACTIVITY—ARE ALL ROCKS RELATED TO EACH OTHER?

Criteria	Outstanding	Good	Fair	Unsatisfactory
Hypothesis	27-30	24-26	20-23	0-19
Summary of Ideas—Testing Hypothesis	27-30	24-26	20-23	0-19
Key Concepts Found—Defining Operationally	27-30	24-26	20-23	0-19
Number of Links Used for Site—Validity of Hypothesis	9-10	7-8	5-6	0-4
TOTAL	90-100	75-89	65-74	0-64

ROCK CYCLE ACTIVITY

Criteria	Outstanding	Good	Fair	Unsatisfactory
Clarity of Project/Model	27-30	24-26	20-23	0-19
Key Concepts Found—Defining Operationally	27-30	24-26	20-23	0-19
Overall Display of Presentation	27-30	24-26	20-23	0-19
Mechanics (neatness, etc)	9-10	7-8	5-6	0-4
Final Score	90-100	75-89	65-74	0-64

Web Exploration Activity: Are all rocks related to each other?

Based on the explorations we have done thus far and the readings we have done in class, do you believe that sedimentary, igneous and metamorphic rocks are all related?

Write a hypothesis and give an explanation of why sedimentary, igneous and metamorphic are related? If you do not believe they are all related explain why. Type and email your hypothesis to cda3@lehigh.edu. After you have typed your hypothesis proceed on with the web exploration for the Rock Cycle.

Now that you have finished your exploration, is your hypothesis correct or void? Explain the results and conclusions you have made from your search. Please write one paragraph. In your paragraph, underline new words that you have learned and key terms that were important in your research.

How many different links did you use in your search? _____

THE ROCK CYCLE

INTERNET ACTIVITY

CHOOSE ONE OF THE FOLLOWING ACTIVITIES:

- ORGANIZE AND ILLUSTRATE THE FOLLOWING LIST OF EVENTS INTO AN ORDER THAT TELLS HOW ROCKS GO THROUGH THE ROCK CYCLE
 - SEDIMENTS
 - IGNEOUS ROCK CEMENTING AND COMPACTING
 - MELTING
 - HEAT AND PRESSURE
 - METAMORPHIC ROCK
 - SEDIMENTARY ROCK
 - WEATHERING AND EROSION

- PRETEND YOU ARE SEDIMENT THAT WENT THROUGH THE ROCK CYCLE, AND YOU ARE NOW A METAMORPHIC ROCK. DESCRIBE THE CHANGES YOU WOULD NEED TO GO THROUGH BEFORE YOU COULD AGAIN BECOME SEDIMENT. THIS COULD BE WRITTEN OR DRAWN.

- WRITE A "ROCK" SONG. WRITE ABOUT THE FORMATION OF METAMORPHIC, IGNEOUS AND SEDIMENTARY ROCKS.

ACCESS THESE INTERNET SITES:

http://www.bc-mining-house.com/edu/rock_min.htm

<http://duke.usask.ca/~reeves/prog/geoe118/geoe118.011.html>

The Rock Cycle

Name _____

