

TE 802: Plan and Report for Focus Class Units

Name: Emily Davidson	Field Instructor: Pat Maldonado
Mentor Teacher: Lisa Ernst	School: Holt 9 th Grade

Part I: Information about the Unit

Subject:

Earth science

Topic:

Advanced Rock Cycles

Type of Class

- Grade level(s): 9 High school
- Type of school: Suburban
- Tracking level: College bound (?)

Abstract

The students will learn about the rock cycle and the methods by which metamorphic, igneous, and sedimentary rocks transform throughout the rock cycle. They will be able to look at different rocks to see the effect that different forms of cooling has on the size of crystals. They will also be able to determine the relationship between the rock cycle and plate tectonics based on the type of rock present. They will be able to differentiate between metamorphic, igneous, and sedimentary rocks based on their size/shape of grains, crystal sizes, and texture.

Part II: Clarifying Your Goals for the Unit

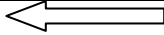
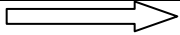
Knowledge: Big Ideas

Metamorphic rocks are identified by their texture of whether they have distinct foliation or not. This will tell about whether the rock underwent contact or regional metamorphism. Igneous rocks are identified by the size of their crystals which explains how long they were forming under the surface as the larger the crystal the longer the formation time. Sedimentary rocks are identified by their grains size and shape as it tells where they were formed and deposited. The methods the rocks in the rock cycle transform are by through cooling, crystallization, weathering, erosion, sedimentation, lithification, and contact or regional metamorphism. These processes are influenced by both plate tectonics and the climate. Rocks are composed of minerals which are naturally occurring, inorganic, crystalline solids that have a characteristic chemical composition, internal structure, and a characteristic set of physical properties.

Knowledge: Experiences, Patterns, and Explanations

	Observations or experiences (examples, phenomena, data)	Patterns (laws, generalizations, graphs, tables, categories)	Explanations (models, theories)
Initial	- Had at least one year previous of rock cycle overview.	- permeable rock is porous rock that allows liquids to pass	

<p>Student EPE</p>	<ul style="list-style-type: none"> - lava - Magma - Limestone - Coal - Aluminum ore - oil shale - sedimentary rock acts as a reservoir for petroleum - cap rock is made of impermeable rock - Read about carbonate from the carbon cycle - Geology: Branch of Earth science 	<p>through it.</p> <ul style="list-style-type: none"> - impermeable rock does not allow for liquids to pass through it 	
<p>Goal EPE</p>	<ul style="list-style-type: none"> - rock cycle animation - sedimentation column - oxidation demo - sedimentary rock samples - metamorphic smashed snickers demo - metamorphic rock samples - salt crystal demo - igneous rock samples 	<ul style="list-style-type: none"> - The longer that rocks stay underground the larger its crystals are. - Rocks with foliation have undergone extreme pressure. - Rocks with darker colors have more basaltic material - Rocks with lighter colors have more silicic material - Schist is a type of layering or foliation found of metamorphic rocks where minerals large enough to be seen by eye tend to line up all in the same direction - any rock - igneous, sedimentary, or metamorphic - can be a parent rock - metamorphic rocks are classified on the basis of texture (grain size, shape, orientation) and mineral composition. -Organic metamorphic rocks are mainly composed of well-preserved organic debris, such as plants, shells or bones (eg., coal, shelly limestone) -Granular igneous rocks are consisting of crystal grains that are large enough to be easily seen by the naked eye, the grains varying in size from 0.5 mm (1/32 in) in adesites to over 5 mm (1/4 in) in granites. - Aphanitic igneous rocks are made up of tiny crystals, which can only be identified using a microscope or 	<ul style="list-style-type: none"> -Clastic metamorphic rocks consists of broken and weathered fragments of pre-existing rocks and / or minerals and / or shell fragments, clastic rocks may have their individual components cemented together by calcite, iron oxide, etc. -Crystalline metamorphic rocks consist of crystals that have been precipitated from solution, which are locked together like the pieces of a three-dimensional jigsaw puzzle, thus giving the rock great strength without cementing material (eg., limestone). - Sedimentary rocks are formed in two ways. Some are formed by pressing together or compacting loose particles which have been deposited on land or in water bodies such as seas or lakes. These loose particles are called sediments. Other sedimentary rocks are formed by the crystallisation of dissolved minerals. - Foliated igneous rocks are composed of minerals that are arranged in parallel bands, sometimes contorted as a result of the way the rock flowed while it was still hot and plastic (eg. flow-banded rhyolite).

		<p>powerful hand lends, they give the rock a flow texture (eg. basalt) when aligned.</p> <p>-Glassy igneous rocks are composed of volcanic glass, sometimes the glass may be streaky, due to aphanitic bands, and may often contain micro crystals of feldspar (eg. obsidian).</p> <p>Pyroclastic igneous rocks are volcanic rocks in which the magma has been shattered by an explosive eruption and so may consist of tiny silvers of volcanic glass, fragments of pumice, crystals or fractured rock; they may be unconsolidated or cemented together when fresh and altered to clays by weathering when not.</p> <p>Porphyritic igneous rocks have larger crystals, phenocrysts, embedded in a finer ground mass; some of the large crystals best being described as megacrysts that have grown in solid rock by means of the replacement of other minerals -- a common feature in many granite.</p>	
 Application: Model-based Reasoning			
Inquiry: Finding and Explaining Patterns in Experience 			

Possible Objectives for Student Learning

Objective	Type
High School or Grade Level Content Expectation(s)	
1. E3.1A Discriminate between igneous, metamorphic, and sedimentary rocks and describe the processes that change one kind of rock into another.	Identifying
2. E3.1B Explain the relationship between the rock cycle and plate tectonics theory in regard to the origins of igneous, sedimentary, and metamorphic rocks.	Identifying
Specific Unit Objective(s)	
1. Students will understand how sedimentary rocks are formed, what they are composed of, and how the size and shape of grains indicate the environment of formation.	Identifying
2. Students will understand how igneous rocks are formed, what they are composed of, and how the crystal sizes indicate the rate of cooling and whether the rock is extrusive or intrusive.	Identifying
3. Students will understand how metamorphic rocks are formed, what they are composed of, and how the texture indicates whether it experienced regional or contact metamorphism.	Identifying

Part III: Lesson Sequence

Types of Lesson Sequences

DAY	Activity	Experimental Inquiry Cycle: POE
Previous: Pre-assessment	Pre-Assessment Quiz	
10/6	<ol style="list-style-type: none"> 1. 5 minute presentations per group for the alternative energy projects. (allows for the special needs students to have one day longer to finish projects) 2. Start mineral presentations 	
10/7	<ol style="list-style-type: none"> 3. Journal Question 4. Difference between minerals and rocks 5. Start igneous salt crystal demo set-up 	Prediction: Students will predict what will happen in the case of the salt crystallization demo. They will decide whether the salt will form bigger crystals in the freezer, in the fridge, on the counter out of the sunlight, or in the sunlight.
10/8	<ol style="list-style-type: none"> 1. Crayon Rock Cycle Lab (shortened day) 	
10/9	<ol style="list-style-type: none"> 2. Journal question 3. Finish Mineral information 4. Rock Cycle Animation 5. Rock Cycle notes 6. Sedimentary rock demos <ol style="list-style-type: none"> a. Sedimentation column b. Rock samples 7. Metamorphic rock demos <ol style="list-style-type: none"> a. Smashed snickers demo b. Rock samples 8. Igneous Rock demos <ol style="list-style-type: none"> a. Salt crystal demo b. Rock samples 	Prediction: <ol style="list-style-type: none"> 1. What will happen in the sedimentation column? 2. What will happen to the layering in the play-doh when smashed between two wood slabs? Observations: <ol style="list-style-type: none"> 1. The warmer the location of the crystal formation the bigger the crystals that will have formed. This shows the connection between intrinsic and extrinsic formation. 2. Students will observe that the heavier material will fall out first, and the lighter material will take a while to settle to the bottom. The layers will form a distinct stratification. 3. The layers in the play-doh will compress into thin layers or will almost completely disappear due to the pressure and the heat that causes the deformation of the rock. Explanation: The students will give explanation based on the answers I gave above, but they will provide their own explanations in connection with the rock cycle.
10/10	Split into 3 groups (igneous, metamorphic, and sedimentary) and fill out a worksheet about the topic and then teach the class about your specific rock type	Finish up any parts of observations or explanations from above.
10/13	<ol style="list-style-type: none"> 1. Finish rock type presentations 2. Finish up any thoughts on rock types 	
10/17	<ol style="list-style-type: none"> 3. Rock Cycle Test 	

A. Name and Key Objective ABOVE

B. Sequence of activities ABOVE

Part IV: Assessment of Focus Students

Focus Objective

1. E3.1A Discriminate between igneous, metamorphic, and sedimentary rocks and describe the processes that change one kind of rock into another.

Developing Assessment Tasks

In the process of developing the rock cycle pre-assessment I took into part that the students had informed us that they are sick of the rock cycle because they have learned it in years past. This pre-assessment will allow us to see how much they truly know, and what we need to focus the most time on. This assessment speaks to what is the rock cycle, how do rocks transform to become other rocks, what is the difference between minerals and rocks, and being able to analyze relationships between rocks and objects in their everyday lives. The assessment will be used as a pre-assessment then the students will be able to revamp their answers as they learn the answers throughout the unit. They will be able to use it as a study tool for their test.

Part V: After the Unit Report

Story of What Happened

We were supposed to only have one week of time allotted to teach the entire rock cycle, and we ended up teaching it in a week and a day! We were able to squeeze such a large unit into this time frame by eliminating the mineral and rock identification that usually takes up the most time. We made sure to familiarize them with the most important minerals and rocks, but since the standards didn't say that we needed to have them identify them if put in front of them we skipped that portion. We tried a variety of different lesson styles in order to find each students particular niche. We started out with minerals and then moved into rocks. We used this week of material to make statements that would transition them into the upcoming plate tectonics unit. Overall it was a successful unit but I will see the most when they take their exams on Friday 10/17.

Making Sense of Focus Students' Responses

Descriptions of focus students

Pseudonym	Academic Standing	Personal Description
A	A range	- female - African American - "preppy" - loves to read in class - pretty popular

		- doing well in all of her classes
B	B range	- Caucasian male - Involved in extra-curriculars like baseball and chess - Taking math classes at State to finish up all his math requirements - always forgets to turn in assignments - always involved in class conversations - gets really upset at himself when he gets the wrong answer for anything.
C	D range	- Caucasian male - seemingly bright student - never turns homework in, always “forgets it in his locker” - Has a learning disability that allows him to use “technology” in the classroom, but his mother doesn’t even understand what that means. - very chatty with any neighbors he sits with in class - doesn’t use his time wisely - never brings a book to class - horrible organization skills, and loses everything

Excellent Response or Rubric

We had the students do a pre-assessment (attached at the end) and then at the end of the unit we had the students fix any answers they had wrong in preparation for the upcoming rocks and minerals test. An example of a wrong answer was:

Question 2 (what specimen is out of place salt, ruby, gold nugget or coal): Each of the students responded that salt was out of place because it was the only thing that wasn’t mined. When we had the students fix their answers the excellent response that I was looking for was:

Coal would be the sample that is out of place because it is the only specimen that is not a mineral because it is from organic origin.

Results of Pre-Assessment

Student A:

1. Draw the rock cycle
 - a. She knew the basic three (igneous, metamorphic, and igneous)
 - b. She knew that they were all connected and she put a basic set of arrows going between the main three, but she didn’t put any labels on any of them. She didn’t have any of the arrows going both ways between any of the rock types.
 - c. They have two years of rock cycle before, but this goes to show that they knew the big zinger rock name terms but they don’t know how they actually come to be.
2. Only specimen that is out of place
 - a. Salt because it is the only thing that isn’t mineable

- b. Misunderstanding of where things come from
 - c. All of them are mined, and they didn't know that Detroit actually has a salt mine
3. Butterfly and metamorphic rock commonality
- a. I don't know.
 - b. Either truly has no idea, not enough imagination to answer a question that isn't a straightforward answer, or just doesn't know enough about what a metamorphic rock truly is.

Student B

1. Rock cycle drawing
- a. I don't know
2. Out of place specimen
- a. I don't know
3. Butterfly and metamorphic rock
- a. I don't know
4. I have found that even though he is very smart he is very lazy and since there was no grade attached to this assignment there was no worth for him. This is how he acts on a general basis, and even though he should have a high A (intelligence wise) he has a B because grade wise he is lazy.

Student C

1. Rock cycle drawing
- a. Drew the rock cycle with 90% of the arrows in the right place but he didn't label everything correctly. He also included an area called magma as well and he was the only student in the hour that did that. His father is a geologist so he gained some knowledge from him.
2. Out of place specimen
- a. He said that the gold nugget was out of place because it was the only thing that was a metal whereas the rest were non-metals. I thought this was an interesting method of analyzing that I hadn't thought of before.
3. Butterfly and metamorphic rock
- a. He made note of the fact that they both change through their lives, and this was the correct answer. This is a great insight into an analyzing question that we wouldn't help any of the students with.

Results of Post-Assessment

For the post assessment we had the students redo their pre-assessment for correctness. All three of the students got the correct answers for everything. They made use of their resources, and I hope that this shows that they will do great on their upcoming tests.

Improvements Parts I-IV

In the future I would have longer than a week to teach the rock cycle.

Day 0:

- Do rock cycle pre-assessment worksheet

Day 1:

- Journal Question: What is the difference between a mineral and a rock? (8 min.)
- Bill Nye Rock Cycle Video (26 min.)
- mineral presentation (rest of time)

Day 2:

- Journal Question: How can you differentiate between different specimens of minerals?
- Mineral identification lab
- Introduction of rock cycle

Day 3:

- Journal Question
- Rock Cycle Crayon Lab

Day 4:

- Rock Cycle Presentation
- start rock type demos (student predictions)

Day 5:

- rock type notes (have the groups split into 3 groups and teach the rest of the class about a given rock type)

Day 6:

- Check on rock type demos
- rock identification

Day 7:

- Overview of rock cycle material

Day 8:

- Rock Cycle Test

Improvements in Your Understanding of Science (ANR) Teaching

I learned how hard it is for students to take notes for more than 10 minutes. In this section there was a large amount of chemistry knowledge that was needed beforehand. Without this previous knowledge we needed to find an interesting way to introduce the important topics without overwhelming them with the chemistry of minerals. The students had a hard time understanding how rocks can be of different “forms” and how after they cool they become new rocks. This comes down again to the chemistry aspect and the fact that we did very minimal rock identification.

General comments

Things you learned about specific problems of practice

<i>Problem of Practice</i>	<i>Something that you learned</i>
Understanding: Academic dialogue with students	<ul style="list-style-type: none">I learned that most of the wordage that was part of the rock cycle is very difficult for students to understand, and that is why we had them do a set of key terms for minerals and rocks. We informed them that the topic was going to be very difficult and that they needed to take the time to know the terms because they would be expected to know them as we talked about them. I figured out though that most students won't ask when they don't understand something, and no matter how much you ask them if they have any questions it is nothing but silence. This is very frustrating because then the students become very angry when they get something wrong.
Motivation: Social dialogue with students	<ul style="list-style-type: none">The students all don't seem to like the rock cycle because they have taken it for two years previously, so finding a method by which to motivate them was very hard. We did a hands-on lab with them and they didn't seem to show that they enjoyed it but you could tell they did. I tried my hardest to keep my students upbeat and motivated but it was hard in this unit.
Classroom Environment and Management/Teaching Strategies	<ul style="list-style-type: none">I had my first experience with having to send a kid into the hall because of attitude stuff. This was a very frustrating day because he got all of the kids riled up, and this was also the day that I was attempting to videotape my lesson. The video camera started breaking down too while I was doing this so it was all over a frustrating day. In the end it went fine because what is bothering the students only seems to plague them for a day, and then the next day they come in as if the day before didn't happen.

Attachments

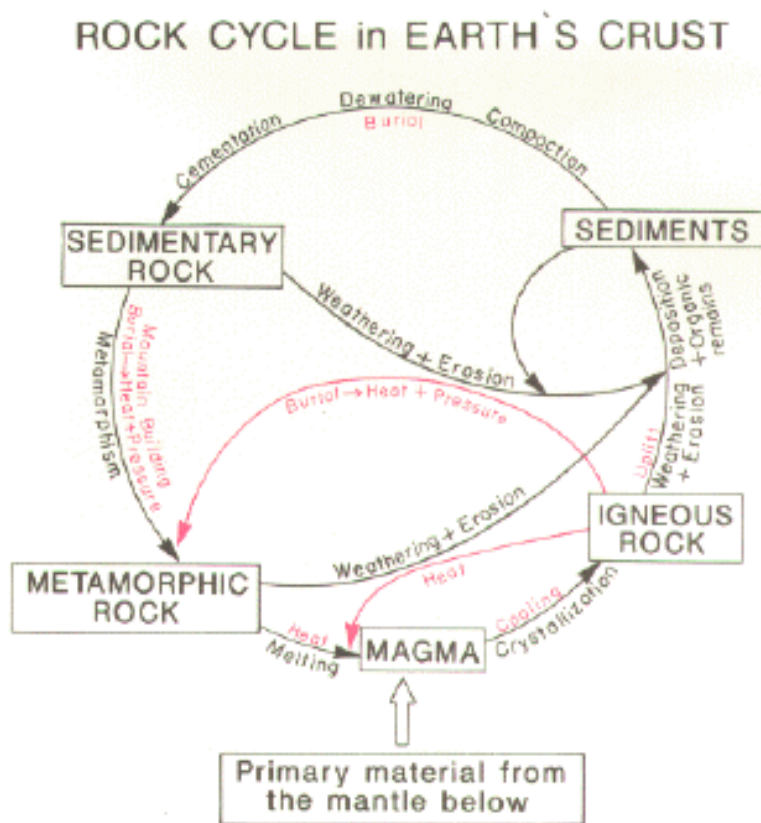
The pre-assessment/post assessment is on the next page.

Advanced Rock Cycle Pre-Assessment

Name: _____ Hour: _____ Date: _____

You have 10 minutes to fill out this quiz. This is a simple quiz to see what you already know about the rock cycle and what we need to work on the most. Please give honest answers as you will not be marked down for wrong answers.

1. Draw the rock cycle making sure that you note all the types of rocks, ways of transitioning between, and make note of heat/pressure changes between them.



Rubric:

- a) Rock Type (sedimentary, metamorphic, and igneous)
- b) Arrows in correct location
- c) Methods of transition between types of rock (weathering, melting, crystallization, etc.)

d) Heat and pressure in transitions

1. A geologist finds a ruby, a gold nugget, coal, and a grain of salt in one of his rock drawers, and notes that one of these samples doesn't belong with the others. Write out which one of these is not like the other? Why is this one different from the other samples?

RUBRIC:

The coal is in the wrong rock drawer because it is the only sample which is not a mineral. Minerals are always inorganic and coal is organic material so therefore it is not a mineral.

- a) Do they know the difference between a mineral and a rock?

2. What do a butterfly and metamorphic rock have in common?

RUBRIC:

Both a butterfly and metamorphic rock undergo a change from an earlier form (a caterpillar in the case of the butterfly, a different rock type in the case of the metamorphic rock) to a new form.

- a) Understanding that metamorphic rocks change form.
- b) Ability to analyze relationships