

Marcus Schmidt: Lincoln Public Schools, Lincoln, NE © 2008

Title: A Walk Through Geologic Time in Nebraska

Grade: 9th Geoscience

Background:

Not having the experience of teaching geoscience I approached this assignment as a unit for my planning purposes and teaching philosophy. I like seeing the “big picture” and when students see the big picture there is more opportunity for every student to be interested in some aspect of the unit or lesson. This unit or lesson is also designed to teach geoscience with an emphasis on Nebraska geology, inquiry and hands-on, while still maintaining higher learning objectives than LPS and State Standards.

Learning Objectives:

1. Students will be able to explain and describe the formation of the earth.
2. Students will be able to explain and describe the methods used to date rocks.
3. Students will develop a geologic column using information from Nebraska.
 - a. Students will use and apply major units of geologic time and their life forms while creating their geologic column
 - b. Students will be able to characterize and classify rock types and be able to describe the conditions they were formed under.
 - c. Students will be able to summarize the steps in the Rock Cycle
4. Students will be able to discuss and describe what life was like in Nebraska through geologic time.

LPS and State Standards:

1. Describe the formation of the land, atmosphere, and the oceans of the earth (12.3.1j).
2. Use geologic principles to establish the relative age of rocks (12.3.2a).
3. Explain how to determine the absolute age of rocks by methods such as radioactive dating, varve counts, and the rates of erosion and deposition (12.3.2b).
4. Summarize the development of the geologic column and how history is recorded in the rock layers (12.3.2d).
5. Describe the major units of geologic time and their life forms (12.3.2e).
6. Identify characteristics of the three major types of rock and explain how each is formed (12.3.3a).
7. Summarize the steps in the Rock Cycle (12.3.3b).

Timeline/Overview

<u>Activity Description</u>	<u>Time</u>	<u>Objective</u>	<u>Standards</u>	<u>Resources/Prep.</u>
History Detective	0.5 d	1, 4	12.3.1j	Intro activity – offer more encouragement than help! Samples
Discussion 1	0.5 d	1	12.3.1j	Dr. Franks pp notes

– See Day 1			12.3.2a	
Hands-On Day 2 Part I	0.5 d	3b, 3c	12.3.3a & c	Samples and wksh handout with rock classes
Discussion 2 Day 2 Part II	0.5 d	3b, 3c	12.3.3a & c	Classes wksh cont. Flow chart & samples
Practice ID Day 2 Part III	0.5 – 1 d	3b, 3c	12.3.3a & c	Classes wksh, flow chart & samples
Engagement Activity Day 3	1 d	3b, 3c	12.3.3a & c	See materials list under day 3
Discussion 3 Day 4	0.5 d	3b, 4	12.3.3a	Handout: Depositional Environments
Post-It Activity Day 4	0.5 d	3b, 4	12.3.3a	Handout: Depositional Environments
Discussion 4 Day 4 – Geologic time with maps of NE	0.5d			Geologic maps – get handouts from UNL of Geologic Bedrock Map
Discussion 5 Day 5 – Geologic Columns	0.5 d	3	12.3.2d	Rock samples and example geologic column(s)
Lab: Geologic Columns	1-2 d	3	12.3.2d	Rock samples and example geologic column(s)
Final Project Days 6-7	2-3 d	All – depending on group’s project	All – depending on group’s project	Varies

Day-to-Day Details:

Day 1:

Part I: Engagement Activity – History Detective - Have rock samples lying around the lab. Students will closely examine the samples making general observations in their notes. Encourage the students to use all of their senses and hypothesize about what type of conditions the rock formed in.

Part II: Discussion/Notes – As students describe the texture and other properties of the rocks observed guide them through Earth History. Points to key on:

1. Earth has changed over time:
 - a. General description of geologic time – how long is long?
 - b. Temperature – Climate modes
 - c. Sea Level – Distribution of sea
 - d. Plate Tectonics – Distribution of land
 - e. Life

2. How do we know how the Earth has changed over time?
 - a. Sedimentary Rocks – Archive of Earth History!

Day 1 Assessment:

Discussion participation

Day 2:

Part I: Hands-On Activity (Inquiry): Present the four major classes of sedimentary rocks (Clastic, Biogenic, Organic, and Chemical). Briefly describe or summarize each class (from pre-existing, shells & skeletons, plant remains, precipitation). Each group of students will be given 4-8 rock samples with 1-2 from each class. Students will examine each sample, discuss within their group and place in correct class. Students will briefly present to the rest of the class their findings.

Part II: Discussion/Notes: Using example sample and the Flow Chart for Identifying Common Sedimentary Rocks the class will classify rocks.

Part III: Practice – Students will pair up and classify rock samples throughout the room.

Day 2 Assessment:

Part I: Participation

Part III: Classifying samples answers

Day 3:

Overview: Students now should know how the earth has changed over time as evidenced by sedimentary rocks. Students should be able to identify and classify common sedimentary rocks. The goal today is to be able to read the story told by the rocks.

Engagement Activity: Wave pools, sand boxes, and fans

BrainSTORMING:

Students will explore (play) with the effects of water and wind on rocks. Students first brainstorm in groups the environmental and weather related events that may occur on rocks. During group work time I will guide them towards: river flows, tidal waters, waves. After brainstorming groups share so everyone is on the same page.

Weather Creation:

Materials will include sand with varying grain size, water, buckets, bowls and troughs. Students will try and create weathering patterns as discussed during brainstorming and as seen on pictures displayed throughout lab. If students cannot think up an event, point to a picture and ask them to recreate the formation.

Weathering Postcasting:

Using pictures identify the weather event from those listed in the brainstorming part of this activity.

Pictures will include examples of:

1. Red beds – Iron oxide from hot terrestrial climate or shallow marine
2. Grain sorting, shape, arrangement
3. Undulations (symmetrical and asymmetrical)
4. Mud cracks and rain drops
5. Lamination

6. Evaporite casts and molds
7. Various internal bedding structures

Day 3 Assessments:

Demonstrate the formation of at least one physical characteristic (lab group grade)
Orally identify common physical characteristics in pictures.

Day 4:

Access Prior Knowledge by reviewing how to read physical characteristics – Handout: Physical Features of Sedimentary Rocks

Discussion/Notes – Depositional Environments and Climate

Using Day 3's activity and discussion build upon weathering with depositional environment and climate – Handout: Depositional Environment

1. Terrestrial Environments
 - a. Rivers and floodplains
 - i. Channels
 - ii. Sediment transport processes and characteristics
 - iii. Soils
 - b. Lake deposits
 - c. Sand dunes
 - i. Nebraska Sand Hills
2. Coastal Deposits
 - a. Estuaries
3. Marine Deposits
 - a. Offshore
 - b. Biogenic

Post-It Activity:

Students will have a list of depositional environments on post-it notes and their task is to place where we might find those environments on a large Nebraska map.

Discuss results – lead into geologic time and show them maps of Nebraska through time.

Day 4 Assessments:

Discussion participation

Post-It Activity results and discussion

Day 5

Using the discussion results and maps from Day 4 briefly overview Era's during Nebraska geologic history. Demonstrate how geologic columns and do a practice example with the students.

Lab: Using rock samples students will create a geologic column.

Day 5 Assessment:

Geologic Column

Days 6-7

Final project overview, work time, and group sharing,

Students will recreate the history of Nebraska through geologic time. If humans were around to record history over millions of years what would it have been like? Your group's recreation can use any appropriate medium to convey your ideas. The following list is not comprehensive. Feel free to discuss your ideas with the instructor.

Video

Music

Play

Presentation

Essay/book/journal article

Build

News broadcast

Photobook – scrapbook