

**GEOS898
UNL**

History on the Rocks

**Assignment 2:
Unit Plan
5 days**

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Sedimentary Rocks

Grade level: 9th -10th

Purpose: This unit lesson will give students an overall view of the importance of sedimentary rock as it applies to the understanding of earth history.

Goals: Students working together will gain more confidence in sedimentary rock classification and building a geological column.

Objectives:

1. Students will be given practice time to determine the lithology of various sedimentary rocks.
2. Students will use rocks to understand more about earth's history.
3. As a result of this lesson, students are introduced to building a geologic column based on Nebraska geology.

Background: Sedimentary rock gives us a picture or archive of the earth's history, which includes climate and environment conditions, as well as evidence of past life. Each environment such as river deposits, tidal flats or deep sea produces distinctive sedimentary deposits. Sedimentary deposits can be broken down into four major rock groups (i.e. Clastic, biogenic, organic, chemical) with various physical characteristics.

Materials and preparation:

Rock samples such as:

- | | | |
|-----------------|--------------|------------|
| 1. Conglomerate | 5. Shale | 9. Coal |
| 2. Breccia | 6. Siltstone | 10. Peat |
| 3. Sandstone | 7. Chert | 11. Gypsum |
| 4. Mudrock | 8. Limestone | |

Flow chart for identifying sedimentary rocks (most text books have this or can be found on line)

Acid

Goggles and aprons

Magnifier

Graph paper

Ruler

Colored pencils

Small white marker boards (2x3 ft) (Prepare 1 board/ 3 students)

Dry erase markers. (several colors)

Pictures of geologic sites in Nebraska

Fossil and rock samples from the above sites.

Safety:

In Lincoln Public Schools, goggles and aprons must be worn by everyone at the table when using acid.

Safety contract must be filled out due to the acid and the outdoor classroom visit. (West Nile, allergic reactions to bee stings, Limes disease, poison ivy, etc.)

Procedures:**Day 1: (50 minutes)**

1. Before beginning this lesson it is assumed the teacher has spent time developing sedimentary deposits, their lithology, physical characteristics, fossils, distribution of layers and chemistry. It is worthwhile for the teacher to spend about 10 minutes reviewing and showing some samples of the above features.
2. Divide the class into groups of three and provide a box of rock samples for students to analyze. Each student should develop a data table classifying the rocks into their major classes, (Clastic, biogenic, organic etc.), and other aspects such as grain size, sorting and final name. They may perform acid and scratch tests on the samples utilizing a flow chart as an aid in identification.
3. Allow approximately 20-30 minutes for students to interact and discuss the samples filling out their data tables. When done, they may come and get a sheet so they can check them selves and get instance feedback. This will allow them to revisit and discuss correct solutions. (Allow about 10 minutes)
4. Students should clean up for the day.

Day 2: (50 minutes)

1. Begin a lecture/discussion on using physical characteristics of rocks to diagnose different depositional environments. Include color as indicators of iron or organic materials, texture including grain size, sorting, shape, etc., composition and sedimentary structures. Take about **20-30 minutes** for this talk. The depth of this lesson will depend on the time you have and the level of your students.
2. Field trip to outcrop in the outdoor classroom. (Note: At Lincoln Southwest we have roughly 27 acres of prairie and wetlands on our property. Within the prairie part we have an outcrop suitable for student observation.) Students will now apply what they have learned from day 1 and 2 as they observe the outcrop. Students will begin to identify and record in their notebooks rock lithology and the possible depositional environment.

3. Following their observations, a class discussion will ensue to be certain salient points are made.
4. This will take the remainder of the period.

Day 3: (50 minutes)

1. Begin by reviewing and showing examples of yesterday talk concerning physical characteristics of rocks. (5-10 minutes)
2. Geologic column basics. Now is the time to put it all together. Spend some time showing the general approach in constructing a geologic column. Including era and period allows them to apply what they learned in previous lessons. Show standard symbols accompanied by a handout with main symbols. Try to limit the handout to include the main symbols that will apply to them. (15-20 minutes)
3. Lab time: Now, utilizing the pictures and rock samples from our trip begin to construct together the earlier periods to show how this is done. Then allow them time with their group of three to view the remaining pictures and rock samples and continue drawing the column using graph paper, rules and colored pencils. (Additional pictures may be used from textbook and internet sources for added clarity.) (20-25 minutes)
4. The above will take about one period.

Day 4: (50 minutes)

1. Begin the day with Q&A since this is the first time doing this.
2. Allow a little more time to finish up their columns if needed.
3. **White Board presentation:** (see rationale below in day 5) The students will now prepare a small white marker board to present to the class. Each group of 3 students using dry erase markers will draw their finished column from their individual sheets on their individual boards. Students worked together in the preparation of their column and will now transfer it to a larger medium for common viewing and evaluation. The final product will include formations, geologic age, rock types, structures, depositional environments and climates.
4. White boards are stored in the room until tomorrow's presentation.

Day 5: (50 minutes) This day is to assess the work done on the column and to cognitively evaluate their ability to identify sedimentary rocks.

Part 1: Sedimentary rock I.D.

1. Teacher Prep: Set up 10 stations spaced approximately 3-5 feet apart.
2. Each student will rotate through the ten stations and be given 2 minutes at each station to identify the rock.
3. It will take approximately 30 minutes for 15 students to rotate through.

Part 2: Geologic Column Presentation;

1. Group presentation of their columns drawn on white boards.
2. **Rational of white group presentations.**
 - a. This allows the group of three to articulate to the class why they drew their column the way they did helping to me to check for understanding.
 - b. It gives the other groups a reference to compare how their columns turned out compared to others.
 - c. It allows the class an opportunity to ask questions to the student presenters making the learning more student centered.
 - d. It develops cooperation between students as they draw their column on their board.
 - e. It allows for student interaction in their group of three where students feel safer asking questions to their peers in a small setting.
 - f. Allows for quick feedback and correction of mistakes.
3. Each group comes up to the front of the room placing their white board in an easel for the class to view. The students will take turns explaining various parts of the column and the class is free to ask questions during the presentation. There is no set time limit here for each group to present. As long as the discussion is rich and active, I let it go.
4. As the groups present I will use the rubric included in this unit to assess certain features.
5. Note: All groups will not have time to present on day four and so a Day 5 will be needed to finish presentations.

Extensions

1. Depending on the class ability and interest, you could add more rocks for identification.
2. Include videos of more fossil evidence and outcrops available commercially.

Assessments:

There are two main assessments for this lesson plan. First would involve a quiz where students rotate through ten stations and identify the sedimentary rocks displayed. The second would be assessing their geologic column using the rubric below.

Student rubric for geologic column.

Category	Needs Improvement	Good	Excellent
Points	1	2	3
Era and Period	Several eras and/or periods not listed correctly.	Only one era or period inaccurately listed.	All eras and periods are listed accurately and in correct order.
Depositional environment	Several environments were incorrectly identified.	One or two environments were incorrect.	All depositional environments were correctly identified for each rock unit.
Climate	Several climates were incorrect.	One or two climates were listed incorrectly.	All climates were correctly identified.

Lesson Specifics:

Skills: It encourages the Applied Learning Skills of communicating and working on teams

Optimum class size - 16 – 24 students

Duration - about 45 – 60 minutes.

Nebraska State Standards:

12.5.2 By the end of twelfth grade, students will develop an understanding of geochemical cycles.

12.5.3 By the end of twelfth grade, students will develop a scientific understanding of the origin of the earth system.

Example Indicators

- Contrast the early earth with the planet we live on today.
- Investigate and estimate geologic time by observing rock sequences and using fossils to correlate the sequences at various locations.
- Investigate and relate how the interactions among the solid earth, oceans, atmosphere, and organisms affect the ongoing evolution of the earth.