

PALEOZOIC STRATIGRAPHY



Wabasha Bridge from the east; bluffs are "below" the city buildings to the right (north)



View looking down from Wabasha Bridge



Southern end of Wabasha Bridge & Lilydale



At Lilydale: Looking for fossils in the mud and rain



Completing a learning cycle: A teacher draws us a sea-level curve, and explains the change in facies

Paleozoic Stratigraphy of Minnesota in Metro Area

Stop 1 Wabasha Street Bridge at Kellogg Blvd.

1. Stand at railing on Kellogg Blvd. and look SSW across the river at the bluff.

Describe what you see
Describe its shape
Draw a simple sketch of the bluff
Estimate height of the bluff.

(*hint: compare it to where you are standing*)

Recall our stop at Minnehaha Falls, which is farther south and across the river from the bluff you are looking at.

What rock(s) layer(s) would you expect to find if you crossed the river and looked at the base of the bluff?

2. Look straight down over the railing. Complete the stratigraphic column below by using the correct rock symbol to represent what you see in the outcrop. Estimate thickness.

3. Look from east to west along the river channel (where the water flows). Notice all of the land surface around the channel (e.g. where roads, airport, buildings are). Take a mental snapshot of the big picture, or the panoramic view, here. Sketch a simple profile from the bluff directly across the river from you to the bluff you are standing on.

Stop 2 Lilydale Regional Park

We will park the vans in a parking lot and be walking/hiking about 1/2 a mile on the gravel road then up a creek bed. Low to moderate climb. Bring your bucket, field book & pens/pencils, camera, filled water bottle, today's handout (in a Ziploc bag). You might want to lighten your backpack load so that you have fewer items to drop in the mud and water and lose!

TRANSLATION TO CLASSROOM

Teacher: Timothy S. Chase
School: Murray Junior High School
2200 Buford Avenue
St. Paul, MN 55108

Class and Grade Level: 7th and 8th grade
Earth and Physical Science; 70 students

Teacher Goal: This student research was designed to facilitate student's constructing their own knowledge about the processes and skills of local rock strata; to unravel "the story within the rocks." This field investigation will lay the groundwork for student understanding of the following:

Local geology
Principle of Superposition
Transgression and regression of the seas
Changes in life represented in the fossil record
Sedimentation processes and Uniformitarianism

Student Objectives - Student will be able to:

1. Sketch and describe major characteristics of the rocks in their relative positions (stratigraphy)
2. Identify different fossil types found or not found in the layers
3. Hypothesize as to why the strata has the pattern of life that it does
4. Formulate a hypothesis regarding which rock layer is older/younger
5. Measure particle size of sandstone fragments using a chart from the field notebook

SOILS

TIMES INQUIRY



We examine soils in a gravel pit



We learn about horizons and soil features, and their identification



Now we work on a new face and apply our knowledge



And finally, a face just around the corner that poses some new questions

TRANSLATION TO CLASSROOM

Teacher: John Lawton
School: Dakota Meadows Middle School
N. Mankato, MN 56003
Grade Level/Class: 8th grade Earth Science

The Geology of Your Backyard

Project Synopsis: Soil investigation is designed for 30+/- students (5 sections), working in groups of 4, to complete in a 45 minute class period. Courtland clay mine investigation is designed for individual as well as large/small group work.

Students will observe soil types/profiles at three locations within walking distance of class. Students will collect soil samples, sketch soil profiles and will determine soil permeability at the three locations. Students will bring a soil sample from home to compare and contrast with school site soils.

Students will be able to:

- a) develop a general understanding of geologic history/time.
- b) identify the soil type found in the Mankato area.
- c) identify general rock types of the rock cycle.
- d) use a variety of maps.
- e) construct a simple topographic map.

Debrief with John after Geology unit and implementation of above action plan.

Teacher Comments:

What worked?

All students were far more engaged and interested in the geology unit than previous years. They wanted to be involved and actively doing something. Their questions showed marked insight and relevance. Students grasped the concept of hypothesis at a much deeper level than with previous years activities. Students retained more detailed information and more information about methodology because they were active in the field investigation.

Assessment obtained by written reflections on open-ended question(s) over the month long unit showed great care and detail in their understanding.

What didn't work?

Although I changed how I assessed the students after the geology unit, they seemed to struggle more with the test material than previous years.

The sequencing and pacing of the geology unit with addition of the field investigation needs some adjustment.

TEACHER REACTIONS

"This has been very beneficial for me since prior to teaching earth science I had only two geology college classes and no field geology. I have had to learn all the material I teach on my own. Now I feel more confident in my knowledge." (TIMES IV participant)

"All serious, dedicated earth science teachers should take this course because the opportunity to meet and talk with other earth science teachers is invaluable" (TIMES II participant)

"I'll be 'turning things upside down' – no more read first, then discuss. Instead we'll look first, then discover, then discuss, then read. How exciting!" (TIMES III participant)

"I have increased my knowledge of Twin Cities geology to the point that I feel I can address any student's question." (TIMES V participant)

This has been the most valuable class I've participated in. It was nice to learn some real content in context. So often the classes I take seem to just re-teach what I already know – this class challenged me!" (TIMES I participant)

THE KEY BOOKEND: TAKING TIME TO DISCUSS AND PLAN CLASSROOM IMPLEMENTATION



ACKNOWLEDGEMENTS

We would like to thank ALL the teachers who have participated in TIMES; we have learned so much from you. We would also like to thank the Science Museum of Minnesota, North Hennepin Community College, the University of St. Thomas, Winona State University & St. Cloud State University. The presenters for material illustrated in this poster were Dr. Carrie Jennings Patterson, Drs. Kate Pound, Megan Jones, Jim Meyers, Tony Runkel, and Howard Hobbs.

Week 1

Monday	Tuesday	Wednesday	Thursday	Friday	Monday	Tuesday	Wednesday	Thursday	Friday
Introduction	Van Discussion Assignments	Pedagogy Discussion Reflection & Action Plans	Pedagogy Discussion Reflection & Action Plans	Pedagogy Discussion Reflection & Action Plans	GET WET DAY Pedagogy Discussion Reflection & Action Plans	Van Discussion Assignments	Pedagogy Discussion Reflection & Action Plans	Pedagogy Discussion Reflection & Action Plans	Pedagogy Discussion Reflection & Action Plans
LANDSCAPE LOCAL BEDROCK TOPOGRAPHY ROCK DESCRIPTION	IGNEOUS ROCKS ST. CLOUD QUARRY PROCESSING PLANT MAPPING GRANITES & BASALTS	IGNEOUS & SEDIMENTARY ROCKS	SEDIMENTARY ROCKS & FOSSILS	SOILS	HYDROLOGY	GROUNDWATER & KARST	URBAN "RESOURCES" INTRO. TO GLACIAL	GLACIAL SEDIMENTS	UNRESOLVED GEOLOGIC PROBLEMS
Discussion Reflection		Proterozoic Basalts & Sedimentary Rocks of the Midcontinent Rift; Paleozoic Sed Rocks	Ordovician Sequence Lilydale Quarry Fossil Collecting	Examine soils in Tiller Corp. Gravel Pits and Quarries	Stream Gauging in Minnehaha Ck.	Stratigraphy in SE Minn. Karst Features Groundwater, Springs Environmental Fault	Science Museum Walking Tour (Dimension Stone) of St. Paul River Warren Falls, Mississippi River Gorge & Retreat of St. Anthony Falls	Minnesota River Floodplain Grey Till, Varves, Sandy Red Till	Post-tests Evaluations
Evening Free	IGNEOUS ROCK CLASSIFICATION	Evening Free	Fossil Cleaning & ID	Finish at 2pm	Pedagogy Discussion Reflection & Action Plans	Late Return	Evening Free	Pedagogy Discussion Reflection & Action Plans	Finish at 2pm
			Plate Tectonics Earthquakes		Evening Free			Geologic Maps County Geologic Atlases	

Week 2