

# MiTEP TEACHER SHARE-A-THON

**March 9, 2012  
 10:00 – 10:45**

## MSTA

<b>Presenter</b>	<b>Lesson Topic</b>	<b>School</b>	<b>E-mail</b>
Ellen Holt	Crystal Formation	GRPS - Brookside Elementary School	<a href="mailto:HoltE@grps.k12.mi.us">HoltE@grps.k12.mi.us</a>
JoAnn Webb-Franklin	Weathering, Erosion, and Deposition	GRPS – Alger Middle School	Webb-FranklinJ@grps.k12.mi.us
Eric VandenBerg	Using Slope	GRPS - Union High School	VandenBergE@grps.k12.mi.us
Jim Welsh	Water Cycle	GRPS – Harrison Park Elementary	WelshJ@grps.k12.mi.us

Ellen Holt  
MiTEP  
Crystal Formation Lesson Plan

Knowledge Needed:

Students will need access to information only after they have fully explored the rock/crystal investigations. The list below can be used for teacher preparation.

ScienceSaurus: A Student Handbook (2005). I have a class set of this reference book. The section on Earth Science includes information on the rock cycle and how rocks are formed. The most relevant information for this lesson is on pages 164-167 which includes a very brief tutorial on identifying rocks and crystal formation.

Issues and Earth Science (2006). This is the book for Grand Rapids Public School's 6<sup>th</sup> grade science curriculum. The second unit, Rocks and Minerals, has additional labs and reading material.

<http://www.newton.dep.anl.gov/askasci/chem03/chem03139.htm>

This "Newton" website discusses a crystal growing activity similar to my lesson. 4<sup>th</sup> grade students did this investigation to observe crystal formation in varying temperatures.

<http://successlink.org> (Rock Cycle and Crystal Formation Unit) This is a document with a similar lesson plan included in a 4 lesson unit. There are some great extension activities with crystal formation included here.

<http://rockforkids.com> This site has good rock and crystal pictures and some other links related to the topic.

Vocabulary:

- crystal—a solid material found in nature that has straight edges and flat sides or that breaks into pieces with straight edges and flat sides
- dissolve—to form a solution with another substance
- igneous rock—rock that formed from cooled magma or lava
- insulator—a material that does not let heat energy pass through it easily
- lava—melted rock that flows out of the ground onto Earth's surface
- metamorphic rock—rock that formed when another kind of rock was squeezed and heated deep inside Earth's crust
- mineral—a solid natural material that has a crystal form and its own set of properties
- rock—a solid mixture of minerals that was formed in Earth's crust
- rock cycle—the process of rocks changing into other kinds of rock
- sedimentary rock—rock that formed when sediments were pressed and cemented together
- texture—property of a rock indicating crystal structure

### Goal of Lesson:

Students will design an investigation to observe and describe crystal formation from a solution of water and alum and see how the size of the crystals formed are influenced by temperature. They will use this activity to help them relate how different igneous rocks formed at different cooling rates.

GLCE: **E.SE.06.41**—Compare and contrast the formation of rock types (igneous, metamorphic, and sedimentary) and demonstrate the similarities and differences using the rock cycle model.

GRPS Unit of Study: Rocks and Minerals (Issues and Earth Science, 6<sup>th</sup> grade)

### Materials/Technology

- 1 sample each of basalt and granite per each group of 4 students
- source of hot water such as a multiple cup coffee maker (water can also be heated in a microwave)
- 4-6 oz. (3 small spice containers) alum for each group of 4 students (can be found in the spice aisle of most any grocery store)
- 1 pint glass container (such as a Mason jar)
- 2 6 oz glass containers for each group of 4 students (such as empty baby food jars, canning jars or clear beakers may also be used)
- Plastic spoon per group of 4 students
- Large quantities of crushed ice
- Insulation material—flexible foam or rubber beverage wrap, newspapers, straw/hay, thick paper towels or dish towels, etc.
- Hand lens per student or 2 per group of 4 students
- Lined paper or science journal/notebooks per person
- Pencil per person
- Rubric scoring guides per person
- Camera (optional)
- Access to internet for extension investigation and youtube clips (optional)

### Procedure/Instructions and Hands-on Connections

Prior lesson/activity to this lesson: Students should have already be able to examine rocks of all types and begun to identify rocks based on their properties. Students should be familiar with the term “texture” and understand that texture refers to crystal size.

**Engage:** Students re-examine samples of basalt and granite. They are asked to use the hand lenses to look at the crystal structure of each sample

and determine which sample has a larger crystal structure and discuss why they think there are differences in crystal size among igneous rocks. Teacher reminds them to think about how igneous rocks formed (cooling lava/magma).

**Explore:**

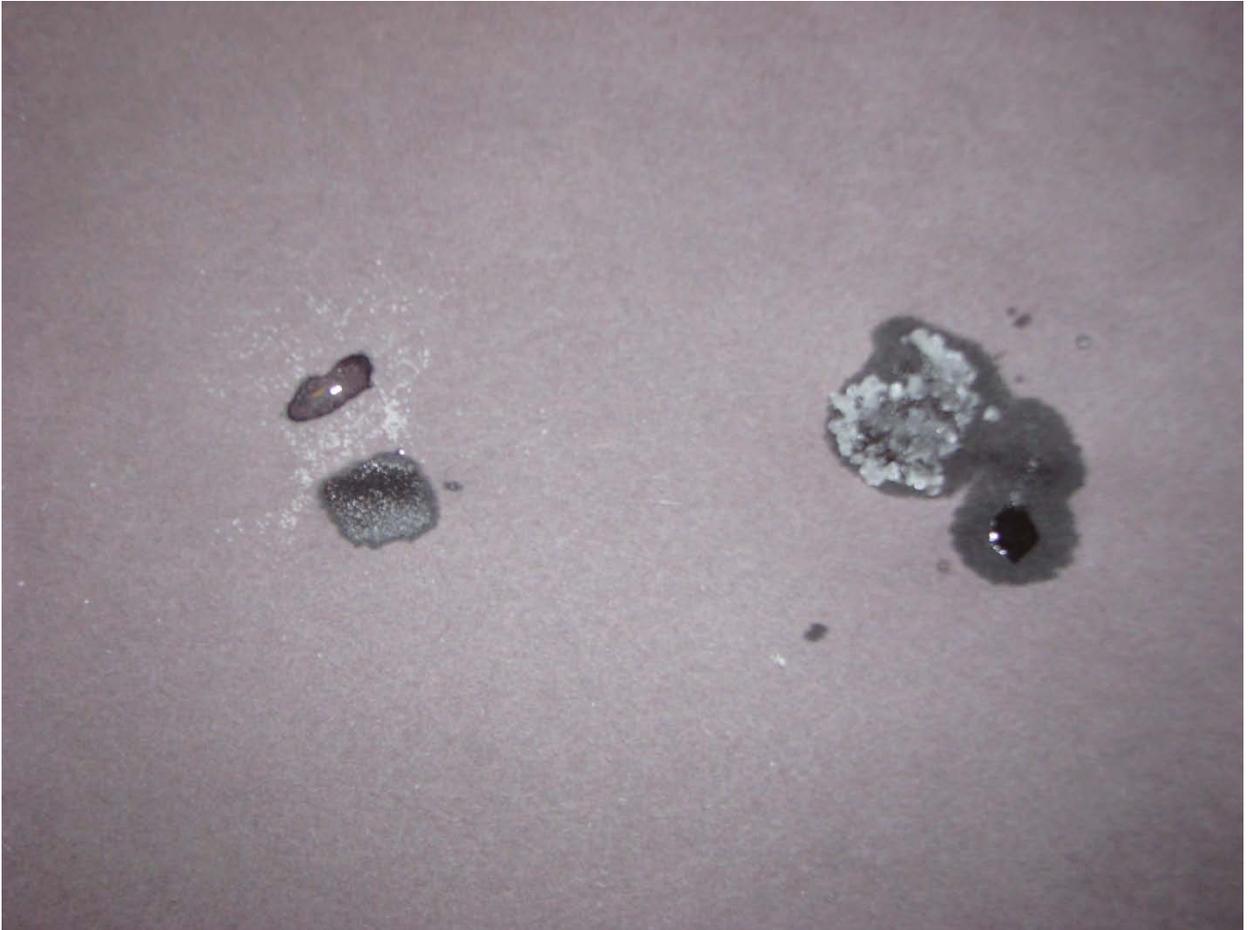
1. Students share out their ideas about the differences in crystal structure in igneous rocks. Teacher should be directing them to discuss the circumstances of how igneous rocks form through the cooling of lava/magma. The teacher can ask such questions as, "Do all things cool off at the same rate? How do you cool off hot soup before you eat it? Are there factors in the environment that might affect how fast or slow igneous rocks cool? Where do we find igneous rocks (which should prompt some discussion on intrusive and extrusive igneous rocks)?"
2. Teacher introduces alum powder as a material that can be used to demonstrate the formation of crystals. (It's also used as a preservative to maintain crispness of fruits and vegetables when canning.) The alum we use for this investigation is found in the spice section of the grocery store.
3. Students are asked for ideas on how to set up the investigation using alum and water. Teacher should direct students to think about the end result, that is, how specifically can we control how the solution cools. Students should decide that two solutions should be set up, one that can be cooled faster than the other solution by using ice. With teacher direction students should decide on the following set-up:
  - Two solutions, one jar sitting in a container where ice can be used to quickly cool the solution and one jar in a container where other materials can be used to insulate the jar against losing heat too quickly
4. Students prepare for the investigation by getting two 6-ounce, clean, empty baby food jars for their group of four. They will also need a plastic spoon, 4-6 ounces of alum, one pint glass jar, two hand lenses, and paper towels for spills.
5. With their groups, students make a claim about which method (cooling slowly or cooling rapidly) will produce the largest crystals.
6. Teacher heats up the water in a multiple cup coffee maker and pours one pint in a mason jar for each group of four students.
7. Each group pours 2 ounces of powdered alum in the hot water and stirs it until dissolved with the plastic spoon. Pour additional alum one ounce at a time until no more alum can be dissolved in the water.
8. Students pour enough solution into each 6 ounce baby food jar to fill it  $\frac{3}{4}$  full.

- Two students in each group immediately arrange one jar in a larger container filled with crushed ice. The other two students in each group do their best to insulate the other jar by screwing the lid back on and packing the jar in a beverage wrap or other container, stuffing the extra space with newspaper, hay/straw, foam, etc. to minimize heat loss.



Beginning set-up

- Students fill out their observation journal by sketching their investigation design and describing anything they see happening.
- Students add ice as necessary during the hour to keep cooling the one jar.
- (During the "wait" time, students would be finishing their rock cycle drawings from the previous day's assignment.)
- At the end of the hour, students take final observations by using a hand lens to see any crystals that have formed inside their jars. If they can see size differences between the crystals in the jars, they jot that down.



Final product

Crystals on the left are smaller and are the result of quickly cooling the alum solution. Crystals on the right are larger and the result of efforts to slow the cooling process.

14. The teacher checks jars during the hour to see if there is a cool jar or two that is progressing with crystal formation. At the end of the hour, one or two jars are picked to continue cooling overnight in a school refrigerator and the insulated jars are placed on a counter out of the way.
15. Once students have completed their observations in their journals, teacher prompts students to share out and describe their investigations with the rest of the class. Claims are discussed to see if adjustments need to be made based on evidence collected.

**Explain:**

Teacher explains that we're using the alum solution to help us understand what is happening when igneous rocks cool. When the solution is cooled quickly we see the smaller sized crystals and when the solution cools more slowly we see the formation of larger sized crystals. Teacher can

show how using the hand lens helps us see the crystal sizes in the jars and points out relevant examples from the class jars. Teacher then directs conversation to the formation of igneous rocks and the cooling process there. Teacher helps students understand that the cooling process in igneous rocks can take from minutes to cool (in the case of some obsidians) to hundreds of thousands of years (in the case of most granites). Teacher asks students to identify limitations of our investigation to make sure students don't hold the misconception that 'cooling quickly' doesn't necessarily mean minutes but that 'quickly' is used in geologic time as a comparison with other igneous rock types that cool at varying rates. Teacher explains that observing the structure/size of the crystals in igneous rocks helps us identify it. Students are told they'll take a final look at some jars tomorrow to further observe the crystal size and finish their CERs.

### **Elaborate:**

Students explore the unit from [successlink.org](http://successlink.org) and may choose to do further crystal investigations. Teacher arranges time after school for those students. Teacher may choose a relevant youtube clip to help further understanding about crystal formation and igneous rock formation.

### **Evaluate:**

Teacher evaluates students based on their investigation set-ups and CERs.

### Assessment Rubric

Assessment for the investigation:

What to look for: Response states a design and specifies data to be collected for the investigation. Procedures are described completely and accurately.

**Level 4** Student accomplishes Level 3 and goes beyond in some significant way

*Above and beyond* such as:

- identifying alternate procedures.
- suggesting improved materials.
- relating clearly to scientific principles and approaches.

**Level 3** Student's design is appropriate and has a reproducible procedure, *Complete and correct* if required.

**Level 2** Student's design or procedure is incomplete AND/OR has significant *Almost there* errors.

**Level 1** Student's design or procedure is incorrect or demonstrates a lack of *On your way* understanding of the goals of the investigation.

**Level 0** Student's design or procedure is missing, illegible, or irrelevant.

**X** Student had no opportunity to respond.

CER rubric:

Claim

The claim is stated clearly and proposes a valid answer to the question.

Yes	Mostly	No
-----	--------	----

3	2	1
---	---	---

Teacher comments: \_\_\_\_\_

Evidence

Data is collected and is related/supports the claim.

Yes	Mostly	No
-----	--------	----

3	2	1
---	---	---

Teacher comments: \_\_\_\_\_

Reasoning

Clearly shows connection between the claim and the data/evidence collected and demonstrates understanding of the material being discussed.

Yes	Mostly	No
-----	--------	----

3	2	1
---	---	---

Teacher comments: \_\_\_\_\_



MiTEP Lesson Plan Summer 2011

## Examining Evidence of Weathering, Erosion, and Deposition in Your Neighborhood

By: JoAnn Webb-Franklin

### Lesson Plan

This lesson plan was developed by me and Professor Patricia Videtich of Grand Valley State University Geology Department. This lesson plan was created for the FRESH (Field Research in Earth Science Happenings). I have adapted parts of the lesson for middle school science classes. The students and I will take the field trip before we complete our Claim, Evidence, and Reasoning activity. The students will use evidence from the field trip to help make a Claim, provide Evidence from data collected along with research, and explain Reasoning based on Evidence.

Order of Lessons

- Grade Level Content Expectations: Erosion and Weathering-Discuss the two GLCEs using Accountable Talk in Whole Group. Students re-write the GLCE's in their science journals in kid friendly language.
- KWL: Weathering KWL
- KWL: Erosion KWL
- Pre-test : Weathering, Erosion, and Deposition Pretest (file:///E:/content/PDFs/Item\_Bank.pdf)
- Read Activity 29 on pages C-23 to C- 28. Read and discuss as whole group. Read over Analysis questions and answer any questions students may have. Students answer questions 2 and 5 individually, questions 1 and 3 whole group, and questions 4 in small groups of 2-4. (file:///E:/content/PDFs/Activity%2029.pdf)
- CER Activity-Students are given a Claim, Evidence, and Reasoning research paper on weathering and erosion to do individually. Students must make a claim, provide and document evidence, and explain Reasoning from evidence. Students will have until the day after the field trip to complete their individual CER research.
- Field Trip to the Cemetery to collect data on weathering and erosion of different rock types over years. Data sheet attached to lesson from Excel.
- CER Activity-Students are put into groups of 4 to discuss their CER results. Students will publicly share each other's finding in their small groups. Students will come to an agreement on the weathering and erosion question using Accountable Talk and as a group they will create a Claim, Evidence, and Reasoning Poster to be presented to the class. The class will do a Gallery Walk and use sticky note to write a positive or encouraging note to their classmates on their CER posters.
- Curriculum Activities: Complete Unit C: Erosion and Deposition. All activities can be found in the teacher's Curriculum Book, or Grand Rapids Public Schools Curriculum drive.
- Differentiated Activity: Create your own cemetery in your own way. Give your cemetery a name. Show evidence of weathering, and erosion. Name the rock type or types used for your headstones. Show name, dates of the birth and death of people buried in your cemetery. You may choose to sketch, use real rocks, make your own rocks, or use paper to design your cemetery. A rubric is provided.
- Compare and Contrast weathering, erosion, and deposition.
- Study for final assessment on Unit C: Weathering, Erosion, and Deposition. We use Accountable Talk to discuss questions. Students take notes and use as a study guide for their final assessment.
- Exit Slips: Students are given exit slips as an Assessment for Learning.
- Final Assessment: Students are given the final assessment as an Assessment of Learning. (file:///E:/content/PDFs/Item\_Bank.pdf)



**Erosion and Weathering  
Grade Level content Expectations**

**E.SE.06.11 Explain how physical and chemical weathering lead to erosion and the formation of soils and sediments.**

**E.SE.06.41 Compare and contrast the formation of rock types (igneous, metamorphic, and sedimentary) and demonstrate the similarities and differences using the rock cycle model.**

Please put the two Grade Level Content Expectations (GLCEs) in kid friendly words that you understand. Hint: "I will be able to ....."

**E.SE.06.11**

---

---

---

---

**E.SE.06.41**

---

---

---

---

Name: \_\_\_\_\_

Subject: Science 6

Teacher Name: Ms. Webb

Date: \_\_\_\_\_

## **Weathering**

<b>K</b> <b>What I <i>Know</i></b>	<b>W</b> <b>What I <i>Want To Learn</i></b>	<b>L</b> <b>What I <i>Have Learned</i></b>

---

Powered by TeAch-nology.com- The Web Portal For Educators! ([www.teach-nology.com](http://www.teach-nology.com))

Name: \_\_\_\_\_

Subject: Science 6

Teacher Name: Ms. Webb

Date: \_\_\_\_\_

## **Erosion**

<p style="text-align: center;"><b>K</b></p> <p style="text-align: center;"><b>What I <i>Know</i></b></p>	<p style="text-align: center;"><b>W</b></p> <p style="text-align: center;"><b>What I <i>Want To Learn</i></b></p>	<p style="text-align: center;"><b>L</b></p> <p style="text-align: center;"><b>What I Have <i>Learned</i></b></p>

---

Powered by TeAch-nology.com- The Web Portal For Educators! ([www.teach-nology.com](http://www.teach-nology.com))

Unit C Erosion and Deposition Vocabulary

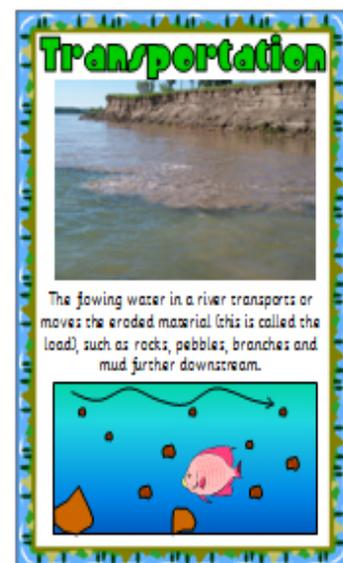
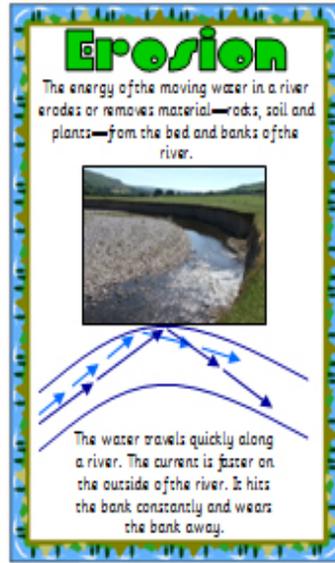
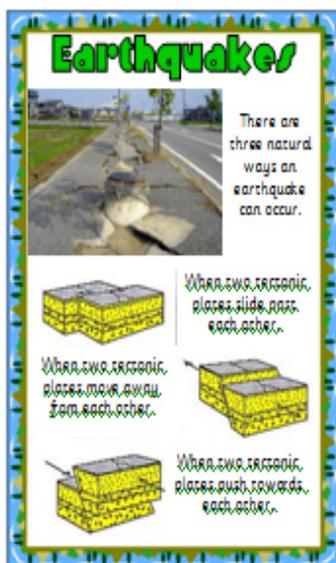
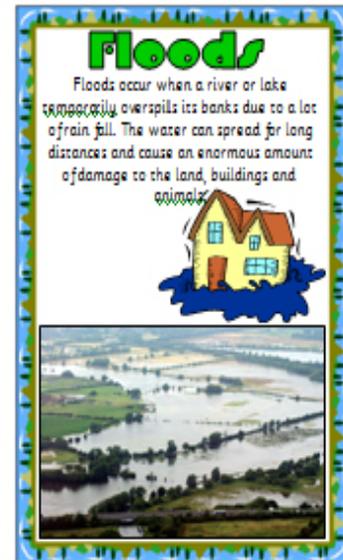
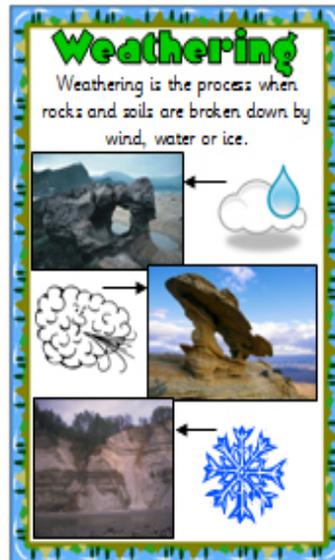
Evidence  
 Inference  
 Landform  
 Marsh  
 Observation  
 trade-offs  
 wetlands  
 contour interval  
 contour line  
 key

landform  
scale  
topography  
topographical map  
contour interval  
contour line  
key  
landform  
scale  
stability  
topography  
topographical maps  
average  
mean  
median  
mode  
sample size  
delta  
landform  
model  
river channel  
sediments  
delta  
earth processes  
constructive  
deposit, deposition  
destructive  
erode, erosion  
floodplain  
sediment

weathering  
ecologist  
engineer  
geologist  
river channel  
controlled variable  
model  
tested variable  
uncontrolled variable

deposition  
erosion  
advantage

breakwater  
constructive  
destructive  
disadvantage  
dredging  
jetty  
longshore current  
seawall  
evidence  
geologist  
advantages  
disadvantages  
ecologist  
engineer  
geologist  
trade-offs



**Vocabulary**

- Weathering:** The process where rocks are broken down into soil.
- Fused:** To combine or mix something.
- Erosion:** The process by which the Earth's surface is worn away.
- Acid rain:** Rain containing acid.
- Gravity:** The force of attraction that pulls things together.
- Glacier:** An extended mass of ice.

## Curriculum Activities

### Issues & Earth Science

#### Main Menu

[Home](#)

#### [Teacher Resources](#)

I: [Course Essentials](#)

II: [Diverse Learners](#)

III: [Assessments](#)

IV: [More Resources](#)

V: [Standards Correlations and Key Skills Matrix](#)

● [Unit C:](#)  
[Erosion and Deposition](#)

[Activities](#)

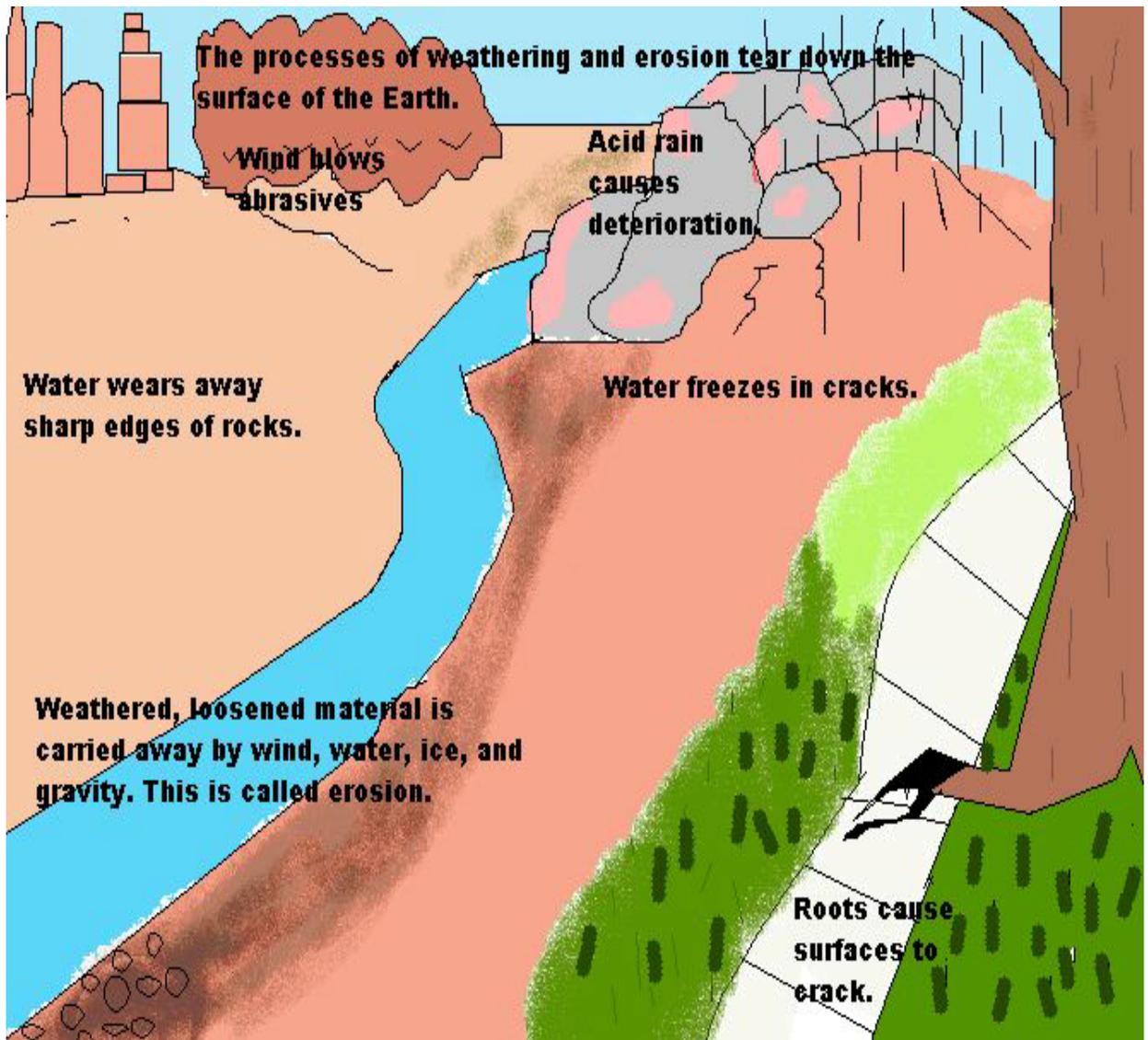
[Transparencies](#)

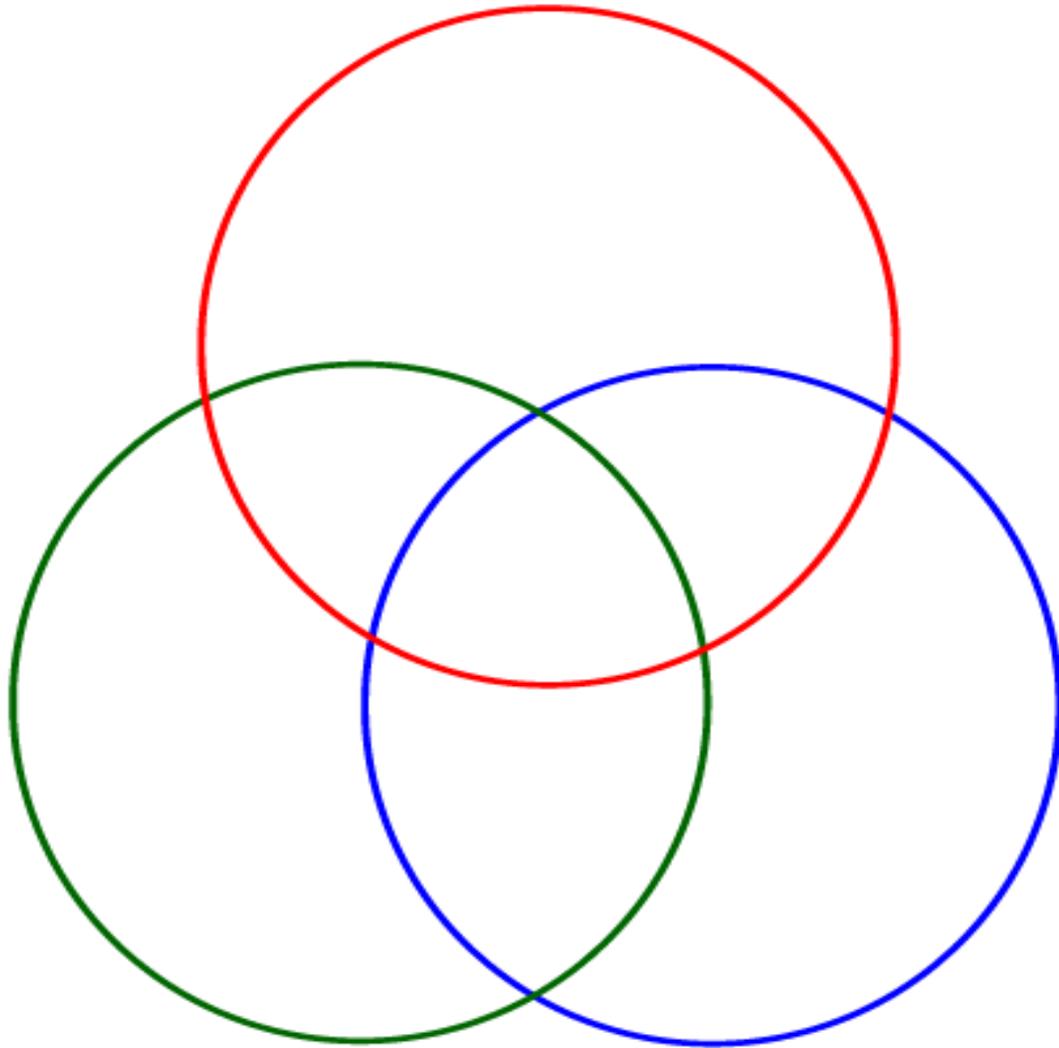
[Student Sheets](#)

#### Erosion and Deposition > Activities

- 24 [Where Should We Build? \(C 1-9\)](#)
- 25 [Making Topographical Maps \(C 11-14\)](#)
- 26 [Boomtown's Topography \(C 15-31\)](#)
- 27 [Investigating Boomtown's Weather \(C 33-43\)](#)
- 28 [Cutting Canyons and Building Deltas \(C 45-53\)](#)
- 29 [Weathering, Erosion, and Deposition \(C 55-65\)](#)
- 30 [Challenges of the Mississippi Delta \(C 67-77\)](#)
- 31 [Resistance to Erosion \(C 79-84\)](#)
- 32 [Investigating a Cliff Model \(C 85-89\)](#)
- 33 [Earth Processes and Boomtown's Coast \(C 91-97\)](#)
- 34 [Preparing the Geologist's Report \(C 99-105\)](#)
- 35 [Building in Boomtown \(C 107-115\)](#)







Please Compare and Contrast Weathering, Erosion, and Deposition.

Red is Weathering  
Blue is Erosion  
Green is Deposition

### **Weathering and Erosion in Your Neighborhood**

**Do you think headstones in a graveyard go through weathering or erosion? Explain your answer.**



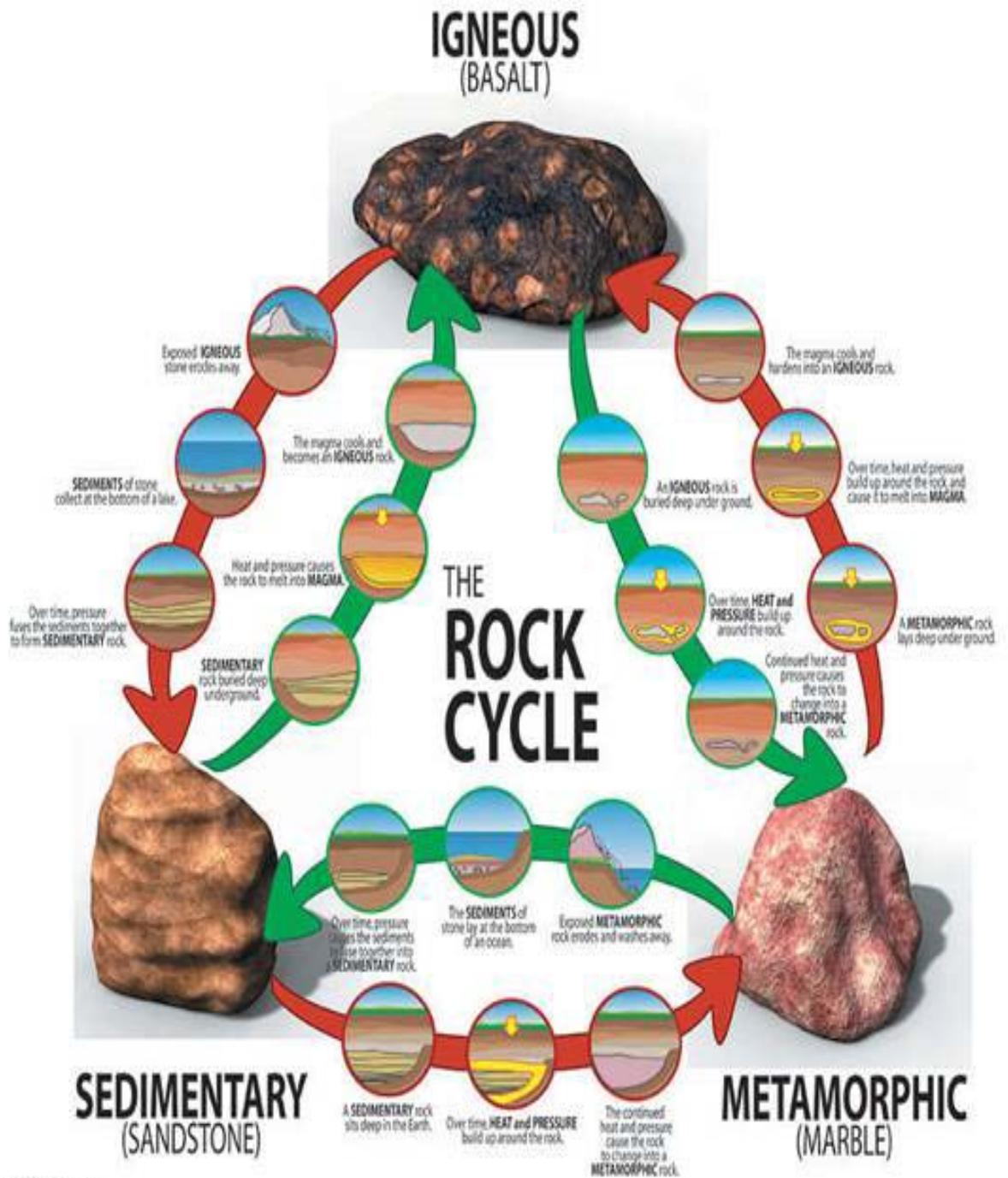
### **Graveyard Activity**

- ❖ **Tour a graveyard in the neighborhood of our school**
- ❖ **Ground keeper gives group a tour of a historical graveyard.**
- ❖ **Students work in pairs looking for evidence or weathering or erosion of headstones.**
- ❖ **Students collect data from 10 headstones in the grave yard. Document the rock type of the headstone (igneous, metamorphic, or sedimentary), year made, the age of the headstone, the condition (excellent, good, fair, or poor), whether the headstone went through weathering (predict the natural force that may have caused the weathering) or erosion (predict whether the eroded sediments were moved around by wind, water, or ice), and the location of the headstone in the graveyard (North, South, East, West, etc.).**

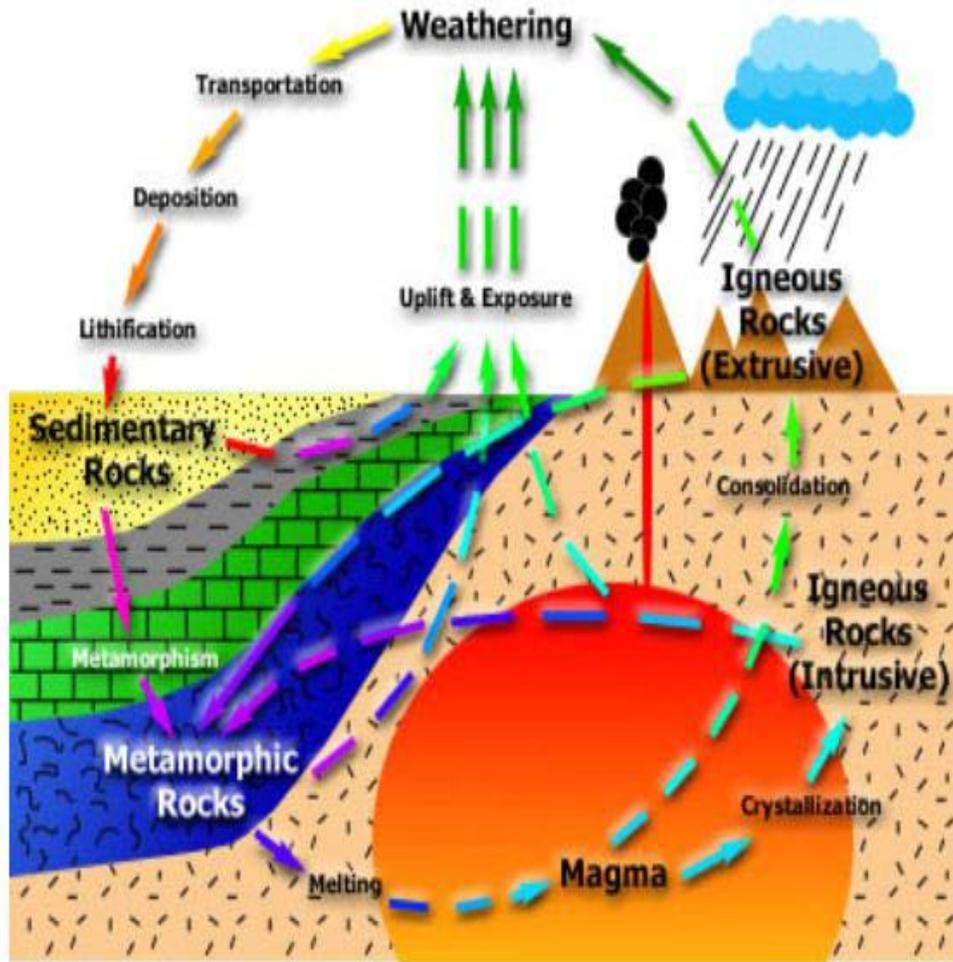
### **Weathering and Erosion in Your Neighborhood Questions**

- 1. What is erosion?**
- 2. What is weathering?**

- 3. Is there a difference between erosion and weathering? If yes, what is the difference?**
  
- 4. Is there a connection between the erosion process and the weathering process? If yes, what is the connection?**
  
- 5. Were most of the headstones you observed made from metamorphic, igneous, or sedimentary rock?**
  
- 6. What rock type you observed, (igneous, metamorphic, or sedimentary), resisted erosion or weathering better than the other two rock types? Hint: Which rock type was in excellent or good condition?**
  
- 7. Use your data as evidence to explain if headstones in graveyards go through weathering and/or erosion.**



© Matt Willard



### Erosion and Weathering

**Erosion** happens when sediments are moved around to different places by wind, water, or ice.

**Weathering happens when rocks are broken into smaller pieces by natural forces, such as a falling.**

**GRAPHIC SUMMARY: *Weathering and Erosion***

	WEATHERING		EROSION		
	MECHANICAL	CHEMICAL	MOVING WATER	WIND	GLACIERS
<b>WHAT IT DOES</b>	<ul style="list-style-type: none"> <li>Physically breaks down large pieces of rock</li> </ul>	<ul style="list-style-type: none"> <li>Changes a rock's chemical makeup</li> </ul>	<ul style="list-style-type: none"> <li>Cuts into rock and wears it away</li> <li>Carries pieces of rock to other places</li> </ul>	<ul style="list-style-type: none"> <li>Carries soil away and deposits it elsewhere</li> </ul>	<ul style="list-style-type: none"> <li>Carry dirt, rocks, and boulders</li> <li>Wear away land</li> </ul>
<b>EXAMPLES</b>	<ul style="list-style-type: none"> <li>Frozen water expands and enlarges cracks</li> <li>Seeds fall into cracks and grow into trees that split the rocks</li> </ul>	<ul style="list-style-type: none"> <li>Acid created by water and carbon dioxide can dissolve rocks</li> <li>Acid rain eats away rock surfaces</li> </ul>	<ul style="list-style-type: none"> <li>Carves canyons and valleys</li> <li>Creates flood plains and deltas</li> </ul>	<ul style="list-style-type: none"> <li>Dust bowls are formed by loss of soil</li> <li>Rich farmland is created by new deposits of soil</li> </ul>	<ul style="list-style-type: none"> <li>Carved out the Great Lakes</li> </ul>

**Weathering and erosion are the main causes of change in the earth's surface.**

**Claim, Evidence, and Reasoning  
Grave Erosion and Weathering**

The 6<sup>th</sup> grade class went on a field trip to study Earth's destructive processes; erosion and weathering. Theodore said erosion and weathering are one in the same destructive process (Hint: Erosion and weathering is the same process that happens in the exact same ways), and Alvin said erosion and weathering were two different destructive processes (Hint: Erosion and weathering are processes that happen in different ways). Document evidence from your science books, internet, library books, etc. and also include some data you collected on erosion and weathering during our field trip to help you with the following question.





**Alger Middle School**  
*Create Your Very Own Cemetery*



Name: \_\_\_\_\_

Teacher: Ms. Webb

Date : \_\_\_\_\_

Title of Work: \_\_\_\_\_

	<b>Criteria</b>				<b>Points</b>
	1	2	3	4	
<b>Name and Location of your cemetery included.</b>	You have a name and a location for your cemetery.	You have a name and part of a location for your cemetery.	You have a name or a location for your cemetery	You left out the name and the location of your cemetery.	—
<b>Headstones in Your Cemetery</b>	You created at least 10 Headstones in your cemetery.	You created at least 7-9 Headstones in your cemetery.	You created at least 4-6 Headstones in your cemetery	You created 1-3 Headstones in your cemetery	—
<b>Names, Birth dates, Death dates of People buried in your cemetery.</b>	You have completed 10 Headstones with names, birth and death dates.	You have completed 7-9 names, birth and death dates.	You have completed 4-6 names, birth and death dates.	You have completed 1-3 names, birth and death dates.	—
<b>Identified Rock type or types of Headstones.</b>	You identified 10 rock types of headstones in your cemetery.	You identified 7-9 rock types of headstones.	You identified 4-6 rock types of headstones.	You identified 1-3 rock types of headstones.	—
<b>Demonstrated evidence of Weathering and Erosion in your cemetery.</b>	You demonstrated 9-10 facts of weathering and erosion.	You demonstrated 6-8 facts of weathering and erosion.	You demonstrated 3-5 facts of weathering and erosion.	You demonstrated 1-2 facts of weathering and erosion.	—
				<b>Total----&gt;</b>	—

**Teacher Comments:**

Powered by TeAch-nology.com- The Web Portal For Educators! ([www.teach-nology.com](http://www.teach-nology.com))

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project Title: \_\_\_\_\_

Teacher(s): Ms. Webb

## Create Your Very Own Cemetery



<b>Process</b>	<b>Below Avg.</b>	<b>Satisfactory</b>	<b>Excellent</b>
1. Has clear vision of final product	1, 2, 3	4, 5, 6	7, 8, 9
2. Properly organized to complete project	1, 2, 3	4, 5, 6	7, 8, 9
3. Managed time wisely	1, 2, 3	4, 5, 6	7, 8, 9
4. Acquired needed knowledge base	1, 2, 3	4, 5, 6	7, 8, 9
5. Communicated efforts with teacher	1, 2, 3	4, 5, 6	7, 8, 9
<b>Product (Project)</b>	<b>Below Avg.</b>	<b>Satisfactory</b>	<b>Excellent</b>
1. Format	1, 2, 3	4, 5, 6	7, 8, 9
2. Mechanics of speaking/writing	1, 2, 3	4, 5, 6	7, 8, 9
3. Organization and structure	1, 2, 3	4, 5, 6	7, 8, 9
4. Creativity	1, 2, 3	4, 5, 6	7, 8, 9
5. Demonstrates knowledge	1, 2, 3	4, 5, 6	7, 8, 9, 10
6. Other:	1, 2, 3	4, 5, 6	7, 8, 9

Total Score: \_\_\_\_\_

Teacher(s) Comments:

## Comparing Rocks and Crystals

Standard:

**State of Michigan Strand: Earth Science**

**Science - Standard V.1 The Geosphere**

All students will describe the Earth's surface; describe and explain how the Earth's features change over time; and analyze effects of technology on the Earth's surface and resources. The geosphere includes Earth's surface and geological processes.

**E.SE.M.4 Rock Formation- Rocks and rock formations bear evidence of the minerals, materials, temperature/pressure conditions, and forces that created them.**

**E.SE.06.41** Compare and contrast the formation of rock types (igneous, metamorphic, and sedimentary) and demonstrate the similarities and differences using the rock cycle model.

Objective/Benchmark:

**TLW will identify rocks**

**TLW distinguish differences between rocks and crystals**

**Grand Rapids Public Schools 6<sup>th</sup> Grade Curriculum**

**Grand Rapids Public Schools Benchmark: 8 (EGV.1.m.2-5)**

TLW explain how rocks are formed; how rocks and fossils are used to determine the age and geological history of the Earth; how rocks are broken down, soil is formed and how surface features change; explain how technology changes the surface of the Earth.

**Engage:**

**Students do a Venn Gram on rocks and crystals. They tell what they know about them. They tell how they are different and how they are alike. This is a whole class discussion and activity.**

**Explore:**

**Students get into groups of three and make rock crystal. They compare their rock crystals to their rocks.**

**Materials:**

**Goggles  
Bowl  
Bluing  
Ammonia  
Salt  
Water  
Food color  
Sponge  
Paper towel  
Foil  
Coal  
Rocks**

**Recipe:**

**1 plastic dish  
¼ cup salt  
¼ cup water  
¼ cup laundry bluing  
½ cup ammonia  
Several lumps of soft coal**

**Mix salt, water, bluing, and ammonia. Place coal in dish and pour liquid mixture over the coal. Add a few drops of food coloring on top and watch crystals form. Compare these crystals to the crystals in rocks.**

**Explain:**

The teacher will dress as "Mother Earth" (Teacher wears a long black wig with white streaks when she is mother Earth (optional to dress). The teacher will begin by reviewing the last lesson Mother Earth taught on minerals. I will ask the students to open up their science log books and read the definition of a mineral. I will have the minerals in front of the students, so they may see them. I will say today we are going to talk about rocks. I will ask "What do you think rocks are made of? I would wait for a response and then give the answer. I will write the answer on the board for them to copy into their science log. I will have a bucket filled with rocks. I will put the minerals in the bucket and pretend to stir them, press down on them, add heat to them, and break them. I will explain to the learner that rocks are made of two or more minerals. I will pull out a piece of rock called Gneiss (pronounced nice) and say, "Wow! Isn't this nice?" I will encourage a response from the students. I will tell them the name of the rock and spell it on the board for them. I will pull out twelve different types of rock and pass them around for the students to look at them.

**Elaborate:**

Give students a sponge, charcoal, paper towel, aluminum foil, and rocks and have students make crystals with the materials. Have them guess which material makes the best crystals. Experiment by making the crystals and testing their guess. They will document their experiment in their rock journals.

Show overhead of Rock Cycle Song and sing

**Evaluate:**

Have students discuss their results in groups. I will look at their rock journals and listen to discussions.

\*This lesson will prepare students to identify the different rock types in following lessons.

## **The Rock Cycle Song**

(Tune: Row, Row, Row Your Boat)

**SEDIMENTARY rock**  
Has been formed in layers  
Often found near water sources  
With fossils from decayers

Then there's **IGNEOUS rock**  
Here since Earth was born  
Molten Lava, cooled and hardened  
That's how it is formed

These two types of rocks  
Can also be transformed  
With pressure, heat and chemicals  
**METAMORPHIC they'll become.**

## References

**Michigan Government.** <<http://www.michigan.gov/mde/0,1607,7-140-28753---,00.html>> (July 20, 2010)

**Geology Lessons**

<<http://www.eduref.org/cgi-bin/lessons.cgi/Science/Geology>> (July 20, 2010)

**Science Lessons**

<<http://www.mapleton.k12.oh.us/mms/Cool%20Science%20Web%20Sites.htm>> (July 20, 2010)

Headstone #	Year Person Died	Headstone age	Rock Type	Condition	Evidence of Erosion	Evidence of weathering	Other observations


*Union High School Construction Program (resource)  
Using Slope (Cross-Curricular)  
Math and Science  
Eric VandenBerg July 18, 2010*

**BIG IDEA**

S2.2.1 For bivariate data that appear to form a linear pattern, find the least squares regression line by estimating visually and by calculating the equation of the regression line. *Interpret the slope of the equation for a regression line.*

Use algebraic and analytical methods to locate and explain patterns and relationships in data, solve problems, and predict outcomes.

Use geometric methods to analyze, categorize and draw conclusions about points, lines, planes, and space

**Engage**

**Engage: 1**

Students will identify why and how slope is important when constructing new homes

Students will walk with teacher to various locations that will lead the students to their findings

Answers to look for: Hills, land grade, roof, stairs, parking lot, drain ditch, sewers, and gutters

**Engage: 2**

Students will go outside to a given location

Slope points - valley margin (natural levees), sewer system, drain ditch, parking lot

“This has slope to it, why is it important?”

**Explore**

Given the formula  $y/x = m$

Or

$$y_2 - y_1/x_2 - x_1 = m$$

Students will explore how to find the slope for: land grade, drain ditch, parking lot

Outside using: line level, 100' tape measure, pencil, poster grid

**Explain**

What did you do to find the slope?

What is the slope?

Why did we find the slope of a valley margin (natural levees), sewer system, drain ditch, and a parking lot?

What are some potential problems that might occur if there was not a slope with our points of interest?

**Elaborate**

Students will use linear functions to determine the slope of a line

Graph Linear equations

- Create a linear function that represents the slope of : *valley margin (natural levees), sewer system, drain ditch, parking lot*
- Graph should depict how excavators graded the land to assure water would follow slope to designated point.

**Evaluate**

Students find the slope of stairs throughout the school  
 Students express their findings in terms of rise over run

**Questions to ask:**

How can flood plains affect the construction of a home?  
 Or, if a house was built in a flood plain what are the potential risks?  
 How do parking lots affect the recharge of local aquifers?  
 If a house is built next to a stream what environmental changes could occur?  
 Hints (fertilizer, well water, erosion, runoff, recharge, levees, flood plains, flood wall)  
 Additional:  
 Sloping and Benching  
[http://www.osha.gov/pls/oshaweb/owadisp.show\\_document?p\\_table=STANDARDS&p\\_id=10932](http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10932)  
<http://www.pdhcenter.com/courses/g111/g111.htm>

Vocabulary	Essential Questions	Content/Concepts	Skill	Assessment
xy plane coordinates of a point slope of a line domain range graphs quadrants quadratic equation standard form zero factor property completing the square complex numbers	<ul style="list-style-type: none"> <li>• What are linear functions?</li> <li>• What do domain and range represent?</li> <li>• How do you graph linear equations?</li> <li>• What is a quadratic function?</li> <li>• What is a quadratic formula?</li> <li>• How is the discriminate of a quadratic used?</li> <li>• What is a quadratic formula and how is it used?</li> <li>• How and when so you use "completing the square"?</li> <li>• What are imaginary numbers?</li> </ul>	<ul style="list-style-type: none"> <li>• Domain and range</li> <li>• Slope</li> <li>• Graphing</li> <li>• Completing the square</li> <li>• Quadratic formula</li> <li>• Finding roots, funding zeros</li> <li>• complex numbers</li> </ul>	The student will: <ul style="list-style-type: none"> <li>• determine the slope of a line</li> <li>• use point slope formula</li> <li>• Graph quadratic equations</li> <li>• Solve quadratic equations by graphing</li> <li>• Solve quadratic equations algebraically</li> <li>• Use discriminant</li> <li>• Simplify square roots involving "i"</li> </ul>	<ul style="list-style-type: none"> <li>• Daily work</li> <li>• Quizzes</li> <li>• Written test</li> <li>• Checkpoint</li> <li>• Teacher observation</li> <li>• Oral responses</li> </ul>

**Construction Vocabulary**

**Direct & Indirect Relation to Slope**

**Backfill-** The replacement of excavated earth into a trench around or against a basement /crawl space foundationwall.

**Blue print(s)** - A type of copying method often used for architectural drawings. Usually used to describe the drawing of a structure which is prepared by an architect or designer for the purpose of design and planning, estimating, securing permits and actual construction.

**Grade**- Ground level, or the elevation at any given point. Also the work of leveling dirt. Also the designated quality of a manufactured piece of wood.

**Rise**- The vertical distance from the eaves line to the ridge. Also the vertical distance from stair tread to stair tread (and not to exceed

**Run, roof** - The horizontal distance from the eaves to a point directly under the ridge. One half the span.

**Run, stair**- the horizontal distance of a stair tread from the nose to the riser.

**Slope**- The incline angle of a roof surface, given as a ratio of the rise (in inches) to the run (in feet). See also pitch.

Jim Welsh  
Lesson Plan  
7/31/11

## Water Cycle

Standards & Benchmarks addressed: E.ES.07.81

- Explain the water cycle and describe how evaporation, transpiration, condensation, cloud formation, precipitation, infiltration, surface runoff and ground water occur within the cycle.

### Engage-

Ask the students: What is a cycle? List responses/discussion.

Definition of a cycle: A series of events that are regularly repeated in the same order.

Use examples of unicycle, bicycle, and tricycle.

In nature, there are many different cycles as well. The rock cycle (from 6<sup>th</sup> grade), the carbon cycle, and the cycle we are going to study today, **the water cycle**.

Ask the students – What are the different forms of water on the Earth?

### Explore-

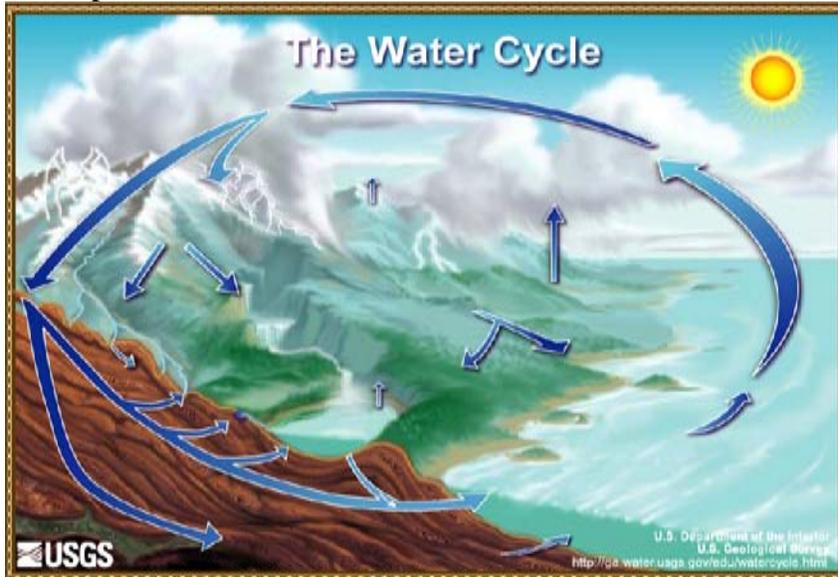
Give the students the following vocabulary:

Condensation  
Evaporation  
Precipitation  
Transpiration  
water table  
surface water  
ground water  
impermeable layer

water vapor  
infiltration

Also give them a blank copy of the following picture of the water cycle.

Have the students work in groups of 4 to complete where they think these words would appear on the picture. Also have dictionaries available for their use.



### **Explain-**

After about 15 minutes, give the students the definitions of the words you want them to know. See how these fit with their understanding of the vocabulary words. Have them complete a vocabulary model of your choice for each of the words.

Next, review the picture along with the vocabulary words. Have the students discuss how they completed the picture. Have students display their work on the ELMO so other students can see how they completed the picture.

Make a drawing on the board of the water cycle. This allows for more details on the workings. Start with a land mass and lake. Draw and label as you go, Energy Source, surface water, evaporation, condensation, precipitation, runoff, infiltration, impermeable layer, ground water, water table, and transpiration.

### **Elaborate-**

Begin discussions that will be explored in future lessons:

Materials that water can pass through

Material that water cannot pass through – impermeable layer  
Can water travel underground?

Where does your drinking water come from?

Show samples of my well water – ground water

Does it matter where landfills are located?

What are septic tanks? Why is this important?

**Evaluate-**

Vocabulary quiz – matching and multiple choice.

Give the students a copy of your drawing. Have them fill in spots indicated with the correct vocabulary words.



Word List			
condensation	impermeable layer	runoff	water table
evaporation	infiltration	surface water	
ground water	precipitation	transpiration	

**Definitions**

**condensation** (konduhnsayshuhn) The change in a state of matter from a gas to a liquid.

**evaporation** (ihvapurayshuhn) The change in a state of matter from a liquid to a gas.

**ground water** Water beneath the earth’s surface, that supplies wells and springs

**impermeable layer** a layer of soil in which water cannot pass through

**infiltration** (ihnfihltrayshuhn) The process by which water seeps into the soil

**precipitation** (prihsihpihtayshuhn) *noun* Water that falls to Earth as rain, snow, sleet, or hail

**runoff** (ruhnowf) Water from rain or snow that flows into streams and rivers from surface areas.

**surface water** Water that is above ground in streams,lakes,rivers and ponds.

**transpiration** Vapor water lost or given off by land plants.

**water table** The upper zone or level of the ground water.