Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Science	Course:	Advanced Earth Science 8	Unit 3 Title:	Geology	Grade Level(s):	8
Assessed Trimester:	Trimester 2	Pacing:	1 Trimester Students will work through regular material in approximately 3 days per week with additional days for enrichment.	Date Created:	6/17/2013	Last Revision Date:	6/17/2014

Course Understandings: *Students will understand that:*

- Scientific inquiry is a way of processing information about their world through the interactions among technology, engineering, and mathematics.
- Scientific investigations involve asking testable questions. Different kinds of questions suggest different scientific investigations and findings of current investigations will guide future investigations.
- Many cultures and groups have been and continue to be involved in advancements in engineering, exploration, and inquiry.
- Earth systems are distinct but interrelated and affect human lives.
- In order to maintain and improve their existence, humans interact with and influence Earth systems.
- Materials within the Earth's systems have physical/chemical properties that make them useful in different ways.

DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

Benchmark:

8.3.1.1.1: Recognize that the Earth is composed of layers, and describe the properties of the layers, including the lithosphere, mantle, and core.
8.3.1.1.2: Correlate the distribution of ocean trenches, mid-ocean ridges, and mountain ranges to volcanic and seismic activity.
8.3.1.1.3: Recognize that major geological events, such as earthquakes, volcanic eruptions and mountain building, result from the slow movement of tectonic plates.
8.3.1.3.1: Interpret successive layers of sedimentary rocks and their fossils to infer relative ages of rock sequences, past geologic events, changes in environmental conditions, and the appearance and extinction of life forms.
8.3.1.3.2: Classify and identify rocks and minerals using characteristics including, but not limited to, density, hardness and streak for minerals; and texture and composition for rocks.
8.3.1.3.3: Relate rock composition and texture to physical conditions at the time of formation of igneous, sedimentary and metamorphic rock.
8.1.3.4.1: Use maps, satellite images, and other data sets to describe patterns and make predictions about local and global systems in Earth science contexts. *For example*: Use data or satellite images to identify locations of earthquakes and volcanoes, ocean surface temperatures, or weather patterns.
8.2.3.1.1: Explain how seismic waves transfer energy through the layers of the Earth and across its surface.
8.3.1.2.1: Explain how landforms result from the processes of crustal deformation, volcanic eruptions, weathering, erosion, and deposition of sediment.
8.3.1.2.2: Explain the role of weathering, erosion, and glacial activity in shaping Minnesota's current landscape.
8.3.4.1.1: Describe how mineral and fossil fuel resources have formed over millions of years, and explain why these resources are finite and non-renewable over human time frames.
8.1.3.3.1: Explain how constraints like scientific laws and engineering principles, as well as economic, political, social, and ethical expectations, must be taken into account in designing engineering solutions or conducting scientific investigations. (Trimester 2 and Trimester 3)

Literacy Benchmark:

6.13.3.3: Follow precisely a multistep procedure when carrying out experiments, designing solutions, taking measurements, or performing technical tasks.
6.13.4.4: Determine the meaning of symbols, equations, graphical representations, tabular representations, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics*.
6.13.7.7: Compare and integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, table, map).
6.13.1.1: Cite specific textual evidence to support analysis of science and technical texts.
6.13.2.2: Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
6.13.9.9: Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
6.13.10.10: By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.
6.14.2.2: Write informative/explanatory texts, as they apply to each discipline and reporting format, including the narration of historical events, of scientific procedures/ experiments, or description of technical processes.

a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.
b. Develop the topic with relevant, credible, sufficient, and well-chosen facts, definitions, concrete details, quotations, or other information and examples.
c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.
d. Use precise language and domain-specific vocabulary to inform about or explain the topic.
e. Establish and maintain a formal style and objective tone.
f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

6.14.4.4: Produce clear and coherent writing in which the development, organization, and style are appropriate to discipline, task, purpose, and audience.
6.14.5.5: With some guidance and support from peers and adults, use a writing process to develop and strengthen writing as needed by planning, drafting, revising, editing, rewriting, or trying a new approach, focusing on how well purpose, discipline, and audience have been addressed.
6.14.6.6: Use technology, including, but not limited to, the Internet, to produce and publish writing and multi-media texts, and present the relationships between information and ideas clearly and efficiently.
6.14.7.7: Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
6.14.8.8: Gather relevant information from multiple data, print, physical (e.g., artifacts, objects, images), and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
6.14.9.9: Draw evidence from literary or informational texts to support analysis, reflection, and research.
6.14.10.10: Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes and audiences.

Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

- Design and carry out an experiment modelling weathering and erosion forces on a small scale (stream table).
- Research an event (volcano or earthquake), applying their knowledge of geologic forces to understand the events' past and future effects on the surrounding community/the world.
- Use their knowledge of the scientific process to answer testable questions.
- Collect and analyze data to draw scientific conclusions.
- Share research and findings.

Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: ● Tectonic plate motion causes Earth to be a geologically active planet which creates landforms and shapes the surface. ● Observable evidence in the present gives information about processes and events that occurred in the past. ● The rock cycle is a continuous process that continuously shapes, forms, and recycles rocks and minerals. ● Scientific inquiry uses multiple interrelated processes to investigate questions and propose explanations about the natural world.	**Students will keep considering:** ● How can we demonstrate that Earth is a geologically active planet? ● How/why do Earth's different systems/processes interact? ● How are rocks and minerals formed and identified? ● How do rocks tell the geological history of an area? ● How can the scientific method be used to answer self-generated questions?

Acquisition

Knowledge - Students will:	Reasoning - Students will:
● Students will identify the layers of the Earth (lithosphere, mantle and core). (8.3.1.1.1) ● Students will understand how waves transfer energy. (8.2.3.1.1) ● Students will list the layers of the Earth (including the crust, lithosphere, asthenosphere, mantle, and core). (8.3.1.1.1) ● Students will define the properties of the layers. (8.3.1.1.1) ● Students will understand there are different types of plate boundaries. (8.3.1.1.3) ● Students will explain tectonic plates and their slow movement. (8.3.1.1.3)	● Students will compare/contrast seismic waves as they go through different layers (ex. the way different Earth materials affect the propagation of seismic waves). (8.2.3.1.1) ● Students will analyze and interpret how the movements of plates form ocean trenches, mid-ocean ridges, mountain ranges, coastal mountain ranges, island arcs and lead to volcanic and seismic activity. (8.3.1.1.2) ● Compare plate movement at different plate boundaries, including subduction zones and divergent boundaries. (8.3.1.1.3)

- Students will describe the motion of tectonic plates and how the how the movement causes geological events. (8.3.1.1.3)
- Students will explain different examples of physical and chemical weathering and erosion forces. (8.3.1.2.1)
- Students will explain how the landscape of Minnesota has been shaped by glaciers and other weathering processes. (8.3.1.2.2)
  **For example: Students can use the maps/emerging technologies to analyze how Minnesota's landscape has been affected by glaciers and other weathering processes.
- Students will interpret cross-sections of sedimentary rocks, using index fossils to infer relative ages and recognizing extinct life forms. (8.3.1.3.1)
- Students will infer changes in environmental conditions (ex. marine to land fossils). (8.3.1.3.1)
- Students will describe how coal and oil are formed. (8.3.4.1.1)
- Students will be able to explain how constraints like scientific laws and engineering principles, as well as economic, political, social, and ethical expectations, must be taken into account in designing engineering solutions or conducting scientific investigations. (8.1.3.3.1)
- Students will be able to identify geological features in map or satellite images. (8.1.3.4.1)
- Students will know the basic procedures to carry out a controlled experiment.

- Students will distinguish between chemical and physical weathering. (8.3.1.2.2)
- Students will analyze different landforms, emphasizing Minnesota geology, and interpret how they formed according to geologic processes. (8.3.1.2.2)
- Students will distinguish between weathering and erosion. (8.3.1.2.1)
- Students will distinguish between rocks and minerals. (8.3.1.3.2)
- Students will classify rocks and minerals based on their properties. (8.3.1.3.2)
- Students will compare/contrast intrusive and extrusive igneous rocks. (8.3.1.3.3)
- Students will compare/contrast chemical, organic, and clastic sedimentary rocks. (8.3.1.3.3)
- Students will compare/contrast foliated and non-foliated metamorphic rocks. (8.3.1.3.3)
- Students will compare/contrast a parent rock to a metamorphic rock or sedimentary rock. (8.3.1.3.3)
- Students will predict/infer how one type of rock can change into any other type (ex. rock cycle). (8.3.1.3.3)
- Students will compare/contrast the human time frame with the mineral/fossil fuel formation time frame. (8.3.4.1.1)
- Students will predict the effect of overuse of mineral and fossil fuel resources. (8.3.4.1.1)
- Students may use computers to examine different types of technology (ideas - Google Earth, probes, computer simulations, Riverside Scientific, etc). (8.1.3.4.1)
- Students will use computers to access or view satellite images and data sets. (8.1.3.4.1)

Skills - Students will:

- Students will use the tools necessary to determine the specific properties of examples of rocks and minerals. (8.3.1.3.2)
- Students will use specific characteristics and properties to classify minerals common to Minnesota. (8.3.1.3.2)
- Students will use a specific characteristics and properties to classify rocks common to Minnesota. (8.3.1.3.2)
- Students will model the rock cycle. (8.3.1.3.3)
- Students will conduct an experiment using stream tables. (8.3.1.2.1)
- Students will analyze a map or image of Minnesota geology. (8.3.1.2.2)
- Plan and conduct a controlled experiment to test a hypothesis about a relationship between two variables (STEM project).

Common Misunderstandings

- Ice takes up less space than liquid water
- Rocks must be heavy
- Earth is all molten rock except for the crust
- Tectonic plates stopped moving a long time ago
- Mountains form very quickly in an extreme event
- We have been to the center of the Earth
- Rocks and minerals are the same
- Volcanoes are the only things that create mountains
- The tallest mountains are on land
- Earthquakes cannot happen in Minnesota
- Earth is younger than 10, 000 years old
- There are no limitations on resources

Essential new vocabulary

- Cleavage
- Fracture
- Igneous
- Sedimentary
- Metamorphic
- Intrusive
- Extrusive
- Crystallization
- Lava
- Magma
- Chemical
- Organic
- Clastic
- Erosion
- Deposition
- Physical weathering
- Chemical weathering
- Compaction
- Cementation
- Sediment
- Foliated
- Non-foliated
- Re-crystallization
- Renewable
- Non-renewable
- Fossil fuel
- Constructive
- Destructive
- Uplift
- Crustal
- deformation
- Mass wasting
- Oxidation
- Glacier
- River Valley
- Moraines
- Floodplain
- Oxbow lake
- Kettle lake
- Inner core
- Outer core
- Mantle
- Asthenosphere
- Lithosphere
- Crust
- P-waves
- S-waves
- Surface waves
- Fault
- Tectonic plate
- Convergent
- Divergent
- Transform
- Subduction
- Earthquakes
- Volcanoes
- Hot Spot
- Oceanic trench
- Mid-ocean ridge
- Mountain range
- Coastal mountain range
- Island arc
- Constraints
- Ethics
- Superposition
- Original horizontality
- Relative age
- Absolute age
- Cross-cutting
- Intrusion
- Index fossil
- Uniformitarianism