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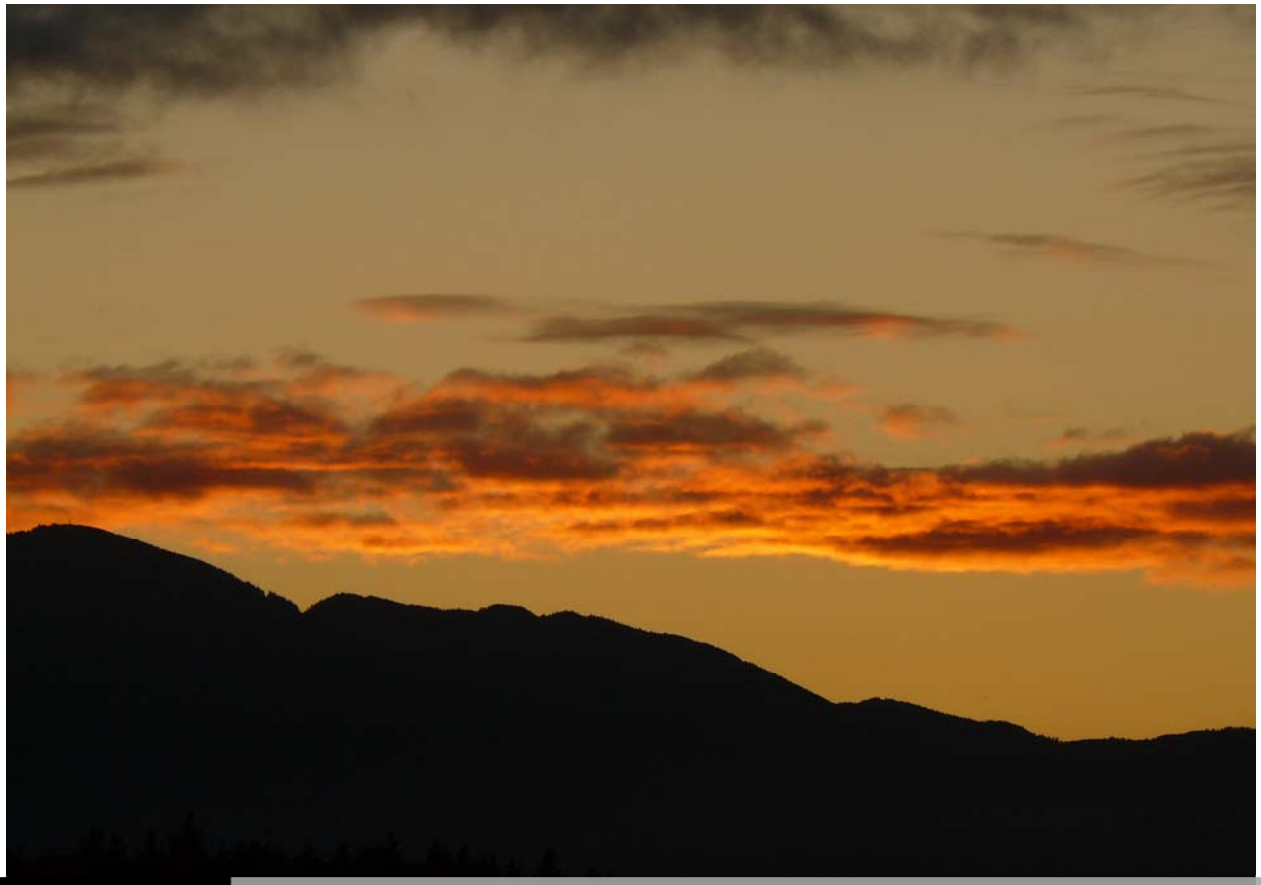

Assessing with Learning Progressions in Science

FOSS LANDFORMS

Photo by Joanne Johnson

Content Professional Development Tools| **Contributor: Ben Fackler-Adams**

Northwest Educational Service District 189
Together We Can

Skagit Valley College
Where Learning Comes to Life

Funding information:
Mathematics & Science Partnership under Title II, Part B
Program Code: 62
CFDA 84.366B

Learning Progression

Landforms

Prerequisite skill:

Working effectively in groups

Learning Target:

Maps are an effective tool for modeling the shape & features of the Earth's surface.

Success Criteria:
I can…

Read basic information from topographic maps.

Formative Assessment:

Topographic profile

Learning Target:

Topographic maps are a means of representing significant details of landforms.

Success Criteria:
I can…

Read topographic maps to understand landform shape.

Formative Assessment:

Act 2 – 5 activities

Learning Target:

Topographic maps can be used to interpret the origin of landforms.

Success Criteria:
I can…

Read topographic maps & identify various types of landforms.

Formative Assessment:

Act 2 - 5 activities

Learning Target:

Constructional & Destructional landforms originate via different sets of processes & their interactions.

Success Criteria:
I can…

Make inferences about the controlling processes & evolution of a landform.

Formative Assessment:

Landform classification exercise.

Learning Target:

Rates of landscape evolution vary with crustal composition, & w/ variations in tectonic & sedimentary processes & climate.

Success Criteria:
I can…

Make inferences about Earth history based on the nature of landforms in a region.

Formative Assessment:

"How Erosion Builds Mountains" worksheet

Big Idea:
The shape of the Earth's surface is controlled by the interaction of crustal composition, climate, erosion, deposition, & tectonics over a range of time scales.

Later big ideas that build on this big idea include:

Earth has changed significantly over geological time frames.

Formative Assessments Used Throughout:

Whiteboarding ----------→
Think-"Pair"-Share ----------→
Questioning ----------→
Whole Class Discussion ----------→
Others? ----------→

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Math Science Partnership
File Name: C_LF

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AGENDA FALL 2011

• Initial Ideas: Record your thoughts (~10 minutes)

What controls the shape of the Earth's surface? or *Why does the shape of the Earth's surface change?*

• Whiteboard (review protocols): *Share your thinking with your group and develop a white board to share that represents your consensus ideas.* (~25 minutes)

• Form Groups & Develop Group Norms (~5 minutes)

• Act. 1: Reading & Utilizing Topographic Maps (~100 minutes)
Read: p. 167 – 178 (thru "Scales of Maps & Models")
Complete: 1, 2, 4, 5, 10, 11, 13 to 17, 18a –c, 19, 27 to 33 (using local quadrangle), 37 to 48.

• Formative Assessment: Think-Pair-Share (~12 minutes)
What questions do you have about topographic maps and landforms?

• Act. 2: Stream Landforms & Processes (~30 minutes)
Read: p. 213 - 219
Complete: 1 to 4 (4a & b only) & 15 to 19

• Formative Assessment: (~12 minutes)
"Mountain Age" from Uncovering Students Ideas In Science V.1

• Act. 3: Glacial Landforms & Processes (~35 minutes)
Read: p. 251 - 256
Complete: 2 to 6, 10, 11, 22 to 22

• Act. 4: Dryland Landforms & Processes (~30 minutes)
Read: p. 270 - 274
Complete: 1 to 10

• Formative Assessment: Think-Pair-Share (~12 minutes)
Which dryland landforms listed in the packet are formed by constructional processes [those that build up (i.e. grow in area, mass, or height)] and which are formed by destructive (erosional) processes?

• Act. 5: Coastal Landforms & Processes (~25 minutes)
Read: p. 284 - 287
Complete: 1 to 4

• Instructor Comments: Constructive & Destructive Landforms & Rates of Landscape Evolution (~20 min.)

• Wrap-Up: "How Erosion Builds Mountains" worksheet (~40 minutes)

• Whole Group Discussion: Classroom Applications (~25 minutes)

Reflection: *Review your Initial Ideas & List of Questions from the 1st Think-Pair-Share. Record your reflections on how your thinking about landforms and landscape evolution has changed, and describe which specific activities had the biggest effect on modifying your understanding.* (~15 minutes)

Whole Group Discussion: Classroom Applications (~25 minutes)

RESOURCES USED:

• *Laboratory Manual In Physical Geology 8e*, 2009, Busch R. Ed., AGI/Pearson, ISBN-13: 978-013-600771-5

• "*How Erosion Builds Mountains*", Pinter N. & Brandon M., 1997, Scientific American

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"*How Erosion Builds Mountains*" Worksheet FALL 2011

Reading: Scientific American Article "How Erosion Builds Mountains" by Nicholas Pinter and Mark Brandon, 1997

What processes build mountains? How can isostasy explain how mountains grow? How can erosion of mountains factor into explaining mountain uplift? Can erosion of mountains be likened to the melting and rising of icebergs? This article presents the ideas of two geologists whose research specializes in looking at answers to these questions.

The article in part presents the concept that the density of crustal materials, gravity, and isostasy (motionless balanced floating) are important (but not the only) factors interacting to control how high mountains are. Evidence of significant crustal uplift includes the observation that intrusive igneous and metamorphic rock types formed deep in Earth's crust are found at the Earth's surface.

1. What is the paradox described by the authors in the shaping of mountains? Do you think the calling of paradox between these two processes is valid? Explain why or why not.

2. Viewing mountains as a **system:**

A. What three processes are integrally linked in mountain building?

B. Describe examples of inputs and outputs in the mountain system

C. How do feedbacks between tectonics, erosion, and climate processes interplay to influence mountain building?

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3. The article presents the idea that the proportion of an iceberg that was above and below the water line depends on the difference in density between the iceberg and the fluid it floats in. Describe how the buoyant "roots" of mountains can be compared to the iceberg analogy.

4. Continents can be viewed as consisting, on the average, of granite. What must be said about the relative densities of granite and the mantle rock below it if continents "float" in the mantle?

5. "Isostasy is the key mechanism that links a mountain's tectonic, or internal evolution to its geomorphic, or external development." Describe how erosion at the surface can explain uplift of mountains.

6. Evidence suggests that during the past 40 million years there has been an unusual surge of tectonic activity and mountain building. Did the surge of mountain building cause the global climate shift? Or did the climate shift cause the surge in mountain building? Which cause and effect relationship do you align with?

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NW ALPS Landforms Content Pre-Test **Fall 2011**

Name: _____

1. What is a landform?

2. What factors or processes do you think produce landforms?

3. Do you think landforms evolve? Why or why not?

4. What sorce of energy produces/produced landforms?

5. Describe how you think landforms are measured?

6. How do you think scientists classify landforms?

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