6th Grade Science - Unit 2
Energy and Changes on Earth (NGSS MS-ESS2)

Overarching question: What do snow storms and plate tectonics have in common?

Essential Questions:

- How and why is Earth constantly changing?
    - How does understanding the properties of Earth materials and the physical laws that govern their behavior lead to the prediction of Earth events?
    - How do Earth's major systems interact?
    - In what ways can Earth processes be explained as interactions among spheres?
    - Why do the continents move, and what causes earthquakes and volcanoes?
    - How do the properties and movements of water and air shape Earth's surface and affect its systems?
    - What regulates weather and climate? (see links below for unit plan and assessment)
    - How do living organisms alter Earth's processes and structures? *(now or in ecology/climate change unit?)*

Big Ideas:

- Changes in states of matter have effects on the earth
- Earth's systems can be broken down into individual components, which have observable measurable properties.
- Earth's components form systems. These systems continually interact at different rates of time, affecting the Earth locally and globally.

Students will be able to:

- Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process
    - Melting, crystallizations, weathering, deformation and sedimentation, which acts together to form minerals and rocks
- Construct an explanation based on evidence for how geoscience processes have changed the Earth's surface at various times and spatial scales
    - Large (plate motions to uplift a mountain) vs. small (rapid landslides)
    - Gradual behavior punctuated by catastrophic events
    - Emphasize local features
- Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions
    - Similarities of rocks/fossils on different continents, shape of continents, locations of ocean structures

- Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and force of gravity
- Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions
    - High vs. low pressure causing weather at fixed location & how sudden changes in weather can occur when masses collide
    - Predicting weather within probabilistic ranges
- Develop and use a model to describe how unequal heating and rotation of the Earth causes patterns of atmospheric and oceanic circulation that determine regional climates
    - Patterns vary by latitude, altitude, geographic land distribution
    - Atmospheric circulation emphasis on sunlight-driven latitudinal banding, Coriolis effect, resulting prevailing winds
    - Emphasis of ocean circulation on transfer of heat by global ocean convection cycle constrained by Coriolis effect and outlines of continents

Knowledge:

- Plate tectonics (plates are constantly moving and affecting the earth)
- All earth processes are the result of energy flowing and matter cycling within and among the planet's systems
    - Energy derived from sun and earth's hot interior
    - Produces chemical and physical changes in Earth's materials & living organisms
- Planet's systems interact in various scales and over various time periods
- Water continually cycles among land, ocean and atmosphere via the water cycle
- Patterns and movements of water affect climate and weather patterns
- Global movements of water and its changes in form are propelled by sunlight and gravity
- Ocean currents are connected based on temperature and salinity
- Water's movements change the earth's surface and formation
- Weather and climate are influenced by interactions involving sunlight, the ocean, atmosphere, ice, landforms and living things and these interactions vary based on location
- The ocean exerts a major influence on weather and climate

Benchmark Skills to be mastered:

- Trace movements of the plates over time
- Explain the relationship between temperature and pressure
- Collect and interpret data
- Use graphical displays such as maps to identify the relationships of phenomena

Performance Summative Assessment:

Here are some links I thought about using for the weather unit:
https://middleschoolscience.com/earth-science/adopt-a-city-mini-weather-unit/

Unit week plan 9 weeks

Lessons:

Teaching with phenomena
https://sites.google.com/site/sciencephenomena/
https://paul-andersen-xw6e.squarespace.com/phenomenal
https://www.ngssphenomena.com/search?q=Earth%20science
http://sunrisescience.blog/free-websites-ngss-anchoring-phenomena/

Ideas for lessons: http://sbsciencematters.com/lesson-units/6th-grade/6earth-platetectonics/

Week 1: Introduction to the Earth Systems (atmosphere, geosphere, hydrosphere, cryosphere, biosphere)
SWBAT identify the connections between the earth's systems
Lesson 1:
-show video of a natural disaster with multiple effects (alaska earthquate → tsunami → coastal flooding → people fleeing and buildings destroyed, etc.)
-students document events and results on organizer with mapping
- share how all Earths' systems are related
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Lab: Via Alaska Earthquake or Lake Nios Share

Week2: The Hydrosphere
Using the NASA Water in Earth's hydrosphere Activity

Obj: How does the water cycle through Earth's systems
Case Study on Aral Sea in Central Asia

Week 3: The atmosphere around you
Obj: The student will be able to explain how modeling the layers of the atmosphere helps them draw conclusions about Earth as a system.
Lab activity:
Using the red bull jump from the stratosphere.

Week 4: Precipitation, Air masses, and cyclones
Obj: how is water continually evaporating and condensing in the atmosphere and how does this process affect cloud formation
Lab: Cloud in a bottle

Week 5: Air masses and weather changes
Obj: How do the interactions of air masses influence the changes in weather patterns.
Assignment: Weather forecasting using data sets from NOAA
ADI: Air Masses and Weather Conditions: How do the motions and interactions of air masses result in changes of weather conditions.

Week 6: Severe weather o
Obj:

Resources:
http://millriverschools.org/documents/drivesync/Curriculum%20Website/Science/GL%206/Gr.%206%20Weather%20and%20Climate.pdf