# CoNSEPT NGSS Skeletal Unit Implementation Template

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## PLANNING A UNIT AROUND "BIG SCIENCE IDEAS"

**What do you want to teach?**

**Focus of Unit:**
The Theory of Plate Tectonics

**What are the Performance Expectations that you are working toward?**

**Performance Expectation(s):** (Search by DCI)

**ESS2.A: Earth Materials and Systems**

**• Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes.**

**ESS2.B: Plate Tectonics and Large Scale System Interactions**

**• Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean floor features and for the distribution of most rocks and minerals within Earth's crust.**
**(ESS2.B Grade 8 GBE)**

## ANCHORING PHENOMENON

**Identify a scientifically rich, complex phenomena** that will require students to use multiple principles to explain (an occurrence or event that happens(ed) in the world)
[This will serve as the reason for engaging in the unit.]

Describe the Anchoring Phenomenon chosen to anchor the unit:

Students will view the video at the following link: https://www.youtube.com/watch?v=_-CNX9W_KPw

This video footage is from an eyewitness that recorded a video of the Japan Tsunami in 2011. The video is approximately 15 minutes long, but the first 8-10 minutes will be appropriate to expose students to the concept.

**Provide a Target Explanation of Phenomenon** [Provide a written explanation of the phenomenon] (Note: the explanation should identify how science principles are coordinated to explain the occurrence or event that happened in the world)

Target explanation of phenomena:

1) Crustal movement from an earthquake (5) under the ocean displaces ocean water causing a wave (tsunami).
2) Earth's crust is broken up into tectonic plates (3) that move from convection current in the mantle/asthenosphere.
3) Three types of tectonic plate boundaries (divergent, convergent, and transform) (5) exist.
4) Earth has two different types of crust (oceanic and continental) (4) with different densities (6) due to differences in mineral content (4).
5) Different types of features exist at different types of boundaries depending on the type of crust (5). (Ex: non volcanic convergent mountain building versus subduction zones)
6) Evidence collected by Alfred Wegener (1) suggested that continents move over time. Examples include similar fossils and rock layers on both sides of the Atlantic Ocean and the puzzle like fit of continents.
7) Efforts to map the seafloor in the 1940s by people such as Harry Hess discovered the existence of Mid-Ocean Ridges (MOR) (2), changing the current thinking that the seafloor was flat.
8) Dating rocks on the seafloor showed they got older as you moved away from the MOR. This became the basis for the idea of seafloor spreading (2) and provides a mechanism to explain continental drift.
9) Over time, oceanic crust that forms at MORs move and eventually runs into a piece of crust that is less dense (6). The more dense crust moves underneath the other crust, causing the formation of a subduction zone (5).
10) Subduction zones (5) are places where earthquakes (3) frequently occur under the ocean. This happens when the subducting crust locks up where it meets the overlying crust, storing energy that can be suddenly release to form an earthquake (3) that forms a tsunami.
11) The movement of tectonic plates is driven by convection currents (6) in the mantle. Warmer, less dense magma rises at MORs. Cooler, more dense magma in the mantle sinks at subduction zones, pulling that curst back into the Earth's interior.

**Develop a Driving Question** that will help bound the work of the unit and frame the anchoring phenomenon for the students. The question should be causal and not easily answered.

Driving question:
Why, if there was an earthquake in Japan, would you have to stay off the beaches in California?

**Big Science Ideas and Activities/Lessons Used in the Unit to Get Ideas on the Table that will be important for Explaining The Phenomenon.**

**Big Idea 1:**
**Continental Drift**

**Activity/Lesson 1:**

**Students are given cut up pieces of a picture and have to figure out how the pieces fit together Students, then will be given pieces that resemble the continents and have to fit them together based on fossil evidence**

**Big Idea 2:**
**Seafloor Spreading**

**Activity/Lesson 2:**
**After learning about how Harry Hess used SONAR to map the ocean floor, student will look at a seafloor map of the Atlantic Ocean and calculate rates of seafloor spreading. The map provides reference points on the ocean floor with approximate ages of each area.**

**Big Idea 3:**
**Earthquake and volcano distribution:**

**Activity/Lesson 3:**
**Historic and real time earthquake and volcano data will be used to identify patterns that are different then the shapes of the continents. Connections to the data will be determined using a world map.**

**Big Idea 4:**
**Layers of the Earth**

**Activity/Lesson 4:**
**Students will learn the layers of the Earth by creating a scale model of each layer of the Earth and researching important information about each layer, including mineral composition, density,and state (solid or liquid)**

**Big Idea 5:**
**Tectonic Plate Boundaries**

**Activity/Lesson 5:**
**PHET simulation about Plate Tectonics (Go to: https://phet.colorado.edu/en/simulation/plate-tectonics). Students will complete a guided activity that shows the features that form along different types of tectonic plate boundaries. The interactions between different types of crust are also demonstrated in the activity.**

**Big Idea 6:**
**Convection**

**Activity/Lesson 6:**
**Student will participate in an activity that demonstrates convection currents.**