



Utah Mining Association



Earth Science Curriculum

Developed by University of Utah Mining Engineering students for the Utah Mining Association

Piloted and refined by Alpine School District teachers

Earth's Crust and Plate Tectonics

Topic: Types of Earth's crust	Estimated Length (minutes): 35 - 50
Standard: Earth Science Core, Standard: 2: Students will understand Earth's internal structure and the dynamic nature of the tectonic plates that form its surface	Objective: 3.d: Model tectonic plate movement and compare the results of plate movement along convergent, divergent, and transform boundaries (e.g. - Mountain building, volcanoes, earthquakes, mid-ocean ridges and oceanic trenches)

Description:

- Students will be able to model movement along plate boundaries
- Students will be able to describe things formed at these boundaries including ore bodies that lead to deposits that are mined by man.
- **Activity: Plate boundary interactions**
 - Teachers may have a variety of activities that demonstrate how plates move past

and into each other. The following activity is offered as a suggestion.

Required Materials/Resources: http://www.youtube.com/watch?v=Wt_jJUnTFhg

- Food items are an excellent choice for how to model boundary collisions. Graham crackers or cookies make excellent test subjects. You will need enough of these for students in each class to have several to run together in a variety of ways.

“Miracle of Copper” (Video) - This video is used at the end of the activity to tie together the idea that ore deposits are one of the geological formations that are created by plate interactions

- <https://www.youtube.com/watch?v=Bgnm5Bfur8E>

Introduction:

- It is assumed that the teacher will have covered the two different types of crust prior to this activity and will have moved on to the different types of boundaries at which plates interact (Subduction zones, Mid ocean ridges, and transform boundaries)
- When the two crusts collide, the Oceanic crust goes under or is subducted under the Continental plate. This is a subduction zone. It is characterized by a trench, and a volcanic island arc or volcanic mountain range. These are having volcanic activity, frequent earthquakes, and are areas where there is a higher probability of mineral/ore deposits.
- At a mid ocean ridge, plates are spreading apart due to magma rising to the surface and hardening thereby wedging the plates apart. This area has a pattern of earthquakes, volcanoes, and other thermal activity.
- At a transform boundary, two tectonic plates are grinding slowly past each other. This causes a variety of earthquakes but produces no volcanic activity. Some thermal activity may be present. They are characterized by a series of faults. The best known example of this would be the San Andreas fault in California.
- Plate interactions cause faults, mountains, and thermal activity
- Mineral deposits are found near mountains, faults, and thermal activities
- Plate tectonics can be used help explain ore body deposition.

Discussion: (Length: 15-20 minutes)

- Discuss plate tectonics (a theory explaining the structure of the earth's crust and many associated phenomena as resulting from the interaction of rigid lithospheric plates that move slowly over the underlying mantle.)
- Explain granitic/continental plates (continental plates are made mostly of granite)
- Explain basalt/oceanic plates (oceanic plates are made mostly of basalt)
- Describe formations that are created when plates collide (because of all the movement of earth material, minerals form here)
- Explain that these areas that are formed are “hot spots” for mineral deposits and

- discuss why that is
- Explain that mineral deposits are the sources for the development of mines

■ **Activity:**

(Length: 10+ minutes)

- This is recommended as a support activity to SAGE interactive questions that students will face at the end of each year.
- As a class or individually have students open up the Phet interactive on tectonics at <<http://phet.colorado.edu/en/simulation/plate-tectonics>>
- Allow students to make changes to the crust to see how it behaves. As a class, sum up the conclusions that they find from this activity.

■ **Activity:**

(Length: 15 minutes)

- Hand each student a piece of foam/Styrofoam and a block of wood that is about the size of a fist.
- Have the students push these two objects together.
- The sponge should bunch up and move upward against the piece of wood.
- Explain that the wood will be underneath the piece of foam/Styrofoam because of the difference in densities.
- Watch the “Convergent Margin” Video (1:15)
 - http://www.youtube.com/watch?v=Wt_jJUnTFhg

Real World Application: (Length: 15 minutes)

Formation of Ore Deposits

- The mineral deposits are created when these plates collide
- Plate tectonics and their movement create natural formations
- Natural formations include mountains, faults, and thermal activity
- The mineral deposits are located near these formations
- The deposits lead to the development of mines
- These minerals that are mined are used in everyday lives
- Watch the video - “Miracle of Copper” (7:57)
 - <https://www.youtube.com/watch?v=Bgnm5Bfur8E>