

**SCED 202 Learning Progressions:
Plate Tectonics Learning Progression – Grade Level 4-8
SCED 202: Matter and Energy in Earth Systems**

Prerequisite skill:

Earth's crust has two distinct types: continental and oceanic. Oceanic crust is more dense than continental crust

Learning Target:

ESS2.B 4th grade. The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges.

Learning Target:

ESS2.A 4th grade. Maps can help locate the different land and water features of Earth

Success Criteria:

I can use a map to **describe simple patterns** of Earth's features.

Formative Assessment:

1. First group whiteboard (basic data patterns)
2. Summary of specialty observations in Table 4-1 (checkpoint 1 with instructor)

Success Criteria:

I can **analyze and interpret data** from maps to describe patterns of Earth's features. (4-ESS2-2)
Specifically:
1. My specialist group can discern patterns in our specialty data to group Earth's plate boundaries into different "types"

Formative Assessment:

1. Your group's key for plate boundary types (checkpoint 2 with instructor)

Learning Target:

Extremes of high and low topographic features form at plate boundaries. Deep linear trenches form on one type of plate boundary (adjacent to mountain ranges) and linear mountain ranges form along another. A third type does not display consistent data.

Success Criteria:

I can **analyze and interpret data** from maps to describe patterns of Earth's features. (4-ESS2-2)
Specifically:
2. My home group can collaborate to mesh our individual specialty "types" of boundaries to devise a master set of "plate boundary types" applied to our plate
3. My home group can compare our "types" of boundaries with "types" from other groups to develop a worldwide plate boundary scheme

Formative Assessment:

2. Step 8 – Group's plate boundary scheme on plate boundary map
- 2b. Step 9 Assessment probe – plate boundary types
- 2c. Step 10 classification scheme tables (checkpoint 3 with instructor)
- 3a. Step 12 Group Discussion and Written charts

Learning Target:

ESS2B.Middle School. Maps of ancient land, based on investigations of rock, make clear how Earth's plates have moved great distances, collided, and spread apart.

Success Criteria:

I can **use patterns** of rock ages on the seafloor to infer directions of plate motion

Formative Assessment:

Compiled class map with arrows of inferred plate motion

Learning Target:

ESS1.C Middle school. Tectonic processes continually generate new ocean sea floor at ridges and destroy old sea floor at trenches

Success Criteria:

1. I can draw and explain a map view and a cross section view of all three plate boundary types
2. I can infer plate boundary types based on geologic features

Formative Assessment:

1. Table 4-3 and associated class discussion
2. Cascadia plate boundary assignment

Learning Target:

ESLI 4.4. Tectonic plates move steadily at rates of up to 10 cm per year

Success Criteria:

I can use satellite data to determine rates of plate motion, and from that determine associated plate boundary types

Formative Assessment:

Plate movement assessment probe

Big Idea:

ESS.2B. Grade 8 to HS. Plate tectonics is the unifying theory that explains movements of rocks at Earth's surface and provides a framework for understanding its geological history. Maps are used to display evidence of plate movement.

Success Criteria:

1. I can draw and explain a map view and a cross section view of all three plate boundary types
2. I can infer plate boundary types based on geologic feature

Later big ideas that build on this big idea include:
ESS2B. High School.

The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection.