Background Information

The Earth’s crust is broken into pieces that are called tectonic plates. Seven major plates exist. Plates move in three ways; they may slide by one another (transform plate boundaries), run into each other (convergent plate boundaries), or move apart from one another (divergent boundaries). Movement of these plates is responsible for landforms and natural events such as earthquakes and volcanoes. Volcanoes and mountains tend to be the result of convergent plate boundaries. Earthquakes are likely to occur at transform plate boundaries. New crust is made where divergent plate boundaries exist. These actions occur on the ocean floor as well as on land. Patterns of results of these actions are recorded on maps.

Source: https://www.nps.gov/subjects/geology/plate-tectonics.htm
Performance Expectation: **ESS2-2 Earth’s Systems**: Analyze and interpret data from maps to describe patterns of Earth’s features. [https://www.nextgenscience.org/pe/4-ess2-2-earths-systems](https://www.nextgenscience.org/pe/4-ess2-2-earths-systems)

**Disciplinary Core Idea**
ESS2.B: Plate Tectonics and Large-Scale System Interactions: The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns.

**Science and Engineering Practices**
- Analyzing and interpreting data: Analyze and interpret data to make sense of phenomena using logical reasoning.
- Constructing explanations for science: Construct an explanation of observed relationships. Identify the evidence that supports particular points in an explanation

**Crosscutting Concepts**
- Patterns: Patterns can be used as evidence to support an explanation.
- Systems and system models: A system can be described in terms of its components and their interactions.

**Materials**
- Colored Pencils
- Map of the United States
- Map of the World
- Landform Cards
- Landform Symbols Power Point (Optional)
- LCD Projector
- Note: No Student Pages

**Advanced Preparation**
There are multiple methods to implement the collection of data for this lesson. Decide what is appropriate for your students. The following are some ideas to consider:
- What size group?
  - Note: Minimum of 2 students per group.
- How and which map(s) will each group use?
  - Note: Review latitude and longitude if appropriate.
- How many and which event and feature cards will each group receive?
  - Note: View the key and cards to help make individual group decisions.
- Which map will groups use first?
  - Note: Moving from “local” to global perspectives of the world needs to consider.
- Will groups plot data for both maps?
  - Note: Looking at patterns of Earth’s features is the goal.
- Will one group plat data for the United States and another group for the world?
  - Note: Looking at patterns of Earth’s features is the goal.
- Will these groups then share data with one another?
  - Note: Looking at patterns of Earth’s features is the goal.
- How many data points will groups plot?
Note: Preselect cards for groups if appropriate.

- Will groups plot one category of data first and then discuss patterns they notice?
  - Note: Categories of data include earthquakes, volcanoes, and mountains.
- Will groups plot all categories of data and then discuss patterns they notice?
  - Note: Categories of data include earthquakes, volcanoes, and mountains.

**Suggested Implementation**

Modify the suggested implementation depending upon the decisions you made prior to this lesson. Distribute the map to groups. Solicit observations about the map. Share with groups that they will now plot some data about the surface of the Earth.

Ask students questions such as:

- What does plot mean?
- What do we need to be able to do this?
- We will be plotting the locations of mountains, volcanoes, and earthquakes.
- How would someone who is looking at your map know which locations were mountains? Volcanoes? Earthquakes?

Share examples of the cards with the group. Ask what is similar and what is different among the cards. Provide a key to the symbols on the cards. (A power point slide and a printable table are available for use.) Distribute event and feature cards as predetermined. Assist groups as needed. If groups are sharing responsibility for plotting data, help groups get together and facilitate the sharing process.

**Debrief**

- What did you notice about the data you plotted?
- Where are many of the earthquakes located?
- Where are many of the mountains located?
- Where are many of the volcanoes located?
**Assessment**
The following single point rubric can be used to assess student understanding. For each of the four criteria listed below, either circle the proficient description or add notes to a box indicating why the student’s performance was either lacking or exceptional.

<table>
<thead>
<tr>
<th>Areas that need improvement. Developing Performance</th>
<th>Criteria for Proficient Performance</th>
<th>Evidence of exceeding standards. Advanced Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Explain relationship between patterns and landforms.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use evidence from maps and data to support claim.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Describe landform patterns.</td>
<td></td>
</tr>
</tbody>
</table>

**Accommodations**
Dexterity may be of concerns. Students may use cm cubes or a similar type of marker to locate the events and landforms.

Some students may wish to explore current data. Earthquake Track from the [https://earthquaketrack.com/](https://earthquaketrack.com/) is one source for the day’s earthquake activity. Many USGS (United States Geological Survey) sites are helpful as well.
### Key to Landform/Event Card Symbols

<table>
<thead>
<tr>
<th>Landform/Event</th>
<th>United States</th>
<th>World</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquakes</td>
<td><img src="image1.png" alt="Earthquakes" /></td>
<td><img src="image2.png" alt="Earthquakes" /></td>
</tr>
<tr>
<td>Mountains</td>
<td><img src="image3.png" alt="Mountains" /></td>
<td><img src="image4.png" alt="Mountains" /></td>
</tr>
<tr>
<td>Volcanoes</td>
<td><img src="image5.png" alt="Volcanoes" /></td>
<td><img src="image6.png" alt="Volcanoes" /></td>
</tr>
</tbody>
</table>