

SECTION 3.1 INTRODUCTION

◀ 1 class period*

3.1 Understand the Question**Think About What Happens at Plate Boundaries****Overview**

Students predict where the plate boundary that surrounds their Earth structure is, using the data provided from their pen-pal letter. They share their predictions with another group and refine them if needed. Groups present their predictions and their explanations for the boundary they drew to the class. Students then update the class's *Project Board* with what they think they know about their plate boundaries. This activity sets the stage for students to realize that they need more data. Throughout this *Learning Set* students update their boundary predictions as they obtain more data.

*A class period is considered to be one 40 to 50 minute class.

Targeted Concepts, Skills, and Nature of Science	Performance Expectations
Scientists often work together and then share their findings. Sharing findings makes new information available and helps scientists refine their ideas and build on others' ideas. When another person's or group's idea is used, credit needs to be given.	Students discuss their ideas about where they think the plate boundaries are that their Earth structure lies within. Students also decide on what they need to investigate and update the class's <i>Project Board</i> .
Scientists must keep clear, accurate, and descriptive records of what they do so they can share their work with others and consider what they did, why they did it, and what they want to do next.	Students should record their predictions for their plate boundaries along with their reasoning, and update their <i>Project Board</i> .
Explanations are claims supported by evidence, accepted ideas, and facts	Students write an explanation for why they chose their plate boundary.

Materials

- 1 per student *Small World Map* BLM
- 1 per student *Create Your Explanation* page
- 1 per class class *Project Board*
- 1 per student *Project Board* page

SECTION 3.1 IMPLEMENTATION

3.1 Understand the Question**Think About What Happens at Plate Boundaries**

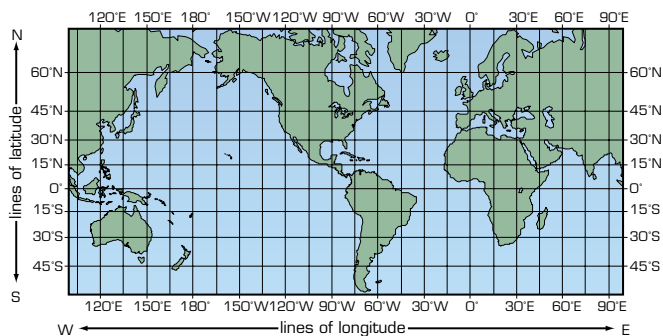
The question for this *Learning Set* is *What happens where plates meet?* To help you answer this question, you will be looking at some data to see where and how often earthquakes occur. It is a good idea to think about what you already know about earthquakes. It is also important to think about what you are unsure about and what you would like to investigate.

Get Started

Using what you know so far, you will make a prediction about where the plate boundaries are located near your earth structure. You will have to think about everything you have learned so far from class presentations, activities, and readings.

Set up a blank world map by labeling the following:

- North, South, East, and West
- All of the oceans and continents
- The equator and prime meridian



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EARTH STRUCTURES AND PROCESSES

◀ 1 class period*

3.1 Understand the Question**Think About What Happens at Plate Boundaries**

5 min.

Inform students that they will be exploring earthquake data to determine plate boundaries.

△ Guide

Let students know that they will begin exploring plate boundaries with the data provided in their pen-pal letters and review what students already know about earthquakes by pointing out earthquake-related items on the class's *Project Board*.

*A class period is considered to be one 40 to 50 minute class.

Get Started

10 min.

Have students make their prediction for the plate boundaries of the region surrounding their Earth structure.

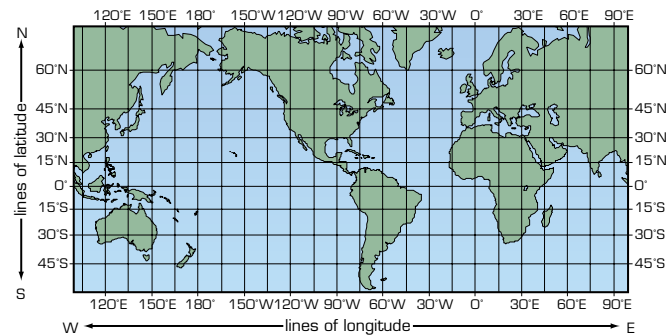
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Get Started

Using what you know so far, you will make a prediction about where the plate boundaries are located near your earth structure. You will have to think about everything you have learned so far from class presentations, activities, and readings.

Set up a blank world map by labeling the following:

- North, South, East, and West
- All of the oceans and continents
- The equator and prime meridian



△ Guide

Let students know that since their Earth structures are located near regions that have changes, and they should plot the location of their Earth structure on a map and predict where the plate boundary is that surrounds their Earth structure and explain why they chose that boundary. Remind students that the plates are continuous boundaries.

◇ Get Going

Then, distribute the *Small World Map* pages and the *Create Your Explanation* pages and let students know how much time they will have.

△ Guide and Assess

Monitor groups as they form their boundary predictions and explanations. Students do not have sufficient information to make a good prediction yet, assure them that this is O.K.



Learning Set 3 • Think About What Happens at Plate Boundaries

Locate the coordinates of your earth structure and label it on the map. The coordinates for your earth structure can be found in the closing of your *Pen Pal Letter*.

Now you can draw a prediction of where the plate boundaries are located. You want to find the plate boundaries for the plate your earth structure is a part of. Remember that plates are one complete piece, similar to a piece of cracked shell on a hard-boiled egg. Unlike a circle, each plate is irregularly shaped. Like a circle, the plate has no beginning or end.

When you have finished drawing your plate boundary prediction, write an explanation for how you decided where to draw the plate boundaries for your Earth structure. Be sure to include all of the supporting evidence you used to make your decisions. You may use a *Create Your Explanation* page to help you develop your explanation.



Communicate

Each member of your team has drawn a plate boundary prediction for your Earth structure. Meet with another team and share each of your plate boundary predictions and the explanations for how the predictions were made. Discuss the evidence that was used to make each prediction. If there are things you are not sure about, you can discuss them with the group as well. Be sure to write these things down so you remember them when it is time to update the *Project Board*.



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Project-Based Inquiry Science

Communicate

10 min.

Have groups share their boundary predictions with another group.

△ Guide

Let students know that they will be working with another group to figure out what they are not sure about. Emphasize that they should list things they aren't sure about so they can remember them for the *Project Board*.

Have two groups pair up, share their predictions, and discuss their evidence. Let students know how much time they have.

Reflect

10 min.

Hold a class discussion on groups' responses.

Reflect

1. Another Earth structure team shared their predictions. Describe one of their predictions and the evidence they used.
2. How confident are you about your plate boundary predictions? Explain why you have your level of confidence.
3. What information might help you be more confident with your prediction?

Update the Project Board

There are things you already know about earthquakes and what happens at plate boundaries. However, you were most likely able to think of some things you are not sure about or do not know. You may have used some of the things you know to help you draw your plate boundary prediction. These ideas can be recorded in the *What do we think we know?* column. You can also add questions that you would like answered can also be added to the *Project Board*. Throughout this *Learning Set*, you will work to answer some of these questions.

What's the Point?

You have evidence that something in the region of your Earth structure is moving and changing. It may have surprised you that the Earth's crust is broken into large, irregularly shaped pieces called plates, but that information certainly helps you understand more about what is moving. Earthquakes commonly occur at plate boundaries. They are the result of two plates bumping into each other or sliding past each other. For this reason, they offer good evidence as to where the plate boundaries are. You will learn more about earthquakes and the patterns of their occurrence in this *Learning Set*. The more questions you answer and information you connect together, the easier it will be to answer the *Big Question* for this Unit, *How can you explain the changes happening around the regions of certain Earth structures?*



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EARTH STRUCTURES AND PROCESSES

Get Going

Let groups know how much time they have to answer the questions.

Guide and Assess

Hold a class discussion of groups' responses, guiding them as needed.

1. Students should describe the plate boundary prediction of the group they met with and the evidence that group used.
2. Student should discuss how confident they are of their plate boundary predictions and why. At this point students should not

be very confident of their predictions because they do not have sufficient data.

- Students should realize that they need more data. Construct a list of students' ideas to use during development of the *Project Board*.

The third question should lead right into the *Project Board* discussion.

Update the *Project Board*

There are things you already know about earthquakes and what happens at plate boundaries. However, you were most likely able to think of some things you are not sure about or do not know. You may have used some of the things you know to help you draw your plate boundary prediction. These ideas can be recorded in the *What do we think we know?* column. You can also add questions that you would like answered can also be added to the *Project Board*. Throughout this *Learning Set*, you will work to answer some of these questions.

Update the *Project Board*

15 min.

Guide a discussion of groups' questions, and update the Project Board.

△ Guide

Begin by asking groups how they can turn the list of ideas created in the third *Reflect* to questions for the class's *Project Board*. Remind them that good questions require several resources to answer, relate to the big question, and require collecting and using data.

Also, ask students if there is anything that needs to be added to the first column of the Project Board.

◇ Evaluate

Before moving on, make sure everyone's questions have been represented. Some examples are provided below.

Examples for column 2: *What do we need to investigate?*

- Is every earthquake on a boundary?
- How many earthquakes have occurred on my Earth structure?
- How often do they happen?
- Do they always happen in the same place?
- Do earthquakes and volcanoes happen at the same time?
- Is there a relationship between earthquake and volcanoes?

Teacher Reflection Questions

- What difficulties did students have coming up with questions about predicting plate boundaries?
- How did you assess students while they were working in their groups developing their predictions?

META NOTES

Students may have similar questions about volcanoes.