Plate Motion (Middle School)

Opportunities for Unit Extensions

Field Trips and Other Resources

If time allows, you may wish to complement the content of this unit by organizing a student experience such as a field trip, a guest speaker, or even a virtual field trip. For the content of the *Plate Motion* unit, we recommend the following:

- After Lesson 2.5, you may want to consider asking a geologist to come in as a guest speaker. At this point in the unit, students will have an understanding of what the outer layer of Earth is, what plates are, and the kinds of landforms and events associated with convergent and divergent plate boundaries. This background knowledge will help your students to interact knowledgeably with the geologist. You might want to spend some time before the visit preparing your students by asking them to brainstorm and organize questions they want to ask the guest speaker when this person comes to visit. Guest speakers should be selected in such a way as to represent diverse demographic groups in terms of sex, gender, culture, ethnicity, race, sexual orientation, and persons with disabilities.
- After Chapter 3, you may choose to visit a local science museum that includes a focus on geology, Earth's history, and/or plate tectonics.
- After the conclusion of the unit, you may want to consider visiting a local park or outdoor area that contains landforms or evidence of movement (earthquakes) associated with plate movement. Taking students out to see these visible markers of plate movement can help them to better understand the content from the *Plate Motion* unit.
- Anytime during this unit you can engage in a virtual field trip to investigate plate motion, past and present, in California. For example, students are often surprised and excited to find that earthquakes occur every day in California, even though many cannot be felt. Visiting the website for the United States Geological Survey (USGS) is one way to find data about current and past earthquake activity, both in California and across the world. There are also websites devoted specifically to tracking and showing earthquake data from California, such as the Southern California Earthquake Center. In addition, there are websites that are devoted to California and United States geology. For example, the website Sanandreasfault.org offers maps and explanations of the geology associated with the San Andreas Fault.

The experiences above could support the disciplinary ideas addressed in this unit, as well as practices such as Asking Questions; Analyzing and Interpreting Data; and Obtaining, Evaluating, and Communicating Information, as well as crosscutting concepts such as Patterns and Stability and Change.

Media and Library Research Extension

Part 1: Information Literacy and Library/Media Research
Information literacy involves students' facility with identifying points at which additional information is needed and subsequently seeking out, assessing, and making use of relevant information to further understanding. Information literacy is particularly beneficial in the domain of science learning as it enables students to extend their understanding of a phenomenon under investigation.

Supporting students with effective use of library and media resources within and beyond your school setting is a key avenue for cultivating information literacy skills. Students' development of information literacy includes the following four components (Note: These are adapted from the Model School Library Standards for California Public Schools):

- Component 1: Accessing information.
- Component 2: Evaluating information.
- Component 3: Using information.
- Component 4: Integrating information literacy skills into all areas of learning.

In the next section, we offer suggestions of instructional strategies and learning activities as part of a research project to support students with these components of information literacy and to enhance students' learning about the central phenomenon they investigate in this unit.

Part 2: Research Project
At the end of the unit, students can work together in various grouping options to conduct a research project. You may choose to offer students the option of working individually, with partners, or in small groups.

Identify what additional information is needed.

- Ask students to consider the sources of information they have used to figure out the central phenomenon in the unit (e.g., texts, diagrams, graphs, data tables).
- Set a question or topic for further research. Share a question or topic relevant to the phenomenon that students have been investigating in this unit. For example:
    - Choose a landform we've studied that is associated with a plate boundary (e.g., a specific trench, volcano, or ridge) and conduct research about it. How and when did it form? What is it like now?
    - Can the same plate have both convergent and divergent boundaries? If so, explain how this could happen.
    - What might the continents on Earth look like in the future?
- You may also want to brainstorm questions with your students or guide them through the process of narrowing down a topic to come up with an appropriate research question.

Access information (Component 1)

- Invite students to share where they think they could find information to answer that question.
- Provide access to these sources (e.g., texts, magazines, newspapers, photos, videos, Internet) in your classroom, at your school library, or at the local public library. You might choose to collaborate with your school librarian on this project so that he/she can support your students in finding the resources most relevant to their research question. You might consider bringing in a relevant guest speaker either from the school faculty or from outside of the school community.

Evaluate information (Component 2)

- Have students evaluate the information from each source by addressing some or all of the following questions as the information is collected:
    - Is this information relevant to our question?
    - Is this a reliable source for information about this topic?
    - Does there seem to be any bias from this source? If so, what?
    - If we look at other sources, will we find similar or conflicting information?
    - Which information that we collected is best for answering our question? Why?
    - What additional information do we need to help answer our question?

Use information (Component 3)

- Provide students with a culminating opportunity to use the information they have gathered to answer their question. You might choose to create your own culminating project or choose from the following suggestions:
    - Have students write a persuasive or explanatory essay about the topic.
    - Have students create posters or a newsletter for the school.
    - Have students create an informational video or performance for the school, their families, or the community.
    - Have students use the information they collect to create a specific project related to the content they are studying.
    - If the topic has policy implications, have students turn their research into a letter to an elected official.

Integrate information literacy skills into all areas of learning (Component 4)

- Invite students to think of questions they have that are related to learning happening across other disciplines (e.g., math, social studies, art) and provide opportunities for them to engage in library and media research in these domains.
- Have students write a research proposal for a topic outside of science. They should include their question, where they will look for information to answer their question, and how they will present their findings.

STEAM Extension

STEAM—science, technology, engineering, art, and mathematics—is an educational approach of integrating art and design into science, technology, engineering, and mathematics (STEM) disciplines. This integration is a natural extension of the ways that art and design overlap with

STEM. Observing, visualizing, communicating, and problem-solving are all areas in which students can authentically engage in both art and STEM. A growing body of evidence shows that for students who are socially and economically disadvantaged, authentic engagement in the arts not only increases motivation and engagement, but also leads to greater academic achievement in STEM subjects. Integrating art and science can provide new opportunities for students who are typically underrepresented in STEM to understand and communicate science concepts, thus helping to address inequities in science and engineering.

Opportunities to engage in art and design happen naturally as students engage in science and engineering practices. Students engage in art as they draw careful observations of natural objects and events, develop models to communicate meaning, and think creatively to design solutions. When these natural connections to art arise in the STEM classroom, students should have the opportunity—supported through instruction—to create work of high artistic quality and to reflect not only on their science learning but also their artistic process. The following extension activity provides an additional opportunity for students to engage in STEAM.

The *Plate Motion* unit provides an opportunity for students to consider the landscape of the world in a new and different way as they begin to see that landforms are always changing and that many of them offer direct evidence of the movement of Earth's plates. Encourage students to find a landform that is directly related to, or is evidence of, plate movement. For example, students may choose to focus on California landforms such as Mount Lassen or Mount Shasta (both of which were formed by subduction along the North American plate), or Death Valley, which was formed during uplift that occurred because of another subduction event. Students can also look across the world for these features or landforms. Students can find photos of their chosen feature or landform and paint or draw it (or, if they live near this feature or landform themselves they can take photographs of it). Along with their artwork, students can learn about the geologic history that created that feature, and you may want to ask them to supply a short description of this history along with the art they created. Students can participate in a gallery walk to learn about the diverse features and landforms that can be found across the world.