

**REMOTE LEARNING LESSON PLANS**

The Remote Learning Lesson Plans are adapted from the IQWST Teacher Edition to support continuous learning. Each plan condenses what is taught with specific teaching recommendations and identifies the digital resources, print resources, and materials needed to teach and learn IQWST remotely.

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| **UNIT TITLE** | **ES3** |
| **DRIVING QUESTION** | How is the Earth Changing? |
| **UNIT STORYLINE** | [ES3 Storyline](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1571332116-es3-3.0-storyline-with-appendix.pdf) |
| **IQWST OVERVIEW** | [IQWST 3.0 Overview](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1534960182-iqwst-3-0-overview.pdf) |
| **TEACHER EDITION**  | [ES3 Teacher Edition (PDF)](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1533046851-san-es3earthv3-te.pdf) |
| **STUDENT EDITION**  | [ES3 Student Edition (PDF)](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1538741612-san-es3earthv3-se-color.pdf) |
| **LESSON PLAN OVERVIEW** | [Remote Learning Overview](http://activatelearning.com/wp-content/uploads/2020/05/remote-lesson-plans-overview.pdf) |

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| **STUDENT MATERIALS:** Each student will need the following materials. Teachers can modify lessons based on which materials the students have access to. For Blended Learning options, teachers may draw from a combination of digital and print resources.  |
| **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS NEEDED** (FOR EACH STUDENT) |
| * Access to Interactive Student Edition
* Access to teacher-led lesson or video
* Access to IQWST lesson videos
* Audio recordings of readings

**Access from any device with a web browser.** * For PCs and Chromebooks, we recommend using **Chrome** as the browser
* For Macs and iOS, we recommend using **Safari** as the browser
* Internet Explorer is NOT supported
* Read the full Technical Requirements [here](https://s3.amazonaws.com/al.general/website/pages/ALDP%2BRequirements.pdf)

**Login:** <http://activatelearning.com/digital-resources/>* Select your program
* Enter the Username and/or Password provided by your teacher
 | * ES3 Student Edition
* Hard copies of selected Projected Images (PIs)

*Print student editions are necessary for students who do not have internet access (or reliable access).*  | **IQWST Equipment (from kit)\***Pad of sticky notes1 Silly Putty® 1 pkg gelatin mix6 Shape cards9 Fossil cardsModeling compound**Household Items**hot watercold water1 graham cracker (to be broken into 2 halves)2 folded towels1 notebook or another thin book (SE)Shell or other small object or toy 1 sheet plain paper**Students may also need the following General Classroom Supplies (if not using the IDE):**Pencils and sharpenerColored pencils Black marker and/or ink penPlain paper for drawing (10-20 sheets)Glue stick or transparent tapePad of sticky notes Scissors*\* If kits have been purchased, they include enough equipment for 8 groups of 4 students. You will need additional equipment if you opt to provide materials to each student.* |

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| **Learning Set 1: How Is the Earth’s Surface Changing?** |
| **Lesson 1** **(3 sessions)** | **Where Is the Earth Changing?** | [Download Lesson 1 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921131-ES3%20Lesson%201.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 1.1*Worldwide Pattern of Volcanoes* | **Anchoring Phenomenon:** Volcanoes and earthquakes largely occur in predictable patterns; observations of those patterns raise questions as to *why*, which leads to study of what is happening beneath our feet. Activity 1.1 focuses on volcanoes; Activity 1.2 focuses on earthquakes--natural phenomena that pique Ss interest and will be connected to the Driving Question. Share Projected Images (PIs) available in the slide decks for each lesson or on the Teacher Portal:* Physical Map of the Earth
* Volcano Locations

Show/Share the video of volcanic eruptions. The video provides access to an engaging phenomenon to pique interest and foster questioning.Discussion Prompts: Throughout the unit, teachers should: 1) choose discussion prompts applicable to remote learning and ability to discuss with Ss, or 2) have Ss write answers to teacher-selected prompts that can be added to the slide deck, if discussion is not possible, or 3) choose questions for Ss to discuss remotely, perhaps writing responses that are then submitted. Questions in the SEs: Throughout the unit, teachers should decide on the method by which the lesson will be delivered, and then have Ss ignore any questions in their SEs that do not fit the way in which the lesson needs to be enacted remotely. Teachers may provide a handout for print-only Ss who cannot access the curriculum remotely, so that they know which questions in their SEs they should respond to. Key: Volcanoes typically occur in locations that follow an observable pattern.  | Access to Student Edition (SE) in Interactive Digital Edition (IDE) [Video: volcanic eruptions](https://pmdvod.nationalgeographic.com/NG_Video/652/991/1667130947966_1578352034468_1667141187581_mp4_video_1024x576_1632000_primary_audio_eng_3.mp4) | Hard copy of the Student Edition (SE) to be used for all activities, readings, writing tasks.In addition, the readings in the SE connect in-class investigations of phenomena with other, everyday phenomena that Ss have either experienced or with which they are familiar.Print color copies of PIs:* Physical Map of the Earth
* Volcano Locations

***Color*** copy of a world map (in black and white in SEs).  |   |
| Activity 1.2*Worldwide Pattern of Earthquakes* | Share PIs* Earthquake Locations
* Physical Map of the Earth and Volcano Locations

Introduce the Driving Question Board (DQB): Throughout the unit, Ss record their own, original questions as they arise. See *IQWST Overview* for more information on how to use and manage the DQB. Share/project, if possible, the unique DQB for this unit and orient Ss often to the larger map vis a vis where they live. Key: Earthquakes typically occur at locations that follow an observable pattern.  | SE Act 1.2Teacher-created DQB (e.g., jamboard, padlet) or physical DQB to share during virtual lessons.Ss will post their own original questions in the “Questions” tab of the IDE | SE Act. 1.2PIs:* Earthquake Locations
* Physical Map of the Earth and Volcano Locations

Ss will write questions on sticky notes, and post at the front of their SEs on the *Driving Question Notes* pages. | Pad of sticky notes |
| Reading One | *Volcanoes and Earthquakes*See TE for Reading Intro and Followup. Key: Scientists use data to predict when volcanoes might erupt or where earthquakes will occur.  | SE Reading One | SE Reading One |  |
| Activity 1.3*Earthquakes, Volcanoes, and World Elevation* | Share PIs* Earthquake and Volcano Locations
* Elevation
* Earthquakes, Volcanoes, and Elevation:
* Earth’s Plates

Show a round dinner plate or an image of one.Key: Earth’s surface is made up of plates of various shapes and sizes. Volcanic and seismic activity are related to those plates.  | SE Act 1.3 | SE Act. 1.3PIs:* Earthquake and Volcano Locations
* Elevation
* Earthquakes, Volcanoes, and Elevation:
* Earth’s Plates
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| **Lesson 2** **(2 sessions)** | **How Did the Earth Look in the Past*?*** | [Download Lesson 2 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921169-ES3%20Lesson%202.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 2.1 *The Theory of Continental Drift: Parts 1A/1B and 2* | Share: [Information Packet](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_te_v2_0_5-phenomena_information_packet-315.pdf)Assign several Ss to each of the 6 information packets. If collaboration is possible remotely, have Ss share in groups before discussing the information in their section as a class. Share PIs: * Physical Map of the Earth
* Pangaea to Present Earth

Key: Wegener’s theory of continental drift: Pangea | SE Activity 2.1 | SE Activity 2.1. Activity includes2 maps, the second which is to be cut apart and affixed to plain paper.[Information Packet](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_te_v2_0_5-phenomena_information_packet-315.pdf)PIs:* Physical Map of the Earth
* Pangaea to Present Earth
 | ScissorsGlue stick or tape1 sheet plain paper |
| Reading One | What Is Continental Drift?Show/Share the plate tectonics video. Key: How the theory of continental drift began and was revised over time.  | SE Reading One[Video: Plate Tectonics](https://youtu.be/RA2-Vc4PIOY) | SE Reading One |  |
| Activity 2.2*The Exploration of the Ocean Floor* | Show/Share the video on seafloor spreading.Share PIs:* Physical Map of the Earth
* Mid-Ocean Ridge
* Ocean Floor Age
* Oceanic Trenches

If possible, do the demo on ocean floor spreading or show the Activity Video. Teachers should mark up the DQB map and have Ss mark up their own Physical maps of the Earth. Key: Details of the ocean floor: its age, variations from one location to another, and the phenomenon that new material can be added to plate edges. | SE Activity 2.2[Activity Video 2.2 Ocean Floor Spreading](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-2.2-demo-of-ocean-floor-spreading.mp4)[Video: seafloor spreading](https://youtu.be/-np488lVaDY) | SE Activity 2.2PIs:•Physical Map of the Earth •Mid-Ocean Ridge•Ocean Floor Age•Oceanic Trenches |  |
| Checkpoint: Ss individual models can be used to assess their developing understanding of how air surrounding us gets heated by the ground’s thermal energy. The class consensus model should reflect the class’ understanding at this point.  |

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| **Lesson 3** **(1 session)** | **What Is the Composition of the Earth’s Surface?** | [Download Lesson 3 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921205-ES3%20Lesson%203.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 3.1*The Theory of Plate Tectonics*  | Review background information and discuss. Show/Share the Setup Video for this activity, and build models to demo. Or, show the Activity Videos and PI: * Earth’s Plates

The SE question, “What are the important features of a model of Earth’s plates?” can be used for discussion, as it summarizes five important features. It could be used before teachers demo or show the video of a model. Given the types of materials needed to build the models, Ss likely cannot do this remotely. Key: The five features of Earth’s plates, and an emphasis on the fact that all models have strengths and limitations.  | SE Activity 3.1[Setup Video: 3.1](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_se_v2_0_5_video-activity_3-270.mp4)[Activity Video 3.1 Plate Tectonics Demo: Paper](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-3.1-paper-tectonic-plate-demo.mp4)[Activity Video 3.1 Plate Tectonics Demo: Saltine Crackers](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-3.1-cracker-tectonic-plate-demo.mp4)[Activity Video 3.1 Plate Tectonics Demo: Penciled](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-3.1-penciled-tectonic-plate-demo.mp4)[Activity Video 3.1 Plate Tectonics Demo: M&Ms](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-3.1-mm-tectonic-plate-demo.mp4)[Activity Video 3.1 Plate Tectonics Demo: Paper + Cracker](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-3.1-paper-and-cracker-tectonic-plate-demo.mp4)[Activity Video 3.1Plate Tectonics Demo: Hard-Boiled Eggs](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-3.1-boiled-egg-tectonic-plate-demo.mp4) | SE Activity 3.1PI: Earth’s Plates |  |

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| **Learning Set 2: What Causes the Features on Earth’s Surface?** |
| **Lesson 4** **(2 sessions)** | **What Makes the Plates Move?** | [Download Lesson 4 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921235-ES3%20Lesson%204.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 4.1*Convection in Liquids*  | Show/Share videos or demo the investigation. Ss must observe the set up videos prior to the activity videos for understanding.Ss who have done other IQWST units (ES2) have studied the phenomenon of convection in weather (in air and water) and now investigate convection as it relates to plate movement.Note: TE has bulleted lists of core ideas Ss should be aware of to this point. Key: Earth’s plates move on hot, convecting mantle that can move and flow.  | SE Activity 4.1[Setup Video: 4.1](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_se_v2_0_5_video-activity_4-271.mp4)[Activity Video 4.1 Liquid Convection: Demonstration 1](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-4.1-aquarium-demo-1.mp4)[Setup Video: 4.1B](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_se_v2_0_5_video-activity_4-272.mp4)[Activity Video 4.1 Liquid Convection Demo 2](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-4.1-aquarium-demo-2.mp4)[Video: convection](https://youtu.be/bN7E6FCuMbY)[Video: convection currents](https://youtu.be/iLo6lOK1yIY) [Video: convection](https://youtu.be/WEDUtS0IMws) | SE Activity 4.1 |  |
| Reading One | *Formation of Metamorphic Rocks*Share video after reading. Key: Plates that make up Earth’s surface move because they ride on the hot, convecting mantle below.  | SE Reading One[Video: metamorphic rock experiment](https://youtu.be/EKFnPVIHAjY) | SE Reading One |  |
| Activity 4.2 (optional) | Silly Putty® Rocks Show the metamorphic rock samples.Show/share the Activity Video and/or have Ss do the investigation remotely, to explore the phenomenon. Key: Rock can be heated and softened (without being melted) so that it flows. | [Activity Video 4.1 Silly Putty Rocks](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-4.2-silly-putty-rocks.mp4) |  | Silly Putty®  |
| Checkpoint: The final Making Sense question in SE Activity 4.2, as a summary of the function and behavior of Earth’s mantle, serves as a way to check Ss understanding of plate tectonics thus far. The last question in the Reading also provides a way to look at Ss understanding of *why* plates move on Earth’s surface.  |

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| **Lesson 5** **(2 sessions)** | **How Do Plates Interact with Each Other?** | [Download Lesson 5 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921267-ES3%20Lesson%205.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 5.1*What Happens When Plates Move?* | Share PI: Earth’s PlatesShare video that demonstrates the phenomenon of ocean floor spreading.Teachers may also choose to share this image from the TE and discuss.If Ss are able to make gelatin (with adult support) and have a graham cracker, they could explore this phenomenon hands-on. Key: When Earth’s plates move alongside each other, earthquakes happen. When plates move toward each other, one plate slides under another, which can form a volcano. | SE Activity 5.1[Activity Video 5.1 Gelatin/Graham Cracker Model of Plate Tectonics](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-5.1-earthquake-model.mp4)[Video: ocean floor spreading](https://youtu.be/3yD7jmHcdVc)  | SE Activity 5.1PI: Earth’s Plates | (1)pkg gelatin mix, hot water, cold water, (1) graham cracker (to be broken into 2 halves) |
| Reading One | *Ring of Fire*Key: Scientists have determined a pattern (related to plates) to volcanic and earthquake phenomena in the Pacific Ocean.  | SE Reading One | SE Reading One |  |
| Activity 5.2*Two Types of Rock Comprise Plates* | Teachers may choose to share these images from the TE or to demonstrate the phenomenon. Ss are likely able to do this remotely with supplies available to them. Show/Share the video demonstrating convergent plate boundary interaction.Diagrams should be discussed, labeled, and displayed on DQB.Key: Plates move in a variety of ways. When plates converge, the thinner, denser ***oceanic*** plate will subduct and melt, and the thicker, less dense ***continental*** plates will fold upwards.Note: Appendix Lesson 1 may be done now or at the end of the unit. If teachers choose not to model this engineering lesson, Reading One: *What Happens in an Earthquake?* may be used now. (See Appendix Lesson 1 in this chart.) The reading could be assigned to all Ss or to some Ss as an extension.  | SE Activity 5.2[Activity Video 5.2 Bath Towels Demo](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-5.2-bath-towels-tectonic-plate-converging-demo.mp4)[Activity Video 5.2 Folder and Bath Towel Tectonic Plate Converging Demo](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-5.2-folder-and-bath-towel-tectonic-plate-converging-demo.mp4)[Video: convergent plates](https://youtu.be/d-8MjqwZ6Og) | SE Activity 5.2Color copy of SE 65  | (2) folded towels, (1) notebook or another thin book (their SE).  |
| Checkpoint: Making Sense question 1 can be used to check Ss understanding of how density affects plate movement and Earth’s features at convergent boundaries (as cause and effect chains). |

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| **Lesson 6** **(2 sessions)** | **What Causes Volcanoes?** | [Download Lesson 6 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1595180134-es3lesson-6.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 6.1*Volcano Formation* | This phenomenon is too dangerous for Ss to model remotely. Teachers should demonstrate, if possible. At the least, show/share the Setup Video for this activity.Key: Volcanoes form when melted rock rises up through Earth’s crust. | SE Activity 6.1[Setup Video 6.1](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_se_v2_0_5_video-activity_6-273.mp4)[Activity Video 6.1 Underwater Volcano Model](https://s3.amazonaws.com/s3-static.iwqst.com/assets/media/iqwstv3/remote-lesson-videos/es3/es3-6.1-volcano-formation.mp4) | SE Activity 6.1 |  |
| Activity 6.2*Hotspot Formation* | Show/Share the video describing hotspot formation.Key: Hotspots form in fixed locations, forming chains of volcanoes.  | SE Activity 6.2[Video: hotspot](https://d16dnhlej6sizh.cloudfront.net/assets/portal/Teacher-Portal-Resources/ES3_se_v2_0_5_video-lesson_6_life_of_hotspot_volcanic_island-284.mp4) | SE Activity 6.2 |  |
| Reading One | *Is a Hotspot Lurking beneath the Continental United States?*Key: Example of a hotspot at Yellowstone National Park.  | SE Reading One | SE Reading One |  |

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| **Learning Set 3: How are Plates Changing?** |
| **Lesson 7** **(1 session)** | **How Are Plates Moving?** | [Download Lesson 7 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921334-ES3%20Lesson%207.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 7.1*How Are Plates Moving?* | Share PIs* Ocean Floor Age
* Direction of Plate Movement

Show/share the video demonstrating plate tectonics. Key: Synthesis: Various types of plate movements cause particular geologic features.  | SE Activity 7.1[Video: plate tectonics](https://youtu.be/3yD7jmHcdVc) | SE Activity 7.1PIs:* Ocean Floor Age
* Direction of Plate Movement
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| **Lesson 8** **(1 session)** | **How Does New Plate Material Form** | [Download Lesson 8 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921369-ES3%20Lesson%208.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 8.1*How Does the Earth Cycle Rock Material?*  | Teaches may choose to share the completed list of Scientific Principles with Ss at this time.Key: Rock material is not created or destroyed; it is recycled as a result of moving plates (conservation of matter).  | SE Activity 8.1 | SE Activity 8.1 |  |
| Reading One | *Recycling for Earth and Cycling within Earth*Key: Elaborates cycles of Earth’s matter: water and rock.  | SE Reading One | SE Reading One |  |
| Checkpoint: Activity 8.1 is an explanation of the origin of plate material and can serve as an assessment of key ideas to this point.  |

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| **Learning Set 4: How Does Plate Tectonics Explain Earth’s Features?** |
| **Lesson 9** **(2-3 sessions)** | **What Do We Know about Plate Tectonics?** | [Download Lesson 9 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1589921421-ES3%20Lesson%209.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 9.1*Creating a List of Important Ideas and Annotating a Cross Section of Earth* | Teachers may choose to share the list of concepts or to brainstorm them with Ss. (See the Teacher Background Information in the TE.) Share the diagram from TE 210 as Ss also look at SE 86 (or have the color copy available to them). \*The PI: Convection and Direction of Plate movement may be used in this lesson to support visualization of the three types of movement. (Also TE 219)Key: Annotating a cross section of Earth by applying the process and terms studied to a visual representation.  | SE Activity 9.1 | SE Activity 9.1Color copy of SE 86 (from TE 210)PI: Convection and Direction of Plate movement  |  |
| Reading One | *How Well Do Scientists Understand Plate Tectonics?*Key: Reviews key ideas and scientists’ still-unanswered questions.  | SE Reading One | SE Reading One |  |
| Activity 9.2*Filling Out the Summary Chart* | Teachers may choose to share the list of concepts or to brainstorm them with Ss. (See the Teacher Background Information in the TE.) Share the diagram from TE 226 as Ss also look at SE 90 (or have the color copy available to them).Key: Summarizes in chart form key concepts and processes related to geologic features of a changing Earth. | SE Activity 9.2 | SE Activity 9.2Color copy of SE 90 (from TE 226) |  |
| Reading Two | *How Does Plate Tectonics Affect Me?*Key: Provides real-world application of concepts learned, and addresses the predictability of natural hazards.  | SE Reading Two | SE Reading Two |  |
| Activity 9.3 | Building Physical Models *(Optional Activity*)Ss will not likely have access to the materials needed for this model-building activity. Therefore, for remote learning, teachers may choose to skip this. \*However, share the PI: Convection and Direction of Plate movement associated with this activity. Key: Physical modeling opportunity and discussion of models/modeling as a scientific practice.  | SE Activity 9.3 | SE Activity 9.3 |  |
| Checkpoint: The Making Sense question at the end of SE Activity 10.3 is to “Answer the Driving Question for the unit: *How is the Earth changing?*” Whether or not Lesson 10 is done, and whether or not Activity 9.3 is done, at the end of Lesson 9, Ss have all of the information they need to answer the Driving Question. Teachers may choose to have Ss answer the Driving Question at the end of Lesson 9 or at the end of Lesson 10.  |

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| **Lesson 10** **(1 session)** | **What Is Happening at the Case Study Sites?** | [Download Lesson 10 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1595180146-es3lesson-10.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 10.1  | Exploration of Case Study SitesFor remote learning, where time is apt to be compressed, and groupwork and presentation possibilities may be limited, teachers may choose to skip the case study explorations. In them, Ss apply what they have learned to a specific site. This could be assigned as an extension activity for some Ss.If the lesson is done remotely, Ts will need two PIs:* Direction of Plate Movement
* Case study Site Summary Table

Ss will need to reference all previous activities in their SEs. Key: Application and extension opportunity.  | SE Activity 10.1 | SE Activity 10.1 |  |
| Reading One | *How Are Case Studies Useful?*Key: Case studies as a method of scientific inquiry.  | SE Reading One | SE Reading One |  |
| Activity 10.2  | Scientific Explanation of One SiteKey: Project work--case/site analysis.  | SE Activity 10.2 | SE Activity 10.2 |  |
| Activity 10.3 | Project PresentationsKey: Presentations | SE Activity 10.3 | SE Activity 10.3 |  |

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| **Appendix** |
| **Appendix 1** **(1 session)** |  **Modeling Earthquake- Proof Structures** | [Download Appendix 1 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1595180204-es3appendix-lesson-1.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 1.1 | Modeling Earthquake-Proof StructuresTeachers may choose to demo this activity, so Ss see more directly the phenomenon of earthquakes and their consequences. Given the materials needed, Ss will not be able to carry out this engineering investigation outside of class. Key: Real-world engineering application. (Scientists and engineers use scientific knowledge to keep people and structures safe.)  | SE Activity 1.1 | SE Activity 1.1 |  |
| Reading One | *What Happens in an Earthquake?*Key: Reinforces concepts, focuses on one earthquake example, and discusses engineers’ role in mitigating the effects of earthquakes.  |  |  |  |

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| **Appendix 2** **(1 session)** | **Geologic Time** | [Download Appendix 2 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1595180236-es3appendix-lesson-2.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 2.1 | Rock Layers Determine Relative AgeUsing PIs and discussion prompts, support Ss in analyzing rock layers and applying information to rock layer diagrams.* Grand Canyon
* Faulted Rock
* Folded Rock
* Intrusion by Magma
* 4 Rock-Layer Diagrams
* Rock Layers Diagram

Key: Relative age (older/younger) is determined by using observations of patterns to determine which event happened before/after another event. | SE Activity 2.1 | SE Activity 2.1Copies of PIs: •Grand Canyon•Faulted Rock•Folded Rock•Intrusion by Magma•4 Rock-Layer Diagrams•Rock Layers Diagram | Colored pencils |
| Activity 2.2 | Role of Fossils in Deciphering Earth’s HistoryUsing PIs and discussion prompts, support Ss in analyzing fossils and determining the order of organisms. If Ss have the card decks, they can do this activity remotely.* Types of Fossils
* Geologic History
* Fossil Card Order
* Lesson 2 Assessment

Key: How the geologic time scale was developed using physical evidence.  | SE Activity 2.2 | SE Activity 2.2Copies of PIs:•Types of Fossils•Geologic History•Fossil Card Order•Lesson 2 Assessment | (6)Shape cards(9)Fossil cards |
| Reading One | *Reconstructing Earth’s History*Key: Supports understanding how it is that scientists developed the geologic time scale.  | SE Reading One | SE Reading One |  |

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| **Appendix 3** **(1 session)** | **Fossil Record** | [Download Appendix 3 Teaching Slides](https://d16dnhlej6sizh.cloudfront.net/assets/portal/1595180264-es3appendix-lesson-3.pptx) |
| **ACTIVITY** | **TEACHING RECOMMENDATIONS** | **DIGITAL RESOURCES** | **PRINT RESOURCES** | **MATERIALS****FOR EACH STUDENT** |
| Activity 3.1 | Evidence from FossilsThis fossil-making activity provides Ss with an opportunity to observe an object both in hand and as an imprint. For remote learning, Ss could use any household object and a piece of clay (gypsum, as would be used in class, is not recommended for remote use). If Ss are unable to do this activity remotely with modeling compound, it may be skipped.Instead, use PIs only:* Dinosaur Skeleton
* Artist Rendering of Dinosaur
* Types of Fossils

Key: Scientists attend to *specific* features of organisms in fossils.  |  | SE Activity 3.1 | Modeling compound.Shell or other small object or toy |
| Reading One | *Fossils Finds*Conditions needed for fossils to form and how fossils are excavated.Key: How fossils are used to reconstruct past events.  | SE Reading One | SE Reading One |  |
| Activity 3.2 | Dating FossilsTeachers may choose to share PIs, and provide a brief explanation of scientists’ processes, but for remote learning, this activity may be skipped. It iis complex and unlikely to result in deep learning without in-class interaction. * PI: Rock outcropping
* PI: Block diagram

Key: How fossils are dated.  |  | SE Activity 3.2 |  |
| Activity 3.3 | Geologic Time ScaleThese activities require analyzing and discussing charts/diagrams, which Ss are able to do remotely. The timeline can be constructed on paper.Show PIs:* Traditional Geologic Time Scale
* Circular Geologic Time Scale

Key: By the end of Lesson 3, the fossil record documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.  |  | SE Activity 3.3Color copies of PIs: •Traditional Geologic Time Scale•Circular Geologic Time Scale  | White paper,pencil, colored pencils  |

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| **SUMMATIVE ASSESSMENT:** Ss should be able to write a scientific explanation for the Driving Question: How is Earth changing? Teachers may choose to use the CER written at the end of Lesson 8 and the Summary Chart from Lesson 9 to assess learning. If the Driving Question is addressed (or revisited) following Appendix lessons 2 and 3, Ss can add information about layers of rock and fossil evidence for a changing Earth.  |

***Teachers might choose to emphasize only a portion of this as a final assessment, given what that are able to teach and what Ss are actually able to do during this remotely taught unit.***