MarchUnit 4A: Plate Tectonics

Content Area: **Science**
Course(s):
Time Period: **March**
Length: **2 Weeks**
Status: **Published**

Unit Overview

Earth's crust consists of a number of plates, immense slabs of rock that are always in motion—crashing together, pulling apart, and grinding past each other. In this concept, you will learn how these very slow movements build and rebuild (the "tectonic" part) the face of the Earth.

Enduring Understandings

Lesson Objectives

By the end of the lesson, students should be able to:

- Describe tectonic plates and explain how they move.
- Explain how the movement of tectonic plates causes natural processes.
- Explain how the three primary types of plate boundaries cause a variety of landforms.
- Explain how the rock cycle and plate tectonics are related.

Essential Questions

- **Overarching Question**
    - How and why is Earth constantly changing?
- **Focus Question**
    - Why do the continents move, and what causes earthquakes and volcanoes?
- **Lesson Questions**
    - What are tectonic plates, and how do they move?
    - How do tectonic plate movements cause various natural processes?
    - How do the three primary types of plate boundaries produce different landforms?
    - How are the rock cycle and plate tectonics related?
- **Can You Explain?**
    - How are tectonic plates related to changes that occur on Earth's surface?

Instructional Strategies & Learning Activities

- The Five E Instructional Model

  Science Techbook follows the 5E instructional model. As you plan your lesson, the provided Model Lesson includes strategies for each of the 5Es.

- Engage (45–90 minutes)

  Students are presented with the phenomenon of volcanic eruptions. Students begin to formulate ideas around the Can You Explain? (CYE) question.

- Explore (135 minutes)

  Students investigate questions about how the natural systems that make up Earth's surface change and affect other parts of Earth's systems. Students complete a Hands-On Activity and create models of plate movement.

- Explain (45–90 minutes)

  Students construct scientific explanations to the CYE question by including evidence of how plate tectonics affect other parts of Earth's systems through models of plate movement.

- Elaborate with STEM (45–135 minutes)

  Students apply their understanding of plate tectonics as they learn about climate change, investigate soil near volcanoes, design a plate tectonic game, and research how scientists determine earthquake risk.

- Evaluate (45–90 minutes)

  Students are evaluated on the state science standards, as well as Standards in ELA/Literacy and Standards in Math standards, using Board Builder and the provided concept summative assessments.

Integration Career Exploration, Life Literacies and Key Skills

Students will learn how scientists determine earthquake risk.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
	Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.
TECH.9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific

	purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
TECH.9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
CRP.K-12.CRP11	Use technology to enhance productivity.
	Multiple solutions often exist to solve a problem.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CAEP.9.2.8.B.4	Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
TECH.9.4.8.IML.1	Critically curate multiple resources to assess the credibility of sources when searching for information.
TECH.9.4.8.CT	Critical Thinking and Problem-solving
TECH.9.4.8.TL.2	Gather data and digitally represent information to communicate a real-world problem (e.g., MS-ESS3-4, 6.1.8.EconET.1, 6.1.8.CivicsPR.4).
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
TECH.9.4.8.TL.3	Select appropriate tools to organize and present information digitally.
TECH.9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
CAEP.9.2.8.B.1	Research careers within the 16 Career Clusters ® and determine attributes of career success.
TECH.9.4.8.IML.3	Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b).
	Increases in the quantity of information available through electronic means have heightened the need to check sources for possible distortion, exaggeration, or misrepresentation.

Technolgy and Design Integration

Technology is fully integrated with the Discovery Techbook

Interdisciplinary Connections

LA.RI.6.10	By the end of the year read and comprehend literary nonfiction at grade level text-complexity or above, with scaffolding as needed.
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.W.6.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.W.6.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
LA.RI.6.1	Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LA.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
LA.RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

Differentiation

Struggling Students

1. Students may struggle with the components of a scientific explanation when describing plate tectonics. Remind them that the “claim” is simply the straight answer to the question. The

ELL

1. Make sure students have a complete understanding of the Lesson Questions. Make sure students understand terms, including *naturalprocesses,*

Accelerated Students

1. Challenge students to begin developing an answer to

explanation includes the claim along with information about how they know (or how scientists know) and why they think the claim is true.	*primary types,* and *boundaries,* in this context. 2. If appropriate, provide sentence frames to help students write their claims and explanations. For example: *Tectonic plates are thick layers of ____ that ____ over Earth's surface. Movement of plates creates landforms such as ____ and _____. ______ also happen when plates move.*	all five lesson questions with a single, labeled sketch. 2. Challenge students to make one labeled drawing that answers the Lesson Question: *How are the rock cycle and plate tectonics related?*

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

IEP and 504 Accommodations will be utilized.

IEP and 504 plans will be utilized.

Benchmarks

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

The students will complete two summative benchmark tests administered by the teacher via Google Forms and Google Classroom. There is one benchmark test administered in the middle of the year around January, and a second one administered in May.

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and

Franklin, 2010, p. 151).

Formative Assessments used in this unit:

Formative assessments as listed in unit.

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

Summative assessments as listed in unit.

Instructional Materials

Materials as required by Discivery Techbook labs.

Standards

	Paleomagnetic anomalies in oceanic and continental crust are not assessed.
SCI.MS-ESS2-2	Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
	Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).
	Patterns
	Patterns in rates of change and other numerical relationships can provide information about natural systems.
	Emphasis is on how processes change Earth’s surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually

	but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.
SCI.MS-ESS2-3	Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
SCI.MS.ESS2.B	Plate Tectonics and Large-Scale System Interactions
	Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth’s plates have moved great distances, collided, and spread apart.
SCI.MS-ESS2	Earth's Systems