# Unit 02: Marine Geology

Content Area: **Science**
Course(s):
Time Period: **Marking Period 1**
Length: **3 weeks**
Status: **Published**

## Brief Summary of Unit

Students will study and learn about seafloor topography and deep-sea features. They will learn how the seafloor is formed and how it is ever-changing. They will also explore the ecology of the deep sea and the unique creatures down in the depths.

June 2024

## Essential Questions

Essential Questions:

How do geologic processes within plate tectonics create the formation of seafloor features?

How has the seafloor changed through geologic time?

How are deep-sea hydrothermal vents, a unique dynamic ecosystem, like no other ecosystem on earth?

Enduring Understandings:

Geologic processes determine the features of the sea floor and its changes over time

Deep sea habitats are unique ecosystems that require specific biological adaptation for life to survive there.

## Students Will Know / Students Will Be Skilled At

Students will be skilled at concepts of marine geology by defining and demonstrating an understanding of the following key terms: plate tectonics, seafloor spreading, abyssal plain, guyot, seamount, continental shelf/slope/rise, deep sea trench, sea mount, subduction, cartography, sonar.

Students will be skilled at identifying/comparing the three types of plate boundaries and their tectonic activities.

Students will be skilled at describing the conditions that exist down in the ocean depths.

Students will know where each tectonic plate boundary exists around the world.

Students will know the different ways in which plate tectonics interact with one another.

## Learning Plan

Meaningful participation in guided question/answer sessions, individual/group discussions, demonstrating an understanding of the purpose of the unit lesson(s), key terms, and concepts.

Preview the essential questions, provide answers, and connect to learning throughout the unit.

Discuss the view the work of marine cartographers and how the advent of sonar technology advanced sea floor mapping.

Marine Geology - Activity worksheet identification of different seafloor structures

Labeling an ocean profile.

Google Slides Presentation:  Tectonic plate boundaries

Data Investigation Activity: Rates of Seafloor Spreading

Google Slides Presentation:  Science World - Monsters of the Deep.

Video:  Volcanoes of the Deep w/ accompanying worksheet

## Evidence/Performance Tasks

**Formative Assessments:**

Worksheets

Do Nows

Exit Tickets

Class Discussions

Complete daily classwork and regular homework assignments related to the identification of concepts learned in the natural setting, vocabulary, problem-solving, and critical thinking.

Review Google Slides about plate tectonic processes and how it changes the shape of the earth's landscape, coastlines, and the seafloor.

Formative assessment on hydrothermal vents, how marine communities grow and change very rapidly.

Quiz on calculating the rate the Atlantic Ocean floor is diverging.

**Summative:**

Unit test/ Quiz topics: plate tectonic processes and edge interactions, convection, sea floor spreading

**Bench Marks:**

*Midterm / Final Exam*

**Alternative:**

Research project illustrating (choice of visually or digitally) the ocean floor in a particular marine ecosystem of choice

## Materials

Textbook, *Essentials of Oceanography (13th Ed.), Trujillo and Thurman and ancillary materials*

Earth Science, Merrill, and ancillary resource materials

Earth Science, Prentice-Hall, and ancillary resource materials

quantitative/qualitative lab equipment for activities, experiments

related oceanography maps, ocean current charts

Informational & interactive Website: noaa.gov

## Standards

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| L.SS.11–12.1 | Demonstrate command of the system and structure of the English language when writing or speaking. |
| F.BF.A | Build a function that models a relationship between two quantities |
| S.ID.A | Summarize, represent, and interpret data on a single count or measurement variable |
| 9.4.12.CI.1 | Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a). |
| 9.4.12.CI.2 | Identify career pathways that highlight personal talents, skills, and abilities (e.g., 1.4.12prof.CR2b, 2.2.12.LF.8). |
| L.KL.11–12.2 | Apply knowledge of language to understand how language functions in different contexts, |

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| | to make effective choices for meaning or style, and to comprehend more fully when reading or listening. |
| 9.4.12.CI.3 | Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1). |
| S.ID.B | Summarize, represent, and interpret data on two categorical and quantitative variables |
| 9.4.12.CT.1 | Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3). |
| L.VL.11–12.3 | Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 11–12 reading and content, including technical meanings, choosing flexibly from a range of strategies. |
| 9.4.12.CT.2 | Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a). |
| S.ID.C | Interpret linear models |
| RL.CR.11–12.1 | Accurately cite strong and thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what a literary text says explicitly and inferentially, as well as interpretations of the text; this may include determining where the text leaves matters uncertain. |
| S.IC.B | Make inferences and justify conclusions from sample surveys, experiments, and observational studies |
| RI.CR.11–12.1 | Accurately cite a range of thorough textual evidence and make relevant connections to strongly support a comprehensive analysis of multiple aspects of what an informational text says explicitly and inferentially, as well as interpretations of the text. |
| 9.4.12.GCA.1 | Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political. economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3). |
| W.AW.11–12.1 | Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. |
| W.IW.11–12.2 | Write informative/explanatory texts (including the narration of historical events, scientific procedures/experiments, or technical processes) to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. |
| F.LE.A | Construct and compare linear and exponential models and solve problems |
| 9.4.12.TL.3 | Analyze the effectiveness of the process and quality of collaborative environments. |
| 9.4.12.TL.4 | Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem (e.g., 7.1.AL.IPERS.6). |
| HS-PS1-5 | Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. |
| F.LE.B | Interpret expressions for functions in terms of the situation they model |
| SL.PE.11–12.1 | Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively. |
| SL.PI.11–12.4 | Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. |
| SL.UM.11–12.5 | Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. |

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| HS-LS1-3 | Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. |
| HS-LS2-3 | Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. |
| HS-LS2-5 | Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. |
| HS-LS2-6 | Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. |
| HS-LS2-7 | Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. |
| HS-LS3-2 | Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. |
| HS-LS4-1 | Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. |
| HS-LS4-3 | Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. |
| HS-LS4-4 | Construct an explanation based on evidence for how natural selection leads to adaptation of populations. |
| HS-ESS1-6 | Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. |
| HS-ESS2-1 | Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. |
| HS-ESS2-2 | Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. |
| HS-ESS2-5 | Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. |
| HS-ESS2-7 | Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. |
| HS-ESS3-1 | Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity. |
| HS-ESS3-4 | Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems. |
| HS-ESS3-5 | Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. |
| HS-ESS3-6 | Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change). |
| HS-ETS1-1 | Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. |
| HS-ETS1-2 | Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. |

## Suggested Strategies for Modification

https://docs.google.com/spreadsheets/d/1BoXlgGboaurkHWyNqQpnIzl77z6Lb7Dg_ExD7n7FQJw/edit?usp=s

haring

Additional modifications may be made based on individual needs of students as stated in student IEP (Individualized Education Program) documentation and as observed by the teacher:

Student directed research/presentation (power point, skit, demonstration) - Recent Scientific Contributions.

Design your own lab experiment

modified tests

cooperative learning groups

one-to-one instruction and assistance

additional time on task

alternative outcome options

individualized student assessment

preferential seating

handouts of class materials

guided notes

visual aides

computer web search