

BPS Science Department Earth Science - Unit 1- Introduction to Earth and Space

Unit 1- In this unit, students will analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth's systems. They will describe how variations in the flow of energy into and out of Earth's systems result in changes. Students will construct arguments based on evidence about the simultaneous coevolution of the Earth's systems and life on Earth. Students will also use computational representation to illustrate relationships among Earth's systems and how those relationships are being modified due to human activity.

Driving Questions:

- How do scientists use a systems approach to construct an understanding of Earth and space?
- How do scientists use patterns and models to explain processes and make predictions about Earth systems?
- How do scientists study the interactions and flow of matter and energy within and between Earth's spheres?

NYSSLS Standards:

Lesson 1.1: In this lesson, students will study various ways Earth can be viewed as a collection of components (**DCI ESS2.A Earth Materials and Systems**) and studied in terms of how these components interact on various size and timescales (**CCC Scale, Proportion, and Quantity**). The use of system models (**SEP Developing and Using Models, CCC Systems and System Models**) will illustrate how evidence can be analyzed and used (**SEP Analyzing and Interpreting Data**) to understand and predict changes (**SEP Engaging in Argument from Evidence, CCC Stability and Change, CCC Patterns**) for a number of important natural phenomena, including those that affect life on Earth (**DCI ESS2.A Earth Materials and Systems, DCI ESS2.E Biogeology**).

- **HS-ESS2-2: Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth's systems.**
 - **ESS2.A: Earth Materials and Systems**
 - Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes (HS-ESS2-2)
- **HS-ESS2-4: Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.**
 - **ESS2.A: Earth Materials and Systems**
 - The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long-term tectonic cycles. (HS-ESS2-4)
- **HS-ESS2-7: Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.**
 - **ESS2.D Weather and Climate**
 - Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6), (HS-ESS2-7)
 - **ESS2.E Biogeology**
 - The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7)

Lesson 1.2: In this lesson, students will explore how modeling Earth as a collection of subsystems (**DCI ESS2.A Earth Materials and Systems, CCC Systems and System Models**) can provide understanding of complex phenomena (**SEP Analyzing and Interpreting Data**) involving interactions between those subsystems that can impact weather, climate, and other aspects of the environment (**DCI ESS2.D Weather and Climate, DCI ESS3.D Global Climate Change, CCC Stability and Change**) in which we live. Students will learn to present this information using a variety of graphical data representations, including maps (**SEP Using Mathematical and Computational Thinking**).

- **HS-ESS2-7: Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.**
 - **ESS2.E Biogeology**
 - The many dynamic and delicate feedbacks between the biosphere and other Earth systems cause a continual co-evolution of Earth's surface and the life that exists on it. (HS-ESS2-7)
- **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.**
 - **ESS3.D Global Climate Change**
 - Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS-ESS3-6)

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Science & Engineering Practices ([link to SEP break-down](#)):



- Developing and Using Models
- Analyzing and Interpreting Data
- Engaging in Argument from Evidence
- Using Mathematical and Computational Thinking

Crosscutting Concepts ([link to guiding questions for CCC](#)):






- Scale, Proportion, and Quantity
- Systems and System Models
- Stability and Change
- Patterns

Opportunities for Student Collaboration p. 3H (Complete Collaboration Strategy Guide):

- Discussion pp. 7, 33 • Four Corners p. 31 • Group Activity p. 16 • Self-Assessment p. 4 • Think, Pair, Share pp. 24, 27 • Which is False? p. 30 • Whip Around p. 8 •

Time Frame	Lesson Framework	Instructional Sequence	Resources- HMH Dimensions- Earth & Space Science Textbook	Resources- HMH Dimensions Digital Component	Additional Resources
9/12/22-9/27/22	Unit 1: Earth & Space		<ul style="list-style-type: none"> • Unit Opener (Pre-Assessment): Predict- How do you think the data used to create this relief map were collected? (pp. 2-3) 	<p>*Unit Project: Map Your School- Students construct different types of maps or other models of the same physical space, such as the school grounds or a classroom. Students brainstorm different ways to map the same space. For example: map of streets or passages/hallways; map of surface materials (concrete, asphalt, grass, carpet, tile, map of room or building types (e.g., classroom, office, closet); map of air temperature. Each student chooses a scale that is appropriate for the map. Students analyze theirs and others' maps to identify the systems that are modeled and interactions between various systems. This can potentially all be delivered as a poster—an assemblage of maps with short descriptions and callouts. Map could also be layered .</p>	
	<p>Lesson 1.1- Studying Earth</p> <p>In this lesson you will analyze interactions among Earth's systems to explain the phenomenon of coral bleaching.</p> <p>Vocabulary: phenomenon system model</p>	<p>Engage</p>	<ul style="list-style-type: none"> • Phenomenon: Can You Explain It? What do you think would cause corals to expel their algae companions? (p. 4) 		<p>ESRT:</p> <ul style="list-style-type: none"> • Planetary Wind and Moisture Belts in the Troposphere (p. 14) • Surface Ocean Currents (p. 4)
		<p>Explore/ Explain</p>	<ul style="list-style-type: none"> • Exploration 1- Exploring Patterns and Systems on Earth (pp. 5-11) <ul style="list-style-type: none"> ○ Explore and Engineered System • Exploration 2- Evidence of Changes in Systems (pp. 12-15) 	<ul style="list-style-type: none"> • Lesson 1- Studying Earth PPT (editable) • Exploration 1:  Hands-On Lab- Observing the Sky- In this lab, students will design, test, and revise a method for observing an aspect of the sky, such as weather or astronomical objects. • Exploration 2:  Hands-On Lab- What's Before Your Eyes?- In this lab, students will make and record observations about multiple samples of salt solution. 	
	<p>Elaborate</p>	<ul style="list-style-type: none"> • Continue Your Exploration- Careers in Science: Oceanographer (p.16) 	<ul style="list-style-type: none"> • Continue Your Exploration: <ul style="list-style-type: none"> ○ Using the Present to Understand the Past ○ Classifying Events in Earth Systems 		

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	Evaluate	<ul style="list-style-type: none"> ● Lesson Self Check (pp. 16-17)- Can You Explain It- Revisit ● Make Your Own Study Guide(p.19) ● Checkpoint Questions (pp 18-19) 	<ul style="list-style-type: none"> ● Can You Explain It? Revisit ● Checkpoint Questions ● Make Your Own Study Guide ● Unit 1 Lesson 1 Quiz (editable) 	
<p><u>Lesson 1.2-Earth's Systems</u></p> <p>In this lesson you will explore Earth's spheres, visualize data on the ozone and physical surfaces of the Earth to infer relationships between the data.</p> <p><u>Vocabulary:</u> geosphere atmosphere hydrosphere biosphere cryosphere anthroposphere ozone topography biodiversity</p>	Engage	<ul style="list-style-type: none"> ● Phenomenon: Can You Explain It? How are data about ozone in the atmosphere presented and analyzed? (p. 20) 		<p>ESRT:</p> <ul style="list-style-type: none"> ● Average Chemical Composition of Earth's Crust, Hydrosphere, and Troposphere (p. 1) <p>Isoline Practice</p> <p>Hawaii Profiles</p> <p>Slope and Gradient Worksheet</p>
	Explore/ Explain	<ul style="list-style-type: none"> ● Exploration 1- Modeling Earth's Systems (pp. 20-24) ● Exploration 2- Visualizing Data (pp. 25-27) ● Exploration 3- Viewing Earth from Above (pp. 28-31) 	<ul style="list-style-type: none"> ● Lesson 2- Earth's Systems PPT (editable) ● Exploration 1:  Hands-On Lab- GPS and Earth's Circumference-In this lab, students will use angles obtained from GPS measurements to estimate Earth's size. ● Exploration 2:  Hands-On Lab- Map Projections- In this lab, students will make and compare shapes from multiple map projections. ● Exploration 3:  Hands-On Lab- Contour Maps: Island Construction- In this lab, students will build a scale model and identify contour intervals and landscape features based on a map. ● Exploration 3:  Hands-On Lab- Remote Sensing- In this lab, students will model a landscape with distinct features, determine elevation of surface features of the model using a probe and map the topography of a model landscape. 	
	Elaborate	<ul style="list-style-type: none"> ● Continue Your Exploration- Guided Research: Map Projections (p. 32) 	<ul style="list-style-type: none"> ● Continue Your Exploration: <ul style="list-style-type: none"> ○ Human Effects on Earth's Systems ○ Cross-Sections and Block Diagrams 	
	Evaluate	<ul style="list-style-type: none"> ● Lesson Self Check (p. 33)- Can You Explain It- Revisit ● Make Your Own Study Guide (p. 35) ● Checkpoint Questions (pp. 34-35) 	<ul style="list-style-type: none"> ● Can You Explain It? Revisit ● Checkpoint Questions ● Make Your Own Study Guide ● Unit 1- Lesson 2 Quiz 	
<u>Thing Explainer</u>		<ul style="list-style-type: none"> ● Shared Space House (pp. 36-39) 	<ul style="list-style-type: none"> ● Shared Space House- Video 	
<u>Enrichment: Unit Connection Activities</u> (Optional)		<ul style="list-style-type: none"> ● *Engineering- Building Designs ● *Social Studies- Regional Maps ● Art Connection- Landscape Paintings 		
<u>Unit Close</u>		<ul style="list-style-type: none"> ● Synthesize the Unit (p. 41) ● Driving Questions- Revisit ● Practice and Review Questions (pp.41-42) ● Unit Project (p. 42) ● Unit Performance Task- (p.43) 	<ul style="list-style-type: none"> ● Assessment Guide: <ul style="list-style-type: none"> ○ Unit Test A- provides an in-depth assessment of the Performance Expectations aligned to the unit. ○ Unit Test B can be used to assess students who need extra support 	 Castle Learning HMH Earth & Space Science Unit 1- Introduction to Earth and Space

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(Editable item bank available under Public Assignments in Castle Learning)

<p>Resources</p> <p>http://ngss.nsta.org/Classroom-Resources.aspx - Searchable NYSSLS/NGSS aligned resources curated by NSTA</p> <p>BPS Earth Science Website– BPS Earth Science curriculum resource hub</p> <p>BPS Science Department Recommended Virtual Labs – Virtual lab resources with embedded links to virtual labs and student sheets. Must be logged into BPS google account through BPS Gmail account to access.</p> <p>BPS Science Department CER Student Writing Template (BPS Science Department CER Practice with a Graph)</p> <p>NYSED’s Office of State Assessment webpage - Access to Released Regents Earth Science Examinations</p> <p>Science Learning Standards (HS) – NYSSLS High School Standards for Earth Science</p> <p>NYSED Bilingual Glossaries – NYS Statewide Language Regional Bilingual Education Resource for NYSED approved bilingual glossaries.</p>					
<p>English Language Learners (ELL) Enhancements</p> <p>To access hyperlinked material, you must be logged into your BPS Google Drive</p>	<p>Listening</p> <ul style="list-style-type: none"> ● Cross- Linguistic Practices: Gives students opportunities to make connections between what they hear and their home language (For example, allow students to listen to a passage and identify cognates.) ● Build background knowledge ● Activating Prior Knowledge ● Activating prior knowledge means both eliciting from students what they already know and building initial knowledge that they need in order to access upcoming content ● Visuals - GIFs, pictures- will assist students in understanding what they are listening to. Visual thinking strategies set the lens for learning. ● Video to review/ introduce a topic – use closed captioning so students see the words and pronunciations while they listen to the content. 	<p>Speaking</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence - such as <i>Evolution is...</i> or <i>I think that evolution is...</i> ● Academic Conversation Starters: Have a visual of a list of academic sentence starters that students can refer to in a discussion such as <i>I expect __ to happen.</i> or <i>My data shows that...</i> This aids students in having more science focused dialogue. ● Choral Reading - Build fluency, self-confidence and motivation with reading/speaking ● Create movement to go with the word. Movement can be a motivating factor and kinesthetic tool for conceptualizing the rhythm and flow of fluent reading while triggering brain function for optimal learning ● Performance Level Descriptors - this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT 	<p>Reading</p> <ul style="list-style-type: none"> ● Supplementary Text to reinforce concepts. If necessary, use lower Lexile levels to ensure comprehension. ● Visual Aids - Pictures or models to support vocabulary words/ concepts ● Video to review introduce a topic - use closed captioning so students can read along and listen to content ● 4 Square / Frayer models to help students gain a deeper understanding of vocabulary. ● Highlighting important text to assist students in answering questions after the reading. ● Chunking-Break reading of text into chunks or paragraphs ● Vocabulary Morphology- segmenting words into affixes (prefixes/suffixes) and roots/base words. Understanding that words connected by meaning/origin can be connected by spelling can be critical to expanding a student’s vocabulary. ● Performance Level Descriptors- this document provides teachers with a description of what output 	<p>Writing</p> <ul style="list-style-type: none"> ● Sentence Frames - to begin a sentence- such as <i>Biodiversity is...</i> or <i>An example of competition is....</i> ● Cloze passages with word banks ● Word banks ● Graphic Organizers to help break down the writing process and organize thoughts ● Standards-based sentence stems ● Performance Level Descriptors- this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of writing. Scroll for grades 9-12. 	<p>Instructional Accommodations (depending on the student’s needs)</p> <ul style="list-style-type: none"> ● Extended time for tests in class, projects and assignments ● Directions read. Broken down as necessary ● Model how to complete the activity in the lesson ● Oral simplification of directions or questions ● Translated version of test when available. Student may have both version English and native language version ● Use of approved bilingual glossaries from NYS in each subject

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	<ul style="list-style-type: none"> ● Word stretching / Vowel stretching allows student to listen closely to the pronunciation words ● Performance Level Descriptors - this document provides teachers with a description of what output they can expect from students based on earned NYSESLAT levels in the modality of listening Scroll for grades 9-12. 	levels in the modality of speaking. Scroll for grades 9-12	they can expect from students based on earned NYSESLAT levels in the modality of reading. Scroll for grades 9-12.		
<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p>Instructional</p> <ul style="list-style-type: none"> ● Pre-teach vocabulary ● Use picture vocabulary ● Scaffold Depth of Knowledge questions ● Provide copy of notes/notes in “cloze” form ● Use of Think, Pair, and Share strategy to help process information ● Scaffold written assignments with the use of graphic organizers ● Allow for multiple ways to respond (verbal, written, response board) ● Provide model of performance task ● Modify informational text to fit the needs of the students ● Provide a digital or paper interactive notebook ● Present complex tasks in multiple ways Provide mnemonic strategies for Living Environment concepts 		<p>Technology:</p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Living Environment concepts ● Record class lecture/discussions and make accessible to student ● Nearpod- interactive presentations of notes ● Playposit - show a video clip about the topic and add your own questions for them to answer as they watch ● Allow students to type answers in chat on Teams <p>Other:</p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 	<p>In Class Assessments</p> <ul style="list-style-type: none"> ● Provide review packet or review sheet of concepts covered on the test ● Practice similar questions prior to the test ● Provide multiple options for projects ● Give a timeline of when things are due and remind them of the process often. ● Use of timer in class ● Break all complex tasks into chunks 	
<p>BPS Science K-12 Schoology Folder:</p> <p>9-12 Resources Earth Science Resources Curriculum Materials</p>	<p>SUTW Strategies</p> <ul style="list-style-type: none"> ● Informal Outline ● Color-Coding – Informative/Explanatory Text ● Two-column notes ● I-V-F Topic Sentence progressing to Four Step Summary Paragraph ● CUPS – Capitalization, Usage, Punctuation, Spelling ● Transitions 				
<p>Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom</p>	<p>Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications</p> <ul style="list-style-type: none"> ● Artifacts (posters, charts, etc.) in the science classroom are representative of the cultures of the student population ● All students are given an opportunity to engage in science discourse ● Teacher demonstrates high expectations for all students <p>CLRT resources which align to Science content are denoted with a *</p>				