

BPS Science Department Earth Science - Unit 11- Human Activity and Earth

Unit 11- During this unit, students will construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. Students will create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. They will evaluate or refine a technological solution that reduces impacts of human activities on natural systems. Students will also use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

Driving Questions:

- How do human societies use Earth's resources?
- How do natural hazards affect individuals and societies?
- How do human activities change the planet?

NYSSLS Standards:

Lesson 11.1: In this lesson, students will construct explanations of the ways humans depend on Earth's natural resources (**SEP Constructing Explanation and Designing Solutions, DCI ESS3.A Natural Resources**) for survival. They explore the many ways resource availability controls the growth and distribution of human populations (**CCC Cause and Effect**) and the relationships between natural hazards and human activity (**DCI ESS3.B Natural Hazards**).

- **HS-ESS3-1 Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.**
 - **ESS3.A Natural Resources**
 - Resource availability has guided the development of human society. (HS-ESS3-1)
 - **ESS3.B Natural Hazards**
 - Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1)
- **HS-ESS3-3 Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.**
 - **ESS3.C Human Impacts on Earth Systems**
 - The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)

Lesson 11.2: In this lesson, students will establish the goals of sustainability and, engaging in argument from evidence (**SEP Engaging in Argument from Evidence**), delineate the interactions between the social, environmental, and economic dimensions of sustainability (**DCI ESS2.D Weather and Climate, DCI ESS3.A Natural Resources, CCC Systems and System Models**). Students will use mathematics and computational thinking (**SEP Using Mathematics and Computational Thinking**) to evaluate human impacts on Earth's systems (water, land, air, and life) (**DCI ESS3.C Human Impacts on Earth Systems, DCI ESS3.D Global Climate Change, CCC Stability and Change**). Students will construct explanations and design solutions (**SEP Constructing Explanations and Designing Solutions, DCI ETS1.B Developing Possible Solutions**) intended to overcome challenges to sustainability, ensuring sustainability today and in the future (**CCC Scale, Proportion, and Quantity**).

- **HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.**
 - **ESS3.A Natural Resources**
 - All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs/risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2)
- **HS-ESS3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.**
 - **ESS3.C Human Impacts on Earth Systems**
 - Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HSS-ESS3-4)
- **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.**
 - **ESS2.D Weather and Climate**
 - Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (secondary to HS-ESS3-6)

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- **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)
- **HS-ETS1-3 Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.**
 - **ETS1.B Developing Possible Solutions**
 - When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (HS-ETS1-3)

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



- Using Mathematics and Computational Thinking
- Constructing Explanations and Designing Solutions
- Engaging in Argument from Evidence

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






- Stability and Change
- Cause and Effect
- Systems and System Models
- Influence of Science, Engineering, and Technology on Society and the Natural World

Opportunities for Student Collaboration p. 619H (Complete Collaboration Strategy Guide):

- **Accessing Prior Knowledge** p. 620 ● **Group Discussion** pp. 627 ● **Stand and Defend** p. 625 ● **Numbered Heads** p. 626 ● **Group Activity** pp. 633, 648 ● **Ranking Ladder** pp. 634, 638 ●
- **Think, Pair, Share** pp. 621, 637 ● **Model** pp. 641, 643 ● **Showdown** p. 643 ● **Jigsaw** pp. 644, 647 ● **Stand Up and Share** p. 651 ●

Time Frame	Lesson Framework	Instructional Sequence	Resources- HMH Dimensions- Earth & Space Science Textbook	Resources- HMH Dimensions Digital Component	Additional Resources
5/1/23-5/19/23	Unit 11: Human Activity and Earth		<ul style="list-style-type: none"> ● Unit Opener (Pre-Assessment): Predict- What are some ways in which food production affects Earth's spheres? (pp. 618-619) 	<ul style="list-style-type: none"> ● *Unit Project: Meeting Future Water Demands- Students research how their community treats its potable (drinking) water. They consider both the technologies employed, such as filtration methods, and other initiatives that encourage responsible water use and reuse. They evaluate how both serve the community at present and if they can be adequately scaled to meet future needs. They write a proposal to the local government for improving the system. 	
	<u>Lesson 11.1- Geographical Influences on Human Activities</u>	Engage	<ul style="list-style-type: none"> ● *Phenomenon: Can You Explain It?- What do people need to consider when choosing a place to live? 		*Patterns in Human Settlement (p. 623)
	In this lesson, you will construct explanations about how the distribution of natural resources and natural hazards affects human populations. <u>Vocabulary:</u> natural resource	Explore/ Explain	<ul style="list-style-type: none"> ● Exploration 1: Human Dependency on Earth's Resources (pp. 621-623) ● Exploration 2: Natural Resources and Human Activity (pp. 624-626) ● Exploration 3: Natural Hazards and Human Activity (pp. 627-629) ● Exploration 4: Reducing the Impact of Natural Hazards (pp. 630-632) 	<ul style="list-style-type: none"> ● Exploration 3:  Hands-On Lab- Tsunami- In this lab, students model the movement of a tsunami and compare the impact of a tsunami on different types of shorelines. ● Exploration 4:  Hands-On Lab- Building a Weather Station- In this lab, students build a weather station, observe and record information, and make predictions based on the data. 	*Figure 9- Map of Natural Hazards Hot Spots (p. 627) *Figure 11- Earthquake Damage in Japan and Nepal (p.629)

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natural hazard	Elaborate	<ul style="list-style-type: none"> ● Continue Your Exploration- Civil Engineer (p. 633) 	<ul style="list-style-type: none"> ● Continue Your Exploration: <ul style="list-style-type: none"> ○ The Cost of an Oil Spill ○ Building the Ike Dike 	
	Evaluate	<ul style="list-style-type: none"> ● Lesson Self Check (pp. 634-635)- Can You Explain It- Revisit ● Make Your Own Study Guide (p. 635) ● Checkpoint Questions (p. 635) 	<ul style="list-style-type: none"> ● Can You Explain It? Revisit ● Checkpoint Questions ● Make Your Own Study Guide ● Unit 11- Lesson 1 Quiz 	
<p><u>Lesson 11.2- Sustainability of Human Activities</u></p> <p>In this lesson, you will investigate techniques used to reduce the impact of human activities on the environment.</p> <p><u>Vocabulary:</u> sustainability ecosystem service anthroposphere biodiversity</p>	Engage	<ul style="list-style-type: none"> ● Phenomenon: Can You Explain It?- What criteria are used to help design cities that reduce the impact of human activities on the environment? 		<p> You Solve It Simulation- How Can You Use Groundwater Sustainably? Students will develop a plan that balances human uses with the needs of the environment.</p> <p>*Water Crisis (p. 642)</p>
	Explore/ Explain	<ul style="list-style-type: none"> ● Exploration 1- Defining Sustainability (pp. 637-640) ● Exploration 2- Human Impacts on Earth's Systems (pp. 641-647) ● Exploration 3: Sustainability Today and Tomorrow (pp. 648-651) 	<ul style="list-style-type: none"> ● Exploration 2:  Hands-On Lab- Ocean Acidification- In this lab, students demonstrate how increased concentrations of dissolved carbon dioxide lead to the increased acidity of water. ● Exploration 3:  Hands-On Lab- Energy Absorption- In this lab, students test materials to determine how much energy they absorb and decide which material would work best to keep the inside of a house cool. 	
	Elaborate	<ul style="list-style-type: none"> ● Continue Your Exploration-  Hands-On Lab- Design a Water Filtration System (p. 652)- In this lab, students design a water filtration system using an engineering design process. 	<ul style="list-style-type: none"> ● Continue Your Exploration: <ul style="list-style-type: none"> ○ Capturing Carbon ○ 21st Century Engineering Challenges 	
	Evaluate	<ul style="list-style-type: none"> ● Lesson Self Check (pp. 653-655)- Can You Explain It- Revisit ● Make Your Own Study Guide (p. 655) ● Checkpoint Questions (pp. 654-655) 	<ul style="list-style-type: none"> ● Can You Explain It? Revisit ● Checkpoint Questions ● Make Your Own Study Guide ● Unit 11- Lesson 2 Quiz 	
<u>Enrichment: Unit Connection Activities</u> (Optional)		<ul style="list-style-type: none"> ● Environmental- Gone Forever ● Health- Feeding the Masses ● Architecture- Living Underground 		
<u>Unit Close</u>		<ul style="list-style-type: none"> ● Synthesize the Unit (p. 657) ● Driving Questions (revisit) ● Practice and Review Questions (pp. 657-658) ● Unit Project Revisited (p. 658) ● Unit Performance Task (p.659) 	<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 	<p> Castle Learning</p> <p>HMH Earth & Space Science Unit 11- Human Activity and Earth (Editable item bank available under Public Assignments in Castle Learning)</p>

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<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. ● Word stretching / Vowel stretching allows student to listen closely to the pronunciation words ● Performance Level Descriptors - this document provides teachers 	<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 levels in the modality of speaking. Scroll for grades 9-12 	<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 they can expect from students based on earned NYSESLAT levels in the 	<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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	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.		modality of reading. Scroll for grades 9-12.		
Special Education Modifications Special Education students must have accommodations as per Individual Educational Plan (IEP)	<u>Instructional</u> <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 		<u>Technology:</u> <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 <u>Other:</u> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction ● Accessible lab space (counter level) 		<u>In Class Assessments</u> <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
BPS Science K-12 Schoology Folder: 9-12 Resources Earth Science Resources Curriculum Materials	<u>SUTW Strategies</u> <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 				
Culturally and Linguistically Responsive Teaching (CLRT) in the Science Classroom	<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>				