CCPS Science Unit Plan

Grade	9th	**Subject**	Science	**Unit #**	2
Unit Name	Biodiversity		**Timeline**	3 weeks	
How to use the Framework	This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding all abbreviations used with this framework.				
Unit Overview	In this unit, we will delve into the fascinating world of biodiversity, exploring how it is measured, its crucial role in sustaining the environment, and the impact it has on the changes we observe in our surroundings. Biodiversity encompasses the variety of life forms on Earth, from the smallest microorganisms to the largest animals. By studying biodiversity, we gain insights into the evolutions of organisms over time and the intricate ecological successions that shape our planet's ecosystems. Understanding biodiversity is key to recognizing all living things' interconnectedness and preserving this diversity for a sustainable future.				
Lesson Plan guidance document and template	CCPS Lesson Plan Template Day View Lesson Plan Template Week View Department of Science Guidance Document				

3Dimensional Instruction

GSE	Science and Engineering Practices	Crosscutting Concepts
SEV2. Obtain, evaluate, and communicate information to construct explanations of stability and change in Earth's ecosystems. **a**. Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change.*(Clarification statement: Short-term examples include but are not limited to El Niño and volcanism. Long-term examples include but are not limited to variations in Earth's orbit such as Milankovitch cycles.)* **b.** Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect. **c.** Construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems, in terms of ecological succession. **d**. Construct an argument to support a claim about the value of biodiversity in ecosystem resilience	• Obtain, Evaluate, and Communicate • Analyze & Interpret Data • Construct an Argument	• Stability & Change

	including keystone, invasive, native, endemic, indicator, and endangered species.		
NGSS Alignment	NGSS Alignment to Disciplinary Core Ideas		

Weekly Lesson Tasks

Week 1

GSE: **SEV2d.** *Construct an argument to support a claim about the value of biodiversity in ecosystem resilience including keystone, invasive, native, endemic, indicator, and endangered species.*	**Focused Concept:** **Biodiversity & How it is Measured** **Types of Species & Their Roles** **Evolution & Biodiversity** **Human Impact on Biodiversity**
Phenomenon: Daily phenomena are found in the Opening.	**DQ:**
SEP:Construct an Argument	**CCC: Stability and Change**

	Day 1	Day 2	Day 3	Day 4	Day 5
Learning Target	***I CAN**…Use mathematical data to explain the relevance of biodiversity in the stability and change of an ecosystem.*	***I CAN**…Obtain information to communicate the value of biodiversity and the types of species.*	***I CAN**…Cite textual evidence to communicate the factors that affect biodiversity.*	***I CAN**…Provide a claim based on evidence to communicate understanding of how organisms can evolve based on interactions.*	***I CAN**…Communicate the importance of maintaining biodiversity hotspots.*
Opening	**When the Grass isn't Greener…** GQ: *How do we measure an ecosystem's health?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary	**The Vine that Ate the South** GQ: *How does a species' role impact biodiversity?* **TTW:** Show students the phenomenon and ask them to write their responses to the following questions on post-it notes and affixing them to chart paper	**The Last Northern White Rhino** GQ: *What factors affect biodiversity?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary	**Resistance** GQ: *How does life on Earth change over time?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary • biological evolution	**Extinction on the Rise - I^2** GQ: *How has biodiversity been affected over the age* **TTW:** Show the phenomenon and engage students in data analysis via the I^2 method. Use the reference sheets below. Extinction on the Rise I2 Worksheet

	• Biodiversity • Richness • Relative Abundance (Evenness) • Genetic Diversity • Species Diversity • Habitat/Ecosystem Diversity	**TTW:** Have students then propose three possible solutions to combating Kudzu. Kudzu Video Clip ***Note: Show only the first 3:12 of the video.*** Vocabulary • niche • habitat • resilience • Native Species • Endemic Species • Indicator Species • Keystone Species • Invasive Species • Endangered Species	• biological extinction • background extinction rate • mass extinction • speciation • geographic isolation • reproductive isolation	• natural selection • gene flow • genetic drift • adaptations • mutation • biological resistance • genetic variability	I² Reference Sheet Vocabulary • biodiversity hotspot • endemic species
Guided Practice/ Transition	**Parking/Bean Biodiversity** **TTW:** Explain how students collect data by inventorying the vehicles in the student and staff parking lot. The teacher will then model how students will analyze the data to determine the level of biodiversity. **Materials:** • Parking Lot Biodiversity Lab Handout • School Parking Lot • Graphing Paper *Alternative "Bean Biodiversity Lab" with Teacher Guidance Document*	**Types of Species Gallery Walk** **TTW:** Use the PowerPoint to show a video about niche and habitat. The teacher should instruct students to record these definitions in their notes.The McDonald's analogy will then be used to describe the importance of different roles within a company. Have students list different jobs at McDonald's, then have them explain what will happen if one of those jobs were removed. Will McDonalds still be able to run efficiently? This would be a good time to discuss resilience of ecosystems as it relates to biodiversity.	**Biodiversity: Speciation & Extinction Reading** (See the ENGAGE & EXPLORE section of the Teacher's Edition for activity details) **TTW:** Engage learners by presenting the following scenario: Biodiversity Scenario **Materials:** • Interactive Notebook or Paper for Notes • Textbook **TTW:** The teacher will explain and model how students use titles, headings, photographs, and illustrations to make predictions about the reading.	**Marble Selection** (See the EXPLAIN & SCIENCE IN ACTION sections of the Teacher's Edition for activity details) **TTW:** Engage learners by completing a natural selection demonstration. The teacher will explain and model how students will randomly select a marble out of the bag (there should be two different colored marbles in the bag). Explain that this represents the gene of a trait. The teacher will choose one color to be the allele for resistance to a bacteria that causes a fatal infectious disease. Any student with the designated color survives. Any student who does not have this color dies. Record the	**Biodiversity Hotspots** Biodiversity Hotspot Video **TTW:** Engage students by presenting the video on biodiversity hotspots. The teacher then will explain and model how students will work in their designated groups to research one of the 36 biodiversity hotspots. Then model how students will use chart paper to present the required information using the poster requirements below. **Materials:** • Biodiversity Hotspot Poster Requirements • Flip chart paper • Flip chart markers

	Biodiversity Mini-Lecture ***Note: This should be completed at the conclusion of the activity*** **TTW:** Explain via PowerPoint or lab sheet what Biodiversity is and how it is measured. This will include the levels or scales of Biodiversity. *Textbook Reference **4.1** pgs 105 - 111* *Introduction to Biodiversity PowerPoint*	**Materials:** • Types of Species Gallery Walk • FlipChart Paper • FlipChart Markers • Textbook **TTW:** Explain how students will use the textbook to research their given species**.** The teacher will model how students will rotate around the room or hall to record information provided by their peers via a gallery walk. *Textbook Reference: **4.2** pgs 111-115; **4.4** pgs 120-123, **7.1** pgs 207-214*	*Textbook Reference **4.4** pgs 120-123*	number of survivors & calculate the percentage. Survivors will then return their marbles to the bag for a new generation. Repeat this for a few rounds and address the Marble Guiding Questions. **Materials:** • Marbles at least two different colors) • Sandwich bag • Marble Guiding Questions *Note: This activity can be done with any material such as beads, bingo chips, or any manipulative you see fit.* **Evolution - Amoeba Sisters Video** **TTW:** Show the amoeba sister video, for students to take Cornell notes and address the Video Note Guiding Questions **Materials:** • Video/Cornell Note Guiding Questions • Interactive Notebook or Paper for Notes • Amoeba Sisters Evolution Video Clip *Note: You may need to pause the video to give students enough time to record or clarify or*	• Biodiversity Hotspot Reference Website *Textbook Reference: **8.4** pgs 256-259; **7.2** pgs 215-225*

				expound on any given concept. *Textbook Reference:* ***4.3*** *pgs 116-119*	
Independent Practice	**Parking/Bean Biodiversity** **TSW:** Create their own classification system (brand, color, style, etc) for cars and inventory the number of vehicles found in each parking lot. Students will record their data in the table and then graph the relative abundance to analyze and compare each parking lot. Students will then address the lab analysis question.	**Types of Species Gallery Walk** **TSW:** Create posters on the given species (randomly selected or strategically selected). The posters must include: ● *The Type of Species* ● *Description of the Species (role)* ● *An illustration of the species found in the state of Georgia* ● *How their role impacts biodiversity in a given ecosystem?* Students will then go around to the various posters to record the information in a 4 column graphic organizer with the categories listed above.	**Biodiversity: Speciation & Extinction Reading** **TSW:** Individually predict what the topic of the reading will be about based on titles, headings, photos, illustrations, etc. As they read they will place checks next to any predictions that may have been correct. *Suggestions: Students should take notes as they read. Cornell notes would be a good template or guide for students.* How to take Cornell notes	**The Debate - Antibacterial Soaps** **TSW:** Use the information learned from the Marble selection activity and video notes students will debate - ***"Should antibacterial products be used regularly? Why or why not?"*** Students will work in designated groups and choose one of the following positions: Those for the use of antibacterial products *Note: This debate could be completed in the CER format.*	**Biodiversity Hotspots** **TSW:** Work within their designated groups to complete a biodiversity hotspot poster. *Be sure students have not selected the same hotspot.* Students will address the 5 criteria above, but can add any additional information they see fit. This information will be placed on their chart paper. Student groups will share out.
Assessment Summary	**Sticky Note Mosaic** Students will use sticky notes to address the following questions. Each question must be answered on a different colored sticky note. This activity can be done individually, in pairs, or in a small group of 3-4. Feel free to	**The Real Goat** Students will revisit their solutions proposed at the beginning to identify how the solution may impact the ecosystem. Students will then view a sustainable solution. Kudzu vs. Goats Video	**The Last Northern Rhino** Students will share their predictions with their groups, and then collectively research the northern white rhino. Students should identify what has happened to the Northern white rhino and what solutions have	**What Stuck with You?** Students will discuss what concepts stuck with them and explain its connection to biodiversity. Students will use a sticky note to individually respond. This can be placed on designated chart paper or a white board.	**Meet Thandi - The Discussion** (See the ART IN SCIENCE section of the Teacher's Edition for activity details) Explain the background of the rhino above page 224 of the textbook.

	use any sticky note colors you have available. Suggested Homework: Biodiversity of Pond Life Pivot Interactive		scientists proposed based on their extinctions. *Provide students with some sort of guiding question for their research such as, "Can we bring animals back from extinction?"*	Suggested Homework: Ecological Succession Graphic Organizer for Day 6 Lesson	
Small Group Tasks (TBA)					

Week 2					
GSE: **SEV2c.** *Construct an argument to predict changes in biomass, biodiversity, and complexity within ecosystems, in terms of ecological succession.* ***(Day 6)*** **SEV2a** *Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change. (Clarification statement: Short-term examples include but are not limited to El Niño and volcanism. Long-term examples include but are not limited to variations in Earth's orbit such as Milankovitch cycles.)* ***(Day 7-9)*** **SEV2b** *Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect.* ***(Day 10)***		**Focused Concept:** **Ecological Succession** **The Atmosphere & Climate** **The Coriolis Effect** **Greenhouse Gasses**			
Phenomenon: Daily phenomena are found in the Opening.			**DQ:**		
SEP: Construct an Argument **Analyze and Interpret Data**			**CCC: Stability and Change** **Cause and Effect**		
	Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Learning Target	***I CAN**…Design a model of ecological succession to analyze and describe the changes observed over time.*	***I CAN**…Analyze graphical models to describe the composition and organization of the atmosphere.*	***I CAN**…Use a model to show the relevance of solar radiation to climate.*	***I CAN**…Use a model to describe the Coriolis Effect and its relationship to climate.*	***I CAN**…Evaluate through research greenhouse gasses and how they influence climate change.*
Opening	**Natural Disasters**	**Twilight**	**The Troposphere**	**Patterns**	**A Trend…**

	GQ: *How do natural disasters impact biodiversity?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Natural Disaster Video *Note: Do not show the entire 10 minutes, show about 2-3 minutes of the clip.* Vocabulary • ecological succession • primary succession • secondary succession • climax community • pioneer species • natural disruption • biomass	GQ: *How can we describe the Earth's atmosphere?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary • atmosphere • air pressure • troposphere • stratosphere • ozone layer • mesosphere • thermosphere • air mass • front	GQ: *What factors influence climate?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary • climate • weather • solar radiation • latitude	GQ: *How does the Earth's orbit impact climate?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary • coriolis effect • global wind patterns • ocean currents • gyres • thermohaline circulation • tradewinds • easterlies • westerlies	GQ: *Is our climate changing?* **TTW:** Show the phenomenon and engage students in the see-think-wonder protocol. Vocabulary • greenhouse effect • greenhouse gasses • carbon dioxide • methane • water vapor • nitrous oxide • hydrofluorocarbon • chlorofluorocarbon • global warming potential
Guided Practice/Transition	**Walk the Line** **TTW:** Explain how students will stand in a line. The instructor will read several statements, and after each statement, tell students to stay on the line if they AGREE or take a step forward if they DISAGREE. Have students pair up with someone on the opposite line and explain why they agree or disagree with the statement. See statements on page 138 of TE.	**Atmospheric Structure & Climate Change** **TTW:** After students complete the Graphing the Atmosphere activity the teacher will conduct a mini lecture about the composition of the atmosphere and the different layers to reinforce the information. **Materials:** • Atmospheric Structure & Climate (slides 1-5 ONLY)	**Atmospheric Structure & Climate Change** **TTW:** After students complete the Solar Radiation activity the teacher will conduct a mini lecture about the factors that affect climate. Be sure students understand the difference between weather and climate. **Materials:** • Atmospheric Structure & Climate (slides 6-9 ONLY)	**How do ocean currents work?** **TTW:** After students complete the Modeling Coriolis Effect Activity, the teacher will guide students in understanding the connection of the global wind patterns and ocean currents by presenting the "How do ocean currents work?" video. The instructor will be sure to pause to be sure students understand key vocabulary. **Materials:**	**Global Warming Simulation** **TTW:** Engage students in the greenhouse simulation using the guidance document below. Prior to beginning the instructor will probe students with the following question: • What will happen to the Earth's temperature if greenhouse gasses are increased? **Materials:**

	Materials: • TE of the Textbook • See Engage on page 138 *Note: This would be a great time to review the information students obtained in their foldable about succession and the two major categories.* *Textbook Reference **5.2** pgs 138 - 140*	*Textbook Reference **16.1** pgs 525 - 535*	*Textbook Reference **6.1** pgs 157- 162*	• How do ocean currents work? *Textbook Reference **6.1** pgs 157- 162*	• The Earth's Greenhouse (Part II) Guidance document (pgs 27-36) • pit balls *Textbook Reference **16.2** pgs 536 - 552*
Independent Practice	**Ecological Succession in a Jar** **TSW:** Answer pre laboratory questions. Students will then work in their assigned groups to establish an ecosystem within a jar following the lab procedures. After completing all observations students will address the Analysis and conclusion questions. **Materials:** • National Geographic Environmental Science Lab Manual TE (pgs 65 - 75) • National Geographic Environmental Science Lab Manual SE 43-50 • Required Lab Materials	**Graphing the Layers of the Atmosphere** **TSW:** Independently or in pairs to complete the graphing activity. Encourage students to trace the temperature line with blue for decreasing temperatures and red for increasing temperatures (see example). Students will then use the data and website to answer the activity questions. **Materials:** • Graphing Layers of the Atmosphere • Red & Blue Color pencils • Nova Reference Site (embedded in worksheet)	**Solar Radiation Lab** **TSW:** Work with a partner to complete the solar radiation lab. Students will then answer the analysis questions. **Materials:** • Solar Radiation Lab • Flashlight • Strip of paper • toilet paper roll • tape • Globe, inflatable globe, or a sphere that represent the Earth	**Modeling the Coriolis Effect** **TSW:** Work with their groups to model the coriolis effect. Students will then answer the analysis questions to analyze data collected from their models. **Materials:** • Modeling the Coriolis Effect Lab • Inflatable Globe • Liquid Chart Markers	**Greenhouse Flashcards** **TSW:** Work with their groups to complete research to identify the source, the amount present in the atmosphere, and its global warming potential of their designated greenhouse gas. The teacher will project when finished and have students present their findings. Students will take notes. **Materials:** • Greenhouse Gas Flashcard Template • Student Chromebooks

	Note: This lab will require doing multiple observations over time. You can choose how many observations you'd like your students to make, and how often. Students can observe every few days or weekly.				
Assessment/Summary	**Journaling** Students will communicate via writing what changes they believe they will see when they observe their ecosystem in a jar. SUGGESTED ASSESSMENT DAY	**Twilight Effect** Students will use the knowledge obtained in today's lesson and activity to discuss what they believe causes the twilight effect. Have them consider layers, temperature, pressure, density, and the sun. Suggested Homework: Ozone Reading & Guided Notes **Materials:** Ozone Layer Reading Ozone Layer Guided Notes *Note: This will give students an introduction to the relevance of the ozone layer before getting to atmospheric pollution*	**The Factors** Students will communicate their understanding of the many factors that shape our climate. Students should revisit the phenomena and address why each front always appears in the same direction. If this was not identified in the SEE, THINK, WONDER, be sure to point it out.	**D.A.T.A** The students will move around the room to address the D.A.T.A. questions on chart paper. This will assess what students have obtained from the lesson.	**Global Warming Potential** Students will respond to the Global Warming Potential prompt on paper or in Canvas (Discussion Post). Students will respond to at least 2 peers' posts/responses.
Small Group Tasks (TBA)					

Week 3	
GSE: **SEV2b** *Analyze and interpret data to determine how changes in atmospheric chemistry (carbon dioxide and methane) impact the greenhouse effect.* ***(Day 11)***	**Focused Concept:** **Greenhouse Effect** **Climate Change** **Volcanism** **El Nino**

SEV2a *Analyze and interpret data related to short-term and long-term natural cyclic fluctuations associated with climate change. (Clarification statement: Short-term examples include but are not limited to El Niño and volcanism. Long-term examples include but are not limited to variations in Earth's orbit such as Milankovitch cycles.)*	**Milankovitch Cycles**				
Phenomenon: Daily phenomena are found in the Opening.			**DQ:**		
SEP: Analyze and Interpret Data			**CCC: Stability and Change** **Cause and Effect**		
	Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
Learning Target	***I CAN****…Analyze and interpret data to explain how carbon dioxide influences the greenhouse effect.*	***I CAN****…Analyze and interpret data of volcanic activity and make a claim that explains if there is a relationship with climate change.*	***I CAN****…Analyze and interpret data of volcanic activity and make a claim that explains if there is a relationship with climate change.*	***I CAN****…Ask questions through research to explain how El Nino impacts climate change.*	***I CAN****…Make a claim based on evidence to communicate if climate change is inevitable.*
Opening	The Landfill GQ: *How do greenhouse gasses influence climate change?* What do you **SEE**? What do you **THINK**? What do you **WONDER**? • Why are landfills necessary? • What are some of the drawbacks of using landfills? • What does this mean for climate change? Vocabulary • greenhouse effect • greenhouse gasses • anthropogenic	A Picture Worth 1000 Words GQ: *Is climate change inevitable?* *"The Scream" by Edvard Munch* *William Ascroft sketches overlooking Thames River* What do you **SEE**? What do you **THINK**? What do you **WONDER**? • How are these images similar? • Could you predict the time of day? How do you know this? • Could the artist be depicting the same event?	Volcanism - I^2 GQ: *Is climate change inevitable?* What do you **SEE**? What do you **THINK**? What do you **WONDER**? *Identify* what you see (Observations). *Interpret* the observations (What does this mean?). • What is the relationship between volcanic eruptions and temperature anomalies? Volcanism I2 Worksheet I^2 Reference Sheet	Changing Weather GQ: *Is climate change inevitable?* What do you **SEE**? What do you **THINK**? What do you **WONDER**? • What changes do you see? • What happens to the frequency of El Nino events over time? • Do you believe there is a correlation between warmer global temperatures and El Nino events?	Milankovitch GQ: *Is climate change inevitable?* The Milankovitch Cycle Video Clip What do you **SEE**? What do you **THINK**? What do you **WONDER**? • What is the correlation to Earth's weather and climate? Vocabulary • Milankovitch cycle • eccentricity • precession • obliquity • elliptical • circular

	• carbon dioxide • methane • global warming potential	• What kind of event would impact the colors of the sky? • Could volcanic eruptions or natural disasters impact weather or climate on the other side of the globe? <u>Vocabulary</u> • climate change • volcanism • Volcanic Explosivity Index (VEI) • solar radiation • latitude • longitude • Aerosols	<u>Vocabulary</u> • climate change • volcanism • Volcanic Explosivity Index (VEI) • solar radiation • latitude • longitude • Aerosols	<u>Vocabulary</u> • El Nino/ENSO • upwellings • tradewinds • La Nina	• solar radiation
Guided Practice/Transition	**Our Atmosphere: The Greenhouse gas Mini-lecture** **TTW:** Model the greenhouse effect by completing a mini-lecture. The instructor will be sure to discuss how methane and carbon greatly impact the greenhouse effect therefore influencing climate change. **<u>Materials:</u>** • Greenhouse gas presentation	**Climate Change & Natural Disasters** **TTW:** Show students two additional graphs and ask them to analyze the data. The instructor will guide students with certain trends that may not be recognized right away with appropriate wait time. • What changes do you see? • What do these changes imply? • What idea does the evidence/ interpretation possibly support?	**Volcanoes vs. Climate Change Discussion** **TTW:** Show students two additional graphs and ask them to analyze the data. The instructor will guide students with certain trends that may not be recognized right away with appropriate wait time. • What changes do you see? • What do these changes imply? • What idea does the evidence/ interpretation possibly support? **<u>Materials:</u>** • Graphs above	**El Nino Demonstration** **TTW:** Model the El Nino Event using the materials listed below. The example video clip also models a way to explain El Nino to students. Have students draw and label normal weather patterns and then illustrate El Nino & La Nina events (see model depictions below). During the demonstration would be a great time to address unknown vocabulary. The instructor will then reinforce the concept via El Nino video. **<u>Materials:</u>** • Tank or a clear bin of some sort • Water	**Milankovitch Demonstration & Mini-Lecture** **TTW:** The teacher will model the three cycles using student volunteers. This can be done outside, the hallway, or in a classroom with an open space. Teachers will designate an object to represent the sun (yellow/orange construction or butcher paper, a yellow/ orange ball, etc --*BE CREATIVE*). Student volunteers can represent the Earth. The teacher will ask students questions to identify what this could mean in terms of solar radiation, seasons, etc). Students should make

			• GaDOE Reference for activity Note: The I^2 method can be used on the additional charts.	• blue food coloring • vegetable oil • red oil-based paint (optional) • Hair dryer or a strong source of wind • El Nino Demonstration Video Clip (For the Instructor) • El Nino Video (For the Students)	note of their observations during this time. **Materials:** • Teacher guide for setting up/ planning the demonstration. • Object/Individual to represent the Sun. • Object/Individual to represent the Earth **Be creative with the materials.*
Independent Practice	**Greenhouse Effect Gizmo** **TSW:** Work independently or in pairs to complete the greenhouse effect gizmo student exploration sheet using the explore learning/gizmo simulation. **Materials:** • Greenhouse effect gizmo simulation • Greenhouse effect Student Exploration Sheet **Suggested Alternative Assignment: Seasonal Trends of Atmospheric Carbon Dioxide (And the Greenhouse Gizmo can be homework for Day 10.*	**Major Volcanic Eruptions** **TSW:** Work in pairs to graph the different volcanic events on the global world map. Students will then analyze their graphical data with the following questions: • Are there any differences in the amount of volcanic activity recorded in the Northern Hemisphere as compared to the Southern hemisphere? • What possible explanation is there for any differences you noticed? • Climatologists have made a claim that only low latitudinal eruptions (20°N	***How do Volcanoes Affect World Climate* Article & Reflection** **TSW:** Work in pairs, read and annotate the article. Students will address the article of reflection questions. Students will need to reference graphing data from Day 12 and some research. **Materials:** • *How do Volcanoes Affect World Climate* Article • Article Reflection Questions	**The Impact** **TSW:** Work in groups to research a country from each continent of Africa, Asia, and Latin America. Assess the following years 1982, 1997, and 2015 and compare the impact of the El Nino events on the environment and the economy. Predict what this means for future El Nino events based on the graph from the opening. Students will present their comparative findings on flip chart paper. *Suggestion: The instructor may want to consider selecting some countries such as Peru, Indonesia, Ethiopia, etc. in advance.* **Materials:** • Flip Chart Paper • Flip Chart Marker • Chromebook	**Is Climate Change Inevitable?** Students will consider natural occurrences such as volcanic eruption, El Nino, and the Milankovitch cycles to make a claim (based on evidence) to address the following question: • Is Climate Change inevitable? Why or Why Not? *Suggestion: This activity would be good for pairs or groups. They can complete it on chart paper, notebook paper, canva, google doc, or whatever is best fitting.* *Note: This task can be as formal or informal as you would like. Students should be sure to provide sufficient evidence to support their position.*

		and 20°S) can significantly affect global climate? What evidence would climatologists need to support this claim? ○ Sort the volcanoes in the list above from greatest VEI to lowest VEI ○ Then sort by latitude ○ Then sort by longitude ● Describe any relationship you discovered between VEI, latitude, and longitude. **Materials:** ● Major Volcanic Eruption Activity ● Color pencils ● Blank global map with longitude & latitude			
Assessment/Summary	**Vital Signs of the Planet Discussion** Students will read the carbon dioxide and methane summary and explore the graphs displayed on the following webpage. Pay close	**Alphabet Soup** Students will be assigned a letter of the alphabet. They must come up with a word that begins with that letter and relates to the current topic (**climate change).** The word must explain	**CER** Students will make a claim about the relationship between volcanic eruptions and changes in global climate. Support your claim with evidence from your map, reading, and research.	**3-2-1** Students will complete a 3-2-1 to assess what they understand: **3** - Things you learned. **2** - Things you found interesting.	**Clear or Cloudy** Students will place one sticky note each for clear and cloudy. They will explain two concepts of climate change and then identify two things that are still unclear about climate

	attention to the "Proxy (indirect) Measurements. Create a discussion post in Canvas based on your analysis and interpretation of the data. Be sure to address the following questions and respond to two peers. • When did Carbon levels change from its historical patterns? • What historical event does this coincide with? • What patterns of methane do you see? • What does this imply? Vital Signs of the Planet **SUGGESTED ASSESSMENT DAY**	how it relates to the topic. *Suggestion: You can have students use a random letter generator.* .	Then, link the evidence to your claim. *Note: If students do not complete this part, they can complete it for homework.*	**1** - Thing you still question. This activity can be done via sticky notes, chart paper, or Canvas discussion post.	change. **SUGGESTED ASSESSMENT DAY**
Small Group Tasks (TBA)					

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep concepts.

Reference Chapter 4 Summary (*pg. 125*)

- **Biodiversity**
- **Species Richness & Relative Abundance (Evenness)**
- **Types of Species (i.e. Keystone, Invasive, Endangered, etc)**
- **Mechanism of Evolution**
- **Speciation**
- **Human Impact on Biodiversity**

Reference Chapter 5.2 Summary (*pg. 149*)

- **Ecological Succession**

Reference Chapter 6.1 Summary (*pg. 187*)

- **Layers of the Atmosphere**
- **Factors that Affect Climate**
- **The Coriolis Effect**
- **Greenhouse Gasses**
- **Greenhouse Effect**
- **Climate Change**
- **Volcanism**
- **El Nino**
- **Milankovitch Cycles**

Labs / Investigations		
Mandatory Labs	**Explore Learning Gizmo**	**Pivot Interactives/Phet**
Ecological Succession in a Jar	**Greenhouse Effect Gizmo**	**Biodiversity of Pond Life**

Additional Resources/Tasks	
Supplemental Resources	