

Topics in Biology - Climate Science

Unit 4 Taking Action

Unit Overview: Unit 4 – Taking Action provides students with information and resources to understand and evaluate solutions to climate change. The first lesson requires students to understand the media's role in influencing engagement and consensus surrounding the climate change debate. Students are then engaged with three lessons that present to students strategies, methods, and technologies to mitigate or provide solutions to climate change. To finish out the unit and the course, students are presented with Green STEM careers. Students will examine the careers, the skills, and the advanced education required to be successful in the Green STEM field.

Unit Storyline: Unit 4 Taking Action allows for students to develop their voice for their role in climate change. Students will learn about technologies and strategies that climate experts are using to mitigate climate change. Along with mitigation strategies, students will be introduced to strategies and plans that will provide solutions for the reversal of climate change and its detrimental effects. Additionally, students will discover how the media plays a role with influencing society on views of climate change and climate change solutions. Finally, students will be introduced to Green STEM careers and skills that are necessary to be successful in this burgeoning field.

Anchor Phenomena

Lake Erie has been experiencing excessive algal growth

Essential Questions/Potential Driving Questions

Is there global warming?

Does global warming contribute to climate change?

How does media influence engagement and consensus in this debate?

How do we design mitigation plans in response to the challenges created by climate change?

How are human activities altering the physical, chemical and biological environment in the Lake Erie Watershed?

Is it possible to mitigate or reverse the effects of climate change on harmful algal blooms?

What do students know about the possible solutions to climate change and Harmful Algal Blooms (HABs) on the Great Lakes?

What are the causes behind climate change?

What are some solutions at the individual and the global levels to address climate change?

What do harmful algal blooms (HABs) look like?

How do you identify HABs?

How do HABs develop?

What are the causes behind harmful algal blooms (HAB's)?

What are some solutions at the individual and the global levels to address harmful algal blooms (HAB's)?

What are types of Green careers that make a difference with regards to climate change mitigation, adaptation, and/or solutions?

What are the skills needed to be successful in a Green career?

How can we utilize carbon capture, utilization, and storage (CCUS) as an effective method to mitigate climate change?

How does using carbon dioxide allow additional oil and gas to be recovered from reservoirs that are slowing production?

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New York State Science Learning Standards (NYSSLS) by Lesson

<p>Lesson: Science Consensus and the Climate Change Debate – Performance Expectations and Disciplinary Core Ideas</p> <ul style="list-style-type: none"> • 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 system <ul style="list-style-type: none"> • ESS3.D Global Climate Change* 	<p>Lesson: Climate Change Mitigation – Performance Expectations and Disciplinary Core Ideas</p> <ul style="list-style-type: none"> • HS-ESS3-4 Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems. <ul style="list-style-type: none"> • ESS3.D Global Climate Change* • ESS3.C Human Impacts on Earth Systems* • 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. <ul style="list-style-type: none"> • ETS 1.B Developing Possible Solutions* 	
<p>Lesson: Carbon Capture – Performance Expectations and Disciplinary Core Ideas</p> <ul style="list-style-type: none"> • HS-ESS3-4 Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems. <ul style="list-style-type: none"> • ETS1.B. Developing Possible Solutions* 	<p>Lesson: Mitigation, Adaptation, and Solutions to Climate Change and Harmful Algal Blooms (HABs) in the Lake Erie Watershed – Performance Expectations and Disciplinary Core Ideas</p> <ul style="list-style-type: none"> • HS-ESS3-4 Evaluate or refine a technological solution that reduces the impacts of human activities on natural systems. <ul style="list-style-type: none"> • LS2.C Ecosystem Dynamics, Functioning, and Resilience* • LS4.D Biodiversity and Humans* • ESS3.2 Human Impacts on Earth Systems* • 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. <ul style="list-style-type: none"> • ETS1.B Developing Possible Solutions* 	
<p>Lesson: Green Careers – Performance Expectations and Disciplinary Core Ideas *HS Human Sustainability Performance Expectations encompass a variety of Green Pathways. HS-ESS3-4 is one example.*</p> <ul style="list-style-type: none"> • HS-ESS 3-4 Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. <ul style="list-style-type: none"> • ESS3.C Human Impacts on Earth Systems* • ETS1.B Developing Possible Solutions* 	<p>Science and Engineering Practices*</p> <ul style="list-style-type: none"> • Engaging in Argument from Evidence • Analyzing and Interpreting Data • Constructing Explanations and Designing Solutions 	<p>Crosscutting Concepts*</p> <ul style="list-style-type: none"> • Cause and Effect • Stability and Change • Connections to Engineering, Technology, and Applications of Science • Influence of Engineering, Technology, and Science on Society and the Natural World. • Science as a Human Endeavor

*Denotes hyperlink for additional information

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Time Frame	Science Consensus and The Climate Change Debate	5 E Model	Teacher Resources and Materials	In Class Student Activities Lab Resources	Online Resource
	<p>Phenomena Global warming is one of the contributing factors to climate change. The media may influence ones ideas about global warming and climate change.</p> <p>Vocabulary climate change global warming carbon dioxide greenhouse gas global average temperature ice core Intergovernmental Panel on Climate Change (IPCC)</p>	<p>Engage - Students will be introduced to evidence of climate change while completing the Preponderance of Evidence Nearpod. Students will complete wonder and notice statements based on viewed evidence.</p>	<p>Preponderance of Evidence PowerPoint</p> <p>Science Consensus and the Climate Change Debate TR Lesson Plan</p>	<p>Preponderance of Evidence Nearpod</p>	<p>Climate Central – Videos, data, graphics, and articles related to climate change and the impact on the public</p> <p>4th National Climate Assessment – Assessment of the science behind climate change and variability and its impacts across the United States, now and throughout this century</p> <p>EPA Climate Change – General information including climate change facts, how climate change is addressed, and climate connections from the United States EPA</p> <p>Our Climate Our Future – Video series that educates young people on the science of climate change and empowers young people to take action</p>
		<p>Explore - In cooperative groups students will examine climate change evidence cards and prepare to present their findings to the class in a jigsaw activity.</p>	<p>Evidence Activity Cards</p> <p>Evidence Activity Card Directions</p>	<p>Evidence Activity Cards</p> <p>Evidence Graphic Organizer</p> <p>Evidence Activity Card Directions</p>	
		<p>Explain Students learn about the process of science: Science consensus, science in policy, and political interference in science; then use this information to analyze a commercial on carbon dioxide</p>	<p>Commercial on Carbon Dioxide (Nearpod Video)</p> <p>Commercial on Carbon Dioxide with embedded question (Nearpod Video)</p> <p>Commercial Transcript</p>	<p>Commercial Task Analysis</p> <p>Commercial Transcript</p>	
		<p>Elaborate Students participate in a teacher-led discussion regarding the arguments of global warming and climate change using the information from this lesson and video evidence. Media influences will play a large role in the discussion.</p>	<p>Think-Pair-Share (TPS) Teacher Protocol</p> <p>Turn and Talk Teacher Protocol</p> <p>Global Warming Swindle Part 1</p> <p>Global Warming Swindle Part 2</p>	<p>Think-Pair-Share Graphic Organizer</p> <p>Video Guide</p>	
		<p>Evaluate Students will use additional video resources to respond to writing prompts to demonstrate their understanding of global warming, climate change, and the role of the media influence in scientific consensus building.</p>	<p>Global Warming Debate Rebuttal</p> <p>Climate-NASA Scientific Consensus</p> <p>Climate Time Machine</p>	<p>Writing Task – Science Consensus and the Climate Change Debate</p>	
	<p>Lesson Connection to Storyline: As students gain evidence and process data concerning climate change and its effect on the worlds environment they begin to understand that media plays a role with influencing what others think about climate change.</p>				

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Time Frame	Climate Change Mitigation	5 E Model	Teacher Resources and Materials	In Class Student Activities Lab Resources	Online Resources
	<p>Phenomena Designed climate change mitigation solutions may have the impact to reduce or reverse the effects of climate change.</p> <p>Vocabulary climate change carbon emissions mitigation energy efficiency renewable energy concentrated solar power biofuels solar electricity wind electricity nuclear electricity hydrogen fuel carbon capture</p>	<p>Engage Students are introduced to carbon emission rates and carbon emission mitigation strategies, including 15 wedge mitigation strategies. Students will respond with notice and wonder statements along with completing a mitigation strategies chart. Students will complete their predictions by finishing an initial stabilization wedge triangle.</p>	<p>Climate Change Mitigation – TR Lesson Plan</p> <p>Mitigation Wedge Strategies – PowerPoint</p> <p>Mitigation Wedge Strategies – Nearpod</p>	<p>Mitigation Wedge Strategies – Nearpod</p> <p>Mitigation Strategies – Chart</p> <p>Mitigation Plan Prediction</p>	<p>En-ROADS Climate Interactive – This simulation model is used to explore how to address global energy and climate challenges through large-scale policy, technological, and societal shifts.</p> <p>Ten Ways You Can Mitigate Climate Change – This resource from The Paleontological Research Institution offers a variety of ways to mitigate climate change.</p>
		<p>Explore Students, in “expert” groups will gain additional information on three wedge mitigation strategies using resource cards and a wedge strategies table. Students will share out their work with group members using a small group discussion protocol.</p>	<p>Expert Group Jigsaw Protocol</p> <p>Expert Group Task Card #1</p>	<p>Wedge Mitigation Strategies Resource Cards</p> <p>Wedge Mitigation Strategies Table</p> <p>Wedge Mitigation Strategies Graphic Organizer</p>	
		<p>Explain Students construct their own mitigation triangle using 10 wedge mitigation strategies using Home Group Task Card #2.</p>	<p>Mitigation Wedge Strategies – Nearpod</p> <p>Home Group Task Card #2</p>	<p>Mitigation Wedge Strategies – Nearpod</p> <p>Home Group Task Card #2</p>	
		<p>Elaborate Students create a mitigation plan and a presentation following a discussion regarding each of their wedge mitigation strategies.</p>	<p>Mitigation Plan</p> <p>Mitigation Wedge Pieces</p> <p>Cooperative Group Roles</p>	<p>Mitigation Plan</p> <p>Mitigation Wedge Pieces</p> <p>Cooperative Group Roles</p>	
		<p>Evaluate Students analyze their mitigation plans as a group and on an individual basis. The individual analysis includes the impact of the mitigation plan on two community members.</p>	<p>Mitigation Plan -Group Analysis Teacher</p>	<p>Mitigation Plan – Group Analysis</p> <p>Mitigation Plan – Individual Analysis</p>	
	<p>Lesson Connection to Storyline: Developing mitigation strategies to reduce carbon emissions and worldwide atmospheric temperature increases relies on knowledge of how various systems work together. Climate and the conditions that are responsible for climate change are both multi systemic. Mitigation strategies must also follow suit and address climate change at the same level.</p>				

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Time Frame	Carbon Capture	5 E Model	Teacher Resources and Materials	In Class Student Activities Lab Resources	Online Resources
	<p>Phenomena Designed climate change mitigation solutions may have the impact to reduce or reverse the effects of climate change.</p> <p>Vocabulary climate change greenhouse effect greenhouse gases mitigation carbon cycle carbon dioxide carbon sink anthropogenic fossil fuel Carbon Capture, Utilization, & Storage (CCUS) enhanced fuel recovery terrestrial sequestration</p>	<p>Engage Students are introduced to Carbon Capture, Utilization, & Storage (CCUS) with the use of a KWL Chart.</p> <p>Explore Students will participate in a Lab – Enhanced Fuel Recovery Model to determine how using carbon dioxide allow additional oil and gas to be recovered from reservoirs that are slowing production.</p> <p>Explain Students expand their understanding of carbon capture, utilization, & storage by participating in a jigsaw using student information text.</p> <p>Elaborate Students will work in cooperative groups to research an assigned Carbon Sequestration Regional Partnership.</p> <p>Evaluate</p>	<p>Carbon Capture Lesson Plan Carbon Capture Lesson PowerPoint CCUS Vocabulary Carbon Dioxide & CCUS KWL Chart</p> <p>Enhanced Fuel Recovery Model – Teacher (Nearpod Video) Lab – Enhanced Fuel Recovery Model – Teacher Resource Dry Ice Safety</p> <p>CCUS Reading Jigsaw Protocol</p> <p>Research Regional Sequestration Partnerships – Teacher Resource Carbon Sequestration Regional Partnerships</p>	<p>Carbon Dioxide & CCUS KWL Chart</p> <p>Lab – Enhanced Fuel Recovery Model</p> <p>CCUS – Student Text CCUS Reading Jigsaw Protocol</p>	<p>North American Oil and Gas Reservoirs</p> <p>Top 10 U.S. Gas Fields</p> <p>Carbon Sequestration Regional Partnerships Initiative – The mission of this initiative is to drive innovation and deliver solutions for an environmentally sustainable and prosperous energy future.</p> <p>Center for Climate and Energy Solutions – Carbon Capture – This website offers more background on the technology of carbon capture.</p>
	<p>Lesson Connection to Storyline: One strategy to mitigate the effects of climate change is Carbon Capture, Utilization, and Storage. Students gain deeper perspective of this strategy to reduce atmospheric carbon dioxide levels.</p>				

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Time Frame	Mitigation, Adaptation, and Solutions to Climate Change and Harmful Algal Blooms (HABs) in the Lake Erie Watershed	5 E Model	Teacher Resources and Materials	In Class Student Activities Lab Resources	Online Resources
	<p>Phenomena Lake Erie has been experiencing excessive algal growth.</p> <p>Vocabulary harmful algal blooms (HABS) mitigation adaptation riparian buffer run-off wastewater nutrient pollution advocacy Environmental Protection Agency (EPA) Buffalo-Niagara Waterkeeper (BKWK)</p>	<p>Lesson Phenomena/Setting the Stage Students are introduced to the Toledo Ohio water crisis (2014) and asked to capture their thoughts and behaviors through medium of choice if their water supply was contaminated for 24 hours.</p>	<p>Mitigation, Adaption, and Solutions to Climate Change and Harmful Algal Blooms (HABS) in the Lake Erie Watershed - TR Lesson Plan</p> <p>Lesson PowerPoint</p> <p>Toledo Water Crisis (Nearpod Video)</p>	<p>Urban Water Cycle</p>	<p>10 Personal Solutions from Union of Concerned Scientists – 10+ ways to reduce individual impact of climate change.</p> <p>EPA - Climate Change Adaptation Resource Center – Key regional climate change impact guides with examples of how communities area adapting to climate change.</p>
		<p>Performance Task Students are introduced to the performance task for this lesson – Media Awareness Campaign</p>	<p>Essential Project Design Elements</p> <p>Question Starts/Questions Only</p> <p>Driving Question Board</p>	<p>Performance Task Description- Media Awareness Campaign (Notes Organizer)</p>	<p>NASA: Solutions to Climate Change – Resources that provide solutions to climate change at national and global levels.</p>
		<p>Engage Students are given the opportunity to connect their prior knowledge surrounding causes of climate change and HABs and elicit student ideas on possible solutions.</p>	<p>Idea Carousel</p>	<p>Investigating Mitigation, Adaptation, and Solutions Graphic Organizer</p> <p>WWF Article - What is the difference between climate change mitigation and adaptation?</p> <p>Venn Diagram to compare/contrast climate change mitigation and adaptation</p>	<p>NOAA - Climate Tech – Collection of articles on the use of technology and climate change.</p>
		<p>Explore Students explore solutions to climate change and HABs and develop ideas about which solutions they find useful with addressing climate change and HABs.</p>	<p>Resource Index - Climate Change and Harmful Algal Blooms (HABS)</p> <p>Investigating Mitigation, Adaptation, and Solutions Graphic Organizer</p> <p>Domino Share</p>		<p>NYS DEC - Harmful Algal Blooms (HABS) – HAB warning sign and related informational links.</p> <p>EPA - Sources & Solutions to Nutrient Pollution – Sources and solutions to nutrient pollution that contributes to HABs.</p>

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		<p>Explain Students will develop an understanding of possible mitigation and adaption solutions to address increasing HABS due to climate change in the Lake Erie Watershed.</p>	<p>Saving the Great Lakes from Toxic Algae (Nearpod Video)</p> <p>Buffalo Niagara Waterkeeper (BNWK) - Learn about Harmful Algal Blooms (HABs) (Nearpod Video)</p> <p>Talk-Think-Open Exchange</p> <p>Buffalo Niagara Waterkeeper (BNWK) - Harmful Algal Blooms (HABs) Activity 1: Erosion Model (Extension activity)</p>		<p>NOAA - Harmful Algal Blooms – Information related to clean up and mitigation of HABS.</p> <p>NASA Technology - HABs – NASA’s use of technology to combat HAB’s</p>
		<p>Elaborate Following either visits to a local shoreline or a virtual visit, students research and choose a specific mitigation, adaptation or solution to Climate Change or HABS and how the two are connected. Students are encouraged to investigate solutions in depth using various resources.</p>	<p>Buffalo Niagara Waterkeeper (BNWK) - Harmful Algal Blooms (HABs) Activity 2: Riparian Zone Restoration Tour</p> <p>Riparian Buffer Diagram (EPA)</p> <p>Buffalo Niagara Waterkeeper (BNWK) Living Shorelines</p> <p>Living Shoreline - North Tonawanda Botanical Gardens (Nearpod Video)</p>	<p>Notice/Wonder – Graphic Organizer</p> <p>Graphic Organizer - Digging Deeper</p>	
		<p>Evaluate Students will complete all sections of the Performance Task Notes Organizer their present their project from their Performance Task.</p>		<p>Performance Task Notes Organizer</p> <p>Adobe Creative Cloud Express</p>	
	<p>Lesson Connection to Storyline: Harmful Algal Blooms (HABS) is one impact of climate change that is a local issue and effects Lake Erie. As students learn about HABS, they develop the ability to investigate and determine the best possible mitigation techniques and/or solutions.</p>				

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Time Frame	Green Careers	5 E Model	Teacher Resources and Materials	In Class Student Activities Lab Resources	Online Resources
	<p>Phenomena- New technologies for solutions to and mitigation of climate change provide opportunities for novel career opportunities.</p> <p>Vocabulary Green Careers</p>	<p>Engage Students will be introduced to Green STEM careers through a series of questions and viewing a video.</p>	<p>Green Careers Lesson Plan Green Careers PowerPoint Best Jobs in Climate Change Questions 2 x 2 x 2</p>		<p>BPS CTE Green Technology Program – Program description with college and career options for students interested in BPS Green Technology Program.</p> <p>Erie County Sustainability Programs - This resource provides information on the programs and actions that Erie County is providing residents with regards to Climate Action and Sustainability.</p>
		<p>Explore Students will participate in the Green Career Skills Spectrum Activity in order to learn about skill sets required for Green career choices.</p>	<p>Green Career Skills Spectrum Activity</p>		
		<p>Explain Students will research a green career option from a Green STEM Career resource.</p>	<p>Green STEM Career Resource Green STEM Career Analysis</p>	<p>Green STEM Career Resource Green STEM Career Analysis</p>	
		<p>Elaborate Students will create a PowerPoint presentation with their information from their Green STEM Careers Students as audience members will take notes.</p>	<p>Green STEM Career PowerPoint Assignment/Criteria Green STEM Career Presentation Rubric Green STEM Career Presentation Note Capture Tool</p>	<p>Green STEM Career PowerPoint Assignment/Criteria Green STEM Career Presentation Rubric Green STEM Career Presentation Note Capture Tool</p>	
		<p>Evaluate Students will write a reflection regarding Green STEM Careers and their impact on mitigation of or a solution to climate change.</p>			
	<p>Lesson Connection to Storyline: Solutions to climate change along with climate change mitigation strategies and the study of climate science will need individuals with a variety of skill sets and education levels to lead and further progress. This lesson explores some possible career choices that offer these opportunities.</p>				

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Resources

[4th National Climate Assessment](#) – Assessment of the science behind climate change and variability and its impacts across the United States, now and throughout this century

[NOAA](#) – National Oceanic and Atmospheric Administration

[Climate Data Sources](#) – This collection of data sources from NOAA are grouped based on the following categories – Climate Data, Climate Data shown creatively, Plants & Animals, Human Health, Environmental Justice/Socio-economic data, Weather, Water, Agriculture, Other.

[NCOOS – Lake Erie Harmful Algal Bloom Forecast](#) – Lake Erie satellite imagery and forecasted algal bloom data.

[Climate Central](#) – Videos, data, graphics, and articles related to climate change and the impact on the public

[As flooding amplifies along the East Coast, Buddhist and Jewish faith leaders join the climate fight](#)** - Climate Central article that explains how religious leaders are joining to create solutions to climate change

[Urban heat even affects small cities. Biddeford is doing something about it](#)** - Climate Central article focused on small municipality in Maine who created a Task Force charged with creating a plan for mitigation of climate change

[Living Landscapes: Northeast Region](#) ** - Resources include videos, essays, and climate science fundamentals through a Native American lens

[Our Climate Our Future – Indigenous Solutions with Alexis Raeana](#)** – 73 questions concerning Indigenous solutions to the climate solution are addressed in this lively and engaging video.

[Our Climate Our Future – Racial Justice is Climate Justice](#)** - The fight for racial justice and the fight for climate justice overlap in many ways from air pollution to hurricane evacuees.

[United Nations – What is Climate Change?](#) – Resource from the United Nations has information about global solutions to climate change

[The US East coast is set to become a green energy job powerhouse](#) – This Climate Central article informs the reader about green energy jobs created by building offshore wind farms

[Getting the Picture: Our Changing Climate](#) – Multimedia interactive resource uses an interdisciplinary approach infusing geography, science, and art for climate education

[NYC’s Trees: A Natural Defense Against Heat, but Not Equally Shared](#) ** - Climate Central reports on the effects of tree coverage in NYC to reduce urban street temperatures including studies that demonstrate lower income neighborhoods have fewer trees

[NASA – Climate Change](#) - Articles, videos, data, and interactives from NASA about climate change

[EPA Climate Change](#) – General information including climate change facts, how climate change is addressed, and climate connections from the United States EPA

[Our Climate, Our Future](#) – Video series that educates young people on the science of climate change and empowers young people to take action

[Protecting Indigenous Lands](#) ** – This video offers information about young people of Indigenous heritage who are raising awareness around protecting Indigenous lands and first foods from impacts of climate change

[Indigenous Climate Solutions](#)** - This animated short answers questions focused on Indigenous solutions to the climate emergency

[Energy 101: Solar PV](#) – This video shows how a PV (photovoltaic) panel converts the energy of the Sun into renewable electricity to power homes and businesses

[Careers in Renewable Energy](#) – This is a series of four videos of live events focused on STEM careers in renewable energy

[NYS P-12 Science Learning Standards \(HS\)](#) – NYSSLS Standards for grades 9-12

[NYSED Bilingual Glossaries](#) – NY Statewide Language Regional Bilingual Education Resource for NYSED approved bilingual glossaries

Group Learning Routines	Group Learning Routines to Support All Learners – All Strategies	Group Learning Routines – Pairs Turn, Exchange, Sort (Elbow Exchange) Questions Starts/Questions Only Questions 2x2x2 Dialogue Lines/Dialogue Circles	Group Learning Routines – Small Groups Think-Talk-Open Exchange Read-Generate-Sort-Solve Buzzwords (Think-Talk-Exchange) – Teacher Directions Buzzwords (think-Talk-Exchange) – Template	Group Learning Routines – Whole Class Domino Share Rumors Idea Carousel Exhibition I used to think...Now I think...
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English Language Learners (ELL) Enhancements

To access [hyperlinked](#) material, you must be logged into your BPS Google Drive

Listening

- **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
- **Activating Prior Knowledge**
- **Visuals** - GIFs, pictures- will assist students in understanding what they are listening to. Use **visual thinking strategies** to set the lens for learning.
- Video to review or introduce a topic – use **closed captioning** to help students see the words and pronunciations while they listen to the content.
- **Word stretching / Vowel stretching** when instructing allows student to listen closely to the pronunciation of the word
- **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.

Speaking

- **Sentence Frames** To begin a sentence - such as *The water cycle is...* or *I think that water cycle is...*
- **Academic Conversation Starters:** Have a visual of a list of academic sentence starters that students can refer to in a discussion. Examples include- I expect ____ to happen. My data shows that... This helps students have a more science focused dialogue.
- **Choral Reading** - To build fluency, self-confidence and motivation with **reading/speaking**
- Create **movement** to go with the word. Movement can be a motivating factor, as well as a 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.

Reading

- **Supplementary Text** to help reinforce concepts. If necessarily, use lower Lexile levels to ensure comprehension.
- **Visual Aids** - Pictures or models to support vocabulary words and concepts
- Video to review or introduce a topic - use **closed captioning** to help students read along while they listen to the 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
- **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 reading.
- **Vocabulary Morphology-** Morphology relates to the segmenting of words into affixes (prefixes and suffixes) and roots or base words, and the origins of words. Understanding that words connected by meaning can be connected by spelling can be critical to expanding a student's vocabulary.

Writing

- **Sentence Frames** - to begin a sentence- such as *The water cycle is...* or *I think that water cycle is....*
- **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.

Instructional Accommodations (depending on the student's needs)

- **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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<p>Special Education Modifications</p> <p>Special Education students must have accommodations as per Individual Educational Plan (IEP)</p>	<p><u>Instructional</u></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 Environmental Science concepts. 	<p><u>Technology:</u></p> <ul style="list-style-type: none"> ● Audio reading of text ● Text to type functions ● Videos to clarify/visualize Environmental Science 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><u>Other:</u></p> <ul style="list-style-type: none"> ● Arrange seating for maximum engagement and minimum distraction 	<p><u>In Class Assessments</u></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>Step Up to Writing</p> <p>Step Up to Writing materials can be found in BPS Science K-12 Schoology Folder → 12 Resources → Climate Science → Climate Science Curriculum → Curriculum Materials → Step Up to Writing Materials</p>	<p><u>SUTW Strategies/Skills</u></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>	<ul style="list-style-type: none"> ● Materials, resources, and/or discussions address diverse cultural backgrounds and real-world applications ● 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>		