

Sayreville Public Schools
Environmental Science CP 5

Environmental Science

Sayreville War Memorial High School

5 Credits

Full Year

Date Curriculum Approved/ Revised: 6/26/18

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Statement of Purpose

The goal of the Environmental Science course is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, and to examine alternative solutions for resolving or preventing them.

Environmental science is interdisciplinary; it embraces a wide variety of topics from different areas of study. Yet there are several major unifying constructs, or themes, that cut across the many topics included in the study of environmental science. The following themes provide a foundation for the structure of the Environmental Science course.

1. Science is a process.

Science is a method of learning more about the world. Science constantly changes the way we understand the world.

2. Energy conversions underlie all ecological processes.

Energy cannot be created; it must come from somewhere. As energy flows through systems, at each step more of it becomes unusable

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3. The Earth itself is one interconnected system.

Natural systems change over time and space. Biogeochemical systems vary in ability to recover from disturbances.

4. Humans alter natural systems.

Humans have had an impact on the environment for millions of years. Technology and population growth have enabled humans to increase both the rate and scale of their impact on the environment.

5. Environmental problems have a cultural and social context.

Understanding the role of cultural, social, and economic factors is vital to the development of solutions.

6. Human survival depends on developing practices that will achieve sustainable systems.

A suitable combination of conservation and development is required. Management of common resources is essential.

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Unit 1: Introduction to Environmental Science

Summary of the Unit: The unit describes the study of environmental science, how we define sustainability, and that science is a process and a method of learning more about the world. It explores how Environmental Ethics are a result of how Environmental Science interacts with, and is guided by, a society’s morals and principles. Science constantly changes the way we understand the world and informs the policies put in place to mitigate human impact. Therefore, the relationship between economics and the environment will govern how national and international environmental policies are working toward sustainability.

Enduring Understanding: We can use science to study and understand the complex interactions between humans and their environments. Humans must practice sustainable methodologies to conserve resources. Governments must work with each other and citizens to form sound environmental policy.

Essential Questions: How do scientists uncover, research, and solve environmental problems? What does it mean to “do science”? What happens to a scientific study after data have been gathered and the results are analyzed? How can we best balance our own interests and needs with the health of the environment? How is sustainability affected by economics?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Quarterly Exam

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	Suggested Benchmarks/ Assessments	NJSLs
Engineering Challenge	5-6 days	Explain Phenomena in Terms of Concepts. Analyze the specifications of a system. Create a model and then Revise the design.	Collaboratively discuss variables that influence a system Choose an independent variable to test and the materials to create new model/ revised.	Experimental design activity Analysis Questions Best design solution Competition	HS-LS2-3, HS-ETS1-2, MP.4, HS-ESS3-2

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<p>Humans and the Environment</p>	<p>12 days</p>	<p>Analyze the vertical structure of Earth’s atmosphere, to account for the global, regional, and local variations of these characteristics and their impact on life.</p> <p>Classify the layers of the atmosphere based on their altitude and other characteristics.</p> <p>Evaluate the recent trends in human population and resource consumption.</p> <p>Explain the phenomena of The Tragedy of the Commons.</p> <p>Compare over time the impact of human activity on the cycling of matter and energy through ecosystems.</p>	<p>Central Case Study: “Fixing a Hole in the Sky”</p> <p>Research & Create a poster, to model the ozone hole when first identified and at an interval since.</p> <p>Create a graphic organizer with the atmospheric data</p> <p>Complete guided reading citing evidence from the text.</p> <p>Finite Resources, Modeling activity.</p>	<p>Analysis Questions</p> <p>Poster Project</p> <p>Graphic Organizer</p> <p>Guided Reading and whole class discussion</p> <p>Finite Resources Activity Analysis Questions</p> <p>Section Quiz</p>	<p>HS-ESS-1-5, HS-ESS-2-1, HS-ESS-2-3, HS-ESS-3-3, HS-LS2-1, 2-6, 2-7, HSN-Q.A.1 RST.11-12.1,</p>
<p>Ecological Footprint & Plastic</p>	<p>10 days</p>	<p>Formulate the percentage by which people in the world are “overshooting” available Resources.</p> <p>Apprise the limits of recycling by examining their town’s</p>	<p>Using real data, calculate & compare the ecological footprint of different countries</p> <p>View “Bag It” to look at how things are recycled</p>	<p>Ecological Footprint Worksheet</p> <p>Plastic Separation Lab</p>	<p>HS-ESS-3-3, HS-ESS-3-6, HS-PS-1-1, HS-PS-2-6, HSN-Q.A.1 RST.11-12.1</p>

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		<p>recycling rules and by taking a closer look at the process in films.</p> <p>Create a model for the formation of plastic polymers.</p> <p>Analyze the results of several studies on plastics in the ocean - chemical leaching out AND chemicals leaching in.</p> <p>Investigate the lipophilic properties of plastics</p> <p>Evaluate the impact of plastics on the ocean.</p>	<p>and what happens to them after that.</p> <p>Computer simulation and a polymer kit.</p> <p>Crosslinking the polymer Lab</p> <p>Use magic sand mixed with water to observe the lipophilic properties of plastics</p>	<p>Model of plastic</p> <p>Analysis questions</p> <p>Interpret the results of the plastic studies</p> <p>Section Quiz</p>	
Science Concepts & Environmental Ethics	2-3 Day	<p>Explain the Nature of Science</p> <p>Explore environmental ethics to apprise how environmental science interacts with, and is guided by a society's morals and principles</p>	<p>Investigate the process of science</p> <p>Discussion centering around 3 important ethical standards in environmental ethics</p>	<p>Scientific Method lab</p> <p>Student responses to discussions.</p>	
Economics and Environmental Policy	10 days	<p>Analyze how to best balance human interests and needs with the health of the environment.</p> <p>Investigate the 2 basic concepts of economics.</p>	<p>Central Case Study: "Cleaning the Tides of San Diego & Tijuana"</p> <p>Complete guided reading citing evidence from the text.</p>	<p>Analysis Questions</p> <p>Guided Reading and whole class discussion</p>	<p>HS-ESS-3-2, HS-ESS-3-3, HS-ESS-3-4, HS-ESS-6-, ETS1-3 RST.11-12.1, HS-LS2-2,4, 2-6, MP.2, HSN.Q.A.1, HSN.Q.A.2, HSN.Q.A.3</p>

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		<p>Explain the relationship between economics and the environment.</p> <p>Asses the economic value of vegetation to a community and its residents.</p> <p>Research and analyze an environmental policy</p>	<p>-Cost-Benefit Analysis Quick Lab</p> <p>Collaboratively research an environmental policy using Chrome Books.</p>	<p>Cost-Benefit Analysis Lab Worksheet</p> <p>Google Slides Presentation</p>	
Review and Assess	2-3 Days	Students will review information gained throughout the unit in preparation for a summative assessment	Review assignment, review game or activity	Quarterly Assessment	HS-ESS-1-5, HS-ESS-2,1-3, HS-LS2-1, 2-6, 2-7, HSN-Q.A.1 RST.11-12.1, HS-ESS-3,2-4, HS-ESS-6-, ETS1-3, RST.11-12.1, MP.2, HSN.Q.A.1
<p>Suggested Modifications for Special Education, English Language Learners and Gifted Students: Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA); Structure lessons around questions that are authentic, relate to students’ interests, social/family background and knowledge of their community.; Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).; Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).; Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).; Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.; Use project-based science learning to connect science with observable phenomena.; Structure the learning around Explaining or solving a social or community-based issue.; Provide ELL students with multiple literacy strategies. ; Collaborate with after-school programs or clubs to extend learning opportunities. *Consistent with individual plans, when appropriate.</p>					
<p>Suggested Technological Innovations/ Use: Google Classroom, Google Drive, Prezi, Animoto, Web Quests, Virtual labs, Simulations, Discovery Education, Bozeman, Kahoot and Pear Deck</p>					

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Cross Curricular/ 21st Century Connections:

9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.

9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

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Unit 2: Systems in Environmental Science

Summary of the Unit: The unit describes which properties of matter are most important to environmental systems. It will review the concept of systems in nature, and the unique properties of water that make it essential to life. Key ideas from chemistry and physics are used to help understand the environment and to measure human impacts on the environment. Earth’s spheres (geosphere, lithosphere, biosphere, atmosphere, and hydrosphere) are defined according to their function in Earth’s systems. Furthermore, Plate Tectonic Theory and the rock cycle will explain the past and current movements of the rocks at Earth’s surface and provide a framework for understanding geologic history which has impacted the Biogeochemical Cycles affecting the movement of water, energy, and nutrients that organisms need to grow and reproduce.

Enduring Understanding: Earth's landscapes are the results of interactions within the earth's natural systems. Elements are constantly cycling through earth's systems. Earth's landscapes are the results of interactions within the earth's natural systems. By their very presence, humans alter natural systems.

Essential Questions: How do the nonliving parts of the Earth’s systems provide the basic materials to support life? What properties of matter are most important to environmental systems? What types of systems play roles in environmental science? What are the characteristics of Earth’s geosphere, biosphere, atmosphere, and hydrosphere? How do nutrients cycle through the environment?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Quarterly Exam

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	Suggested Benchmarks/ Assessments	NJSLs
Matter and the Environment	5-8 days	Evaluate the nonliving parts of Earth's system. Analyze how the nonliving parts provides the essential material to support life.	Central Case Study: “The Gulf of Mexico’s Dead Zone”	Analysis Questions	RST.11-12.1-2, HS-LS2,2-3,2-6, HS-LS4,5-6, HS-ESS2-5, HS-ESS3-4

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		<p>Differentiate among an atom, an element, a molecule, and a compound.</p> <p>Differentiate the unique properties of water.</p> <p>Analyzing the Properties of Water through Investigation Lab.</p>	<p>Using prior knowledge complete a pre-test</p> <p>Unique Properties of Water Exploration Lab</p>	<p>Pre-test of Building blocks of chemistry</p> <p>Lab Conclusion Questions</p> <p>Water Quiz/Post-test of Building blocks of chemistry</p>	
Earth's Spheres: Geosphere, lithosphere, biosphere, and hydrosphere	4-5 days	<p>Illustrate the compositional layers of the earth's interior by creating a scale model.</p> <p>Apprise the compositional layers of the earth's interior.</p>	<p>Design a scale model of the interior of the Earth</p> <p>Video: Why Does the Earth Have Layers?</p>	<p>Scale Model of Earth's interior</p> <p>Earth's Spheres Quiz</p>	MP.2, HSN.Q.A.1, HS-ESS1-5, HS-ESS2-2-4
Soil & Agriculture	6-8 days	<p>Compare Soil & Sand</p> <p>Conduct soil testing to identify different types of soil</p> <p>Define sustainable agriculture</p>	<p>Analyze a sample of soil & sand</p> <p>Investigate & identifying soil using the soil triangle</p> <p>Evaluate video on sustainable farming</p>	<p>Analysis questions</p> <p>Identification of the soil types</p>	HS-ESS2-2, HS-ESS2-5, HS-ESS3-4, HS-ESS3-6

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		<p>Describe modern practices and technological advancements farmers and ranchers use to improve agricultural sustainability</p> <p>Design a solution to a modern agricultural need or problem following a systematic engineering process.</p>	<p>Apply the concept of sustainability to agriculture.</p> <p>Discuss how technology can help humanity achieve sustainability agriculture.</p> <p>Conduct a series of virtual experiments involving erosion.</p>	<p>Writing Prompt on Sustainable Agriculture</p> <p>Chart of results</p> <p>Propose a solution for 2 online scenarios to help control erosion.</p>	
Plate Tectonics and the Rock Cycle	15 days	<p>Simulate the different types of plate boundaries by completing a lab on plate movement.</p> <p>Critique evidence supporting Wegener's Theory of Continental drift and the missing mechanism.</p> <p>Simulate the process that cause the different types of rocks to be formed.</p>	<p>Lab activity on plate boundaries</p> <p>A short video of on Wegener's theory of continental drift.</p> <p>Starburst rock lab.</p>	<p>Lab Analysis Questions</p> <p>Plate Tectonics Quiz</p> <p>Lab Analysis Questions</p> <p>Rock cycle Quiz</p>	HS-ESS1-5, HS-ESS2-2-4, HS-LS4-5-6,
Biogeochemical cycles	6-8 days	Develop 21st century research & collaborative skills	Collaboratively research using Chrome Books, the	Google Slides Presentation	HS-LS-2-3, HS-LS-2-4, HS-LS-2-6

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		Investigate the 4 biogeochemical cycles. Explain how water, carbon, nitrogen, and phosphorus cycles within ecosystems.	4 biogeochemical cycles. Biogeochemical cycles vocabulary -Biogeochemical Cycles Lab	Carbon Cycle Lab or Contributors to the Carbon Cycle Lab	RST.9-10.8, RST.11-12.1, RST.11-12.7, RST.11-12.8 WHST.9-12.2, WHST.9-12.5 MP.2, MP.4 HSN.Q.A.1 HSN.Q.A.2, HSN.Q.A.3
Review and Assess	2-3 days	Students will review information gained throughout the unit in preparation for a summative assessment	Review assignment, review game or activity	Quarterly Assessment	HS-LS-1-5, HS-LS-2-3, HS-LS-2-4, HS-LS-2-6, HS-LS-2-2 RST.9-10.8, RST.11-12.1, RST.11-12.7, RST.11-12.8 WHST.9-12.2 WHST.9-12.5 MP.2, MP.4 HSN.Q.A.1 HSN.Q.A.2 HSN.Q.A.3
<p>Suggested Modifications for Special Education, English Language Learners and Gifted Students: Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA); Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.; Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).; Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).; Provide multiple grouping opportunities for students to share their ideas and to encourage work among</p>					

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various backgrounds and cultures (e.g. multiple representation and multimodal experiences).; Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.; Use project-based science learning to connect science with observable phenomena.; Structure the learning around Explaining or solving a social or community-based issue.; Provide ELL students with multiple literacy strategies. ; Collaborate with after-school programs or clubs to extend learning opportunities.

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Suggested Technological Innovations/ Use: Google Classroom, Google Drive, Prezi, Animoto, Web Quests, Virtual labs, Simulations, Discovery Education, Bozeman, Kahoot and Pear Deck

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9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Unit 3: Humans and the Environment

Summary of the Unit: In this unit, students will explore the components of biodiversity which include how life varies across ecological levels; (genetic, species and ecosystem biodiversity), biodiversity distribution and the benefits of biodiversity, which leads to connecting the importance of protecting biodiversity to the health of the environment. Additionally, students will investigate the adverse impact of human activity on biodiversity and the main causes of biodiversity loss and extinction. Furthermore, students will assess the legal actions nations can take to protect biodiversity and compare strategies for managing individual species, whole ecosystems, and habitats. Consequently, students will examine the history of human population growth, the technological advances that have contributed to the recent trends in human population growth and predict how the human population growth rate may change in the future following the demographic transitions of nations. Accordingly, students will critique how the human population impacts their environment, including the negative and positive effects of technology. Moreover, students will analyze environmental health regarding the different types of environmental hazards and the factors that affect how people respond differently to those hazards. Finally, the unit will conclude with how natural disasters affect the health of the human population.

Enduring Understanding: Life on Earth depends on interactions among organisms and between organisms and their environment. Humans affect the global environment more than any other species alive today and there is a necessity to protect biodiversity, in order to support a stable ecosystem. Hence, there is a relationship between the health of the environment and the health of the human population.

Essential Questions: What is biodiversity? Why is global biodiversity decreasing? How can we protect and preserve biodiversity? How does the human population affect the environment? What is the relationship between environmental health and our own health?

Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Quarterly Exam

Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	Suggested Benchmarks/ Assessments	NJSLS

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<p>Components of Biodiversity</p>	<p>4 days</p>	<p>Develop a logical argument why it is important to protect biodiversity.</p> <p>Differentiate the components of biodiversity.</p> <p>Connect how biodiverse ecosystems provide economically valuable services and products.</p>	<p>Central Case Study; Saving the Siberian Tiger</p> <p>Guided Reading citing evidence from the text.</p> <p>Analyze the video documentary Earth from Above – Biodiversity.</p>	<p>Analysis Questions</p> <p>Guided Reading and whole class discussion</p> <p>Construct a list citing evidence of three specific ways that biodiversity has provided either a product or service that improves lives.</p> <p>Quiz on the components of biodiversity.</p>	<p>RST.11-12.1, RST.11-12.2, WHST.9-12.1, HSN.Q.A.2, MP.2, MP.4, HS-LS-2-1, HS-LS2-2, HS-LS2-6, HS-ESS3-1, HS-ESS3-2, HS-ESS3-3,</p>
<p>Biodiversity Loss & Conservation</p>	<p>10 days</p>	<p>Investigate the major causes of biodiversity loss.</p> <p>Develop 21st century research & collaborative skills.</p> <p>Explore a biodiversity hotspot.</p>	<p>Research an extinct or endangered plant/animal species that lived in New Jersey.</p> <p>Create a poster showing its biome, its common species, its endemic species, and reasons why it</p>	<p>Google Slides Presentation</p> <p>Hotspot Poster</p>	<p>RST.11-12.1, RST.11-12.2, WHST.9-12.1, WHST.9-12.7, SL.11-12.5, TECH.8.1.12. A.2, TECH.8.1.12.A.CS 2, HSN.Q.A.2, MP.2, MP.4, HS-LS-2-1, HS-LS2-2, HS-LS2-6, HS-</p>

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		<p>Evaluate Recovery and Reintroduction strategies for managing endangered species.</p> <p>Apply concepts of Biodiversity and conservation.</p>	<p>is losing biodiversity.</p> <p>Analysis of the Golden Lion Tamarin real data graph.</p> <p>Formulate responses to the biodiversity and conservation assessment.</p>	<p>Golden Lion Tamarin Math Activity</p> <p>Biodiversity and conservation assessment.</p>	<p>ESS3-1, HS-ESS3-2, HS-ESS3-3,</p>
Trends in Human Population Growth	12 days	<p>Examine population growth and the resources needed to keep cultures sustainable.</p> <p>Interpret data as a means to research historical periods</p> <p>Connect demographic transitions to population growth rates.</p> <p>Interpret data to make inferences about population growth.</p> <p>Explain how the age structure and sex ratio of a</p>	<p>Central Case Study; China's One-Child Policy</p> <p>Development in motion (gapminder.org) project.</p> <p>Analysis of Real data growth rates.</p> <p>Population pyramid / age structure diagram project.</p>	<p>Analysis Questions</p> <p>Class discussion on the pros and cons of longevity.</p> <p>Real data growth rates Math Activity.</p> <p>Age structure diagrams</p>	<p>RST.11-12.1, RST.11-12.2, WHST.9-12.1, WHST.9-12.7, SL.11-12.5, TECH.8.1.12. A.2, TECH.8.1.12.A.CS 2, HSN.Q.A.2, MP.2, MP.4, HS-LS-2-1, HS-LS2-2, HS-LS2-6, HS-ESS3-1, HS-ESS3-2, HS-ESS3-3,</p>

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		<p>population define its potential for growth.</p> <p>Apply concepts of human population</p>	<p>Formulate responses to the human population assessment</p>	<p>Human population assessment</p>	
<p>Environmental Health</p>	<p>15 days</p>	<p>Compare the relationship between environmental health and our own health.</p> <p>Investigate the chemical hazard DDT.</p> <p>Compare and contrast epidemiology and toxicology.</p> <p>Collaboratively formulate responses to the guided reading.</p> <p>Explain the reasons why individuals respond differently to the same environmental hazard</p> <p>Analyze how infectious disease spreads.</p>	<p>Central Case Study; The rise and Fall and Rise of DDT.</p> <p>Guided Reading citing evidence from the text.</p> <p>Tracking an Outbreak inquiry activity.</p>	<p>Analysis Questions</p> <p>Guided Reading and whole class discussion</p> <p>Tracking an Outbreak inquiry activity analysis questions</p>	<p>RST.11-12.1, RST.11-12.2, WHST.9-12.1, WHST.9-12.7, SL.11-12.5, TECH.8.1.12. A.2, TECH.8.1.12.A.CS 2, HSN.Q.A.2, MP.2, MP.4, HS-LS-2-1, HS-LS2-2, HS-LS2-6, HS-ESS2-1, HS-ESS2-7, HS-ESS3-1, HS-ESS3-2, HS-ESS3-3, HS-ESS3-4, HS-ETS1-3</p>

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		<p>Design a public service announcement to encourage other teens to avoid a lifestyle choice that is a social hazard.</p> <p>Inventory & Analyze household hazardous materials, to learn how to use, store and dispose of them safely.</p> <p>Investigate hazardous chemicals in the environment.</p> <p>Analyze how Natural Disasters effect the human population</p>	<p>Create and design a public service announcement.</p> <p>Home Hazmat Survey Inquiry Activity</p> <p>Biomagnification simulation.</p> <p>Research a Natural Disaster.</p>	<p>Public service announcement Poster</p> <p>Home Hazmat Survey Inquiry Activity analysis questions</p> <p>Biomagnification simulation analysis questions</p> <p>Google Slides presentation</p>	
Review and Assess	2-3 days	Students will review information gained throughout the unit in preparation for a summative assessment	Review assignment, review game or activity	Quarterly Assessment	RST.11-12.1, RST.11-12.2, WHST.9-12.1, HS-LS-2-1, HS-LS2-2, HS-LS2-6, HS-ESS3-1, HS-ESS3-2, HS-ESS3-3, HS-ESS3-4
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Unit 4: Toward a Sustainable Future

Summary of the Unit: The unit describes not only the causes of our unsustainability, but the effects and solutions thereof. The goal of a sustainable future is a path; understanding why and how the earth is in its current state is essential to explore the alternatives necessary to make a change. Exploring the earth's current climate, the concept and effects of climate change, and the response necessary for sustainability will lead to an investigation through nonrenewable energy and renewable energy alternatives. An overview of energy, an understanding of fossil fuels and their consequences of use, and an analysis of nuclear power will be covered before renewable energy alternatives are examined. After climate change and nonrenewable energy are understood, biomass, geothermal energy, hydropower, ocean energy, solar power, wind energy, and energy from hydrogen will be interpreted. Toward a Sustainable Future will make a connection between climate change, nonrenewable energy, and renewable energy alternatives.

Enduring Understanding: All human societies across the world depend on water, energy, and food. As demand for these resources continues to increase, using them sustainably is a critical concern for scientists and citizens, governments, and policy makers. In today's world, water, energy, and food are each subject to ever-growing demand. There is also an imbalance between demand and availability in many places leaving millions of people with a shortage of these resources. Climate change is also exacerbating both demand and availability. Factors that threaten access to these resources are of concern to everyone on the planet, from citizens and communities to corporations and countries. Water, energy, and food are intimately interlinked: water is required to produce energy and food, energy is required to produce water and food, while food can be a source of energy. Actions in one sector are likely having impacts on other sectors which can result in conflicts or competition. We consider a move to greater sustainability, in all aspects of life, critical to our future. We only have one earth. We must find ways to reduce our harmful impact on the environment. Today's decisions define our future environment.

Essential Questions:

Global Climate Change: What are the causes and consequences of warming the earth? What factors determine earth's climate? What evidence shows that global climate change is occurring, and why is it happening? What are the effects of climate change? How can we respond to climate change?

Nonrenewable Energy: Can we depend on nonrenewable energy sources for our energy needs? What is energy and how is it used? How did fossil fuels form, and how are they obtained and used? What problems are associated with fossil fuel use? What are the advantages and disadvantages of nuclear energy?

Renewable Energy Alternatives: What are the potential uses and limitations of renewable energy sources? How can we use biomass energy and geothermal energy? How can water be used to address energy needs? How can we rely on the sun and wind for power? How can we use hydrogen as a source of energy?

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Summative Assessment and/ or Summative Criteria to demonstrate mastery of the Unit. Quarterly Exam					
Topic/ Selection	Suggested Timeline per topic	General Objectives	Instructional Activities	Suggested Benchmarks/ Assessments	NJSLS
Nonrenewable Energy	7 – 10 days	<p>Analyze and explain what energy is and how/why humans use non-renewable energy sources</p> <p>Identify common forms of nonrenewable energy and their applications</p> <p>Relate energy use to the many technologies used in our daily lives</p>	<p>Choose a type of fossil fuel and illustrate its effects, how it is collected, used and advantages/disadvantages</p> <p>Central Case Study</p> <p>Complete guided reading citing evidence from the text.</p> <p>Calculate the amount of a fossil fuel used by different groups of people to view nonrenewable energy use using different perspectives</p> <p>Select a topic about nonrenewable resources,</p>	<p>Fossil Fuels Poster Project</p> <p>Analysis Questions</p> <p>Guided Reading and whole class discussion</p> <p>Ecological Footprints Oil Consumption Quick Lab Worksheet</p>	<p>HS-ESS3-1, HS-ESS3-2, HS-ESS3-3, <i>SCI.9-12.5.1.12. B, SCI.9-12.5.2.12. B, SCI.9-12.5.4.12. E, TECH.8.1.12.B.CS1</i></p>

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		<p>Research a topic on fossil fuels then creatively teach that topic</p> <p>Create objectives and assessments about a topic on fossil fuels</p>	<p>then research. Teach the material to the rest of the class.</p>	<p>Students as Teachers Presentation</p>	
<p>Renewable Energy Alternatives</p>	<p>7-10 days</p>	<p>Identify common forms of renewable energy alternatives and their applications</p> <p>Label different devices and technologies used to harness renewable energy alternatives</p> <p>Explore local renewable energy alternatives in a relatable and real-world setting</p> <p>Connect and explain reasons for alternative energy</p>	<p>Small group research & discussion of renewable energy alternatives</p> <p>Research and label parts to understand the mechanisms of the technologies</p> <p>Locate a local source of renewable energy. Research and illustrate local forms of clean energy.</p> <p>Review assignment, review game, or activity</p>	<p>Small groups will share discussions with the class</p> <p>Labeling Activity</p> <p>Regional Renewable Energy Activity</p> <p>Study Guide and Section Test</p>	<p><i>SCI.HS, SCI.HS-PS3-2, HS-ESS3-1, HS-ESS3-2, HS-ESS3-3, TECH.8.1.12.C</i></p>
<p>Global Climate Change</p>	<p>12 days</p>	<p>Identify topographical features that may influence climate</p>	<p>Complete guided reading citing evidence from the text.</p>	<p>Guided Reading and whole class discussion</p>	<p><i>SCI.HS-PS3-4, SCI.HS-LS2, SCI.HS-LS2-7, TECH.8.1.12.C, TECH.8.1.12. D, 9-12.</i></p>

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		<p>Evaluate if storms are increasing in intensity</p> <p>Research specific examples of evidence of global climate change</p> <p>Explore ways to reduce the consumption of fossil fuels for transportation</p> <p>Model a typical ecosystem where greenhouse gases effect the climate</p>	<p>Exploration - Climate Change Lab Station Activity</p> <p>Use models to represent greenhouse gases and infer what can be suggested about carbon dioxide's effect on Earth's temperature.</p>	<p>Station "passport" (group record of station work)</p> <p>Effects of Greenhouse Gases Lab</p>	<p><i>HS-ESS1-1.2.1, 9-12. HS-ESS2-1. ESS2. A.1</i></p>
Review and Assess	2-3 Days	Students will review information gained throughout the unit in preparation for a summative assessment	Review assignment, review game or activity	Quarterly Assessment	<p>HS-ESS3-1, HS-ESS3-2, HS-ESS3-3, <i>SCI.9-12.5.1.12.B, SCI.9-12.5.2.12.B, SCI.9-12.5.4.12.E, TECH.8.1.12.B.CS1, SCI.HS, SCI.HS-PS3-2, SCI.HS-PS3-4, SCI.HS-LS2, SCI.HS-LS2-7, TECH.8.1.12.C, TECH.8.1.12.D, 9-12.HS-ESS1-1.2.1, 9-12.HS-ESS2-1.ESS2.A.1</i></p>

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<p>Suggested Modifications for Special Education, English Language Learners and Gifted Students: Restructure lesson using UDL principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA); Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.; Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).; Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).; Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).; Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.; Use project-based science learning to connect science with observable phenomena.; Structure the learning around Explaining or solving a social or community-based issue.; Provide ELL students with multiple literacy strategies. ; Collaborate with after-school programs or clubs to extend learning opportunities.</p> <p>*Consistent with individual plans, when appropriate.</p>					
<p>Suggested Technological Innovations/ Use: Google Classroom, Google Drive, Prezi, Animoto, Web Quests, Virtual labs, Simulations, Discovery Education, Bozeman, Kahoot and Pear Deck</p>					
<p>Cross Curricular/ 21st Century Connections:</p> <p>9.1 21st Century Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.</p> <p>9.2 21st Century Life and Career Skills: Personal Financial Literacy: All students will develop skills and strategies that promote personal and financial responsibility related to financial planning, savings, investment, and charitable giving in the global economy.</p> <p>9.3 21st Century Life and Career Skills: Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.</p>					