Unit 7: Climate Change Interdisciplinary Curriculum Unit

Content Area: **Science**
Course(s): **SCIENCE**
Time Period: **3rd Marking Period**
Length: **4-5 Weeks**
Status: **Published**

Section Title

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Climate Change Interdisciplinary Curriculum

Summary of the Unit

In this unit of study, students will analyze and interpret data to deepen their understanding of how human activities impact Earth's systems by engaging in scientific inquiry and critical thinking. Students will gather and assess information from various sources, such as environmental studies, climate data, and pollution reports, to identify patterns and trends in their community. By interpreting this data, students can grasp the connection between human actions and natural processes as they relate to the environment. This approach allows them to design innovative solutions aimed at reducing negative effects, such as developing sustainable practices, promoting renewable energy, and advocating for changes within the local community. Through this process, students not only enhance their scientific literacy but also become proactive people of the environment, equipped with the knowledge and skills to drive positive change.

Enduring Understandings

- Human actions along with natural changes in Earth's environment have impacted the environment overall, often harming, destroying, or depleting habitats and natural resources and leading to the shortage and extinction of materials and animals.
- Usually, as human populations grow and use more natural resources, the harmful effects on Earth also increase, unless the activities and technologies are designed to be better, we will continue to face these issues.
- Relationships can be either cause-and-effect or just coincidental, and just because two things happen together does not mean one caused the other.
- The use of technology and any limits on it depend on what individuals or society need, want, and value; on scientific research; and factors like climate, natural resources, and economic

conditions. Therefore, technology use differs across regions and over time.
- There are organized methods for creating and assessing solutions to see how well they solve a problem within given criteria and limitations.

Essential Questions

- How do we monitor the health of the environment (our life support system)?
- What does it mean to "go green"?
- Is there anything that can be done to remedy the problems that exist with our natural resources?
- Is it possible to predict and protect ourselves from natural hazards?
- What is climate and how does it compare to weather?
- What are temperature anomalies and what does this mean in terms of climate?
- What causes the climate and weather on Earth?
- What causes global climate change?
- How does global climate change impact society?
- How do scientists know what the past climate was like?
- What are some technologies and behaviors that will help to reduce climate change?
- What is a natural resource?
- What makes a natural resource renewable? Non-renewable?
- Where do natural resources come from?
- How are natural resources used in society? What are some examples?
- Why does the distribution of natural resources vary across the globe?
- Is there a correlation between natural resource consumption and population growth?
- Can a renewable resource ever be depleted?
- What impact do humans have on Earth’s environment when we gather and use natural resources?
- What is the relationship between ecological footprints per capita, human population growth, economic income and changes in biodiversity?
- What does it mean to be sustainable?
- What are some examples of sustainable activities and technologies?
- How does sustainability benefit both people and the planet?
- Is being sustainable an individual effort or a global effort?

Summative Assessment and/or Summative Criteria

- Quarterly Assessment
- Department Based Tests / Quizzes
- Project Rubrics
- Mosa Mack "Make" and "Engineer" Rubrics
- CER (Claim, Evidence, Reasoning) Rubrics and Lab Reflections
- Cumulative Cross curricular Trifold Solution Project

Resources

- Savvas Elevate textbook series and web resources
- Textbook C Materials and Worksheets
- Supplemental textbook materials, and misc. resources for Natural Resources
- Kesler Labs
- Centers
- Escape Rooms
- Science Videos
- Mosa Mack
- Discovery Education
- BrainPop
- Achieve 3000

Unit Plan

Topic / Selection Timeframe	General Objectives	Instructional Activities	Benchmarks/Assessments	Standards
Natural Resources 1-2 Weeks	1. Define renewable and nonrenewable resources. 2. Identify examples of renewable and nonrenewable resources. 3. Explain how each natural resource is distributed throughout the world and how this impacts the environment and society.	Mosa Mack: Renewable Resources Lab investigations Discovery Education virtual explorations Videos BrainPOP: Natural resources, Fossil fuels, Energy sources, nuclear energy, Solar energy, Gas and oil, Wind	Department-created unit tests and quizzes Project rubrics Mosa Mack's “make” and “engineer” rubrics Lab journals	ESS3-1 ESS3-3 ESS3-4 ESS3-5

		energy Incorporate interdisciplinary skills during centers or other instructional activities such as identifying nonfiction sign posts (LAL), interpreting mathematical data from graphs, analyzing current events		
Climate Change 1-2 Weeks	1. Define the greenhouse effect and explain why it is necessary for life on earth, but also leads to evolving concerns about climate change. 2. Analyze cause and effect relationships of human processes, earth processes, and how climate change occurs. 3. Calculate carbon footprints.	Mosa Mack: Climate Change & Ecological Footprint Discovery Education virtual explorations BrainPOP: Climate change, Humans and the environment, National parks Textbook materials from Book C Incorporate interdisciplinary skills during centers or other instructional activities such as identifying nonfiction sign posts (LAL),	Department-created unit tests and quizzes Project rubrics Mosa Mack's “make” and “engineer” rubrics Lab journals	ESS3-3

		interpreting mathematical data from graphs, analyzing current events		
Local environmental concerns 1-2 week	1. Apply scientific principles to design a method for monitoring and minimizing human environmental impact. 2. Identify ways to conserve resources or mitigate the problems resulting from overpopulation and overuse of Earth's resources.	Build upon prior knowledge and activities to develop a personal plan and solution around a local climate change problem Use CER format for producing a scientific argument for a climate change topic Human Impact Investigation project Gather and analyze evidence of overpopulation Gather data about self, family, and community use of resources Self-selected climate change topic research project - SWBAT to develop a solution to a local environmental concern of	Human Impact Digital Notebook and rubric Tri-fold problem/solution climate change project CER guidelines and rubric	ESS3-3

		their choice		

Standards

CS.6-8.8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
LA.W.7.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.7.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.
LA.W.7.4	Produce clear and coherent writing in which the development, organization, voice and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
LA.W.7.6	Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.
LA.W.7.7	Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.
LA.W.7.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.W.7.9	Draw evidence from literary or informational texts to support analysis, reflection, and research.
LA.RL.7.1	Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.
LA.SL.7.1.A	Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
LA.SL.7.1.B	Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
LA.SL.7.2	Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
MA.7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
MA.7.RP.A	Analyze proportional relationships and use them to solve real-world and mathematical problems.
MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.7.RP.A.2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for

	equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
MA.7.RP.A.2b	Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
SCI.MS.ESS3.D	Global Climate Change
SCI.MS-ESS3-3	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
SCI.MS-ESS3-1	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
SCI.MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
SCI.MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused climate change over the past century.
SCI.MS-ESS3-2	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
SOC.6.1.8.GeoSV.3.a	Use maps and other geographic tools to construct an argument on the impact of geography on the developments and outcomes of the American Revolution including New Jersey's pivotal role.
	Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).
	Stability might be disturbed either by sudden events or gradual changes that accumulate over time.
	Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.
	Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.
	Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
	Engineering design is a systematic, creative, and iterative process used to address local and global problems. The process includes generating ideas, choosing the best solution, and making, testing, and redesigning models or prototypes.
	Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.
	Geospatial technologies and representations help us to make sense of the distribution of people, places and environments, and spatial patterns across Earth's surface.

Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities.

Analyze and interpret data to determine similarities and differences in findings.

Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events.

Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).

Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.

Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables and clarifying arguments and models.

Graphs, charts, and images can be used to identify patterns in data.

Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Analyzing data 6–8 builds on grades K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.

Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Constructing explanations and designing solutions in 6–8 builds on grades K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

Cause and effect relationships may be used to predict phenomena in natural or designed systems.

Engaging in argument from evidence in 6–8 builds on grades K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

Typically, as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise.

Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).

Suggested Modifications for Special Education, ELL and Gifted Students

- 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 tools such as Google Meet, 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 understanding.
- 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.
- Restructure lesson using UDL principals

Suggested Technological Innovations/Use

- Mosa Mack
- Elevate Savvas Textbook
- Discovery Education
- BrainPop
- Achieve 3000
- Ck-12
- Digital notebooks
- Google Suite Tools

Cross Curricular/Career Readiness, Life Literacies and Key Skills Practice

ENGLISH LANGUAGE ARTS:

- Conduct research, analyze claims, and write arguments to determine methods for monitoring

and minimizing a human impact on the environment, drawing on several sources and generating additional, related, focused questions that allow multiple avenues of exploration.
- Gather relevant information from multiple print and digital sources about a method for monitoring and minimizing a human impact on the environment, assess the credibility of each source, and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.
- Draw evidence from informational texts about minimizing a human impact on the environment to support analysis, reflection, and research.
- Cite specific textual evidence about a method for monitoring and minimizing a human impact on the environment to support analysis of science and technical texts.
- Compare and contrast the information gained from experiments, simulations, videos, or multimedia sources with that gained from reading a text on a method for monitoring and minimizing a human impact on the environment.
- Integrate quantitative or technical information about a method for monitoring and minimizing a human impact on the environment expressed in words with a version of that information expressed visually

MATHEMATICS:

- Use abstract and quantitative reasoning to analyze and interpret data to determine similarities and differences in findings of how well-designed methods meet the criteria and constraints of solutions that could reduce a human impact on the environment.
- Understand the concept of a ratio and use ratio language to describe a ratio relationship between human impacts on environments and the impact of methods to minimize these impacts.
- Apply ratio language, proportions, and percentages to calculate changes in temperature, sea level, and greenhouse gas emissions over time and predict future trends.
- Analyzing and interpreting data, using variables to represent quantities to determine how well-designed methods meet the criteria and constraints of solutions that could reduce a human impact on the environment, and constructing simple equations and inequalities to solve problems by reasoning about the quantities.
- Develop graphs and charts to visualize climate change data trends and statistics.
- While analyzing data to determine how well-designed methods meet the criteria and constraints of solutions that could reduce a human impact on the environment, solve multistep mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies
- Analyze data to identify patterns and correlations related to climate change.

SOCIAL STUDIES:

- Use geographic models to determine the impact of environmental modifications made by earlier civilizations on the current-day environmental challenges.
- Use evidence and quantitative data to propose or defend a public policy related to climate change.
- Assess the impact of government incentives and disincentives on the economy.

UDL Framework

In this climate change unit designed using the UDL framework, students will first encounter clear and attainable outcomes that highlight the significance of understanding climate change's impact on the environment and society. Their diverse needs, backgrounds, strengths, and barriers will be anticipated, ensuring that all students can access and engage with the material. They will experience instructional activities tailored to include various means of representation, expression, and engagement, such as multimedia presentations, interactive simulations, and group discussions. Students will have multiple ways to demonstrate their understanding through projects, presentations, and written reflections as part of the assessment plan. Lastly, ongoing reflection and adaptation will ensure that instructional strategies remain effective, inclusive, and aligned with students' needs and the overall learning goals.