Grades 9-12
Environmental Science
Curriculum

Middle Township Public Schools
216 S. Main Street
Cape May Court House, NJ 08210

Born On Date: August 2018

SUBJECT: Environmental Science **GRADE LEVEL: High School** **UNIT TITLE: Ecosystems** **LENGTH OF STUDY: 45 days** **START OF UNIT: Marking period one** **END OF UNIT: End of marking period one**

Unit Learning Goals
Students will be able to develop and use models. ● Develop a model based on evidence to illustrate the relationships between systems or components of a system. (HS-LS2-5) Students will be able to use mathematics and computational thinking. ● Use mathematical and/or computational representations of phenomena or design solutions to support explanations. (HS-LS2-1) ● Use mathematical representations of phenomena or design solutions to support and revise explanations. (HS- LS2-2) ● Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4) Students will be able to construct explanations and design solutions. ● Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) 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. (HS-LS2-3) ● Design, evaluate, and refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade off considerations. (HS-LS2-7) Students will be able to engage in argument from evidence. ● Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments. (HS-LS2-6) ● Evaluate the evidence behind currently accepted explanations to determine the merits of arguments. (HS-LS2-8) Students will be able to ask questions and define problems. ● Analyze complex real-world problems by specifying criteria and constraints for successful solutions. (HS-ETS1-1)
Crosscutting Concepts: **Cause and Effect** ● Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-LS2-8) **Scale, Proportion, and Quantity** ● The significance of a phenomenon is dependent on the scale, proportion, and quantity at which it occurs. (HS- LS2-1) ● Using the concept of orders of magnitude allows one to understand how a model at one scale relates to a model at another scale. (HS-LS2-2)

- **Systems and System Models**
- Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales. (HS-LS2-5)

Energy and Matter

- Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems. (HS-LS2-4)
- Energy drives the cycling of matter within and between systems. (HS-LS2-3)

Stability and Change

- Much of science deals with constructing explanations of how things change and how they remain stable. (HS-LS2-6, HS-LS2-7)

Suggested Sequence of Lessons Text book Chapters: 1,2,4,5,8,9,10	Instructional Materials	Performance Expectations	Disciplinary Core Ideas	Modification SE/ESL	Assessment
Ecosystems *Evolution* *Diversity of living things* *Energy flow in ecosystems* *The cycling of Materials* *How ecosystems change* **Populations**: *Understanding populations* *The human Population* *Biodiversity* -	Text book: **Holt Environmental Science K.Arms 2008** Power points/google slides Google classroom/Chromebook/ textbooks Whiteboard or interactive board, ELMO/overhead camera, access to videos online/projector, laptop/computer, internet access,	Students who demonstrate understanding can: **HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.** [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent	**LS2.A: Interdependent Relationships in Ecosystems** • Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity	Small group instruction, graphic organizers, modified worksheets and tests Structure lessons around questions that are authentic, relate to students interests and community. Provide students with multiple choices for how they can represent their understandings	**Formative Assessments** Diagnostic pre- and post-assessments. Class Discussions Worksheets with teacher feedback Drafts of lab reports with teacher feedback. **Summative Assessments** Quizzes Tests Performance Assessments

		factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [*Assessment Boundary: Assessment does not include deriving mathematical equations to make comparisons.*] **HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.** [Clarification Statement: Examples of mathematical representations include finding the average,	to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS- LS2-1, HS-LS2-2) **LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** Photosynthesis and cellular respiration (including anaerobic processes) provide most of the energy for life processes. (HS-LS2-3) Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level.	Provide opportunities for students to share their ideas and to encourage work among various backgrounds and cultures. Use project based science learning to connect science to observable phenomenon. Provide ELL students with multiple literacy strategies.	/Laboratory Investigations Research / Lab Reports

		determining trends, and using graphical comparisons of multiple sets of data.] [*Assessment Boundary: Assessment is limited to provided data.*] **HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.** [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [*Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*] **HS-LS2-4. Use mathematical representations to support**	Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4) • Photosynthesis and cellular respiration are important components of the carbon cycle, in which carbon is exchanged among the biosphere, atmosphere, oceans, and geosphere through chemical, physical, geological, and biological		

		claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [*Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.*]	processes. (HS-LS2-5) **LS2.C: Ecosystem Dynamics, Functioning, and Resilience** A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2, HS-LS2-6) Moreover, anthropogenic		

		HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [*Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.*] **HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing**	changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7) **LS2.D: Social Interactions and Group Behavior** Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8) **LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(Secondary to HS-LS2-7)* Humans depend		

		conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.] **HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*** [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.] **HS-LS2-8. Evaluate the evidence for the role of group**	on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.*(Secondary to HS-LS2-7)* *(Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)* **PS3.D: Energy in Chemical Processes** The main way		

		behavior on individual and species' chances to survive and reproduce.[Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.] **HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on**	that solar energy is captured and stored on Earth is through the complex chemical process known as Photosynthesis. *(Secondary to HS-LS2-5)* **ETS1.B: Developing Possible Solutions** When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *(Secondary to HS-LS2-7)* **ETS1.A: Defining and Delimiting Engineering Problems** Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk Mitigation into account, and they should be quantified to the extent possible and stated in such		

		interactions within and between systems relevant to the problem.	a way that one can tell if a given design meets them. (HS-ETS1-1) Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)		

Materials Needed
Text book **Chromebook** **Lab Materials**

Interdisciplinary Connections	21st Century Themes and Skills (Life and Career)
For ELA/Literacy **RST.9-10.8** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. (HS-LS2-6), (HS-LS2-7), (HS-LS2-8)**RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS-LS2-1), (HS-LS2-2), (HS-LS2-3), (HS-LS2-6), (HS-LS2-8) **RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-LS2-6), (HS-LS2-7), (HS-LS2-8) **RST.11-12.8** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-LS2-6), (HS-LS2-7), (HS-LS2-8) **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS2-1), (HS-LS2-2), (HS-LS2-3) **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS2-3) **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-LS2-7) **For Mathematics**	**9.4.O Science, Technology, Engineering & Mathematics Career Cluster** **Communication Skills:** All clusters rely on effective oral and written communication strategies for creating, expressing, and interpreting information and ideas that incorporate technical terminology and information. **Problem-Solving and Critical Thinking:** Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams. **Information Technology Applications:** Technology is used to access, manage, integrate, and disseminate information. **Systems:** • Roles within teams, work units, departments, organizations, inter- organizational systems, and the larger environment impact business operations. ● Key organizational systems ● impact organizational performance and the quality of products and services. ● Understanding the global context of 21st-century industries and careers impacts business operations. **Safety, Health, and Environment:** Implementation of health, safety, and environmental management systems and organizational policies and procedures impacts organizational performance, regulatory compliance, and continuous improvement. **Leadership and Teamwork:** Effective leadership and teamwork strategies foster collaboration and cooperation between business units, business partners, and business associates toward the accomplishment of organizational goals. **Employability and Career Development:** Employability skills and career and entrepreneurship opportunities build the capacity for successful careers in a global economy. **Academic Foundations:**

MP.2 Reason abstractly and quantitatively. (HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS-LS2-6), (HS-LS2-7) **MP4** Model with mathematics. (HS-LS2-1), (HS-LS2-2), (HS-LS2-4)**HSN.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS- LS2-7) **HSN.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. (HS-LS2-1), (HS-LS2-2), (HS-LS2-4), (HS-LS2-7)**HSN.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-1), (HS-LS2-2), (HS- LS2-4), (HS-LS2-7) **HSS-ID.A.1** Represent data with plots on the real number line. (HS- LS2-6) **HSS-IC.A.1** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. (HS-LS2-6) **HSS-IC.B.6** Evaluate reports based on data. (HS-LS2-6)	Academic concepts lay the foundation for the full range of career and postsecondary education opportunities within the career cluster.

SUBJECT: Environmental Science
GRADE LEVEL: High School
UNIT TITLE: Earth's Systems
LENGTH OF STUDY: 45 days
START OF UNIT: Marking period two
END OF UNIT: End of marking period two

Unit Learning Goals
Students will be able to develop and use models. ● Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-ESS2-1, HS-ESS2-3, HS-ESS2-6) ● Use a model to provide mechanistic accounts of phenomena. (HS-ESS2-4) Students will be able to plan and carry out investigations. ● Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-ESS2-5) Students will be able to analyze and interpret data. ● Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution. (HS-ESS2-2) Students will be able to engage in argument from evidence. ● Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7) Students will be able to investigate the scientific knowledge is based on empirical evidence
Crosscutting Concepts: **Cause and Effect** ● •Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS2- 4) **Energy and Matter** ● The total amount of energy and matter in closed systems is conserved. (HS-ESS2-6) ● Energy drives the cycling of matter within and between systems. (HS- ESS2-3) ● **Structure and Function** ● The functions and properties of natural and designed objects and systems can be inferred from their overall structure, the way their components are shaped and used, and the molecular substructures of its various materials. (HS-ESS2-5) **Stability and Change** ● Much of science deals with constructing explanations of how things change and how they remain stable. (HS-ESS2-7)

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are Irreversible. (HS-ESS2-1)
- Feedback (negative or positive) can Stabilize or destabilize a system. (HS-ESS2-2)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

- •Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. (HS-ESS2-3)

Influence of Engineering, Technology, and Science on Society and the Natural World

- •New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS- ESS2-2)

Suggested Sequence of Lessons Text book Chapters: 3,11,12,13,20	Instructional Materials	Performance Expectations	Disciplinary Core Ideas	Modification SE/ESL	Assessment
The Dynamic Earth *Geosphere* *Atmosphere* *Hydrosphere and Biosphere* **Water**: *Water resources* *Water use and management* *Water pollution* **Air**: *Air pollution* *Acid Precipitation* **Atmosphere and**	**Holt Environmental Science K.Arms 2008** Power points/google slides Google classroom/Chromebook/ textbooks Whiteboard or interactive board, ELMO/overhead camera, access to videos online/projector, laptop/computer, internet access,	Students who demonstrate understanding can: **HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features.**	**ESS1.B: Earth and the Solar System** • Cyclical changes in the shape of Earth's orbit around the sun, together with changes in the tilt of the planet's axis of rotation, both occurring over hundreds of thousands of years, have altered the intensity and distribution of sunlight falling on the earth. These	Small group instruction, graphic organizers, modified worksheets and tests Structure lessons around questions that are authentic, relate to students interests and community. Provide students with multiple	**Formative Assessments** Diagnostic pre- and post-assessments. Class Discussions Worksheets with teacher feedback Drafts of lab reports with teacher feedback. **Summative Assessments** Quizzes Tests Performance

Climate change *Ozone* *Global warming* **The Environment and Human Health** *Pollution and Human Health*		[Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [*Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.*]**HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create**	phenomena cause a cycle of ice ages and other gradual climate changes.*(Secondary to HS-ESS2-4)* **ESS2.A: Earth Materials and Systems** Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (HS-ESS2-1, HS-ESS2-2) Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from	choices for how they can represent their understandings Provide opportunities for students to share their ideas and to encourage work among various backgrounds and cultures. Use project based science learning to connect science to observable phenomenon. Provide ELL students with multiple literacy strategies.	Assessments /Laboratory Investigations Research / Lab Reports

		feedbacks that cause changes to other Earth systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and	Earth's interior and gravitational movement of denser materials toward the interior. (HS-ESS2-3) The geological record shows that changes to global and regional climate can be caused by interactions among changes in the sun's energy output or Earth's orbit, tectonic events, ocean circulation, volcanic activity, glaciers, vegetation, and human activities. These changes can occur on a variety of time scales from sudden (e.g., volcanic ash clouds) to intermediate (ice ages) to very long- term tectonic cycles. (HS-ESS2-4) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** The radioactive decay of unstable isotopes continually generates new energy within		

		increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the **wetland extent.]** **HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change**	Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (HS-ESS2-3) Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geologic history. Plate movements are responsible for most continental and ocean-floor features and for the distribution of most rocks and minerals within Earth's crust. (HS-ESS2-1) **ESS2.C: The Roles of Water in Earth's Surface Processes** The abundance of liquid water on Earth's surface and its unique combination of physical and		

		of Earth's magnetic field (as constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.] **HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.** **[Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions**	chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5) **ESS2.D: Weather and Climate** The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (HS-ESS2-2, HS- ESS2-4) Gradual atmospheric		

		of years: long-term changes in atmospheric composition.] [*Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.*] **HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.** **[Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the**	changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (HS-ESS2-6, HS-ESS2-7)		

		foundation for living organisms.] **HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.[Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life;**			

		how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [*Assessment Boundary: Assessment does not include a comprehensive understanding of the Mechanisms of how the biosphere interacts with all of Earth are other 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.			

Materials Needed
Text book **Chromebook** **Lab Materials**

Interdisciplinary Connections	21st Century Themes and Skills (Life and Career)
For ELA/Literacy **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS- ESS2-2), (HS-ESS2-3) **RST.11-12.2** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (HS- ESS2-2) **WHST.9-12.1** Write arguments focused on discipline-specific content. (HS-ESS2-7) **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating	**9.4.O Science, Technology, Engineering & Mathematics Career Cluster** **Communication Skills:** All clusters rely on effective oral and written communication strategies for creating, expressing, and interpreting information and ideas that incorporate technical terminology and information. **Problem-Solving and Critical Thinking:** Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams. **Information Technology Applications:** Technology is used to access, manage, integrate, and disseminate information. **Systems:** • Roles within teams, work units, departments, organizations, inter- organizational systems, and the larger environment impact business operations. ● Key organizational systems

understanding of the subject under investigation. (HS-ESS2-5)**SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. (HS-ESS2-1), (HS-ESS2-3), (HS-ESS2-4) **For Mathematics** **MP.2** Reason abstractly and quantitatively. (HS-ESS2-1), (HS-ESS2-2), (HS-ESS2-3), (HS-ESS2-4), (HS-ESS2-6) **MP4** Model with mathematics. (HS-ESS2-1), (HS-ESS2-3), (HS-ESS2-4), (HS-ESS2-6) **HSN.Q.A.1** Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS2-1), (HS-ESS2-2), (HS-ESS2-3), (HS-ESS2-4), (HS-ESS2-6) **HSN.Q.A.2** Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS2-1), (HS-ESS2-3), (HS-ESS2-4), (HS-ESS2- 6) **HSN.Q.A.3** Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS2-1), (HS-ESS2-2), (HS-ESS2-3), (HS-ESS2-4), (HS-ESS2-5), (HS-ESS2-6)	● Impact organizational performance and the quality of products and services. ● Understanding the global context of 21st-century industries and careers impacts business operations. **Safety, Health, and Environment:** Implementation of health, safety, and environmental management systems and organizational policies and procedures impacts organizational performance, regulatory compliance, and continuous improvement. **Leadership and Teamwork:** Effective leadership and teamwork strategies foster collaboration and cooperation between business units, business partners, and business associates toward the accomplishment of organizational goals. **Employability and Career Development:** Employability skills and career and entrepreneurship opportunities build the capacity for successful careers in a global economy. **Academic Foundations:** Academic concepts lay the foundation for the full range of career and postsecondary education opportunities within the career cluster.

SUBJECT: Environmental Science
GRADE LEVEL: High School
UNIT TITLE: Earth and Human Activity
LENGTH OF STUDY: 45 days
START OF UNIT: Marking period three
END OF UNIT: End of Marking period three

Unit Learning Goals
Students will be able to analyze and interpret data. • Analyze data using computational models in order to make valid and reliable scientific claims. (HS-ESS3-5) Students will be able to use mathematics and computational thinking. ● Create a computational model or simulation of a phenomenon, designed device, process, or system. (HS-ESS3-3) ● Use a computational representation of phenomena or design solutions to describe and/or support claims and/or explanations. (HS-ESS3-6) Students will be able to construct explanations and design solutions. ● Evaluate a solution to a complex real- world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade off considerations. (HS-ETS1-3) ● Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) 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. (HS-ESS3-1) ● Design or refine a solution to a complex real-world problem, based on scientific knowledge, student- generated sources of evidence, prioritized criteria, and trade off considerations. (HS-ESS3-4) Students will be able to engage in argument from evidence. ● •Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2) Students will be able to use a variety of methods to investigate science. ● Science investigations use diverse methods and do not always use the same set of procedures to obtain data. (HS-ESS3-5) ● New technologies advance scientific knowledge. (HS-ESS3-5) Students will be able to engage in argument from evidence. ● Construct an oral and written argument or counter-arguments based on data and evidence. (HS-ESS2-7)

Crosscutting Concepts:
Cause and Effect

- •Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. (HS-ESS3- 1)

Systems and System Models

- When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models. (HS-ESS3-6)

Stability and Change

- Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. (HS-ESS3-3, HS-ESS3-5)
- Feedback (negative or positive) can stabilize or destabilize a system. (HS- ESS3-4)
- Connections to Engineering, Technology, and Applications of Science
- Influence of Science, Engineering, and Technology on Society and the Natural World
- • Modern civilization depends on major technological systems. (HS-ESS3-1, HS-ESS3-3)
- Engineers continuously modify these
- Technological systems by applying scientific knowledge and engineering design practices to increase benefits while decreasing costs and risks. (HS- ESS3-2, HS-ESS3-4)
- New technologies can have deep impacts on society and the environment, including some that were not anticipated. (HS-ESS3-3)
- Analysis of costs and benefits is a critical aspect of decisions about technology. (HS-ESS3-2)
- New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology. (HS- ETS1-1, HS-ETS1-3)
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- Connections to Nature of Science
- Science is a Human Endeavor
- Science is a result of human endeavors, imagination, and creativity. (HS-ESS3-3)

Science Addresses Questions About the Natural and Material World

- Science and technology may raise ethical issues for which science, by itself, does not provide answers and solutions. (HS-ESS3-2)
- Science knowledge indicates what can happen in natural systems—not what should happen. The latter involves ethics, values, and human decisions about the use of knowledge. (HS-ESS3-2)
- Many decisions are not made using science alone, but rely on social and cultural contexts to resolve issues. (HS-ESS3-2)

Suggested Sequence of Lessons **Text book Chapters:14,15, 16,17,18,19,20,21**	Instructional Materials	Performance Expectations	Disciplinary Core Ideas	Modification SE/ESL	Assessment
Land *How we use land* *Urban land use Land* *Management and Conservation* **Food and Agriculture** *Crops and soil* **Mining and Mineral Resources** *Mining and Mineral Resources* *Mineral Exploration and Mining* *Mining Regulations* **Nonrenewable Energy** *Fossil Fuels* *Nuclear Energy* **Renewable Energy** *Renewable Energy* *Alternative Energy and Conservation* **Waste** *Solid waste*	**Holt Environmental Science K.Arms 2008** Power points/google slides Google classroom/Chromebook/ textbooks Whiteboard or interactive board, ELMO/overhead camera, access to videos online/projector, laptop/computer, internet access, Lab materials	**HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.** [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of	**ESS2.D: Weather and Climate** • Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. *(Secondary to HS-ESS3-6)* **ESS3.A: Natural Resources** Resource availability has guided the development of human society. (HS- ESS3-1) All forms of energy production and other resource extraction have associated economic, social,	Small group instruction, graphic organizers, modified worksheets and tests Structure lessons around questions that are authentic, relate to students interests and community. Provide students with multiple choices for how they can represent their understandings Provide opportunities for students to share their ideas and to encourage work among various backgrounds and cultures. Use project based science learning to connect science to observable phenomenon. Provide ELL	**Formative Assessments** Diagnostic pre- and post-assessments. Class Discussions Worksheets with teacher feedback Drafts of lab reports with teacher feedback. **Summative Assessments** Quizzes Tests Performance Assessments /Laboratory Investigations Research / Lab Reports

Reduction Solid waste **The Environment and Human Health** *Pollution and Human Health* **Economics, Policy and the Future** *Economics and International Cooperation* *Environmental Policies in the US* *The Importance of the Individual*		temperature and precipitation, and the types of crops and livestock that can be raised.] **HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.*** **[Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.]** **HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.** **[Clarification Statement: Examples of factors that affect the**	environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (HS-ESS3-2) **ESS3.B: Natural Hazards** • Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (HS-ESS3-1) **ESS3.C: Human Impacts on Earth Systems** The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3) Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (HS-ESS3-4) **ESS3.D: Global**	students with multiple literacy strategies.	

		management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [*Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.*]HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.* [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future	**Climate Change** Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (HS-ESS3- 5) Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (HS- ESS3-6) **ETS1.B: Developing Possible Solutions** • When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. *(Secondary to HS-ESS3-2), (Secondary HS-ESS3-4)* **ETS1.A: Defining and Delimiting**		

		impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).] **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 systems.** **[Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).]** ***[Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]*** **HS-ESS3-6. Use a computational representation to illustrate the**	**Engineering Problems** Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (HS-ETS1-1) Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (HS-ETS1-1)		

		relationships among Earth systems and how those relationships are being modified due to human activity. [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [*Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.*] HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.			

Materials Needed
Text book Chromebook Lab Materials

Interdisciplinary Connections	21st Century Themes and Skills (Life and Career)
For ELA/Literacy RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS- ESS3-1), (HS-ESS3-2), (HS-ESS3-4), (HS-ESS3-5) RST.11-12.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. (HS- ESS3-5) RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem. (HS-ESS3-5) RST.11-12.8 Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. (HS-ESS3-2), (HS-ESS3-4) WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-ESS3-1) For Mathematics MP.2 Reason abstractly and quantitatively. (HS-ESS3-1), (HS-ESS3-2), (HS-ESS3-3), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6) MP4 Model with mathematics. (HS-ESS3-3), (HS-ESS3-6) HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS3-1), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6) HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS3-1), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3- 6) HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS3-1), (HS-ESS3-4), (HS-ESS3-5), (HS-ESS3-6)	

SUBJECT: Environmental Science GRADE LEVEL: High School UNIT TITLE: The Delaware Bay Estuary LENGTH OF STUDY: 45 days START OF UNIT: Marking period four END OF UNIT: June /End of marking period four

Unit Learning Goals
Students will be able to construct explanations and design solutions. ● Design a solution to a complex real- world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade off considerations. (HS-ETS1-2) ● Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) 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. (HS-LS2-3) Students will be able to plan and carry out investigations. ● Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design Students will be able to use mathematics and computational thinking. ● •Use mathematical representations of phenomena or design solutions to support claims. (HS-LS2-4) Students will be able to use scientific knowledge in an effort to revise ideas with new evidence. ● Most scientific knowledge is quite durable, but is, in principle, subject to change based on new evidence and/or interpretation of existing evidence. (HS-LS2-3)

Suggested Sequence of Lessons **Text book Chapters:** Online Database and binders from Rutgers "Inservice"	Instructional Materials	Performance Expectations	Disciplinary Core Ideas	Modification SE/ESL	Assessment
Discovering the Delaware Bay *estuary mapping* *watershed* *modeling watershed life*	Power points/google slides Google classroom/Chromebook/ textbooks Whiteboard or	Students who demonstrate understanding can: **HS-LS2-3. Construct and revise an explanation based on evidence for the**	**LS2.B: Cycles of Matter and Energy Transfer in Ecosystems** Photosynthesis and cellular respiration (including anaerobic processes)	Small group instruction, graphic organizers, modified worksheets and tests Structure lessons around	**Formative Assessments** Diagnostic pre- and post-assessments. Class Discussions Worksheets

bay salinity **Oysters as a Natural Resource:** *History of the* *Delaware Bay* *Oyster Fishery* *oyster harvest graphs* *oyster fishery development and decline* *oyster harvest quantities* **Oyster Biology and Ecology** *Morphology and anatomy of Oysters* *Oysters survival and life cycle* *Oyster diseases* *Filter feeding* *Oyster reefs/ assessing habitat value*	interactive board, ELMO/overhead camera, access to videos online/projector, laptop/computer, internet access, Lab materials	**cycling of matter and flow of energy in aerobic and anaerobic conditions.** [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [*Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.*]**HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles	provide most of the energy for life processes. (HS-LS2-3) Plants or algae form the lowest level of the food web. At each link upward in a food web, only a small fraction of the matter consumed at the lower level is transferred upward, to produce growth and release energy in cellular respiration at the higher level. Given this inefficiency, there are generally fewer organisms at higher levels of a food web. Some matter reacts to release energy for life functions, some matter is stored in newly made structures, and much is discarded. The chemical elements that make up the molecules of organisms pass through food webs and into and out of the atmosphere and soil, and they are combined and recombined in different ways. At each link in an ecosystem, matter and energy are conserved. (HS-LS2-4) **LS2.C: Ecosystem Dynamics,**	questions that are authentic, relate to students interests and community. Provide students with multiple choices for how they can represent their understandings Provide opportunities for students to share their ideas and to encourage work among various backgrounds and cultures. Use project based science learning to connect science to observable phenomenon. Provide ELL students with multiple literacy strategies.	with teacher feedback Drafts of lab reports with teacher feedback. **Summative Assessments** Quizzes Tests Performance Assessments /Laboratory Investigations Research / Lab Reports

		and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [*Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.*] **HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*** [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.] **HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and**	**Functioning, and Resilience** • Moreover, anthropogenic changes(induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7) **LS4.D: Biodiversity and Humans** Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). *(Secondary to HS-LS2-7)* Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate		

		surface processes.[Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]**HS-**	change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value.*(Secondary to HS-LS2-7)* **ESS2.C: The Roles of Water in Earth's Surface Processes** The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (HS-ESS2-5) **ETS1.C: Optimizing the**		

		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.	**Design Solution** • Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (HS-ETS1-2) **ETS1.B: Developing Possible Solutions** When evaluating solutions it is important to take into account a range of constraints including cost, safety, reliability and aesthetics and to consider social, cultural and environmental impacts. *(Secondary to HS-LS2-7)*		

Materials Needed
Text book Chromebook Lab Materials https://billionoysterproject.org/wp-content/uploads/2013/06/curriculum_guide_1-1.pdf Rutgers link to Delaware Bay curriculum -Teachers can use as a guide for informational purposes (activities and data need to be adjusted to NGSS for increased rigor to maintain High School standards and differentiated for students learning needs).

Interdisciplinary Connections	21st Century Themes and Skills (Life and Career)
For ELA/Literacy **RST.11-12.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. (HS- LS2-3) **WHST.9-12.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. (HS-LS2-3) **WHST.9-12.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (HS-LS2-3) **WHST.9-12.7** Conduct short as well as more sustained research projects to answer a question (including a self--generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. (HS-ESS2-5) (HS-LS2-7) **For Mathematics** **MP.2 Reason abstractly and quantitatively. (HS-LS2-4), (HS-LS2-7)MP.4 Model with mathematics. (HS-LS2-4)** **HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi---step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-LS2-4), (HS-LS2-7)** **HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-LS2-4), (HS-LS2-7)** **HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-LS2-4), (HS-LS2-7), (HS- ESS2-5)**	**9.4.O Science, Technology, Engineering & Mathematics Career Cluster** **Communication Skills:** All clusters rely on effective oral and written communication strategies for creating, expressing, and interpreting information and ideas that incorporate technical terminology and information. **Problem-Solving and Critical Thinking:** Critical and creative thinking strategies facilitate innovation and problem-solving independently and in teams. **Information Technology Applications:** Technology is used to access, manage, integrate, and disseminate information. **Systems:** • Roles within teams, work units, departments, organizations, inter- organizational systems, and the larger environment impact business operations. ● Key organizational systems ● impact organizational performance and the quality of products and services. ● Understanding the global context of 21st-century industries and careers impacts business operations. **Safety, Health, and Environment:** Implementation of health, safety, and environmental management systems and organizational policies and procedures impacts organizational performance, regulatory compliance, and continuous improvement. **Leadership and Teamwork:** Effective leadership and teamwork strategies foster collaboration and cooperation between business units, business partners, and business associates toward the accomplishment of organizational goals. **Employability and Career Development:** Employability skills and career and entrepreneurship opportunities build the capacity for successful careers in a global economy. **Academic Foundations:** Academic concepts lay the foundation for the full range of career and postsecondary education opportunities within the career cluster.