

Unit 1: History of the Earth

Content Area: **Science**
Course(s): **Earth Sci.**
Time Period: **Marking Period 1**
Length: **Approx. 12 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS.ESS1.A	The Universe and Its Stars
SCI.HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
SCI.HS-ESS1	Earth's Place in the Universe
SCI.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
SCI.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
SCI.HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
SCI.HS-ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
SCI.HS-LS1	From Molecules to Organisms: Structures and Processes
SCI.HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.GCA.1	Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1,

7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).

Solutions to the problems faced by a global society require the contribution of individuals with different points of view and experiences.

Phenomena

Science and Engineering Practices

SCI.HS-LS1-6	<p>Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</p> <p>Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.</p> <p>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.</p> <p>Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.</p>
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Disciplinary Core Ideas

SCI.HS-ESS1-2	Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.
SCI.HS-ESS1-3	Communicate scientific ideas about the way stars, over their life cycle, produce elements.
SCI.HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth’s formation and early history.
SCI.HS-ESS1-4	Use mathematical or computational representations to predict the motion of orbiting objects in the solar system.
SCI.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun’s core to release energy that eventually reaches Earth in the form of radiation.
SCI.HS-PS2-2	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
SCI.HS-PS2-4	Use mathematical representations of Newton’s Law of Gravitation and Coulomb’s Law to describe and predict the gravitational and electrostatic forces between objects.

Crosscutting Concepts

Patterns
Stability and Change
Energy and Matter

Transfer Goals and Career Ready Practices

Transfer Goals

Explain that earth operates as a set of complex, dynamic, and interconnected systems, and is a part of the all-encompassing system of the universe. Realize that the theory of plate tectonics provides a framework for understanding the dynamic processes within and on the Earth. Students should know that heat generated from within the earth create convection currents that move the plates across the globe; many people in the world are affected by the earth's forces, but these forces are necessary for life to exist. The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.

Concepts

Essential Questions

- How can chemical properties be used to help identify various forms of matter?
- How does prior knowledge or misconceptions affect the creation of a hypothesis?
- How do geologic changes in the past help us to predict the future?
- How do people reconstruct and date events in Earth's planetary history?
- What evidence can be used to show both geological and atmospheric changes over the earth's 4.568 billion years of history?
- How is life on Earth connected to the rest of the universe?

Understandings

- Heavier elements come from the larger star explosions.
- As distance increases from the mid ocean ridge, the age of rock also increases.
- Convection currents in the upper mantle drive plate motion.
- Earth's divisions in time are based on major biological and geological changes.
- Evidence from lava flows and ocean floor rocks show that the Earth's magnetic field reverses (North-South) over geologic time.

- How decay and half-life work to enable radiometric dating.
- Minerals are classified into families based on their chemical composition.
- The Earth and the solar system was created from a cloud of dust 4.6 billion years ago.
- The entire universe was created from an object smaller than an atom made of pure energy.
- The Earth's interior and surface are the product of several dynamic processes.
- The relationship between sediment depth and age.
- The rock cycle — a continuous pattern of change — helps explain what happens over and over again to the rocks in our earth.
- The surface features of the Earth are constantly changing.
- The symbols on the periodic table and the fact that elements are grouped based on various trends.

Critical Knowledge and Skills

Knowledge

Students will know:

- The ability of plate tectonics to explain ages of crustal rocks
- Age of the Earth
- The Big Bang Theory
- The life cycle of the star
- The Hertzsprung-Russell Diagram
- The electromagnetic spectrum
- Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment
- Geoscience factors control the evolution of life (ex. photosynthetic life altered the atmosphere, weathering rates allow for the evolution of life, microbial life on land increased the formation of soil, etc.)
- Formation of the Earth and Solar System
- History of the Earth
- Impact cratering
- Radiometric dating of moon rocks, minerals, and meteorites
- Seafloor spreading
- Size and composition of solar system objects
- The appearance of land features are the result of constructive forces (ex. Volcanism, tectonic uplift, etc.) and destructive mechanisms (ex. weathering, mass wasting, coastal erosion, etc.)

Skills

Students will be able to:

- Determine the differences and similarities between Earth and other planetary objects, such as the moon
- Explain the difference between redshifted and blueshifted objects
- Illustrate the life cycle of a star
- Provide evidence to support the big bang theory
- Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
- Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
- 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
- Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks
- Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
 - Big Bang Theory Tic-Tac-Toe
 - Crater Impact Lab
 - Crater Impact on the Earth's Surface Research Trifold
 - Geologic Time Scale Model
 - Lab Safety Project
 - Layers of the Earth Diagram
 - Marble Isotope Lab
 - Radiometric Popcorn Lab
 - Seafloor Spreading Modeling Diagram

School Summative Assessment Plan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- **Unit Tests**
- **Weekly Quizzes**

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the environmental science curriculum:

- **Midterm and Final Assessment**

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

Textbook: "Holt-Earth Science"

Supplementary Resources

Videos:

[Khan Academy](#)

[Bozeman Science](#)

[Youtube](#)

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**

- Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
- GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**

- All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

- **Additional Support Videos**

- The videos above are just examples of videos that can be used to support each of the Lessons within this Topic.

Differentiated Instruction

- Gifted Students (N.J.A.C.6A:8-3.1)
 - Within each lesson, the Gifted Students are to be given the Enrichment Questions.
 - These questions are to extend the knowledge of each portion of the lesson.
 - Performance Task
 - Additional practice was provided for students that provided a higher level of thinking for the concepts.
- English Language Learners (N.J.A.C.6A:15)
 - Within each lesson, the English Language Learners are given three levels of questioning. Each level is accommodating to the level of learning that the individual student(s) is learning at.
 - Beginning
 - Intermediate
 - Advanced
 - All assignments can be created in the student's native language if needed.
 - Work with ELL Teacher to allow for all assignments to be completed with extra time.
- At Risk Students (N.J.A.C.6A:8-4.3c)
 - Work with the I & RS Team to reach the needs of students.
 - *Mentors provided
 - Offer additional supports as needed (after school help, parent contacts, frequent checks for understanding, etc.)

Interdisciplinary Connections

MATH -

- CCSS.Math.Content.HSF-IF.B.6
 - CCSS.Math.Content.HSF-IF.B.5
 - MATH.HSM
 - CCSS.Math.Content.HSN-Q.A.1
 - CCSS.Math.Content.HSN-Q.A.2
 - CCSS.Math.Content.HSN-Q.A.3
- **Use a mathematical model to illustrate the rate of seafloor spreading at the mid-Atlantic Ridge.**
 - **Create a graph to demonstrate the composition of the Earth's early atmosphere.**
 - **Calculate the rate of decay of isotopes to demonstrate methods used in science to understand the history of the earth.**

ELA -

- LA.11-12.CCSS.ELA-Literacy.SL.11-12.5
 - LA.11-12.CCSS.ELA-Literacy.RST.11-12.1
 - LA.11-12.CCSS.ELA-Literacy.RST.11-12.2
 - LA.9-10.CCSS.ELA-Literacy.WHST.9-10.1
 - LA.9-10.CCSS.ELA-Literacy.WHST.9-10.7
 - LA.9-10.CCSS.ELA-Literacy.RST.11-12.7
 - LA.9-10.CCSS.ELA-Literacy.WHST.11-12.9
- **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. -**
 - **Draw evidence from informational texts to support analysis, reflection, and research.**
 - **Example:**
 - **Students are required to complete research projects in order to help them understand a concept. Students are required to use multiple sources in order to reach a specific conclusion. Students are also required to summarize their findings in an aesthetically pleasing way (poster, power point, website, etc.)**
 - **Crater Impact on the Earth's Surface Research Trifold**
 - **Lab Safety Poster Project**
 - **Layers of the Earth Diagram**

SOCIAL STUDIES -

- **Examples:**
 - **Radiometric Dating**
 - **The use of radiometric dating and the law of superposition are used in order to determine the age of certain civilizations.**

WORLD LANGUAGES -

- **Lunar features Latin terms:**
 - **Maria (lunar features)**
 - **Igneous (fire origin)**

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY -

- **Students are required to obtain certain lab skills throughout the unit. This knowledge gained enables for an easy transition into the workplace.**
 - **Safety**
 - **Communication**
 - **Following procedure**
- **Data collection is used throughout the unit.**
 - **This allows them to understand how data collection can aid in the workplace.**
 - **Graphs**
 - **Tables**

BUSINESS EDUCATION -

- **Students work in collaborative groups through**
 - **In-class activities**
 - **Labs**
 - **Projects**
- **Through collaborative research, students will understand that individual contribution is imperative to group success**
- **Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments**
- **Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom**

GLOBAL AWARENESS -

- **Example:**
 - **Students work in collaborative groups**
 - **Learning from and working collaboratively with individuals representing diverse cultures, religions and lifestyles in a spirit of mutual respect and open dialogue in personal, work and community contexts**
 - **Alfred Wegener's hypothesis was reviewed by peers and found to be inconclusive due to an omitted mechanism for crustal movement**
 - **This decision was eventually reversed by Harry Hess in the 1960's by the observation of magnetic reversals at the mid-ocean ridge**
 - **This proves that different cultures are involved in scientific decisions**

Learning Plan / Pacing Guide

CP Environmental Science

***Do nows and exit ticket are performed on a daily basis**

- Week 1
 - Class Introductions
 - Intro to Lab Safety Video and Lab Safety Gallery Walk
- Week 2
 - Nebular Hypothesis, Accretion Theory, Giant Impact Theory
 - Lunar Seek and Find
 - Crater Impact Activity
 - Accretion Theory, Nebular Hypothesis, Giant Impact Theory Quiz
 - **More advanced students** were given additional higher level thinking questions
- Week 3-4
 - Life cycle of a star
 - Difference between Low and Mass Star Cycles
 - Video Clips
 - "How and when the elements were created?" Webquest
 - Video and Online Resources used
- Week 5
 - Crater Impact on Earth's Surface Research Trifold
 - Geologic Time Scale Model
 - Outdoor kinesthetic scale model activity
- Week 6-7
 - Lecture and video clips on Geologic Time
 - Geologic Time Scale Jigsaw Activity
 - Peer Review
 - Exam 1
 - Atmospheric Changes
 - Accretion Theory
 - Nebular Theory
 - Giant Impact Theory
- Week 8
 - Ice Core Data Solves Global Mystery
 - Includes graph and analysis questions
 - **Graph done together as a class in ICR classes**
 - Penny/Skittle Isotope Lab
 - **More advanced students** were given additional higher level thinking questions
 - **Modified due to allergies**
 - Quiz on Atoms and Isotopes
- Week 9
 - Study Guide for Exam
 - Exam 2
 - Geologic Time

- Atoms and Isotopes
- Half-Life and Radiometric Dating

- Week 10
 - Intro to Layers of the Earth
 - Layers of the Earth Diagram
 - Layers of the Earth POGIL
 - Lecture and video clips of Layers of the Earth
- Week 11
 - Continental Drift Lecture and Review Questions

 - Plate Tectonics Webquest

 - Plate Tectonics Graphic Organizer and Review Questions

- Week 12
 - Seafloor Spreading Modeling Activity

- Week 13
 - Plate Tectonics Mapping Activity
 - Exam 2
 - Continental Drift
 - Plate Tectonics
 - Layers of the Earth
 - **More advanced students** were given additional higher level thinking questions

ICR Environmental Science

- Week 1
 - Class Introductions and Lab Safety Poster

- Week 2

- Life cycle of a star
- Week 3-4 (**ICR** was given additional time on the following assignments, **more advanced students** were given additional higher level thinking questions)
 - Nebular Hypothesis, Accretion Theory, Giant Impact Theory
 - Research Graphic Organizer
 - **Graphic Organizer Only administered to ICR**
 - Lunar Seek and Find
 - **Modified:**
 - **Amount of questions**
 - **Questions were reworded**
 - **Students were guided throughout the lesson as a class**
 - **Vocabulary was also given**
 - Crater Impact Activity
 - **Lab was modeled before the students completed the lab**
 - **Students were given extra time in class to complete activity**
 - Accretion Theory, Nebular Hypothesis, Giant Impact Theory Quiz
 - **Reviewed the content the day prior to the quiz**
 - **Questions, format, and amount were modified for ICR**
- Week 5
 - Crater Impact on Earth's Surface Research Trifold
 - **Assigned crater impacts based on ability**
 - **Students completed on the computer**
 - **Students were given extra time in class to complete activity**
 - Geologic Time Scale Model
 - **Extra time was given in class to complete**
 - **Students worked in larger groups**
 - **Teachers and aids helped out throughout the activity**
- Week 6-7
 - Lecture and video clips on Geologic Time
 - Geologic Timescale Jigsaw Activity
 - **Graphic Organizer provided**
 - Quiz on Geologic Time and Atmospheric Changes
 - **Questions, format, and amount were modified**
- Week 8
 - Marble Isotope Lab
 - **Modified amount and questions for ICR**
 - **More guidance and modifications offered in RC**
 - **More advanced students** were given additional higher level thinking questions

- Quiz on Atoms and Isotopes
 - **Questions, format, and amount were modified for ICR and RC**

- Week 9
 - Radiometric Dating Lab
 - **Provided with modified copy of assignment (includes more detailed directions and different questions)**
 - **Provided with modeling instruction.**
 - **More advanced students** were given additional higher level thinking questions
 - Study Guide for Exam
 - Exam 1
 - Geologic Timescale
 - Atmospheric Changes
 - Atoms and Isotopes
 - Half-Life and Radiometric Dating
 - Accretion Theory
 - Nebular Theory
 - Giant Impact Theory
 - **Questions, format, and amount were modified for ICR**

- Week 10
 - Intro to Layers of the Earth
 - Layers of the Earth Diagram Scaled Model
 - **More detailed instructions and graphic organizer to input their research provided**
 - **Guided instruction offered to small groups**
 - Layers of the Earth POGIL
 - **Teachers supported throughout the activity**
 - Lecture and video clips of Layers of the Earth
 - **Notes posted on google classroom**
 - **Teachers supported throughout the activity**

- Week 11
 - Continental Drift Lecture and Review Questions
 - **Guided Notes with videos, pictures, and examples provided**
 - Plate Tectonics Webquest
 - **Format modified and amount of questions changed**
 - Plate Tectonics Graphic Organizer and Review Questions
 - **Teachers supported throughout the activity**
 - **Questions were reviewed after students completed assignment**

- Week 12
 - Seafloor Spreading Modeling Activity
 - **Teachers modeled the activity prior to completion**
 - **Teachers supported throughout the activity**

- Week 13
 - Plate Tectonics Mapping Activity
 - **Interactive Activity was completed as a class to illustrate plate tectonic movement**
 - **Notes were given on the board, teachers and aids supported throughout the process**
 - **Different questions were provided for ICR**
 - **Reviews were given for multiple days post assignment**
 - Exam 2
 - Continental Drift
 - Plate Tectonics
 - Layers of the Earth
 - **Questions, format, and amount were modified**
 - **More advanced students** were given additional higher level thinking questions

RC Environmental Science (*extra time allotted for all assignments over the course of this unit)

- Week 1
 - Class Introductions, Syllabus and Lab Safety Poster
- Week 2
 - Life cycle of a star
- Week 3-4
 - Nebular Hypothesis, Accretion Theory, Giant Impact Theory
 - Research and Jigsaw Introductory Activity:
 - each student completes a portion of the provided graphic organizer about each theory to teach to their peers
 - Readings of each theory with guided questions
 - Lunar Seek and Find:
 - Guided and electronic rather than using the moon globe
 - Vocabulary reviewed
 - Crater Impact Activity:
 - Modelling of lab prior to completion
 - Modified pace- extended time
 - Guided instruction as they move through the lab
 - Accretion Theory, Nebular Hypothesis, Giant Impact Theory Quiz
 - Students can use their graphic organizer as a resource on the quiz
 - Crater Impact on Earth's Surface Research
 - Students research two of the largest impacts on Earth's surface

- Graphic organizer with guided questions

- Week 5-6
 - Geologic Time
 - Geologic Timeline Reading: Students will complete a short reading in pairs of two along with 5 questions to introduce the Geologic Time Scale. Review answers as a class to gauge their understanding.
 - Geologic Time Scale Jigsaw Activity: Each student assigned an era to become an expert on and will teach others about their era.
 - Graphic Organizer provided as students talked about the Eras so they could keep this as their notes
 - Geologic Time Scale Video Clips: Short video clips of each portion of the timeline and have them predict what might cause the end of periods and eras, discuss some changes they have seen since the beginning of time, and discuss how long humans have been on Earth compared to the rest of species
 - Quiz on Geologic Time and Atmospheric Changes
 - Questions, format, and amount were modified

- Week 7
 - Geologic History:
 - Understanding the Periodic Table:
 - Guided notes on protons, neutrons, electrons, ions and isotopes
 - Protons, Neutron and Electrons practice problems on whiteboards
 - Drawing Atoms practice problems on whiteboards
 - Do nows/Exit pass of drawing atoms
 - Marble Isotope Lab
 - Modified version of the Marble isotope lab (lower amount of lab problems, different questions, etc.)
 - Begin the lab together as a class and once they feel comfortable/ have a better understanding allow them to complete on their own
 - Quiz on Atoms and Isotopes
 - Questions, format, and amount modified

- Week 8
 - Radiometric Lab
 - Lab will be modelled prior to completing
 - Study Guide for Exam
 - Review study guide in class, hard copy posted and review game
 - Exam 1
 - Geologic Timescale
 - Atmospheric Changes
 - Atoms and Isotopes
 - Half-Life and Radiometric Dating
 - Accretion Theory
 - Nebular Theory
 - Giant Impact Theory

- Questions, format, and amount were modified
- Week 9
 - Intro to Layers of the Earth
 - Layers of the Earth Guided NOtes
 - Notes and video clips of Layers of the Earth with provided guided notes
- Week 10 and 11
 - Continental Drift Lecture and Review Questions
 - Guided Notes with videos, pictures, and examples
 - Plate Tectonics Webquest
 - Format modified and amount of questions
 - Plate Tectonics Graphic Organizer and Review Questions
 - Plate Tectonics Interactive
 - Given an earthquake and volcano data set from: observe a world map simulation of earthquake and volcano distributions then use the data points to identify major plate boundaries (guided activity)
 - Review questions
 - Seafloor Spreading Modeling Activity
 - Modified directions
 - Guided activity
- Week 12
 - Exam 2 Study Guide and Review Game
 - Continental Drift
 - Plate Tectonics
 - Layers of the Earth
 - Questions, format, and amount were modified
 - Exam 2

Unit 2: Earth's Systems

Content Area: **Science**
Course(s): **Earth Sci.**
Time Period: **Generic Time Period**
Length: **17-18 weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.2.1.12	Personal and Mental Health
SCI.HS.ESS3.A	Natural Resources
SCI.HS.ESS3.B	Natural Hazards
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS-ESS3	Earth and Human Activity
TECH.9.4.12.CI	Creativity and Innovation
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CI.3	Investigate new challenges and opportunities for personal growth, advancement, and transition (e.g., 2.1.12.PGD.1).
TECH.9.4.12.CT	Critical Thinking and Problem-solving
TECH.9.4.12.CT.4	Participate in online strategy and planning sessions for course-based, school-based, or other project and determine the strategies that contribute to effective outcomes. Healthy habits and behaviors are created by personal learning experiences, knowledge, beliefs, and goals towards living and maintaining a healthy lifestyle of fitness, self-expression, social interaction, and enjoying movement in a safe and healthy environment (e.g., golf, tennis, badminton, martial arts, bowling, kayaking, ping-pong, cricket, hiking, biking, swimming). Self-confidence, personal traits, stress, limitations, and strengths impact the mental and emotional development of an individual.

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.

Analyzing and Interpreting Data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

Engaging in Argument from Evidence

Developing and Using Models

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Disciplinary Core Ideas

SCI.HS-ESS1-5	Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks.
SCI.HS-ESS1	Earth's Place in the Universe
SCI.HS-ESS1-6	Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history.
SCI.HS-ESS2	Earth's Systems
SCI.HS-ESS1-1	Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.
SCI.HS-PS1	Matter and Its Interactions
SCI.HS-PS4-1	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
SCI.HS-PS2	Motion and Stability: Forces and Interactions

Crosscutting Concepts

Energy and Matter
Patterns
Cause and Effect
Stability and Change

Transfer Goals and Career Ready Practices

Transfer Goals

Explain that earth's surface is complex and dynamic set of interconnected systems-principally the geosphere, hydrosphere, atmosphere, and biosphere - that interact over a wide range of temporal and spatial scales. All of the earth's process are the result of energy flowing and matter cycling within and among these systems.

Concepts

Essential Questions

- How and why is Earth constantly changing?
- How do natural resources affect political policies?
- How does mineral availability across the globe affect political policies?
- How do cultural differences and economics affect themagnitude of natural hazards across the globe?

Understandings

- Recycling Minerals and Metals which minimizes impacts where it is not recycled.
- Both natural and manmade factors affect the rate of weathering and erosion.
- Convection currents in the upper mantle drive plate motion. Earth's interior is obtained through seismic waves.
- Energy alternatives to burning fossil fuels exist.
- Evidence from lava flows and ocean floor rocks show that Earth's magnetic field reverses (north – south) over geologic time.
- Explain the mechanisms for plate motions using earthquake data, mathematics, and conceptual models.
- Feedbacks between the biosphere and other factors allow for the evolution of animals and microbial life on land which increases the formation of soil and allows for the evolution of land plants and coral reefs.
- Human activities affect the rate of soil erosion.
- Magma type determine the type of volcanic eruptions that occur.
- Management of natural resources includes the cost of extraction and waste management per capita consumption and development of new technologies.
- Natural Resources and natural hazards (Earthquakes, volcanic eruptions, severe storms, and droughts) results in changes in climate that can affect populations or drive mass migrations.
- Oxygen, carbon dioxide, nitrogen, and water cycle through through the oceans, atmosphere, soil, and biosphere.
- Factors that affect mass movement Internal and external forces drive the rock cycle.

Critical Knowledge and Skills

Knowledge

Students will know:

- How earthquakes are measured
- How the different types of volcanic landforms form
- How the nitrogen, water cycle, carbon dioxide, and oxygen cycle through and affect ecosystems
- Factors that affect mass movement
- How soil varies with depth
- Other dangers associated with earthquakes
- The causes of earthquakes
- The difference between mechanical and chemical weathering
- The difference between the epicenter and the focus
- The differences between aftershocks and foreshocks
- The factors that affect the rate of weathering
- The factors that contribute to earthquake damage
- The factors that determine the type of volcanic eruptions that occur
- The main types of volcanoes
- The major components of soil and list the most important factors in soil formation
- The origin of magma * The relationship between plate tectonics and volcanism
- The three types of rocks and how they differ
- The three types of seismic waves
- The three common types of soil
- Where intraplate volcanism occurs

Skills

Students will be able to:

- 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.
- Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- Describe the factors that contribute to earthquake damage
- Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- Explain the difference between the types of rocks
- Explain the difference between the types of volcanoes
- Give examples of phenomena that affect the rate of weathering

- Students will diagram and explain the causes, effects, and feedbacks between the biosphere and the nitrogen, oxygen, carbon dioxide, and water cycles.
- Classify mass movements and identify factors that trigger them
- Demonstrate how each rock type forms
- Demonstrate how human activities affect the rate of soil erosion
- Describe how earthquake waves are measured
- Describe the rock cycle
- Determine the lag time between Primary and Secondary seismic waves
- Determine the type of volcanic eruptions that occur based on magma composition
- Diagram and explain the types of physical weathering * Distinguish the difference between clastic sedimentary rocks and chemical sedimentary rocks * Explain how human activity increases the rate of chemical weathering * Explain the elastic rebound theory
- Explain the relationship between plate tectonics and volcanism
- Identify other dangers associated with earthquakes
- Identify the causes of earthquakes
- Identify the layers and major components of soil
- Identify the type of lava flows based on their chemical composition
- List the forces that power the earth's rock cycle
- Locate the focus and epicenter of an earthquake
- Relate volcanic activity to changes in climate

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
 - Focus and Epicenter Triangulation
 - Lake Nyos Commercial Presentations
 - Volcano Narrative Essay
 - Cycles Poster
 - Igneous Rock Lab
 - Sedimentary Rock Lab
 - Soil Layer Lab
 - Soil Profile Lab
 - Weathering Cartoon

School Summative Assessment Plan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- **Unit Tests**
- **Weekly Quizzes**

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the environmental science curriculum:

- **Midterm and Final Assessment**

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

- Text:
 - Holt-Earth Science

Supplementary Resources

Additional outside Resources:

- [Khan Academy](#)
- [Bozeman Science Online Videos](#)
- [YouTube](#)

Technology Integration and Differentiated Instruction

Technology Integration

- Google Products
 - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
 - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time see results upon completion of the assignments to allow for 21st century learning.
 - One to One Student laptop
 - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.
 - Additional Support Videos
 - The video websites below are just examples of videos that can be used to support each of the Lessons within this Topic
 - Bozeman Science, Amoeba Sisters, Khan Academy

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- Within each lesson, the Gifted Students are to be given the Enrichment Questions.**
 - These questions are to extend the knowledge of each portion of the lesson.**
- Performance Task**
 - Additional practice was provided for students that provided a higher level of thinking for the concepts.**

English Language Learners (N.J.A.C.6A:15)

- **Within each lesson, the English Language Learners are given three levels of questioning. Each level is accommodating to the level of learning that the individual student(s) is learning at.**
 - Beginning**
 - Intermediate**
 - Advanced**

- ❑ All assignments can be created in the student's native language if needed.
- ❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At Risk Students (N.J.A.C.6A:8-4.3c)

- Work with the I&RS Team to reach the needs of students.
- Mentors provided
- Offer additional supports as needed (after school help, parent contacts, frequent checks for understanding, etc.)

Special Education Students (N.J.A.C.6A:8-3.1)

- Frequent checks for understanding
- Preferred seating assignments
- Multiple representations- Encourage and allow tables, graphic organizers, etc.
- Hard copy of notes
- Extend the time needed to complete assignments/assessments
- Provide a copy of grading rubrics for projects/labs
- Provide a copy of a model representation for projects
- Clarification of directions/instructions
- Use of technology when appropriate
- Repeat/rephrase instructions as needed

Interdisciplinary Connections

MATH -

MA.9-12.N-Q

MATH.HSM

CCSS.Math.Content.HSN-Q.A.1

CCSS.Math.Content.HSN-Q.A.2

CCSS.Math.Content.HSN-Q.A.3

- Earthquakes Lag-time graph
- Earthquake Triangulation Graph (Virtual Web Graph)

SCIENCE -

ELA -

LA.11-12.CCSS.ELA-Literacy.SL.11-12.5

LA.11-12.CCSS.ELA-Literacy.RST.11-12.1

LA.11-12.CCSS.ELA-Literacy.RST.11-12.2

LA.9-10.CCSS.ELA-Literacy.WHST.9-10.1

LA.9-10.CCSS.ELA-Literacy.WHST.9-10.7

LA.9-10.CCSS.ELA-Literacy.WHST.11-12.9

LA.9-10.CCSS.ELA-Literacy.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.

-Draw evidence from informational texts to support analysis, reflection, and research.

- Fracking Debates
- RC- Fracking Persuasive Essay
- Krakatoa narrative essay writing
- Rock Cycle- Prezi
- Tsunami Research

SOCIAL STUDIES -

Examples:

Ores- Mining and Extracting minerals

- Laws involved at various locations across the globe
- Effect on local communities

WORLD LANGUAGES -

Rock Cycle Hawaiian terms:

- Pahoehoe
- Aa

VISUAL/PERFORMING ARTS -

- Lake Nyos Internet research/Video presentations
 - Lake Nyos video creation-Students will be assigned a specific role to play (town officials) and create a public service announcement that address given concerns.
 - Students will videotape their commercials/announcements using windows media player and play them for the class.

APPLIED TECHNOLOGY -

- Students are required to obtain certain lab skills throughout the unit. This knowledge gained enables for an easy transition into the workplace.
 - Safety

- Communication
- Following procedure
- Data collection is used throughout the unit. This allows them to understand how data collection can aid in the workplace.
 - Graphs
 - Tables

CAREER/BUSINESS EDUCATION -

CRP1

CRP2

CRP7

CRP9.2.8.B.3

CRP11

Example:

- Students work in collaborative groups through
 - In-class activities
 - Labs
 - Projects
- Through collaborative research, students will understand that individual contribution is imperative to group success
- Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments
- Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom

GLOBAL AWARENESS -

Example:

Ores- Mining and Extracting Minerals

- Effect of natural resource availability on political policies

Learning Plan / Pacing Guide

CP Environmental Science

- Weeks 1-2

- Lecture/review questions - Plate tectonics
- Plate tectonics Earthquake Mapping Activity- (**USGS website**)
 - Students provided data to map in class
- Plate Boundary Identify Activity
 - Using a student created world map, identify plate boundary types based on plate movements
- Exam
 - Layers of the earth
 - Plate tectonics
 - Continental drift
- Weeks 3-4
 - Minerals
 - Ore extraction: political, social, and economical implications

- Weeks 5-6
 - The rock cycle webquest
 - Types of Rocks Labs
 - Students will need to identify types of rocks (sedimentary, igneous, and metamorphic) through a hands-on lab activity
 - The rock cycle poster
 - Students researched the rock cycle and created a PREZI presentation illustrating the knowledge they gained through their research

- Weeks 7-8
 - Volcanoes and plate tectonics
 - lecture/notes/questions
 - Volcanic eruption lab - pressure and viscosity (the soda can lab)
 - **Engineering Connection**

- Students will:
 - Be directed to an **online article** about drilling to the earth's mantle
 - Students will read the article and answer assigned questions.
 - Will explain and design safety procedures that could be implemented to reduce the potential of a volcanic eruption

- The Volcano Watchers Video
- Lake Nyos Internet research/Video presentations
 - Lake Nyos video creation-Students will be assigned a specific role to play (town officials) and create a public service announcement that address given concerns.
 - Students will videotape their commercials/announcements using **windows media player** and play them for the class.
 - Peer reviewed student video presentations- Lake Nyos

- Weeks 9-10
 - Krakatoa Docudrama- video
 - Krakatoa narrative essay writing
 - Exam review - study guide
 - Exam: rock cycle, plate tectonics, continental drift

- Weeks 11-12
 - Earthquakes- **Webquest**
 - Earthquakes Lecture/review questions
 - Earthquakes Lag-time graph
 - Earthquake Triangulation Graph (**virtual web graph**)
 - Tsunami Research (microsoft publisher brochure)

- Weeks 13-17
 - Natural Resources
 - Fracking video - gasland
 - Fracking debate

- Weeks 18-19
 - Soil lab-

- Students will collect soil samples and observe the differences between the layers
- Soil porosity and permeability lab

- Landslides/geologic hazard.- Lab activity
- Weathering and erosion cartoon drawings

- Weeks 20-21

- The Dust Bowl Event
 - As an ecology case study on how natural and human caused factors changed an environment.
 - Natural Disaster and Environmental Change Research Activity
 - Internet research how a natural disaster, human activity, or a combination of both caused environmental change in a local area.
 - Document the changes to the local environment and formulate a documentary presentation.

ICR Environmental Science

- Weeks 1-2
 - Lecture/review questions - Plate tectonics
 - Notes posted on Google Classroom
 - Check for understanding throughout the period
 - Online Earthquake Mapping Activity

- Teachers support throughout activity

- Small group assistance as needed
 - Exam
 - Layers of the earth
 - Plate tectonics
 - Continental drift
 - Modified the number of questions, wording, format

- Weeks 3-4
 - Minerals
 - Ore extraction: political, social, and economical implications
- Weeks 5-6
 - The Rock Cycle Notes
 - Notes posted on Google Classroom
 - Check for understanding throughout the period
 - Pictures and Diagrams illustrated content
 - Graphic Organizer provided
 - The rock cycle webquest
 - Teachers support throughout activity
 - Small group assistance as needed
 - Extra time allotted if necessary
 - Types of Rocks Labs
 - Students will need to identify types of rocks (sedimentary, igneous, and metamorphic) through a hands-on lab activity
 - Teacher support offered throughout lab activity
 - Modified question load and reworded questions
 - The rock cycle poster
 - Students researched the rock cycle and created a PREZI presentation illustrating the knowledge they gained through their research

- Students given the option to complete assignment on a PREZI, Power Point Presentation, or a Poster

- Weeks 7-8
 - Volcanoes and plate tectonics
 - lecture/notes/questions

- Notes posted on Google Classroom

- Check for understanding throughout the period
 - Pictures and Diagrams illustrated content
 - Volcanic eruption lab - pressure and viscosity (the soda can lab)
 - **Engineering Connection**
 - Students will:
 - Be directed to an **online article** about drilling to the earth's mantle
 - Students will read the article and answer assigned questions.
 - Will explain and design safety procedures that could be implemented to reduce the potential of a volcanic eruption
 - Lab is modeled prior to completion of the lab analysis questions
 - The Volcano Watchers Video
 - Lake Nyos Internet research/Video presentations
 - Lake Nyos video creation-Students will be assigned a specific role to play (town officials) and create a public service announcement that address given concerns.
 - Students will videotape their commercials/announcements using **windows media player** and play them for the class.
 - Peer reviewed student video presentations- Lake Nyos
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- Weeks 9-10
 - Krakatoa Docudrama- video
 - Krakatoa narrative essay writing
 - Exam review - study guide
 - Exam: rock cycle, plate tectonics, continental drift
-
- Weeks 11-12
 - Earthquakes- **Webquest**
 - Earthquakes Lecture/review questions
 - Earthquakes Lag-time graph
 - Earthquake Triangulation Graph (**virtual web graph**)
 - Tsunami Research (microsoft publisher brochure)
-
- Weeks 13-17

- Natural Resources
- Fracking video - gasland
- Fracking debate

- Weeks 18-19
 - Soil lab-

- Students will collect soil samples and observe the differences between the layers
 - Soil porosity and permeability lab

- Landslides/geologic hazard.- Lab activity
- Weathering and erosion cartoon drawings

- Weeks 20-21

- The Dust Bowl Event
 - As an ecology case study on how natural and human caused factors changed an environment.
 - Natural Disaster and Environmental Change Research Activity
 - Internet research how a natural disaster, human activity, or a combination of both caused environmental change in a local area.
 - Document the changes to the local environment and formulate a documentary presentation.

RC Environmental Science (*extra time allotted for all assignments over the course of this unit)

- Weeks 1-2

- Lecture/review questions - Plate tectonics
 - Guided notes posted on Google Classroom with video clips
 - Check for understanding throughout the period
 - Exit passes to see what needs to be retaught
- Online Earthquake Mapping Activity

- Modified amount of questions
- Complete as a large group or small groups to help them identify patterns

- Exam

- Layers of the earth
 - Plate tectonics
 - Continental drift
 - Modified the number of questions, wording, format
- Weeks 3-4
 - Minerals
 - Ore extraction: political, social, and economical implications

- Weeks 5-6
 - The Rock Cycle Notes
 - Jigsaw- have each student research a different type of rock to teach the others about
 - Notes posted on Google Classroom
 - Check for understanding throughout the period
 - Pictures and Diagrams illustrated content
 - Graphic Organizer provided
 - The rock cycle webquest
 - Modified questions and amount
 - Start out as a whole group and small group assistance as needed
 - Extra time allotted if necessary
 - Types of Rocks Labs
 - Students will need to identify types of rocks (sedimentary, igneous, and metamorphic) through a hands-on lab activity
 - Teacher support offered throughout lab activity
 - Modified question load and reworded questions

- Weeks 7-8
 - Volcanoes and plate tectonics
 - introduction with guided notes and video clips
 - Notes posted on Google Classroom
 - Check for understanding throughout the period
 - Pictures and Diagrams illustrated content
 - Volcanic eruption lab - pressure and viscosity (the soda can lab)
 - **Engineering Connection**
 - Students will:
 - Be directed to an **online article** about drilling to the earth's mantle
 - Students will read the article and answer assigned questions (modified from the CP version)
 - Will explain and design safety procedures that could be implemented to reduce the potential of a volcanic eruption
 - Lab is modeled prior to completion of the lab analysis questions
 - Volcano Video
 - Lake Nyos Internet research/Video presentations
 - Lake Nyos video creation-Students will be assigned a specific role to play (town officials) and create a public service announcement that address given concerns.
 - Students will videotape their commercials/announcements using windows media player and play them for the class.

- Peer reviewed student video presentations- Lake Nyos

- Weeks 9-10

- Krakatoa Docudrama- video
- Krakatoa narrative essay writing
- Exam review - study guide
- Exam: rock cycle, plate tectonics, continental drift

- Weeks 10-11

- Earthquakes- Webquest (modified questions)
- Earthquakes Lecture/review questions
- Earthquakes Lag-time graph
- Earthquake Triangulation Graph (virtual web graph)
- Tsunami Research (microsoft publisher brochure)

- Weeks 12-13

- Natural resources
- Fracking video - gasland
- Fracking debate and persuasive essay

- Weeks 14-15

- Soil lab-
 - Students will collect soil samples and observe the differences between the layers
- Soil porosity and permeability online lab

- Weathering and erosion online readings with guided questions

- Weeks 16-17

- The Dust Bowl Event (modified amount for RC)

- As an ecology case study on how natural and human caused factors changed an environment.
- Natural Disaster and Environmental Change Research Activity
 - Internet research how a natural disaster, human activity, or a combination of both caused environmental change in a local area.
 - Document the changes to the local environment and formulate a documentary presentation.

Unit 3: Weather and Climate

Content Area: **Science**
Course(s): **Earth Sci.**
Time Period: **Generic Time Period**
Length: **14 weeks**
Status: **Published**

Standards and Phenomena

Phenomena

Science and Engineering Practices

Planning and Carrying Out Investigations

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

Obtaining, Evaluating, and Communicating Information

Planning and carrying out in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.

Mathematical and computational thinking at the 9–12 builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Using Mathematics and Computational Thinking

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

Analyzing and Interpreting Data

Disciplinary Core Ideas

SCI.HS.PS4.A

Wave Properties

SCI.HS-ESS2-5

Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.

SCI.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.

SCI.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.

SCI.HS-ESS2-6	Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
SCI.HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.

Crosscutting Concepts

SCI.HS.LS1.A	Structure and Function Stability and Change Cause and Effect Energy and Matter
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Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS.LS1.B	Growth and Development of Organisms
SCI.HS.LS1.C	Organization for Matter and Energy Flow in Organisms
SCI.HS.LS2.A	Interdependent Relationships in Ecosystems
SCI.HS.LS2.A	Interdependent Relationships in Ecosystems
SCI.HS.LS2.D	Social Interactions and Group Behavior
SCI.HS.ESS3.C	Human Impacts on Earth Systems
SCI.HS.ETS1.B	Developing Possible Solutions
SCI.HS-ESS3-6	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity (i.e., climate change).
SCI.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.
SCI.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.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
SCI.HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
SCI.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.
SCI.HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

SCI.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 conditions may result in a new ecosystem.
SCI.HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
TECH.9.4.12.CI.1	Demonstrate the ability to reflect, analyze, and use creative skills and ideas (e.g., 1.1.12prof.CR3a).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.GCA.1	<p>Collaborate with individuals to analyze a variety of potential solutions to climate change effects and determine why some solutions (e.g., political, economic, cultural) may work better than others (e.g., SL.11-12.1., HS-ETS1-1, HS-ETS1-2, HS-ETS1-4, 6.3.12.GeoGI.1, 7.1.IH.IPERS.6, 7.1.IL.IPERS.7, 8.2.12.ETW.3).</p> <p>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 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.</p> <p>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 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.</p>

Transfer Goals and Career Ready Practices

Transfer Goals

Explain the forces that drive global circulation patterns and how those patterns determine weather and global climate. Global climate patterns are driven by a combination of unequal heating of Earth by the Sun, atmospheric convection currents, the rotation of Earth and the Coriolis effect, the Earth's orbit around the sun on a tilted axis, and ocean currents. Realize that differences in temperature and precipitation occurring from atmospheric effects allow plant and marine growth to adapt respectively in terrestrial and aquatic ecosystems known as biomes. Atmospheric layers have a structure and function which maintain life on earth. How does indoor and outdoor air pollution affect our lives, how can we sample and mitigate it? What are the air quality issues in our region? The presence of ozone in the troposphere hardens lung tissue in living organisms and impairs the immune system while the presence of ozone in the stratosphere absorbs 95% of cancer causing ultraviolet radiation. Finally, explain why the earth's surface temperature is heating up called global warming. How does global warming effect climate change which leads to change/loss of habitat (biome)? How does the Kyoto Protocol aim to reduce global warming?

Concepts

Essential Questions

- How and why do organisms interact with their environment and what are the effects of these interactions?
- How do Earth's surface processes and human activities affect each other?
- What can be done in order to reduce the amount of influence humans have on global climate change?
- What can be done to raise awareness or educate the public on climate change?
- What regulates weather and climate?
- Why is it that some of the population believe climate change is not a threat to life on Earth?

Understandings

Energy alternatives to burning fossil fuels include solar energy, nuclear energy, wind energy, hydroelectricity, biofuel, etc.

Evidence of climate change includes more severe and frequent storms, melting ice caps, rising sea levels, shift in climate patterns, etc.

There is different phenomenon occurring within each layer of the atmosphere.

Weather patterns are caused by differences in moisture, temperature, wind and pressure.

Local and Global winds drive air masses which will affect weather and climate.

Human influence on carbon dioxide includes deforestation, burning fossil fuels, cattle farming, etc.

The universal language used by meteorologists enables scientists of all cultures to share and compare weather.

Critical Knowledge and Skills

Knowledge

Students will know:

- How to interpret weather and climate,
- Temperature, pressure, wind, and moisture content cause weather patterns
- The atmosphere is separated based on temperature change
- Global wind belts drive weather patterns
- A universal language of meteorologists is used to share weather patterns across the world
- Air Masses are determined by the temperature and moisture content
- Weather and Climate are affected by latitude, distribution of land and water, general circulation of the atmosphere, ocean currents, altitude, topographical barriers and storms
- Evidence for climate change exists
- Increase in CO₂ levels results in an increase in photosynthetic biomass on land and an increase in ocean acidification
- Atoms such as Carbon, Oxygen, Hydrogen, and Nitrogen are being conserved as they move through the ecosystem
- Human influence has altered the carbon dioxide and oxygen cycle
- How the hydrosphere, atmosphere, cryosphere, geosphere, and biosphere are affected by impacts of human activity
- Earth's climate has changed due to natural and manmade phenomena
- Human sustainability is affected by: -agricultural efficiency, levels of conservation, and urban planning
- Examples of data on the impacts of human activities could include:
 - 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).
- Comparison of relationships among interdependent factors including boundaries, resources, climate, and competition
- Urbanization, Building Dams, Dissemination of Invasive Species impact the environment and biodiversity
- Changes in ecosystem conditions include: Modest biological and physical changes such as moderate hunting or seasonal flood
- Extreme factors such as volcanic eruptions or sea level rise.
- Matter and energy are conserved as matter cycles and energy flows through ecosystems.
- Atoms such as Carbon, Oxygen, Hydrogen, and Nitrogen are being conserved as they move through the ecosystem
- Biomass being passed between trophic levels from one level to another
- Distinguish between group and individual behavior
- Identifying evidence supporting the outcomes of group behavior
- Developing logical and reasonable arguments based on evidence
- Matter and energy are conserved as matter cycles and energy flows through ecosystems
- Oxygen and carbon dioxide cycle through the hydrosphere, atmosphere, biosphere, and lithosphere

Skills

Students will be able to:

- Construct scientific arguments using data to support claims that spatial and temporal patterns in weather and climate found around the Earth are created by complex global, regional, and local interactions involving sunlight, and all of the Earth's spheres.
- Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere as it relates to our climate system.
- Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
- Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- 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 conditions may result in a new ecosystem.
- Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Labs
- Classwork
- Homework
- Projects
- Do Nows
- Performance Tasks
 - Biochemical Nutrient Cycle Poster of Nitrogen

- Nitrogen Passport Activity
- Layers of the Atmosphere Webquest
- Atmosphere Profile & Outline
- Reason for Seasons Webquest
- Reason for Seasons Poster
- Graphing
- Marine Influence
- Altitude and Temperature
- Climatic Factors
- Ocean Currents Map Activity
- Ocean Currents POGIL
- Local and Global Winds Modeling Activity
- Coriolis Effect Globe/Balloon Activity
- Station Models Lab Stations
- Station Models Relay Race
- Mapping the Jet Streams Activity
- Ozone Research Poster
- Biomes Research Project

School Summative Assessment Plan

To measure mastery of concepts and a collection of units the following will be administered per the discretion of the teacher:

- ***Unit Tests***
- ***Weekly Quizzes***

To show mastery of the concepts within multiple units from the beginning of the year to the end of the year, the following will be administered to the students across all levels within the environmental science curriculum:

- ***Midterm and Final Assessment***

These summative assessments encompass multiple standards covered throughout the year. Students will need to illustrate the knowledge they have gained throughout the school year through analytical questions and performance tasks.

Primary Resources

- Holt-Earth Science

Supplementary Resources

Additional outside Resources:

- [Khan Academy](#)
- [Bozeman Science Online Videos](#)
- [YouTube](#)

Technology Integration and Differentiated Instruction

Technology Integration

- Google Products
 - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
 - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time see results upon completion of the assignments to allow for 21st century learning.
 - One to One Student laptop
 - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.
 - Additional Support Videos
 - The video websites below are just examples of videos that can be used to support each of the Lessons within this Topic
 - Bozeman Science, Amoeba Sisters, Khan Academy

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

- Within each lesson, the Gifted Students are to be given the Enrichment Questions.

These questions are to extend the knowledge of each portion of the lesson.

Performance Task

Additional practice was provided for students that provided a higher level of thinking for the concepts.

English Language Learners (N.J.A.C.6A:15)

• Within each lesson, the English Language Learners are given three levels of questioning. Each level is accommodating to the level of learning that the individual student(s) is learning at.

Beginning

Intermediate

Advanced

All assignments can be created in the student's native language if needed.

Work with ELL Teacher to allow for all assignments to be completed with extra time.

At Risk Students (N.J.A.C.6A:8-4.3c)

- Work with the I&RS Team to reach the needs of students.
- Mentors provided
- Offer additional supports as needed (after school help, parent contacts, frequent checks for understanding, etc.)

Special Education Students (N.J.A.C.6A:8-3.1)

- Frequent checks for understanding
- Preferred seating assignments
- Multiple representations- Encourage and allow tables, graphic organizers, etc.
- Hard copy of notes
- Extend the time needed to complete assignments/assessments
- Provide a copy of grading rubrics for projects/labs
- Provide a copy of a model representation for projects
- Clarification of directions/instructions
- Use of technology when appropriate
- Repeat/rephrase instructions as needed

Interdisciplinary Connections

MATH -

MATH.HSM

CCSS.Math.Content.HSN-Q.A

CCSS.Math.Content.HSN-Q.A.1

CCSS.Math.Content.HSN-Q.A.2

CCSS.Math.Content.HSN-Q.A.3

-Graph to show the relationships between altitude and climate

-Analyze the relationships between carbon dioxide and temperature

SCIENCE -

ELA-

LA.11-12.CCSS.ELA-Literacy.SL.11-12.5

LA.11-12.CCSS.ELA-Literacy.RST.11-12.1

LA.11-12.CCSS.ELA-Literacy.RST.11-12.2

LA.11-12.CCSS.ELA-Literacy.RST.11-12.2

LA.9-10.CCSS.ELA-Literacy.WHST.9-10.1

LA.9-10.CCSS.ELA-Literacy.WHST.9-10.7

LA.9-10.CCSS.ELA-Literacy.WHST.11-12.9

LA.9-10.CCSS.ELA-Literacy.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.

-Draw evidence from informational texts to support analysis, reflection, and research.

Example:

Students are required to complete a biomes research projects in order to help them understand a concept. Students are required to use multiple sources in order to reach a specific conclusion. Students are also required

to summarize their findings in an aesthetically pleasing way (poster, power point, website, etc.)

SOCIAL STUDIES -

Examples:

- World War II
 - The use of the Jet Stream in the stratosphere to help plan attacks against the United States with Air Balloons

WORLD LANGUAGES -

-Station Models- universal language to represent weather

VISUAL/PERFORMING ARTS -

RC- Tornado and Hurricane News Report

APPLIED TECHNOLOGY -

- Students are required to obtain certain lab skills throughout the unit. This knowledge gained enables for an easy transition into the workplace.
 - Safety
 - Communication
 - Following procedure
- Data collection is used throughout the unit. This allows them to understand how data collection can aid in the workplace.
 - Graphs
 - Tables

BUSINESS EDUCATION -

CRP1

CRP2

CRP4

CRP5

CRP6

CRP7

CRP8

CRP 9

CRP11

Example:

- Students work in collaborative groups through
 - In-class activities
 - Labs
 - Projects
- Through collaborative research, students will understand that individual contribution is imperative to group success
- Understanding is demonstrated through in-class discussion, formative assessments, and summative assessments
- Students are expected to apply appropriate academic and technical skills through research using technology in and out of the classroom

GLOBAL AWARENESS -

Example:

- Analyzing the carbon footprint of the United States to other countries
 - Industrialized vs. Nonindustrialized countries
- Determining the effect of Global Warming and climate change across the globe

Learning Plan / Pacing Guide

Do Now's and Exit Tickets are given on a daily basis

College Prep Environmental Science

- Week 1
 - Lecture & Notes on Nitrogen Cycle
 - Biochemical Nutrient Cycle Poster of Nitrogen
 - Nitrogen Passport Activity
 - Quiz
 - Nitrogen Cycle
- Week 2-3
 - Lecture & Notes on Layers of the Atmosphere
 - Layers of the Atmosphere Webquest
 - Atmosphere Profile & Outline
 - Reason for Seasons Webquest
 - Reason for Seasons Poster
- Week 4
 - Layers of the Atmosphere Quiz
 - Graphing
 - Marine Influence
 - Altitude and Temperature
 - Climatic Factors
 - Climate Lecture & Notes
 - Climate Review Questions
 - **More advanced students** were given additional higher level thinking questions
- Week 5

- Ocean Currents Map Activity
- Ocean Currents POGIL
- Local and Global Winds Modeling Activity
- Local and Global Winds Lecture & Notes
- Local and Global Winds Review Questions
 - **More advanced students** were given additional higher level thinking questions
- Week 6-7
 - Coriolis Effect Globe/Balloon Activity
 - Coriolis Effect
 - Station Models Graphic Organizer
 - Station Models Lab Stations
 - Station Models Relay Race
- Week 8
 - Mapping the Jet Streams Activity
 - Study Guide Review for Exam 3
 - Layers of the Atmosphere
 - Climate
 - Seasons
 - Winds
 - Station Models
- Week 9
 - Hurricanes and tornadoes
- Week 10
 - Review Game for Exam 3
 - Exam 3
 - **More advanced students** were given additional higher level thinking questions
 - Ozone Research Poster
 - Lecture & Notes on Ozone
 - Movie Clip on Ozone & Discussion Questions
 - **More advanced students** were given additional higher level thinking questions
- Week 11-12
 - Biomes Research Project
 - Biomes Research Presentations
 - Quiz or Exam on Biomes, Ozone, and Global Warming
- Week 13
 - Guidelines to prepare students for Performance Assessment Portion of their Final Exam
 - Part 1 of Final Exam- Cumulative assessment on what students learned throughout the year. Students are responsible for using guiding questions to come up with a way to display the big themes and essential questions from the entire year.
- Week 14
 - Part 2 of Final Exam Performance Assessment- Lab based practical
 - Review for written Final Exam

Do Now's and Exit Tickets are given on a daily basis

- Week 1
 - Lecture & Notes on Nitrogen Cycle
 - notes posted on class website
 - Biochemical Nutrient Cycle Poster of Nitrogen
 - more time provided if needed
 - Nitrogen Passport Activity
 - modelling and frequent checks provided by teachers
 - Quiz
 - Nitrogen Cycle
- rewording of questions
- Week 2-3
 - Lecture & Notes on Layers of the Atmosphere
 - notes posted on class website
 - graphic organizer provided
 - Layers of the Atmosphere Webquest
 - modified questions and extra time provided
 - Atmosphere Profile & Outline
 - Reason for Seasons Webquest
 - Reason for Seasons Poster
 - extra time provided
- Week 4
 - Layers of the Atmosphere Quiz
 - modified quiz (reworded and reformatted)
 - Graphing
 - Marine Influence
 - Altitude and Temperature
 - Climatic Factors
 - Climate Lecture & Notes
 - notes posted on class website
 - Climate Review Questions
- Week 5
 - Ocean Currents Map Activity
 - model activity
 - Ocean Currents POGIL
 - Local and Global Winds Modeling Activity
 - Local and Global Winds Lecture & Notes
 - notes posted on class website
 - Local and Global Winds Review Questions
- Week 6-7
 - Coriolis Effect Globe/Balloon Activity
 - modelling provided
 - Coriolis Effect
 - Station Models Graphic Organizer
 - Station Models Lab Stations
 - Station Models Relay Race
- Week 8
 - Mapping the Jet Streams Activity
 - Study Guide Review for Exam 3 (reformatted and reworded)
 - Layers of the Atmosphere

- Climate
 - Seasons
 - Winds
 - Station Models
- Week 9
 - Hurricanes and tornadoes
- Week 10
 - Review for Exam 3
 - Exam 3
 - **modified questions and reformatted**
 - Ozone Research Poster
 - extra time provided
 - broken down into smaller chunks
 - Lecture & Notes on Ozone
 - notes posted on class website
 - Movie Clip on Ozone & Discussion Questions
- Week 11-12
 - Biomes Research Project
 - extra time provided as needed
 - broken down into smaller chunks
 - Biomes Research Presentations
 - Quiz or Exam on Biomes, Ozone, and Global Warming
 - modified questions and reformatted
- Week 13
 - Guidelines to prepare students for Performance Assessment Portion of their Final Exam
 - a list was provided to students to prepare
 - Part 1 of Final Exam- Cumulative assessment on what students learned throughout the year. Students are responsible for using guiding questions to come up with a way to display the big themes and essential questions from the entire year.
- Week 14
 - Part 2 of Final Exam Performance Assessment- Lab based practical
 - students are allowed to use notes
 - Review for written Final Exam

RC Environmental Science

Do Now's and Exit Tickets are given on a daily basis

- Week 1
 - Lecture & Notes on Nitrogen Cycle
 - Biochemical Nutrient Cycle Poster of Nitrogen
 - Nitrogen Passport Activity
 - completed as a whole group or small groups
 - Quiz
 - Nitrogen Cycle - modified amount and reformatted
- Week 2-3
 - Lecture & Notes on Layers of the Atmosphere
 - guided notes with video clips
 - notes posted on class website
 - Layers of the Atmosphere Webquest
 - modified amount of questions
 - first part complete as a whole group to model expectations
 - Atmosphere Profile & Outline

- complete as a whole group
 - Reason for Seasons Webquest
 - Reason for Seasons Poster
 - extra time provided
- Week 4
 - Layers of the Atmosphere Quiz
 - reformatted and modified wording
 - Graphing
 - Marine Influence
 - Altitude and Temperature
 - Climatic Factors
 - Climate Lecture & Notes
 - notes posted on class website
 - Climate Review Questions

- Week 5
 - Ocean Currents Map Activity
 - Ocean Currents POGIL
 - Local and Global Winds Modeling Activity
 - Local and Global Winds Lecture & Notes
 - notes posted on class website
 - Local and Global Winds Review Questions

- Week 6-7
 - Coriolis Effect Globe/Balloon Activity
 - modelling provided
 - Coriolis Effect
 - Station Models Graphic Organizer
 - Station Models Lab Stations
 - Station Models Relay Race
- Week 8
 - Mapping the Jet Streams Activity
 - Study Guide Review for Exam 3
 - Layers of the Atmosphere
 - Climate
 - Seasons
 - Winds
 - Station Models
- Week 9
 - Hurricanes and tornadoes
- Week 10
 - Review for Exam 3
 - Exam 3
 - **modified questions and reformatted**
 - Ozone Research Poster
 - extra time provided
 - broken down into smaller chunks
 - Lecture & Notes on Ozone

- notes posted on class website
 - Movie Clip on Ozone & Discussion Questions
- Week 11-12
 - Biomes Research Project
 - extra time provided as needed
 - broken down into smaller chunks
 - Biomes Research Presentations
 - Quiz or Exam on Biomes, Ozone, and Global Warming
 - modified questions and reformatted
- Week 13
 - Guidelines to prepare students for Performance Assessment Portion of their Final Exam
 - a list was provided to students to prepare
 - Part 1 of Final Exam- Cumulative assessment on what students learned throughout the year. Students are responsible for using guiding questions to come up with a way to display the big themes and essential questions from the entire year.
- Week 14
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 - Review for written Final Exam