



# Township of Ocean Schools

Assistant Superintendent  
Office of Teaching and Learning

## **SPARTAN MISSION:**

*Meeting the needs of all students with a proud tradition of academic excellence.*

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## **Curriculum Development Timeline**

**School:** Ocean Township High School

**Course:** Earth and Our Environment

**Department:** Science

<b>Board Approval</b>	<b>Supervisor</b>	<b>Notes</b>
August 2010	Patrick Sullivan	Update Standards
August 2013	Patrick Sullivan	Update Standards & Name Change from Earth Systems
December 2017	Patrick Sullivan	Update Standards
March 2019	Patrick Sullivan	Review

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Pacing Guide			
Week	Marking Period 1	Week	Marking Period 3
1	Introduction to Earth & our environment	11	Weather and climate
2	Geological time & dating the Earth	12	Weather and climate
3	Geological time & dating the Earth	13	Weather and climate
4	Dynamic Earth	14	Human impact on the environment
5	Dynamic Earth	15	Human impact on the environment
Week	Marking Period 2	Week	Marking Period 4
6	Dynamic Earth	16	Human impact on the environment
7	Water resources	17	Energy, resources, & the future
8	Water resources	18	Energy, resources, & the future
9	Water resources	19	Energy, resources, & the future
10	Weather and climate	20	Sustainable development project

## Core Instructional & Supplemental Materials including various levels of Texts

Textbook: Arms, Karen. *Environmental Science*. Austin: Holt Rinehart Winston, 2008. Print.

Online Textbook: CK-12. *Earth Science Concepts for High School*.

<https://www.ck12.org/book/CK-12-Earth-Science-Concepts-For-High-School/>

Lab activities: Health & Science Pipeline Initiative (HASPI). Earth Science Curriculum.

<http://www.haspi.org/haspi-curriculum.html>

**Digital Resources Across All Levels:** (D=differentiated)

Edpuzzle (D)

Gizmo (D)

YouTube Videos

New York Times Articles

PhET Interactive Simulations (D)

Science News Articles

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Time Frame	Week 1
<b>Topic</b>	
Introduction to Earth and our environment	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What is the process of science, and what can it be used to do, discover, or make?</li><li>• Why should we study Earth and environmental sciences?</li><li>• What are the major systems on Earth?</li><li>• How are systems on Earth connected?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• Science is a non-linear process involving making observations, asking questions, designing experiments, gathering data, analyzing data, and communicating results.</li><li>• Human life is dependent on many of Earth's systems, and understanding these interactions can lead to better societies.</li><li>• Some of the major natural systems of Earth are the atmosphere, geosphere, hydrosphere, cryosphere, and biosphere.</li><li>• Earth consists of many interconnected systems, both natural and man-made, that all affect each other in ways that can be understood.</li></ul>	
<u><a href="#">Alignment to Standards</a></u>	
HS-ESS2-2, HS-ESS2-5, HS-ESS2-6, HE-ESS2-7	
<b>Learning Activities &amp; Key Concepts and Skills</b>	
<ul style="list-style-type: none"><li>• Lab safety bingo. Students learn where important safety equipment and other supplies are.</li><li>• How does carbonless copy paper work? Students use the scientific method to answer a seemingly simple question.</li><li>• Scientific sketching. Students practice observation skills and recording visual information like a scientist.</li><li>• Spheres of the environment research. Students read about the 5 major natural systems and how they interact.</li><li>• Do landfills work? Students set up a model of a landfill and make predictions about</li></ul>	

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which materials will decompose, to be investigated again at the end of the semester.

### Assessments

#### **Formative:**

- Discussion during carbonless copy paper activity
- Scientific sketches
- Comprehension questions in spheres research
- Predictions during landfill set up

#### **Summative:**

- End of unit test - multiple choice and short answer

#### **Benchmark:**

- Opening benchmark - skills

#### **Alternative:**

- Lab portfolio

### Career Education

- CRP-2 – Students use knowledge and skills through their lab work.
- CRP-12 – Students work productively in collaborative groups using culturally global competence.

### 21st Century Skills

- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.

### Interdisciplinary Connections

VPA.1.1.12.D.CS2 - Stimuli for the creation of artworks can come from many places, including other arts disciplines. (Sketching like a scientist)  
RST.11-12.10. By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

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### Technology Integration

TECH.8.1.12.A-- Select and use applications effectively and productively.

Students will use their Chromebooks to join Google Classroom to access digital resources throughout the semester.

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Time Frame	Week 2-3
<b>Topic</b>	
Geological time & dating Earth	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• How old is the Earth?</li><li>• How can we find the age of the Earth and other objects?</li><li>• Why do we study the Earth's history?</li><li>• What can we find out from studying rocks and fossils?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• The Earth has been around and changing for billions of years.</li><li>• We can use various absolute and relative dating methods to find the age and study the history of Earth.</li><li>• Studying the Earth's history can tell us about changes in the past and help predict future changes.</li><li>• Scientists can use rocks and fossils to learn about evolution, extinction, and climate.</li></ul>	
<u><a href="#">Alignment to Standards</a></u>	
HS-ESS1-5, HS-ESS1-6, HS-ESS2-1, HS-ESS2-7, HS-ESS3-1	
<b>Learning Activities &amp; Key Concepts and Skills</b>	
<ul style="list-style-type: none"><li>• Dendrochronology - Students discuss methods of dating, including relative dating. They then use model tree cores to find the age of a cabin.</li><li>• Stratigraphic layers &amp; the fossil record - Students use model drill cores to discover the laws of stratigraphy and superposition.</li><li>• Radiometric dating with popcorn - Students discuss the difference between relative and absolute dating. They then model radioactive atoms in rocks using bags of popcorn. They graph their results and calculate the "half-life" of popcorn.</li><li>• Modeling the geological timescale - Students research major events in the history of earth, and work in small groups to create a timeline highlighting important changes in an assigned time period. The group projects are combined and students do a poster walk to get info on the entire history of earth.</li></ul>	

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- Human health in the fossil record - Students read articles and answer questions about evidence of human health problems, such as cancer, Lyme, and childbirth, in the fossil record. This makes the study of fossils feel more immediate and personal to them.
- Newsela fossils jigsaw - Students read a current event about human fossils, then share that information with other groups

## Assessments

### **Formative:**

- Lab analysis questions (open ended)
- Geological timeline event card
- Fossil discussion

### **Summative:**

- Unit test (multiple choice and open ended)

### **Benchmark:**

- 

### **Alternative:**

- Lab portfolio

## Career Education

- CRP-2 – Students use knowledge and skills through their lab work.
- CRP-12 – Students work productively in collaborative groups using culturally global competence.

## 21st Century Skills

- 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

## Interdisciplinary Connections

LA.11-12.RI.11-12.1 - Accurately cite strong and thorough textual evidence, (e.g., via

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discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.  
(Reading/analyzing current events)

LA.11-12.SL.11-12.1 - Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.  
(Reading and sharing current events)

RST.11-12.9. Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

SOC.9-12.1.1.1 - Compare present and past events to evaluate the consequences of past decisions and to apply lessons learned. (Compare geological data and events, causes, and effects)

MA.K-12.4 - Model with mathematics. (Make a graph model of data)

### Technology Integration

- TECH.8.1.12.C. – Students will use google docs to formulate and submit lab reports to google classroom.
- TECH.8.1.12.D.5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	Week 4-6
Topic	
Dynamic Earth	
Essential Questions	
<ul style="list-style-type: none"><li>• What is the structure of the Earth?</li><li>• How do changes in the Earth affect humans?</li><li>• How can we predict and minimize the effects of the changing Earth?</li><li>• Why do we study the Earth's crust?</li></ul>	

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### Enduring Understandings

- The Earth is constantly changing due to its molten core and the tectonic plates that float on it.
- Changes in Earth's crust can have effects on human society, including structural damage, health risks, and social disruptions.
- We can use science and engineering to anticipate and protect from those impacts.
- We can study those changes to learn things about the past and possibly the future.

### [Alignment to Standards](#)

HS-ESS1-5, HS-ESS2-1, HS-ESS2-2, HS-ESS2-3, HS-ESS3-1, HS-ESS3-6

### Learning Activities & Key Concepts and Skills

- Far-flung fossils - Students study model continents and the fossils found on various layers of them. They use their information gathered to support the theory of continental drift.
- Tectonic plate movement WebQuest - Students gather data on tectonic plate movement on various interactive websites.
- Building Pangea Gizmo - Students use an online simulation to recreate Pangea using multiple forms of evidence (fossils, glacial scars, rock types).
- Cosmos: Lost Worlds of Planet Earth - Students watch the episode of the popular science mini-series and answer comprehension questions as they watch. Then they reflect by answering an open-ended question. The episode connects fossils, mass extinctions, and plate tectonics.
- Plate tectonics Gizmo - Students use an online simulation to research what happens at different types of plate boundaries. They record their findings in a handout.
- Modeling convection currents - Students construct a model of the Earth's mantle with a hot spot, and explain the movement of model "crust" above.
- Seafloor spreading model - Students use paper strips with colored "magnetic stripes" to model how seafloor spreading happens and causes tectonic plate movement.
- Earthquake epicenter Gizmos – Students use an online simulation to model how scientists use the different speeds of P and S waves to find the epicenter of an earthquake. They also discuss reasons why it would be useful to know the epicenter.
- Earthquake safe buildings - Students discuss the problems faced when building in an earthquake zone. They then work as a team to design, build, and test an earthquake-safe building, using only limited materials. They then reflect on the engineering process.

### Assessments

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### **Formative:**

- Lab analysis questions
- Gizmo screenshots and handouts – plate tectonics and earthquake epicenters
- Cosmos video questions
- Convection currents model
- Seafloor spreading model

### **Summative:**

- Unit test (multiple choice and open ended)

### **Benchmark:**

- 

### **Alternative:**

- Lab portfolio

### Career Education

CRP3- Analyze how economic conditions and societal changes influence employment trends and future education. (Engineering/design)

### 21st Century Skills

- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.

### Interdisciplinary Connections

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LA.9-10.RST.9-10.3 – Students follow procedures when carrying out an experiment

LA.9-10.WHST.9-10.2 – There is a writing component to each unit in the form of lab reports. Additionally, each assessment includes an essay and/or short answer questions.

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.

MA.9-12.N-Q.A.1 – Students calculate population size of fossils.

### Technology Integration

- TECH.8.1.12.C. – Students will use google docs to formulate and submit lab reports to google classroom.
- TECH.8.1.12.D.5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	Week 7-9
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### Topic

Water resources

### Essential Questions

- Why water is considered a natural resource?
- Where is most of our freshwater found?
- How do our everyday choices affect water resources?
- How will a shortage of freshwater affect humans?

### Enduring Understandings

- Water is a finite resource that all human societies depend on.
- Most accessible freshwater is found underground in aquifers (groundwater) that need to be protected.
- Our choices about how we use and pollute water today will impact how we are able to use water resources in the future.

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- Shortages of clean freshwater can lead to problems with human health, politics, and economics.

### [Alignment to Standards](#)

HS-LS4-6, HS-ESS2-5, HS-ESS2-6, HS-ESS3-1, HS-ESS3-2, HS-ESS3-4, HS-ESS3-6

### Learning Activities & Key Concepts and Skills

- Water pollution - Students add various types of pollution to pond water samples and see how each one may contribute to changes in the biotic and abiotic factors in the pond (eutrophication).
- Modeling the water cycle - Students model the water cycle using food coloring to represent pollution. They discuss how the water cycle works, and also how pollution may or may not be included in it.
- Blue Gold documentary - Students view the film about the coming fresh water crisis. They answer discussion questions about each part, then participate in a class discussion about why there is a crisis and how we can work to avert it.
- Make a groundwater model - Students read information about ground water, then design and build a model aquifer. They use their model to study how pollution moves through an aquifer, and how groundwater pumping affects the water table.
- Water quality & human health - Students read about common water pollutants and their human health effects. They then test local surface water for some of these contaminants, and make brochures warning the public about possible health problems in our area.
- Build the best water filter - Students use limited materials to design and build the most effective water filter.
- Ocean acidification - Students examine what happens to the pH of ocean water when CO<sub>2</sub> is absorbed. Then they will examine what happens to shelled organisms when they are exposed to more acidic environments.
- Bio-magnification activity - Students model an aquatic ecosystem with "DDT" in the water. They tag each other to represent predation, then analyze how the toxin moves up the food chain and is magnified on the way.

### Assessments

#### **Formative:**

- Lab analysis questions
- Questions during the Blue Gold video
- Groundwater models
- Water filters

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### **Summative:**

- Unit test (multiple choice and open ended)

### **Benchmark:**

- 

### **Alternative:**

- Lab portfolio

## Career Education

CRP3-Analyze how economic conditions and societal changes influence employment trends and future education. (Discuss future economies, societies, and jobs based on using up resources)

## 21st Century Skills

- 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

## Interdisciplinary Connections

LA.11-12.RI.11-12.1 - Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain. (Read & analyze human health articles)

RST.11-12.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.

## Technology Integration

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TECH.8.1.12.A - Select and use applications effectively and productively.  
Students will use their Chromebooks to research the structure of an aquifer and how water quality affects human health around the world.

Time Frame	Week 10-13
<b>Topic</b>	
Weather & Climate	
<b>Essential Questions</b>	
<ul style="list-style-type: none"><li>• What is the difference between weather and climate?</li><li>• What human activities impact our climate?</li><li>• How are human actions affecting climate?</li><li>• What can we do about our changing climate?</li></ul>	
<b>Enduring Understandings</b>	
<ul style="list-style-type: none"><li>• Weather is the result of complex systems interacting, while climate is the long term average of weather interactions.</li><li>• Human activities such as manufacturing, transportation, agriculture, and generating electricity release carbon dioxide change our climate.</li><li>• Human activities are making our climate warmer.</li><li>• We can use science and engineering to study, reduce, and deal with the effects of climate change.</li></ul>	
<u><a href="#">Alignment to Standards</a></u>	
HS-ESS2-4, HS-ESS2-6, HS-ESS3-1, HS-ESS3-3, HS-ESS3-5, HS-ESS3-6	
<b>Learning Activities &amp; Key Concepts and Skills</b>	
<ul style="list-style-type: none"><li>• Graphing weather and climate - Students practice using graphing software (Google Sheets) while making graphs comparing local average temperatures (climate) and observed temps (weather). They discuss the difference between climate and weather, and how they are connected.</li><li>• Unequal heating &amp; regional climate - Students design their own experiment comparing</li></ul>	

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the rate of heating of different types of material found on earth's surface (SW, FW, sand, soil, blacktop, etc). They discuss how the different rates may affect local weather and climate. They then reflect on the process of designing an experiment.

- Greenhouse gases model - Students model the greenhouse effect with different gases and a lamp. They draw correlations between the amount of CO<sub>2</sub> in the atmosphere and our changing climate.
- Greenhouse effect Gizmo - Students manipulate a model atmosphere and monitor the heat in, heat out, and temperature of the system.
- Climate & health - Students read articles and answer questions about the connection between climate change and human health
- Twister dashboard - Students use an interactive map to research the occurrence of tornadoes in the US. They then examine the data to determine the ideal conditions that produce tornadoes.
- Hurricane research - Students examine hurricane, sea surface, and climate data, and draw conclusions about the relationship between a warming climate and the number and severity of hurricanes.
- Hurricane Sandy activity - Students examine the conditions that lead to the formation of Hurricane Sandy, and discuss the factors that contributed to the huge amount of damage caused by it. They then research and build a working model of one proposed solution to protect the NYC area before the next "Superstorm." Finally, they explain and demonstrate their model to the rest of the class.

## Assessments

### **Formative:**

- Lab analysis questions
- Weather & climate graphs
- Hurricane data maps & graphs
- Hurricane protection models

### **Summative:**

- Unit test (multiple choice and open ended)

### **Benchmark:**

- 

### **Alternative:**

- Lab portfolio

## Career Education

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- CRP-2 – Students use knowledge and skills through their lab work.
- CRP-12 – Students work productively in collaborative groups using culturally global competence.

### 21st Century Skills

- 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

### Interdisciplinary Connections

LA.11-12.W.11-12.1.A - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.

(Evaluating various hurricane solutions)

RST.11-12.5. Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.11-12.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.

MA.K-12.5 - Use appropriate tools strategically. (Use graphing software to analyze data)

### Technology Integration

TECH.8.1.12.A-- Select and use applications effectively and productively.

TECH.8.1.12.A--Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.

(Students use their Chromebooks and Google Sheets to make graphs and analyze the data, to access and manipulate an online simulation, to research how climate affects health, to access an interactive map of hurricane data, and to read an article and watch videos from immediately after Hurricane Sandy.)

Time Frame

Week 14-16

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Topic
Human impact
Essential Questions
<ul style="list-style-type: none"><li>• How do human activities impact the environment?</li><li>• How are human systems like society and economics connected to natural system?</li><li>• How can we reduce the impact of human activities?</li></ul>
Enduring Understandings
<ul style="list-style-type: none"><li>• Our everyday activities like shopping, voting, and using resources impact the environment in many ways, both negative and positive.</li><li>• Cultural and political values, and economic choices can influence the way people treat the environment on a large scale.</li><li>• We can make choices that will reduce society's impact on the environment.</li></ul>
<u><a href="#">Alignment to Standards</a></u>
HS-ESS2-2, HS-ESS2-4, HS-ESS3-1, HS-ESS3-3, HS-ESS3-4, HS-ESS3-6
Learning Activities & Key Concepts and Skills
<ul style="list-style-type: none"><li>• 11<sup>th</sup> Hour documentary project - Students view the documentary, then work in small groups to explain how various seemingly unrelated topics actually have a huge effect on the environment and each other.</li><li>• Calculating your ecological footprint - Students use an interactive website to calculate their impact on earth's resources. They then discuss ways they individually and we as a culture can reduce our impact.</li><li>• Plastic website review - Students visit various websites that discuss the pros and cons of plastics, and write reviews of each. They are reminded to be aware of bias on each page.</li><li>• Addicted to Plastic documentary - Students view the documentary and answer discussion questions.</li><li>• Plastic discussion - In a student-directed discussion, students discuss the pros and cons of plastics, based on both their research and the film.</li></ul>
Assessments

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### **Formative:**

- Lab analysis questions
- Notes from videos (11<sup>th</sup> Hour and Addicted to Plastic)
- Plastic website review write-up
- Plastic discussion participation

### **Summative:**

- Quiz (open ended)

### **Benchmark:**

- 

### **Alternative:**

- Presentation on human-natural systems connection
- Discussion about pros and cons of plastic

## Career Education

- CRP-2 – Students use knowledge and skills through their lab work.
- CRP-12 – Students work productively in collaborative groups using culturally global competence.

## 21st Century Skills

- 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.

## Interdisciplinary Connections

LA.11-12.SL.11-12.4 - Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. (Present information from documentary)

LA.11-12.W.11-12.1.A - Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. (Evaluate information from various sources online)

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LA.11-12.SL.11-12.1.C - Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. (Participate productively in a student-led discussion)

RST.11-12.2. Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.

SOC.9-12.1.3.2 - Evaluate sources for validity and credibility and to detect propaganda, censorship, and bias. (Evaluate plastic websites from different sources)

SOC.9-12.1.4.2 - Demonstrate effective presentation skills by presenting information in a clear, concise, and well-organized manner taking into consider appropriate use of language for task and audience. (Documentary presentation)

### Technology Integration

TECH.8.1.12.A-1 – Additional resources and extension activities on google classroom in order to reflect on their learning and expand on knowledge.

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content.

Time Frame	Week 17-19
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### Topic

Energy, Resources, & The Future

### Essential Questions

- What are natural resources, and why are they important?
- What are the differences between renewable and nonrenewable resources?
- Are most human societies currently using resources wisely?
- How can we build a sustainable society for the future?

### Enduring Understandings

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- Society depends on natural resources such as plants and animals for food, clean air, clean water, and fossil fuels for energy.
- Renewable resources are those that are replaced continuously by natural processes, and are therefore better for the environment.
- We are using fossil fuels and other limited resources at an unsustainable rate.
- Science, economics, and society can come together and plan ways to make our society more sustainable.

## [Alignment to Standards](#)

HS-LS4-6, HS-PS3-2, HS-PS3-3, HS-ESS3-1, HS-ESS3-2, HS-ESS3-3, HS-ESS3-4, HS-ESS3-6

## Learning Activities & Key Concepts and Skills

- Distribution of natural resources map analysis - Students analyze data from a set of interactive maps. They identify correlations between the distribution and use of various natural resources and the distribution and overall wellbeing of the human population.
- Green energy sales pitch - Students work in small groups to choose and research a type of renewable energy. They are then paired with another small group and make a presentation about why their energy source is the best for our future. The rest of the class votes on which small group was more convincing.
- Hydroelectric power challenge - Students construct a model water wheel and use it to explain how kinetic energy can be converted into mechanical energy/electricity. They then design an experiment to determine how different variables effect the energy output (height/speed of water, etc.)
- Playing it cool energy marketplace - Students model an energy marketplace. They discover how production costs and profit margins are related to the amount of renewable energy sold/used. They also see how things like government subsidies and civil unrest can affect energy prices.
- Overfishing and sustainability - Students act as fishers whose living depends on "fishing" for popcorn. They discover what is currently happening to many fisheries around the world, in a modern "tragedy of the commons." They discuss ways we could make fisheries more sustainable, and extrapolate to other common resources (e.g., water, air).

## Assessments

## Career Education

- CRP-2 – Students use knowledge and skills through their lab work.
- CRP-12 – Students work productively in collaborative groups using culturally global

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competence.

### 21st Century Skills

- 9.3.12.ED.5 Demonstrate group collaboration skills to enhance professional education and training practice.
- 9.3.ST.2 Use technology to acquire, manipulate, analyze and report data.
- 9.3.ST.4 Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.

### Interdisciplinary Connections

LA.11-12.SL.11-12.4 - Present information, findings and supporting evidence clearly, concisely, and logically. The content, organization, development, and style are appropriate to task, purpose, and audience. (Green energy persuasive presentation)

SOC.9-12.1.4.2 - Demonstrate effective presentation skills by presenting information in a clear, concise, and well-organized manner taking into consider appropriate use of language for task and audience. (Green energy persuasive presentation)

SOC.9-12.1.1.1 - Compare present and past events to evaluate the consequences of past decisions and to apply lessons learned. (Evaluate how our use of resources impacts us today)

### Technology Integration

TECH.8.1.12.D-5 – Demonstrate personal responsibility for life-long learning by researching the internet to apply skills to new content

Time Frame

Week 20

### Topic

Sustainable Development Project

### Essential Questions

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How can we apply the concepts of sustainability to future design and development?

### Enduring Understandings

- All of the topics covered this semester are interconnected.
- By applying these course topics on both large and small scale, we can make a sustainable future.

### Alignment to Standards

Reinforces all standards covered in previous units

### Learning Activities & Key Concepts and Skills

Sustainable development project - Students work independently to design the best development for a local plot of land. Topics that must be addressed include economic and social benefits, effect on local water/air pollution, effect on the groundwater, and type(s) of energy that will be used.

### Assessments

#### **Formative:**

- Graphic organizer with daily progress (brainstorming, researching, writing, and designing model)

#### **Summative:**

- Written paper
- Presentation of visual model

#### **Benchmark:**

- Final benchmark – skills
- Written paper is final benchmark – content

#### **Alternative:**

- Project – paper + model + presentation

Career Education

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See previous units

### 21st Century Skills

See previous units

### Interdisciplinary Connections

See previous units

### Technology Integration

TECH.8.1.12.A--Select and use applications effectively and productively.  
Students use their Chromebooks to research engineering solutions to various environmental problems.

### Modifications (ELL, Special Education, At-Risk Students, Gifted & Talented, & 504 Plans)

#### **ELL:**

- Work toward longer passages as skills in English increase
- Use visuals
- Introduce key vocabulary before lesson
- Teacher models reading aloud daily
- Provide peer tutoring
- Use of Bilingual Dictionary
- Guided notes and/or scaffold outline for written assignments
- Provide students with English Learner leveled readers.

#### **Supports for Students With IEPs:**

- Allow extra time to complete assignments or tests
- Guided notes and/or scaffold outline for written assignments
- Work in a small group
- Allow answers to be given orally or dictated
- Use large print books, Braille, or books on CD (digital text)

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- Follow all IEP modifications

### **At-Risk Students:**

- Guided notes and/or scaffold outline for written assignments
- Introduce key vocabulary before lesson
- Work in a small group
- Lesson taught again using a differentiated approach
- Allow answers to be given orally or dictated
- Use visuals / Anchor Charts
- Leveled texts according to ability

### **Gifted and Talented:**

- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities
- Expose students to beyond level texts.

### **Supports for Students With 504 Plans:**

- Follow all the 504 plan modifications
- Text to speech/audio recorded selections
- Amplification system as needed
- Leveled texts according to ability
- Fine motor skill stations embedded in rotation as needed
- Modified or constrained spelling word lists
- Provide anchor charts with high frequency words and phonemic patterns

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