

**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 1</b>	<b>Pacing: 15 days</b>
<b>Unit Title: Evidence of Common Ancestry</b>			

**OVERVIEW OF UNIT:**

**In this unit, Students will look at empirical and fossil evidence that documents the change of diversity in organisms within Earth’s History. Students will compare and contrast organisms from different time periods to their ancestors that exist today, also comparing the similarities in the growth and development of offspring across multiple species.**

<b>Unit References</b>	
<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>● The fossil record documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth.</li> <li>● The collection of fossils and their placement in chronological order as identified through the location of sedimentary layers in which they are found or through radioactive dating is known as the fossil record.</li> <li>● Relative fossil dating is achieved by examining the fossil’s relative position in sedimentary rock layers.</li> <li>● Objects and events in the fossil record occur in consistent patterns that are understandable through measurement and observation.</li> <li>● Patterns exist in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in rock layers.</li> <li>● Patterns can occur within one species of organism or across many species.</li> <li>● Similarities and differences exist in the gross anatomical structures of modern organisms.</li> </ul>	<ul style="list-style-type: none"> <li>● How do we know when an organism (fossil) was alive?</li> <li>● How do we know that birds and dinosaurs are related?</li> </ul>

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- There are anatomical similarities and differences among modern organisms and between modern organisms and fossil organisms.
- Similarities and differences exist in the gross anatomical structures of modern organisms and their fossil relatives.
- Similarities and differences in the gross anatomical structures of modern organisms enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent.
- Patterns and anatomical similarities in the fossil record can be used to identify cause-and-effect relationships.
- Science assumes that objects and events in evolutionary history occur in consistent patterns that are understandable through measurement and observation.

#### Objectives

- Students will be able to determine when an organism (fossil) was alive.
- Students will be able to determine how dinosaurs and birds are related.

#### Assessment

##### **Formative Assessment:**

- Labs
- Claim-Evidence- Reasoning
- Class Discussions

##### **Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

##### **Benchmark:**

- LinkIt Benchmark

##### **Alternative:**

- Performance Assessments

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- Projects
- Models
- Modified Tests Independently Developed by Teacher

### Key Vocabulary

Extinction, fossil record, evolution, adaptations, selective breeding, geologic time scale, natural selection

### Resources & Materials

Stemscopes website & kits

- Print and digital copies of textbook
- Lab write-ups
- SEP simulations
- Content videos
- PhET Interactive Simulations
- Reading articles
- Math connections
- Pre-assembled Kits

### Technology Infusion

#### Teacher Technology:

- Chromebooks
- Stemscopes website
- SMARTBoard

#### Student Technology:

- Chromebooks
- Stemscopes website

#### Activities:

- Students will use Chromebooks to access the Stemscopes website to: activate prior knowledge, build schema, watch videos, complete labs, take assessments and collect data.

**Standard**

**Standard Description**

8.1.8.A.1

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

<b>Interdisciplinary Integration</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>• Students will be able to analyze data in order to create a scientific explanation.</li> <li>• Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
4.31.12.B.1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

<b>21<sup>st</sup> Century Life Skills</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>• Students will work in groups to collaborate, at times taking leadership roles to communicate project ideas to the whole class.</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

<b>Careers</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>• Students will explain the consequences of human movement and development on the Earth.</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
CRP5.	Consider the environmental, social and economic impacts of decisions.

**ELA Companion Standards**

**Activities:**

- Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

Standard	Standard Description
WHST.6-8.1	Write arguments focused on <i>discipline-specific content</i> .

**Standards**

Standard #	Standard Description	Student Learning Objectives	Clarification Statement
MS-LS4-1.	Biological Evolution	Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.	Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]
MS-LS4-2.	Biological Evolution	Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships.	Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]
MS-LS4-3	Biological Evolution	. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy.	Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

Differentiation			
Special Education	English Language Learners (ELL)	Response to Intervention (RTI)	Enrichment
<ul style="list-style-type: none"> <li>● Provide modifications &amp; accommodations as listed in the student's IEP</li> <li>● Position student near helping peer or have quick access to teacher</li> <li>● Modify or reduce assignments/tasks</li> <li>● Reduce length of assignment for different mode of delivery</li> <li>● Increase one-to-one time</li> <li>● Prioritize tasks</li> <li>● Use graphic organizers</li> <li>● Use online resources for skill building</li> <li>● Provide teacher notes</li> <li>● Use collaborative grouping strategies such as small groups</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/specialed/">http://www.state.nj.us/education/specialed/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Provide text-to-speech</li> <li>● Use of translation dictionary or software</li> <li>● Provide graphic organizers</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/ELL.htm">http://www.state.nj.us/education/aps/cccs/ELL.htm</a></li> <li>● Adapt a Strategy – Adjusting strategies for ESL students - <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>● Tiered interventions following RTI framework</li> <li>● Effective RTI strategies for teachers - <a href="http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/">http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/</a></li> <li>● Interventional Central - <a href="http://www.interventioncentral.org/">http://www.interventioncentral.org/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Process should be modified: higher order thinking skills, open-ended thinking, discovery</li> <li>● Utilize project-based learning for greater depth of knowledge</li> <li>● Utilize exploratory connections to higher grade concepts</li> <li>● Contents should be modified: real world problems, audiences, deadlines, evaluations, transformations</li> <li>● Learning environments should be modified: student-centered learning, independence, openness, complexity, groups varied</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm">http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm</a></li> </ul>

**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 2</b>	<b>Pacing: 20 days</b>
<b>Unit Title: Selection and Adaptation</b>			

**OVERVIEW OF UNIT:**

**In this unit,** Students construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They will use ideas of genetic variation in a population to make sense of how organisms survive and reproduce, thus passing on the traits of the species.

<b>Unit References</b>	
<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>Genetic variations of traits in a population increase or decrease some individuals' probability of surviving and reproducing in a specific environment.</li> <li>Natural selection leads to the predominance of certain traits in a population and the suppression of others.</li> <li>Natural selection may have more than one cause, and some cause-and-effect relationships within natural selection can only be described using probability.</li> <li>Natural selection, which over generations leads to adaptations, is one important process through which species change over time in response to changes in environmental conditions.</li> <li>The distribution of traits in a population changes.</li> <li>Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common.</li> </ul>	<p><i>How can changes to the genetic code increase or decrease an individual's chances of survival?</i></p> <p><i>How can the environment effect natural selection?</i></p> <p><i>Are Genetically Modified Organisms (GMO) safe to eat?</i></p>

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<ul style="list-style-type: none"><li>● Natural selection may have more than one cause, and some cause-and-effect relationships in natural selection can only be described using probability.</li><li>● Mathematical representations can be used to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.</li><li>● In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding.</li><li>● In artificial selection, humans choose desirable, genetically determined traits in to pass on to offspring.</li><li>● Phenomena, such as genetic outcomes in artificial selection, may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.</li><li>● Technologies have changed the way humans influence the inheritance of desired traits in organisms.</li><li>● Engineering advances have led to important discoveries in the field of selective breeding.</li><li>● Engineering advances in the field of selective breeding have led to the development of entire industries and engineered systems.</li><li>● Scientific discoveries have led to the development of entire industries and engineered systems.</li></ul>	
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**Objectives**

<ul style="list-style-type: none"><li>● Students will be able to determine how changes to the genetic code increase or decrease an individual’s chances of survival.</li><li>● Students will be able to describe how the environment can affect natural selection.</li><li>● Students will be able to explain if Genetically Modified Organisms (GMOs) are safe to eat.</li></ul>
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**Assessment**

<p><b>Formative Assessment:</b></p> <ul style="list-style-type: none"><li>● Labs</li><li>● Claim-Evidence- Reasoning</li></ul>
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- Class Discussions

**Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

**Benchmark:**

- LinkIt Benchmark

**Alternative:**

- Performance Assessments
- Projects
- Models
- Modified Tests Independently Developed by Teacher

**Key Vocabulary**

Sexual reproduction, heredity, genetics, punnet square, dominant traits, recessive traits, alleles, phenotype, genotype

**Resources & Materials**

Stemscopes website & kits

- Print and digital copies of textbook
- Lab write-ups
- SEP simulations
- Content videos
- PhET Interactive Simulations
- Reading articles
- Math connections
- Pre-assembled Kits

**Technology Infusion**

**Teacher Technology:**

- Chromebooks
- Stemscopes website
- SMARTBoard

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**Student Technology:**

- Chromebooks
- Stemscoopes website

**Activities:**

- Students will use Chromebooks to access the Stemscoopes website to: activate prior knowledge, build schema, watch videos, complete labs, take assessments and collect data.

<b>Standard</b>	<b>Standard Description</b>
8.1.8.A.1	8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

**Interdisciplinary Integration**

**Activities:**

- Students will be able to analyze data in order to create a scientific explanation.
- Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

<b>Standard</b>	<b>Standard Description</b>
4.31.12.B.1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

**21<sup>st</sup> Century Life Skills**

**Activities:**

- Students will work in groups to collaborate, at times taking leadership roles to communicate project ideas to the whole class.

<b>Standard</b>	<b>Standard Description</b>
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

**Careers**

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<b>Activities:</b> <ul style="list-style-type: none"><li>• Students will explain the consequences of human movement and development on the Earth.</li></ul>	
<b>Standard</b>	<b>Standard Description</b>
CRP5.	Consider the environmental, social and economic impacts of decisions.

**ELA Companion Standards**

<b>Activities:</b> <ul style="list-style-type: none"><li>• Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim</li></ul>	
<b>Standard</b>	<b>Standard Description</b>
RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.

<b>Standards</b>			
Standard #	Standard Description	Student Learning Objectives	Clarification Statement
MS-LS4-4.	Biological Evolution	Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	Emphasis is on using simple probability statements and proportional reasoning to construct explanations.
MS-LS4-5.	Biological Evolution	Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.	Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.
MS-LS4-6.	Biological Evolution	Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.	Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time. [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

Differentiation			
Special Education	English Language Learners (ELL)	Response to Intervention (RTI)	Enrichment
<ul style="list-style-type: none"> <li>● Provide modifications &amp; accommodations as listed in the student's IEP</li> <li>● Position student near helping peer or have quick access to teacher</li> <li>● Modify or reduce assignments/tasks</li> <li>● Reduce length of assignment for different mode of delivery</li> <li>● Increase one-to-one time</li> <li>● Prioritize tasks</li> <li>● Use graphic organizers</li> <li>● Use online resources for skill building</li> <li>● Provide teacher notes</li> <li>● Use collaborative grouping strategies such as small groups</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/specialed/">http://www.state.nj.us/education/specialed/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Provide text-to-speech</li> <li>● Use of translation dictionary or software</li> <li>● Provide graphic organizers</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/ELL.htm">http://www.state.nj.us/education/aps/cccs/ELL.htm</a></li> <li>● Adapt a Strategy – Adjusting strategies for ESL students - <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>● Tiered interventions following RTI framework</li> <li>● Effective RTI strategies for teachers - <a href="http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/">http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/</a></li> <li>● Interventional Central - <a href="http://www.interventioncentral.org/">http://www.interventioncentral.org/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Process should be modified: higher order thinking skills, open-ended thinking, discovery</li> <li>● Utilize project-based learning for greater depth of knowledge</li> <li>● Utilize exploratory connections to higher grade concepts</li> <li>● Contents should be modified: real world problems, audiences, deadlines, evaluations, transformations</li> <li>● Learning environments should be modified: student-centered learning, independence, openness, complexity, groups varied</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm">http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm</a></li> </ul>

**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 3</b>	<b>Pacing: 30 days</b>
<b>Unit Title: Stability and Change on Earth</b>			

**OVERVIEW OF UNIT:**

***Why aren't minerals and groundwater distributed evenly across the world?***

Students construct an understanding of the ways that human activities affect Earth's systems. Students use practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts on the development of these resources. Students also understand that the distribution of these resources is uneven due to past and current geosciences processes or removal by humans.

<b>Unit References</b>	
<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>• Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources.</li> <li>• All human activities draw on Earth's land, ocean, atmosphere, and biosphere resources and have both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.</li> <li>• Minerals, fresh water, and biosphere resources are distributed unevenly around the planet as a result of past geologic processes.</li> <li>• Cause-and-effect relationships may be used to explain how uneven distributions of Earth's mineral, energy, and groundwater resources have resulted from past and current geosciences processes.</li> <li>• Resources that are unevenly distributed as a result of past processes include but are not limited to petroleum, metal ores, and soil.</li> <li>• Mineral, fresh water, ocean, biosphere, and atmosphere resources are limited, and many are not renewable or replaceable over human lifetimes.</li> </ul>	<p><i>Why aren't minerals and groundwater distributed evenly across the world?</i></p> <p><i>How can we predict and prepare for natural disasters?</i></p> <p><i>How might we treat resources if we thought about the Earth as a spaceship on an extended survey of the solar system? (How would astronauts manage their resources?)</i></p> <p><i>How can basic chemistry be used to explain the mechanisms that control the global temperature the atmosphere?</i></p>

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- The distribution of some of Earth's land, ocean, atmosphere, and biosphere resources are changing significantly due to removal by humans.
- Natural hazards can be the result of interior processes, surface processes, or severe weather events.
- Some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable.
- Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces, can help forecast the locations and likelihoods of future events.
- Data on natural hazards can be used to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
- Data on natural hazards can include the locations, magnitudes, and frequencies of the natural hazards.
- Graphs, charts, and images can be used to identify patterns of natural hazards in a region.
- Graphs, charts, and images can be used to understand patterns of geologic forces that can help forecast the locations and likelihoods of future events.
- Technologies that can be used to mitigate the effects of natural hazards can be global or local.
- Technologies used to mitigate the effects of natural hazards vary from region to region and over time.

### Objectives

- Students will be able to infer why minerals and groundwater are not distributed evenly across the world.
- Students will be able to predict and prepare for natural disasters.
- Students will be able to determine how we might treat resources if we thought about the Earth as a spaceship on an extended survey of the solar system.
- Students will be able to describe how basic chemistry can be used to explain the mechanisms that control the global temperature of the atmosphere.

### Assessment

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**Formative Assessment:**

- Labs
- Claim-Evidence- Reasoning
- Class Discussions

**Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

**Benchmark:**

- LinkIt Benchmark

**Alternative:**

- Performance Assessments
- Projects
- Models
- Modified Tests Independently Developed by Teacher

**Key Vocabulary**

Natural resources, renewable, nonrenewable, consumption, distribution

**Resources & Materials**

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**Technology Infusion**

**Teacher Technology:**



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**Activities:**

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**Interdisciplinary Integration**

**Activities:**

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- Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

<b>Standard</b>	<b>Standard Description</b>
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**21<sup>st</sup> Century Life Skills**

**Activities:**

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<b>Standard</b>	<b>Standard Description</b>
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

Careers	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will explain the consequences of human movement and development on the Earth.</li> </ul>	
Standard	Standard Description
CRP5.	Consider the environmental, social and economic impacts of decisions.

ELA Companion Standards	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim</li> </ul>	
Standard	Standard Description
WHST.6-8.1	Write arguments focused on <i>discipline-specific content</i> .

Standards			
Standard #	Standard Description	Student Learning Objectives	Clarification Statement
MS-ESS3-1	Earth and Human Activity	Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.	<p>Emphasis is on how these resources are limited and typically nonrenewable, and how their distributions are significantly changing as a result of removal by humans.</p> <p>Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).</p>
MS-ESS3-2	Earth and Human Activity	Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.	<p>Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor</p>

			hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).
MS-ESS3-4	Earth and Human Activity	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.	Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.
MS-ESS3-5	Earth and Human Activity	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.	Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.

**Differentiation**

Special Education	English Language Learners (ELL)	Response to Intervention (RTI)	Enrichment
<ul style="list-style-type: none"> <li>● Provide modifications &amp; accommodations as listed in the student's IEP</li> <li>● Position student near helping peer or have quick access to teacher</li> <li>● Modify or reduce assignments/tasks</li> <li>● Reduce length of assignment for different mode of delivery</li> <li>● Increase one-to-one time</li> <li>● Prioritize tasks</li> <li>● Use online resources for skill building</li> <li>● Provide teacher notes – scaffolded notes (fill in )</li> <li>● Use collaborative grouping strategies such as small groups</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/specialed/">http://www.state.nj.us/education/specialed/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Provide text-to-speech</li> <li>● Use of translation dictionary or software</li> <li>● Provide graphic organizers</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/ELL.htm">http://www.state.nj.us/education/aps/cccs/ELL.htm</a></li> <li>● Adapt a Strategy – Adjusting strategies for ESL students - <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>● Tiered interventions following RTI framework</li> <li>● Effective RTI strategies for teachers - <a href="http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/">http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/</a></li> <li>● Interventional Central - <a href="http://www.interventioncentral.org/">http://www.interventioncentral.org/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Process should be modified: higher order thinking skills, open-ended thinking, discovery</li> <li>● Utilize project-based learning for greater depth of knowledge</li> <li>● Utilize exploratory connections to higher grade concepts</li> <li>● Contents should be modified: real world problems, audiences, deadlines, evaluations, transformations</li> <li>● Learning environments should be modified: student-centered learning, independence, openness, complexity, groups varied</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm">http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm</a></li> </ul>

**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 4</b>	<b>Pacing: 25 days</b>
<b>Unit Title: Human Impacts on Earth Systems and Global Climate Change</b>			

**OVERVIEW OF UNIT:**

In this unit of study, students analyze and interpret data and design solutions to build on their understanding of the ways that human activities affect Earth’s systems. The emphasis of this unit is the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses. The crosscutting concepts of *cause and effect* and *the influence of science, engineering, and technology on society and the natural world* are called out as organizing concepts for these disciplinary core ideas.

Building on Unit 3, students define a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluate alternative solutions; analyze data from tests of different solutions; combining the best ideas into an improved solution; and develop and iteratively test and improve their model to reach an optimal solution. In this unit of study students are expected to demonstrate proficiency in *analyzing and interpreting data* and *designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, and MS-ETS1-3.

<b>Unit References</b>	
<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species.</li> <li>Changes to Earth’s environments can have different impacts (negative and positive) for different living things.</li> <li>Typically as human populations and per capita consumption of natural resources increase, so do the negative impacts on Earth, unless the activities and technologies involved are engineered otherwise.</li> </ul>	<p><b>Part A:</b> <i>How do we monitor the health of the environment (our life support system)?</i></p>

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- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.
- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

### Objectives

- Students will be able to determine how we monitor the health of the environment.

### Assessment

#### **Formative Assessment:**

- Labs
- Claim-Evidence- Reasoning
- Class Discussions

#### **Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

#### **Benchmark:**

- LinkIt Benchmark

#### **Alternative:**

- Performance Assessments
- Projects
- Models
- Modified Tests Independently Developed by Teacher

### Key Vocabulary

Renewable resources, nonrenewable resources, biosphere, greenhouse effect, population, aquifers, development, pollution, recycling, conservation

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**Resources & Materials**

- Stemscopes website & kits
- Print and digital copies of textbook
  - Lab write-ups
  - SEP simulations
  - Content videos
  - PhET Interactive Simulations
  - Reading articles
  - Math connections
  - Pre-assembled Kits

**Technology Infusion**

- Teacher Technology:**
- Chromebooks
  - Stemscopes website
  - SMARTBoard
- Student Technology:**
- Chromebooks
  - Stemscopes website
- Activities:**
- Students will use Chromebooks to access the Stemscopes website to: activate prior knowledge, build schema, watch videos, complete labs, take assessments and collect data.

<b>Standard</b>	<b>Standard Description</b>
8.1.8.A.1	8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

**Interdisciplinary Integration**

- Activities:**
- Students will be able to analyze data in order to create a scientific explanation.
  - Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

<b>Standard</b>	<b>Standard Description</b>
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4.31.12.B.1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

### 21<sup>st</sup> Century Life Skills

**Activities:**

- Students will work in groups to collaborate, at times taking leadership roles to communicate project ideas to the whole class.

Standard	Standard Description
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

### Careers

**Activities:**

- Students will explain the consequences of human movement and development on the Earth.

Standard	Standard Description
CRP5.	Consider the environmental, social and economic impacts of decisions.

### ELA Companion Standards

**Activities:**

- Students will explain the consequences of human movement and development on the Earth.

Standard	Standard Description
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

### Standards

Standard #	Standard Description	Student Learning Objectives	Clarification Statement
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MS-ESS3-3	Earth and Human Activity	Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).
MS-ETS1-1	Engineering Design	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	N/A
MS-ETS1-2	Engineering Design	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	N/A
MS-ETS1-3	Engineering Design	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	N/A

Differentiation			
Special Education	English Language Learners (ELL)	Response to Intervention (RTI)	Enrichment
<ul style="list-style-type: none"> <li>Provide modifications &amp; accommodations as listed in the student's IEP</li> </ul>	<ul style="list-style-type: none"> <li>Provide text-to-speech</li> <li>Use of translation dictionary or software</li> </ul>	<ul style="list-style-type: none"> <li>Tiered interventions following RTI framework</li> </ul>	<ul style="list-style-type: none"> <li>Process should be modified: higher order thinking skills,</li> </ul>

<ul style="list-style-type: none"> <li>● Position student near helping peer or have quick access to teacher</li> <li>● Modify or reduce assignments/tasks</li> <li>● Reduce length of assignment for different mode of delivery</li> <li>● Increase one-to-one time</li> <li>● Prioritize tasks</li> <li>● Use graphic organizers</li> <li>● Use online resources for skill building</li> <li>● Provide teacher notes</li> <li>● Use collaborative grouping strategies such as small groups</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/specialed/">http://www.state.nj.us/education/specialed/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Provide graphic organizers</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/ELL.htm">http://www.state.nj.us/education/aps/cccs/ELL.htm</a></li> <li>● Adapt a Strategy – Adjusting strategies for ESL students - <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>● Effective RTI strategies for teachers - <a href="http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/">http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/</a></li> <li>● Interventional Central - <a href="http://www.interventioncentral.org/">http://www.interventioncentral.org/</a></li> </ul>	<p>open-ended thinking, discovery</p> <ul style="list-style-type: none"> <li>● Utilize project-based learning for greater depth of knowledge</li> <li>● Utilize exploratory connections to higher grade concepts</li> <li>● Contents should be modified: real world problems, audiences, deadlines, evaluations, transformations</li> <li>● Learning environments should be modified: student-centered learning, independence, openness, complexity, groups varied</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm">http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm</a></li> </ul>
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**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 5</b>	<b>Pacing: 20 days</b>
<b>Unit Title: Relationships Among Forms of Energy</b>			

**OVERVIEW OF UNIT:**

*How can physics explain sports?*

In this unit, students use the practices of *analyzing and interpreting data*, *developing and using models*, and *engaging in argument from evidence* to make sense of relationship between energy and forces. Students develop their understanding of important qualitative ideas about the conservation of energy. Students understand that objects that are moving have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions. Students also understand the difference between energy and temperature, and the relationship between forces and energy.

**Unit References**

<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>• Kinetic energy is related to the mass of an object and to the speed of an object.</li> <li>• Kinetic energy has a relationship to mass separate from its relationship to speed.</li> <li>• Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of the object's speed.                             <ul style="list-style-type: none"> <li>• Proportional relationships among different types of quantities provide information about the magnitude of properties and processes.</li> </ul> </li> <li>• When the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.</li> <li>• A system of objects may contain stored (potential) energy, depending on the objects' relative positions.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Is it better to have an aluminum (baseball/softball) bat or a wooden bat?</i></li> <li>• <i>Who can design the best roller coaster?</i></li> </ul>

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- When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the objects.
  - Models that could include representations, diagrams, pictures, and written descriptions of systems can be used to represent systems and their interactions, such as inputs, processes, and outputs, and energy and matter flows within systems.
- When the kinetic energy of an object changes, energy is transferred to or from the object.
- When the motion energy of an object changes, there is inevitably some other change in energy at the same time.
  - Kinetic energy may take different forms (e.g., energy in fields, thermal energy, energy of motion).

#### Objectives

- Students will be able to distinguish if its better to have an aluminum bat or a wooden bat.
- Students will be able to determine the aspects of a functioning roller coaster

#### Assessment

##### **Formative Assessment:**

- Labs
- Claim-Evidence- Reasoning
- Class Discussions

##### **Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

##### **Benchmark:**

- LinkIt Benchmark

##### **Alternative:**

- Performance Assessments

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- Projects
- Models
- Modified Tests Independently Developed by Teacher

### Key Vocabulary

Kinetic energy, potential energy, thermal energy, momentum, speed, mass

### Resources & Materials

Stemscopes website & kits

- Print and digital copies of textbook
- Lab write-ups
- SEP simulations
- Content videos
- PhET Interactive Simulations
- Reading articles
- Math connections
- Pre-assembled Kits

### Technology Infusion

#### Teacher Technology:

- Chromebooks
- Stemscopes website
- SMARTBoard

#### Student Technology:

- Chromebooks
- Stemscopes website

#### Activities:

- Students will use Chromebooks to access the Stemscopes website to: activate prior knowledge, build schema, watch videos, complete labs, take assessments and collect data.

**Standard**

**Standard Description**

8.1.8.A.1

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

<b>Interdisciplinary Integration</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will be able to analyze data in order to create a scientific explanation.</li> <li>Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
4.31.12.B.1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

<b>21<sup>st</sup> Century Life Skills</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will work in groups to collaborate, at times taking leadership roles to communicate project ideas to the whole class.</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

<b>Careers</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will create scientific explanations to describe observable phenomena in order to communicate findings.</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
CRP4	Communicate clearly and effectively and with reason.

ELA Companion Standards	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will create scientific explanations to describe observable phenomena in order to communicate findings.</li> </ul>	
Standard	Standard Description
RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Standards			
Standard #	Standard Description	Student Learning Objectives	Clarification Statement
MS-PS3-1	Energy	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.	Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.
MS-PS3-2	Energy	Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.	Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate’s hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems. [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]
MS-PS3-5	Energy	Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.	Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object. [Assessment Boundary:



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			Assessment does not include calculations of energy.]
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<b>Differentiation</b>			
Special Education	English Language Learners (ELL)	Response to Intervention (RTI)	Enrichment
<ul style="list-style-type: none"> <li>● Provide modifications &amp; accommodations as listed in the student’s IEP</li> <li>● Position student near helping peer or have quick access to teacher</li> <li>● Modify or reduce assignments/tasks</li> <li>● Reduce length of assignment for different mode of delivery</li> <li>● Increase one-to-one time</li> <li>● Prioritize tasks</li> <li>● Use graphic organizers</li> <li>● Use online resources for skill building</li> <li>● Provide teacher notes</li> <li>● Use collaborative grouping strategies such as small groups</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/specialed/">http://www.state.nj.us/education/specialed/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Provide text-to-speech</li> <li>● Use of translation dictionary or software</li> <li>● Provide graphic organizers</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/ELL.htm">http://www.state.nj.us/education/aps/cccs/ELL.htm</a></li> <li>● Adapt a Strategy – Adjusting strategies for ESL students - <a href="http://www.teachersfirst.com/content/esl/adaptstrat.cfm">http://www.teachersfirst.com/content/esl/adaptstrat.cfm</a></li> </ul>	<ul style="list-style-type: none"> <li>● Tiered interventions following RTI framework</li> <li>● Effective RTI strategies for teachers - <a href="http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/">http://www.specialeducationguide.com/pre-k-12/response-to-intervention/effective-rti-strategies-for-teachers/</a></li> <li>● Interventional Central - <a href="http://www.interventioncentral.org/">http://www.interventioncentral.org/</a></li> </ul>	<ul style="list-style-type: none"> <li>● Process should be modified: higher order thinking skills, open-ended thinking, discovery</li> <li>● Utilize project-based learning for greater depth of knowledge</li> <li>● Utilize exploratory connections to higher grade concepts</li> <li>● Contents should be modified: real world problems, audiences, deadlines, evaluations, transformations</li> <li>● Learning environments should be modified: student-centered learning, independence, openness, complexity, groups varied</li> <li>● NJDOE resources - <a href="http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm">http://www.state.nj.us/education/aps/cccs/g_and_t_req.htm</a></li> </ul>

**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 6</b>	<b>Pacing: 30 days</b>
<b>Unit Title: Thermal Energy</b>			

**OVERVIEW OF UNIT:**

***How can a standard thermometer be used to tell you how particles are behaving?***

In this unit, students *ask questions, plan and carry out investigations, engage in argument from evidence, analyze and interpret data, construct explanations, define problems and design solutions* as they make sense of the difference between energy and temperature. They use the practices to make sense of how the total change of energy in any system is always equal to the total energy transferred into or out of the system.

<b>Unit References</b>	
<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>There are relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of particles as measured by the temperature of the sample.</li> <li>Temperature is a measure of the average kinetic energy of particles of matter.</li> <li>The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.</li> <li>The amount of energy transfer needed to change the temperature of a matter sample by a given amount depends on the nature of the matter, the size of the sample, and the environment.                             <ul style="list-style-type: none"> <li>Proportional relationships among the amount of energy transferred, the mass, and the change in the average kinetic energy of particles as measured by temperature of the sample provide information about the magnitude of properties and processes.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li><i>How can a standard thermometer be used to tell you how particles are behaving?</i></li> <li>You are an engineer working for NASA. In preparation for a manned space mission to the Moon, you are tasked with designing, constructing, and testing a device that will keep a hot beverage hot for the longest period of time. It costs approximately \$10,000 per pound to take payload into orbit so the device must be lightweight and compact. The lack of atmosphere on the Moon produces temperature extremes that range from -157 degrees C in the dark to +121 degrees C in the light.</li> </ul>

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- . Temperature is a measure of the average kinetic energy of particles of matter.
- The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones.
- The transfer of energy can be tracked as energy flows through a designed or natural system.
- The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful.
- Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions.
- A solution needs to be tested and then modified on the basis of the test results in order to improve it.
  - There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.

### Objectives

- Students will be able to determine how a standard thermometer can be used to tell you how particles are behaving.
- Students will be able to design, construct, and test a device in preparation for a manned space mission to the Moon.

### Assessment

#### **Formative Assessment:**

- Labs
- Claim-Evidence- Reasoning
- Class Discussions

#### **Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

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**Benchmark:**

- LinkIt Benchmark

**Alternative:**

- Performance Assessments
- Projects
- Models
- Modified Tests Independently Developed by Teacher

**Key Vocabulary**

Kinetic energy, potential energy, thermal energy, energy transfer, expansion, contraction, conduction, convection, radiation,

**Resources & Materials**

Stemscopes website & kits

- Print and digital copies of textbook
- Lab write-ups
- SEP simulations
- Content videos
- PhET Interactive Simulations
- Reading articles
- Math connections
- Pre-assembled Kits

**Technology Infusion**

**Teacher Technology:**

- Chromebooks
- Stemscopes website
- SMARTBoard

**Student Technology:**

- Chromebooks
- Stemscopes website

**Activities:**

- Students will use Chromebooks to access the Stemscopes website to: activate prior knowledge, build schema, watch videos, complete labs, take assessments and collect data.

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<b>Standard</b>	<b>Standard Description</b>
8.1.8.A.1	8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

### Interdisciplinary Integration

**Activities:**

- Students will be able to analyze data in order to create a scientific explanation.
- Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

<b>Standard</b>	<b>Standard Description</b>
4.31.12.B.1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

### 21<sup>st</sup> Century Life Skills

**Activities:**

- Students will work in groups to collaborate, at times taking leadership roles to communicate project ideas to the whole class.

<b>Standard</b>	<b>Standard Description</b>
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

### Careers

**Activities:**

- Students will create scientific explanations to describe observable phenomena in order to communicate findings.

<b>Standard</b>	<b>Standard Description</b>
CRP4	Communicate clearly and effectively and with reason.

### ELA Companion Standards

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**Activities:**

- Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

<b>Standard</b>	<b>Standard Description</b>
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.

Standards			
Standard #	Standard Description	Student Learning Objectives	Clarification Statement
MS-PS3-3	Energy	Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup. [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
MS-PS3-4	Energy	Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.	Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
MS-ETS1-1	Engineering Design	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	N/A
MS-ETS1-2	Engineering Design	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	N/A
MS-ETS1-3	Engineering Design	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	N/A
MS-ETS1-4	Engineering Design	Develop a model to generate data for iterative testing and modification of a proposed object,	N/A



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		tool, or process such that an optimal design can be achieved.	
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<b>Differentiation</b>			
Special Education	English Language Learners (ELL)	Response to Intervention (RTI)	Enrichment
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**Califon Public School  
Science Curriculum**



<b>Subject: Science</b>	<b>Grade: 8</b>	<b>Unit #: 7</b>	<b>Pacing: 20 days</b>
<b>Unit Title: The Electromagnetic Spectrum</b>			

**OVERVIEW OF UNIT:**

In this unit of study, students *develop and use models, use mathematical thinking, and obtain, evaluate, and communicate information* in order to describe and predict characteristic properties and behaviors of waves. Students also apply their understanding of waves as a means of sending digital information.

<b>Unit References</b>	
<b>Big Ideas</b>	<b>Essential Questions</b>
<ul style="list-style-type: none"> <li>• A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.</li> <li>• Describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.</li> <li>• Graphs and charts can be used to identify patterns in data.</li> <li>• Waves can be described with both qualitative and quantitative thinking.</li> <li>• When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object’s material and the frequency (color) of the light.</li> <li>• The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends.</li> <li>• A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media.</li> <li>• Waves are reflected, absorbed, or transmitted through various materials.</li> <li>• A sound wave needs a medium through which it is transmitted.</li> </ul>	<p><i>How do the light and sound systems in the auditorium work?</i></p> <p><i>If rotary phones worked for my grandparents, why did they invent cell phones?</i></p>

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- Because light can travel through space, it cannot be a matter wave, like sound or water waves.
- The structure of a wave can be modified to serve particular functions by taking into account properties of different materials and how materials can be shaped and used.
- Structures can be designed to use properties of waves to serve particular functions.
- Waves can be used for communication purposes.
- Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information than are analog signals.
- Wave-related technologies extend the measurement, exploration, modeling, and computational capacity of scientific investigations.

### Objectives

- Students will be able to determine how the light and sound systems in the auditorium work
- Students will be able to describe how digitized signals transmit information.

### Assessment

#### **Formative Assessment:**

- Labs
- Claim-Evidence- Reasoning
- Class Discussions

#### **Summative Assessment:**

- Multiple Choice Assessment
- Open Ended Response
- Claim-Evidence- Reasoning

#### **Benchmark:**

- LinkIt Benchmark

#### **Alternative:**

- Performance Assessments

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- Projects
- Models
- Modified Tests Independently Developed by Teacher

### Key Vocabulary

Waves, wave pulses, amplitude, frequency, wavelength, reflection

### Resources & Materials

Stemscopes website & kits

- Print and digital copies of textbook
- Lab write-ups
- SEP simulations
- Content videos
- PhET Interactive Simulations
- Reading articles
- Math connections
- Pre-assembled Kits

### Technology Infusion

#### Teacher Technology:

- Chromebooks
- Stemscopes website
- SMARTBoard

#### Student Technology:

- Chromebooks
- Stemscopes website

#### Activities:

- Students will use Chromebooks to access the Stemscopes website to: activate prior knowledge, build schema, watch videos, complete labs, take assessments and collect data.

**Standard**

**Standard Description**

8.1.8.A.1

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

<b>Interdisciplinary Integration</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will be able to analyze data in order to create a scientific explanation.</li> <li>Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
4.31.12.B.1	Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.
NJSLSA.W1.	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

<b>21<sup>st</sup> Century Life Skills</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will work in groups to collaborate, at times taking leadership roles to communicate project ideas to the whole class.</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career

<b>Careers</b>	
<b>Activities:</b> <ul style="list-style-type: none"> <li>Students will create scientific explanations to describe observable phenomena in order to communicate findings.</li> </ul>	
<b>Standard</b>	<b>Standard Description</b>
CRP4	Communicate clearly and effectively and with reason.

**ELA Companion Standards**

**Activities:**

- Students will be able to create a scientific explanation using evidence and reasoning from observation and informational text to support a scientific claim

<b>Standard</b>	<b>Standard Description</b>
WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.

Standards			
Standard #	Standard Description	Student Learning Objectives	Clarification Statement
MS-PS4-1	Waves and Their Applications in Technologies for Information Transfer	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]
MS-PS4-2	Waves and Their Applications in Technologies for Information Transfer	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]
MS-PS4-3	Waves and Their Applications in Technologies for Information Transfer	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]



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