Park Hill School District

Building Successful Futures • Each Student • Every Day

6th Grade Science Curriculum

Course Description: Students will engage within three strands of content within 6th grade science: Life Science, Earth Science, and Physical Science. Units encompass Cells and Body Systems, Weather and Climate, Energy Transfer, and Human Impact on the Environment. Students will engage in experiences that build foundational knowledge for future science coursework.

Scope and Sequence:

Timeframe	Unit	Instructional Topics
28 blocks	Unit 1: Systems & Subsystems in Earth & Life Science	Topic 1: Cells Topic 2: Anatomy of a Cell Topic 3: Bodies and Systems Topic 4: The Water Cycle Topic 5: Influences of Weather and Climates
18 blocks	Unit 2: Earth System Interactions Cause Weather	Topic 1: Ocean Currents Topic 2: Thermal Energy Transfer Topic 3: Energy Transfer and Temperature
20 blocks	Unit 3: Causes & Effects of Regional Climates	Topic 1: Reproduction in Plants and Animals Topic 2: Growth of Organisms Topic 3: Predicting Weather
13 blocks	Unit 4: Effects of Global Warming	Topic 1: Human Impact on the Environment Topic 2: Human Activities and Global Climate Change

Curriculum Standards: Missouri DESE 6th-8th Grade Science Standards

Curriculum Revision Tracking

Fall 2025

- Additional lab options were added to Engaging Experiences in Unit 1 and Unit 3

Spring 2023

- Units were reworked in order to align with the integrated bundles inside STEMScopes
- All units include DESE's new priority standards.
- All priority standards have been unwrapped into learning targets.
- Engaging Scenarios were shifted to the beginning of each unit in order to drive the learning for the unit and tie all the topics together with a fluid storyline.
- Each topic and Engaging Experience within a unit is an entire scope in STEMscopes, where teachers suggested an appropriate timeline and suggested which STEMscopes activities to use with students.

Spring 2020

- Move Unit 2: Growth and Development of Organisms to last unit of the year

Unit 1: MS Life Bundle 3 - Interdependent Relationships in Ecosystems

- Change the order of Topics.
- Topic 2: Organism Interactions in Ecosystem Scope
- Omit Explore 2
- Topic 5: Dynamic Nature of Ecosystems Scope
    - Omit Explore 1 Scientific Investigation: Modeling an Algae Bloom
    - Omit Explore 3 Activity: So Squirrely
    - Omit Explore 4: Tuva: Bylot Island Ecology
- Topic 6: Ecosystem Biodiversity Scope
    - Omit Explore 2 Activity: Ocean Biodiversity

Unit 2: MS Life Bundle 2 - Growth and Development of Organisms

- Moved to last unit of the year
- Topic 1: Reproduction in Plants and Animals Scope
    - Omit Explore 3 Engineering Solution: Design a Flower

Unit 3: MS Physical Bundle 4 - Potential and Kinetic Energy

- Topic 2: Potential Energy Scope
    - Omit Explore 4 Engineering Solution: Half Pipe Design and move it to an option for an Engaging Scenario

Unit 4: MS Physical Bundle 3 - Forces and Motion

- Topic 1: Newton's Third Law Scope
  - Omit Explore 3 Engineering Solution: Shock Absorber and move it to an option for an Engaging Scenario
- Topic 2: Changes in Force and Motion
  - Omit Explore 2 Inquiry Investigation: Newton's Second Law
  - Omit Explain

Unit 1: Systems & Subsystems in Earth & Life Science

Subject: Science
Grade: 6
Name of Unit: Unit 1: Systems & Subsystems in Earth & Life Science
Length of Unit: 28 blocks
Overview of Unit: Students will learn and explore how subsystems build systems. This includes organelles working together to make cells, body systems working together in an organism, and elements of weather that make a climate.

Unit 1 Storyline Summary
Anchoring phenomena: How can models of systems help determine similarities and differences between Earth systems and living systems? An engine has a lot of parts that somehow work together in a system to make a car run. **Culminating mission:** Students develop a model that compares the Earth's climate system and the human body system.

Priority Standards for unit:

- 6-8.LS1.A.1 Provide evidence that organisms (unicellular and multicellular) are made of cells and that a single cell must carry out all of the basic functions of life.
- 6-8.LS1.A.2 Develop and use a model to describe the function of a cell as a whole and ways parts of the cells contribute to that function.
- 6-8.LS1.A.3 Develop an argument supported by evidence for how multicellular organisms are organized by varying levels of complexity; cells, tissue, organs, organ system.
- 6-8.LS1.A.4 Present evidence that body systems interact to carry out key body functions, including providing nutrients and oxygen to cells, removing carbon dioxide and waste from cells and the body, controlling body motion/activity and coordination, and protecting the body.
- 6-8.ESS2.C.1 Design and develop a model to describe the cycling of water through Earth's System driven by energy from the sun and the force of gravity.
- 6-8.ESS2.C.3 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Priority Standard: 6-8.LS1.A.1 Provide evidence that organisms (unicellular and multicellular) are made of cells and that a single cell must carry out all of the basic functions of life.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will describe the presence or absence of cells in living and nonliving things.	1 Understanding
Students will compare and contrast living and non-living things at a microscopic level including cells and atoms.	2 Apply
Students will describe a part of a living thing that is not made up of cells.	1 Understanding
Students will describe the functions of living things (e.g., reproduction, growth, response).	2 Apply

Priority Standard: 6-8.LS1.A.2 Develop and use a model to describe the function of a cell as a whole and ways parts of the cells contribute to that function.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will demonstrate how a cell controls what enters and leaves the cell in order to maintain the cell's internal processes (e.g., homeostasis) which need energy.	2 Apply
Students will identify the key differences between plant and animal cells based on structure and function (e.g., cell walls and chloroplasts).	1 Understanding

Students will show the movement of molecules through the cell membrane.	2 Apply
Students will describe the purpose of organelles including cell membrane, cell wall, mitochondria, and nucleus.	1 Understanding

Priority Standard: 6-8.LS1.A.3 Develop an argument supported by evidence for how multicellular Organisms are organized by varying levels of complexity; cells, tissue, organs, organs, organ System	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a logical argument to show every scale of body function (e.g., cells, tissues, organs, organ systems) is composed of systems of interacting with components.	3 Analyzing
Students will identify patterns in multicellular organisms in how they are organized from specialized cells, tissues, organs, and organ systems.	2 Applying
Students will prove a body is a system of specialized organs that interact with each other and their subsystems to carry out the functions necessary for life.	4 Evaluating

Priority Standard: 6-8.LS1.A.4 Present evidence that body systems interact to carry out key body functions, including providing nutrients and oxygen to cells, removing carbon dioxide and waste from cells and the body, controlling body motion/activity and coordination, and protecting the body.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify patterns showing every scale of body function (e.g., cells, tissues, organs, organ systems) is composed of systems of interacting components.	2 Apply
Students will infer the body is a system of specialized organs that interact with each other and their subsystems to carry out the functions necessary for life.	2 Apply
Students will investigate how different tissues and organs can work together to carry out complex functions (e.g., the heart contains muscle, connective, and epithelial tissues that allow the heart to receive and pump blood).	3 Analyzing

Priority Standard: 6-8.ESS2.C.1 Design and develop a model to describe the cycle of water through Earth's System driven by energy from the sun and the force of gravity.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a model (conceptual or physical) in which they identify the relevant components of Earth's systems including water, energy, gravity, atmosphere, landforms, plants, and other living things.	3 Analyzing
Students will use the model to account for both energy from light and the force of gravity driving water cycling between oceans, the atmosphere, and land.	3 Analyzing

Priority Standard: 6-8.ESS2.C.3 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify patterns of atmospheric and oceanic circulation that determine regional climates including the rotating Earth.	2 Apply
Students will identify patterns of the atmosphere, the ocean, the continents, and the global distribution of landforms on the surface of Earth, ice, and living things.	2 Apply
Students will identify and describe the relationships between temperature, latitude, and motion of waters and air masses.	2 Apply

Essential Questions:

1. How do cells and atoms work together to make larger systems such as organisms?
2. How do cells carry out functions to help the organism perform necessary life processes?
3. How do cells work together to make a multicellular organism perform its life processes needed for survival?
4. How do organs and organ systems work together to perform life processes in multicellular organisms?
5. How do the water movement on Earth, organisms, and geological features interact with one another?
6. What causes changes in weather seasonally and across different regional climates?

Enduring Understanding /Big Ideas:

1. All living things are made up of cells. In organisms, cells work together to form tissues and organs that are specialized for particular body functions.
2. Within cells, special structures are responsible for particular functions, such as the cell membrane forming the boundary that controls what enters and leaves the cell.
3. All living things are made up of cells. In multicellular organisms, cells work together to form tissues and organs that are specialized for particular body functions.
4. Organs perform specific functions which allow organ systems to carry out larger life processes necessary for survival.
5. Water cycles among land, ocean, and atmosphere, and is propelled by sunlight and gravity. Density variations of sea water drive interconnected ocean currents. Water movement causes weathering and erosion, changing landscape features.
6. Complex interactions determine local weather patterns and influence climate, including the role of the ocean.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
• absorb • altitude • climate • function • latitude • regional geography • rotation • specialize • subsystem • system • weather	• atmosphere • atmospheric circulation • cell • cell membrane • cell wall • chloroplast • condensation • Coriolis effect • crystallization • evaporation • gravity • groundwater • mitochondria • multicellular • nucleus • ocean currents • organ • organelle • organism • percolation • precipitation • radiant energy • runoff • thermal energy • tissue • transpiration • unicellular • water cycle

Resources for Vocabulary Development:

STEMscopedia & Picture Vocabulary

Engaging Scenario

An Engaging Scenario is a culminating activity tied to the unit's priority standards, that includes the following components: situation, challenge, specific roles, audience, product, or performance.

Engaging Scenario 2 blocks

Students develop a model that compares the Earth's climate system and the human body system. The students' mission is to prepare part of a presentation comparing how Earth systems, such as Earth's climate system, are similar to living systems, such as the human body system. Develop a model that compares Earth's climate system and the human body system. Provide a diagram of your proposed model and an evaluation of how well the model offers a comparison of the two systems.

Topic 1: Cells

Engaging Experience

Title: Cells

Suggested Length of Time: 6 blocks

Standards Addressed:

Priority Standard: 6-8.LS1.A.1 Provide evidence that organisms (unicellular and multicellular) are made of cells and that a single cell must carry out all of the basic functions of life.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will describe the presence or absence of cells in living and nonliving things.	1 Understanding
Students will compare and contrast living and non-living things at a microscopic level including cells and atoms.	2 Apply
Students will describe part of a living thing that is not made up of cells.	1 Understanding
Students will describe the functions of living things (e.g., reproduction, growth, response).	2 Apply

Engage	Explore	Explain	Elaborate	Evaluate
Mission Briefing (in Mission Log) Student Introduction Letter (found in Bundle Resources) Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Single or Multi? Explore 2: Cells Equal Living	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections Science Today: Watch It!	Vocabulary Quiz (with Anatomy of a Cell) Assessment using a mix of multiple choice, short answer, and CER questions (with Anatomy of a Cell). Mission Log

Instructional Notes:

Use elaborate activities throughout the instructional unit to supplement and reinforce student learning.

Topic 2: Anatomy of a Cell

Engaging Experience

Title: Anatomy of a Cell

Suggested Length of Time: 6 blocks

Standards Addressed:

Priority Standard: 6-8.LS1.A.2 Develop and use a model to describe the function of a cell as a whole and ways parts of the cells contribute to that function.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will demonstrate how a cell controls what enters and leaves the cell in order to maintain the cell's internal processes (e.g., homeostasis) which need energy.	2 Apply
Students will identify the key differences between plant and animal cells based on structure and function (e.g., cell walls and chloroplasts).	1 Understanding
Students will show the movement of molecules through the cell membrane.	2 Apply
Students will describe the purpose of organelles including cell membrane, cell wall, mitochondria, and nucleus.	1 Understanding

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Functions of a Cell Explore 2: Engineering Solution - Cell Architect, Inc. (Academic Grade)	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (same as previous topic) Science Today: Watch It!	Vocabulary Quiz (with Cells) Assessment using a mix of multiple choice, short answer, and CER questions (Cells). Mission Log
<u>Instructional Notes:</u> Graphic Organizer is a resource for notetaking. Content Connections is optional. Use the elaborate activities throughout the instructional unit to supplement and reinforce student learning.				

Topic 3: Bodies & Systems

Engaging Experience 1:

Title: Bodies and Systems

Suggested Length of Time: 7 blocks

Standards Addressed:

Priority Standard: 6-8.LS1.A.2 Develop and use a model to describe the function of a cell as a whole and ways parts of the cells contribute to that function.

Learning Targets	Webb's DOK Level Bloom's Level
Students will develop a logical argument to show every scale of body function (e.g., cells, tissues, organs, organ systems) is composed of systems of interacting with components.	3 Analyzing
Students will identify patterns in multicellular organisms in how they are organized from specialized cells, tissues, organs, and organ systems.	2 Apply
Students will prove a body is a system of specialized organs that interact with each other and their subsystems to carry out the functions necessary for life.	4 Evaluating

Priority Standard: 6-8.LS1.A.4 Present evidence that body systems interact to carry out key body functions, including providing nutrients and oxygen to cells, removing carbon dioxide and waste from cells and the body, controlling body motion/activity and coordination, and protecting the body.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify patterns showing every scale of body function (e.g., cells, tissues, organs, organ systems) is composed of systems of interacting with components.	2 Apply
Students will infer the body is a system of specialized organs that interact with each other and their subsystems to carry out the functions necessary for life.	2 Apply
Students will investigate how different tissues and organs can work together to carry out complex functions (e.g., the heart contains muscle, connective, and epithelial tissues that allow the heart to receive and pump blood).	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Subsystem Matchup Explore 2: Activity Body Systems (demo as class) Explore 3: Systems, Inc.	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (same as previous topic) Science Today: Watch It!	Vocabulary Quiz Assessment using a mix of multiple choice and short answers. Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking.
Content Connections is optional.
Use elaborate activities throughout the instructional unit to supplement and reinforce student learning.

Students participate in frog dissection to make further connections between systems and subsystems of living things.

*1 block for living system review, 1 block for dissection lab.

Topic 4: The Water Cycle

Engaging Experience

Title: The Water Cycle

Suggested Length of Time: 5 blocks

Standards Addressed:

Priority Standard: 6-8.ESS2.C.1 Design and develop a model to describe the cycle of water through Earth's System driven by energy from the sun and the force of gravity.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will develop a model (conceptual or physical) in which they identify the relevant components of Earth's systems including water, energy, gravity, atmosphere, landforms, plants, and other living things.	3 Analyzing
Students will use the model to account for both energy from light and the force of gravity driving water cycling between oceans, the atmosphere, and land.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Water in the Atmosphere Explore 2: Water Cycle Journey	STEMscopedia Linking Literacy Picture Vocabulary Science Rock: Water Cycle Song	Scientist Spotlight Career Connections (same as previous topic) Science Today: Watch It!	Vocabulary Quiz (with Influences of Weather and Climate) Assessment using a mix of multiple choice and short answer. (With Influences of Weather and Climate) Mission Log

Instructional Notes:

Graphic Organizer is a resource for notetaking. Content Connections is optional. Use elaborate activities throughout the instructional unit to supplement and reinforce student learning. Explore 1 can be converted to observing condensation in a glass of ice water if you don't have a plant-activity that could be cut down for time.

Topic 5: Influences of Weather & Climates

Engaging Experience

Title: Influences of Weather and Climates

Suggested Length of Time: 5 blocks

Standards Addressed:

Priority Standard: 6-8.ESS2.C.3 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will identify patterns of atmospheric and oceanic circulation that determine regional climates including the rotating Earth.	2 Apply
Students will identify patterns of the atmosphere, the ocean, the continents and the global distribution of landforms on the surface of Earth, ice, and living things.	2 Apply
Students will identify and describe the relationships between temperature, latitude, and motion of waters and air masses.	2 Apply

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Intensity of Light and Moving Air Explore 2: Ocean Surface Currents Explore 3: Currents and Climate	STEMscopedia Linking Literacy Picture Vocabulary Science Rock: Water Cycle Song	Scientist Spotlight Career Connections (same as previous topic) Science Today: Watch It!	Vocabulary Quiz (with Influences of Weather and Climate) Assessment using a mix of multiple choice and short answer. (With Influences of Weather and Climate) Mission Log

Instructional Notes:

Graphic Organizer is a resource for notetaking. Content Connections is optional.

Use elaborate activities throughout the instructional unit to supplement and reinforce student learning.

Explore 1 can be adjusted to make more 6th grade friendly. Consider using a heat lamp to demo this activity.

Explore 2 can be adjusted so students are not blowing into the water; consider using a pump.

Explore 3 can be made more 6th grade friendly. Consider making the graph with Excel or Google Spreadsheet using a template in Schoology

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Cells	Living things are made of cells.	6 blocks
2	Anatomy of a Cell	Cells have different parts that contribute to the overall function of the cell.	6 blocks
3	Bodies & Systems	The human body is a system of interacting subsystems composed of groups of cells.	5 blocks
4	The Water Cycle	The Sun's energy and the force of gravity drive the cycling of water through Earth's systems.	5 blocks
5	Influences of Weather and Climates	Climate is caused by circulation in the air and oceans, which is caused by Earth's rotation and uneven heating of land and water.	5 blocks
Engaging Scenario		Students develop a model that compares the Earth's climate system and the human body system.	1 block

Unit 2: Earth System Interactions Cause Weather

Subject: Science
Grade: 6
Name of Unit: Earth System Interactions Cause Weather
Length of Unit: 18 blocks
Overview of Unit: Students will learn and explore how thermal energy transfers and its impact on temperature and ocean currents.

Unit 2 Storyline Summary
Anchoring phenomena: How can models of thermal energy transfer help us to understand the different kinds of weather in California? Clouds move with wind currents, which shift directions in patterns as they move around the world. **Culminating mission:** Students design a portable structure that will keep athletes cool in hot climates and warm in cool climates. The structure must be easy to move between venues, and it cannot depend on electric or battery power.

Priority Unit Standards:

- **6-8.ESS2.C.3** Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- **6-8.PS3.A.3** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.
- **6-8.PS3.A.4** Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the temperature of the sample.
- **6-8.ETS1.A** 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.
- **6-8.ETS1.B.3** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

Priority Standards Unwrapped:

Priority Standard: 6-8.ESS2.C.3 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify patterns of atmospheric and oceanic circulation that determine regional climates including the rotating Earth.	2 Apply
Students will identify patterns of the atmosphere, the ocean, the continents, and the global distribution of landforms on the surface of Earth, ice, and living things.	2 Apply
Students will identify and describe the relationships between temperature, latitude, and motion of waters and air masses.	2 Apply

Priority Standard:6-8.PS3.A.3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students define thermal energy and describe how it is transferred.	1 Understanding
Students will identify that thermal energy is transferred from objects with more heat to objects with less heat.	1 Understanding

Students will apply the Engineering Design Process to create a solution that requires either minimizing or maximizing thermal energy transfer, students design and build a solution to the problem.	4 Creating
Students will describe different types of materials used in the design solution and their properties (e.g., thickness, heat conductivity, reflectivity) and how these materials will be used to minimize or maximize\ thermal energy transfer.	4 Evaluating

Priority Standard:6-8.PS3.A.4 Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the temperature of the sample.

Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify a phenomenon under investigation that involves thermal energy transfer.	2 Apply
Students will design an investigation with independent, dependent and control variables to evaluate the factors involved in energy transfer through an object.	4 Creating
Students will relate the changes in temperature in the sample to the types of matter and to the change in the average kinetic energy of the particles.	4 Evaluating

Priority Standard: 6-8.ETS1.A Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, considering relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify the system in which a problem is embedded, including the major components and relationships in the system and its boundaries, to clarify what is and is not part of the problem.	4 Evaluating
Students will define criteria that must be considered in the solution and that meet the needs of the solution and allow for comparison among different solutions.	4 Evaluating
Students will develop constraints that must be considered in the solution, including time, materials, cost, needs, safety, and possible unintended effects.	4 Creating

Priority Standard: 6-8.ETS1.B.3 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a model in which they identify the components relevant to testing ideas about the designed system, including the problem being solved, criteria, and constraints.	3 Analyzing
Students will identify the limitations of a model with regards to representing the proposed solution.	4 Evaluating

Students will describe how the data generated by a given model can be used to optimize the design solution through iterative testing and modification.	4 Evaluating

Essential Questions:

1. What causes changes in weather seasonally and across different regional climates?
2. How can the transfer of thermal energy be transferred at different rates in a system?
3. How can the transfer of energy in a system be maximized or minimized?
4. How can the effectiveness of a solution to a system be evaluated?
5. When developing or using a model what factors are used to modify to improve the model?

Enduring Understanding / Big Ideas:

1. Complex interactions determine local weather patterns and influence climate, including the role of the ocean.
2. The properties of materials affect thermal energy transfer including thickness, heat conductivity, and reflectivity.
3. By using different materials and the amount of materials, energy can be transferred through a system at different rates.
4. Solutions can be evaluated and compared to other solutions based on the system and its boundaries including time needed, materials, cost, needs, safety, and possible unintended effects.
5. Improving a model requires evaluation of the problem being solved, criteria and constraints on the model, and interactive testing and modification to the model as seen in the Engineering and Design Process.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
• climate • energy • global • rotation • temperature • system	• atmospheric movement • conduction • conductor • convection • convection current • Coriolis effect • density • heat transfer • kinetic energy • Law of Conservation of Energy • mass • matter • motion • ocean currents • radiation • salinity • speed • states of matter • thermal energy

Resources for Vocabulary Development:
STEMscopedia & Picture Vocabulary

Engaging Scenario

An Engaging Scenario is a culminating activity tied to the unit's priority standards, that includes the following components: situation, challenge, specific roles, audience, product or performance.

Engaging Scenario 1 block
Students will design a portable structure that will keep athletes cool in hot climates and warm in cool climates. The structure must be easy to move between venues and cannot depend on electric or battery power. The new product proposal must include a model that shows how thermal energy transfer affects the climate in San Francisco and Bakersfield, a labeled diagram of the proposed product, and an explanation of how the product will maintain a comfortable temperature for the athletes.

Topic 1: Ocean Currents

Engaging Experience

Title: Ocean Currents

Suggested Length of Time: 5 blocks

Standards Addressed:

Priority Standard: 6-8.ESS2.C.3 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will identify patterns of atmospheric and oceanic circulation that determine regional climates including the rotating Earth.	2 Apply
Students will identify patterns of the atmosphere, the ocean, the continents and the global distribution of landforms on the surface of Earth, ice, and living things.	2 Apply
Students will identify and describe the relationships between temperature, latitude, and motion of waters and air masses.	2 Apply

Engage	Explore	Explain	Elaborate	Evaluate
Mission Briefing (in Mission Log) Student Introduction Letter (found in Bundle Resources) Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Deep Ocean Currents Explore 2: Influences on Our Weather and Climate	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (repeated with Influence of Weather and Climate) Science Today: Watch It! PHET Simulation Practice: Under Pressure	Vocabulary Quiz Assessment using a mix of multiple choice and short answers. Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use elaborate activities throughout the instructional unit to supplement and reinforce student learning.
Explore 1 should be done as a class.

Topic 2: Thermal Energy Transfer

Engaging Experience

Title: Thermal Energy Transfer

Suggested Length of Time: 6 blocks

Standards Addressed:

Priority Standard: 6-8.LS1.A.2 Develop and use a model to describe the function of a cell as a whole and ways parts of the cells contribute to that function.

Learning Targets	Webb's DOK Level / Bloom's Level
Students define thermal energy and describe how it is transferred.	1 Understanding
Students will identify that thermal energy is transferred from objects with more heat to objects with less heat.	1 Understanding
Students will apply the Engineering Design Process to create a solution that requires either minimizing or maximizing thermal energy transfer, students design and build a solution to the problem.	4 Creating
Students will describe different types of materials used in the design solution and their properties (e.g., thickness, heat conductivity, reflectivity) and how these materials will be used to minimize or maximize\ thermal energy transfer.	4 Evaluating

Priority Standard:6-8.PS3.A.4 Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the temperature of the sample.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify a phenomenon under investigation that involves thermal energy transfer.	2 Apply
Students will design an investigation with independent, dependent and control variables to evaluate the factors involved in energy transfer through an object.	4 Creating
Students will relate the changes in temperature in the sample to the types of matter and to the change in the average kinetic energy of the particles.	4 Creating

Priority Standard: 6-8.ETS1.A 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify the system in which a problem is embedded, including the major components and relationships in the system and its boundaries, to clarify what is and is not part of the problem.	4 Evaluating
Students will define criteria that must be considered in the solution and that meets the needs of the solution and allows for comparison among different solutions	4 Evaluating

Students will develop constraints that must be considered in the solution, including time, materials, cost, needs, safety, and possible unintended effects.	4 Creating

Priority Standard: 6-8.ETS1.B.3 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a model in which they identify the components relevant to testing ideas about the designed system, including the problem being solved, criteria, and constraints.	3 Analyzing
Students will identify the limitations of a model with regards to representing the proposed solution.	4 Evaluating
Students will describe how the data generated by a given model can be used to optimize the design solution through iterative testing and modification.	4 Evaluating

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Investigation - Materials Matter Explore 2: Investigation - Amounts Matter Explore 3: Engineering Solution - Build a Medicine Container	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (Storm Chaser) Science Today: Watch It! PHET Simulation Practice: Energy Forms and Changes	Vocabulary Quiz (with Energy Transfer and Temperature) Assessment using a mix of multiple choice, short answer, and CER questions (with Energy Transfer and Temperature) Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use elaborate activities throughout the instructional unit to supplement and reinforce student learning.
Explore 1 should be done as a class demo (see candle!) Explore 3 - students should bring in recyclable materials to build.
This Bundle is designed with Kinetic Energy scope, which is an 8th grade topic. Unit Vocabulary terms include Kinetic Energy vocabulary and supplementary information may be needed.

Topic 3: Energy Transfer & Temperature

Engaging Experience

Title: Energy Transfer and Temperature

Suggested Length of Time: 6 blocks

Standards Addressed:

Priority Standard:6-8.PS3.A.3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

Learning Targets	Webb's DOK Level Bloom's Level
Students define thermal energy and describe how it is transferred.	1 Understanding
Students will identify that thermal energy is transferred from objects with more heat to objects with less heat.	1 Understanding
Students will apply the Engineering Design Process to create a solution that requires either minimizing or maximizing thermal energy transfer, students design and build a solution to the problem.	4 Creating
Students will describe different types of materials used in the design solution and their properties (e.g., thickness, heat conductivity, reflectivity) and how these materials will be used to minimize or maximize\ thermal energy transfer.	4 Evaluating

Priority Standard:6-8.PS3.A.4 Plan and conduct an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the temperature of the sample.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify a phenomenon under investigation that involves thermal energy transfer.	2 Apply
Students will design an investigation with independent, dependent and control variables to evaluate the factors involved in energy transfer through an object.	4 Creating
Students will relate the changes in temperature in the sample to the types of matter and to the change in the average kinetic energy of the particles.	4 Evaluating

Priority Standard: 6-8.ETS1.A 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify the system in which a problem is embedded, including the major components and relationships in the system and its boundaries, to clarify what is and is not part of the problem.	4 Evaluating
Students will design an investigation with independent, Students will define criteria that must be considered in the solution and that meets the needs of the solution and allows for comparison among different solutions.	4 Evaluating

Students will develop constraints that must be considered in the solution, including time, materials, cost, needs, safety, and possible unintended effects.	4 Creating

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Investigation - Materials Matter Explore 2: Investigation - Amounts Matter Explore 3: Investigation - Environment Matters	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (Storm Chaser) Science Today: Watch It! PHET Simulation Practice: Energy Forms and Changes	Vocabulary Quiz (with Thermal Energy Transfer) Assessment using a mix of multiple choice, short answer, and CER questions (with Thermal Energy Transfer) Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use the elaborate activities throughout the instructional unit to supplement and reinforce student learning.
Explore 2 - class demo due to time - can do all three at the same time Explore 3 - consider having each group do one and combine data for time

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Ocean Currents	The Sun's energy and the force of gravity drive the cycling of water through Earth's systems.	5 blocks
2	Thermal Energy Transfer	Climate is caused by circulation in the air and oceans, which is caused by Earth's rotation and uneven heating of land and water.	6 blocks
3	Energy Transfer and Temperature	Devices can minimize or maximize the transfer of thermal energy.	6 blocks
Engaging Scenario		Students design a portable structure that will keep athletes cool in hot climates and warm in cool climates. The structure must be easy to move between venues, and it cannot depend on electric or battery power.	1 block

Unit 3: Effects of Regional Climates

Subject: Science
Grade: 6
Name of Unit: Effects of Regional Climates
Length of Unit: 20 blocks
Overview of Unit: Students will learn and explore the causes and effects of regional climates. The effects are seen in reproduction of plants and animals and the growth of organisms. Causes for these regional climates are weather changes which also impact organisms and ecosystems.

Unit 3 Storyline Summary
Anchoring phenomena: Why is the climate different in different regions of the planet, and how do the differences in climate affect organisms? **Culminating mission:** Students plan a new dogsled race similar to the Iditarod but that takes place in the sand dunes of the Arabian Desert.

Priority Standards for unit:

- 6-8.LS1.B.1 Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- 6-8.LS1.B.2 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- 6-8.ESS2.C.2 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

Priority Standards Unwrapped

Priority Standard:6-8.LS1.B.1 Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will evaluate the likelihood of successful reproduction based on the behavior of animals and the specialization of plant structures.	4 Evaluating
Students will determine cause and effect relationships between specialized plant structures and the probability of successful reproduction of plants that have those structures.	2 Apply
Students will investigate animal behaviors and the probability of successful reproduction of animals that exhibit those behaviors.	3 Analyzing

Priority Standard:6-8.LS1.B.2 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of Organisms.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify patterns that describe how the natural world operates today as they did in the past and will continue to do so in the future.	2 Apply
Students will connect the evidence and support an explanation for a phenomenon involving genetic and environmental influences on organism growth.	3 Analyzing

Students will explain phenomena in terms of concepts that relate the given phenomenon to a scientific idea, including the idea that both environmental and genetic factors influence the growth of organisms.	3 Analyzing
Students will identify and describe evidence about environmental and genetic factors and how they influence the growth of organisms.	3 Analyzing

Priority Standard:6-8.LS1.B.2 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of Organisms.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will investigate the relationships between air mass interactions and weather conditions.	2 Apply
Students will determine cause and effect relationships between the motions and complex interactions of air masses to changes in weather conditions.	2 Apply
Students will analyze data collected to identify patterns in weather conditions in a specific area (e.g., temperature, air pressure, humidity, wind speed) over time and how it relates to movement of air masses and landforms, ocean temperatures, and ocean currents.	3 Analyzing
Students give evidence to support the claim that weather can be predicted only probabilistically because weather patterns are so complex and have multiple causes.	3 Analyzing

Priority Standard: 6-8.ESS2.C.2 Research, collect, and analyze data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will investigate the relationships between air mass interactions and weather conditions.	2 Apply
Students will determine cause and effect relationships between the motions and complex interactions of air masses to changes in weather conditions.	2 Apply
Students will analyze data collected to identify patterns in weather conditions in a specific area (e.g., temperature, air pressure, humidity, wind speed) over time and how it relates to movement of air masses and landforms, ocean temperatures, and ocean currents.	3 Analyzing
Students give evidence to support the claim that weather can be predicted only probabilistically because weather patterns are so complex and have multiple causes.	3 Analyzing

Essential Questions:

1. What behaviors and structures do plants and animals use to increase success of growth and reproduction?
2. What affects an organism's growth?
3. How do complex interactions of air masses result in changes in weather conditions?

Enduring Understanding/Big Ideas:

1. Animals engage in behaviors and plants have specialized structures to increase the odds of reproduction. An organism's growth is affected by both genetic and environmental factors.
2. An organism's growth is affected by both genetic and environmental factors.
3. Complex interactions determine local weather patterns and influence climate, including the role of the ocean.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
● adaptation ● behavior ● growth ● landforms ● probabilistically ● specialized ● variation	● anther ● air mass ● allele ● asexual reproduction ● atmosphere ● chromosome ● cold front ● environmental factors ● forecast ● gene ● genetic factors ● genetic variation ● global winds ● inherited trait ● ocean currents ● offspring ● organism ● ovary ● Punnett square ● petals ● pistil ● pollen ● pollination ● reproduction ● sexual reproduction ● stamen ● warm front ● weather ● weather map ● weather pattern

Resources for Vocabulary Development:
STEMscopedia & Picture Vocabulary

Engaging Scenario

An Engaging Scenario is a culminating activity tied to the unit's priority standards, that includes the following components: situation, challenge, specific roles, audience, product, or performance.

Engaging Scenario 2 blocks

The students' mission is to develop and present a plan for a desert sled dog race in the Rub' al-Khali, or Empty Quarter, of the Arabian Desert. Your plan must include the following: •an analysis of the differences in the climates of Alaska and the Arabian Desert and the cause of the differences •a comparison of the desired traits of sled dogs racing in Alaska and in the Arabian Desert •an explanation of how a breeding plan will allow dogs to be bred to race in the desert •a plan for support team weather- monitoring stations along the race trail to help support teams make weather predictions

Topic 1: Reproduction in Plants and Animals

Engaging Experience

Title: Reproduction in Plants and Animals

Suggested Length of Time: 5 blocks

Standards Addressed:

Priority Standard:6-8.LS1.B.1 Construct an explanation for how characteristic animal behaviors as well as specialized plant structures affect the probability of successful reproduction of animals and plants respectively.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will evaluate the likelihood of successful reproduction based on the behavior of animals and the specialization of plant structures.	4 Evaluating
Students will determine cause and effect relationships between specialized plant structures and the probability of successful reproduction of plants that have those structures.	2 Apply
Students will investigate animal behaviors and the probability of successful reproduction of animals that exhibit those behaviors.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Mission Briefing (in Mission Log) Student Introduction Letter (found in Bundle Resources) Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Which Behavior has more Success? Explore 2: Increasing the Odds Explore 3: Design a Flower	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (Storm Chaser) Science Today: Watch It!	Vocabulary Quiz ((with Growth of Organisms) Assessment using a mix of multiple choice, short answer, and CER questions (with Growth of Organisms) Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use the elaborate activities throughout the instructional unit to supplement and reinforce student learning.
Explore 2 - consider completing as a class
Explore 3 - students dissect real flowers, as an extension or optional assessment students could make paper flowers, or students color and label a diagram.

Topic 2: Growth of Organisms

Engaging Experience

Title: Growth of Organisms

Suggested Length of Time: 6 blocks

Standards Addressed:

Priority Standard:6-8.LS1.B.2 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of Organisms.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will identify patterns that describe how the natural world operates today as they did in the past and will continue to do so in the future.	2 Apply
Students will connect the evidence and support an explanation for a phenomenon involving genetic and environmental influences on organism growth.	3 Analyzing
Students will explain phenomena in terms of concepts that relate the given phenomenon to a scientific idea, including the idea that both environmental and genetic factors influence the growth of organisms.	3 Analyzing
Students will identify and describe evidence about environmental and genetic factors and how they influence the growth of organisms.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: What are the chances? Explore 2: Research - Growth of the Fittest	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (Arborist - same as last topic) Science Today: Watch It!	Vocabulary Quiz (with Reproduction in Plants and Animals) Assessment using a mix of multiple choice, short answers, and CER. (With Reproduction in Plants and Animals) Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use the elaborate activities throughout the instructional unit to supplement and reinforce student learning.

**To help describe Growth of Organisms and Reproduction in Plants and Animals and bring context for the Engaging Scenario, it is highly suggested to complete the following explore activities from the Inheritance and Genetic Variation Scope

- Explore 2: Genetic Variation in Monsters - most important!!
- Explore 3: Using a Punnett Square
- Explore 4: Asexual Reproduction

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Reproduction in Plants and Animals	The success of animal and plant reproduction depends on the behavioral characteristics of these living organisms.	5 blocks
2	Growth of Organisms	Environmental and genetic factors influence an organism's growth.	6 blocks
3	Predicting Weather	The motions and interactions of air masses result in changes in weather conditions.	7 blocks
Engaging Scenario		Students plan a new dogsled race similar to the Iditarod but that takes place in the sand dunes of the Arabian Desert.	2

Unit 4: Effects of Global Warming

Subject: Science
Grade: 6
Name of Unit: Effects of Global Warming
Length of Unit: 13 blocks
Overview of Unit: Students will learn and explore the causes and effects of global warming. Students will explore the effects of human activity on the environment and the overall changing climate.

Unit 4 Storyline Summary
Anchoring phenomena: Has global climate change impacted the water supply in California? A swan is swimming in an oil spill. **Culminating mission:** Students address the effects of global warming on living systems by preparing an argument explaining why different groups should not have their water supply reduced and by participating in a debate with other groups to present their arguments.

Priority Standards for unit:

- 6-8.ESS3.C.1 Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's System.
- 6-8.ESS3.C.2 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
- 6-8.ETS1.B.2 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.
- 6-8.ETS1.B.3 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- 6-8.ESS3.D Analyze evidence of the factors that have caused the change in global temperatures over the past century.

Priority Standards Unwrapped

Priority Standard: 6-8.ESS3.C.1 Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's System.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a logical argument to support or refute the claim that Earth's systems are affected by increases in the size of the human population and per-capita consumption of natural resources.	3 Analyzing
Students identify evidence to support a claim that changes in the size of human population(s) in a given region or ecosystem over a given timespan affects Earth's systems.	3 Analyzing
Students identify evidence to support a claim that per-capita consumption of resources by humans in a given region or ecosystem over a given timespan affects Earth's systems.	3 Analyzing
Students identify evidence to support a claim that changes in Earth systems in a given region or ecosystem over a given timespan affect Earth's systems.	3 Analyzing
Students identify evidence to support a claim that engineered solutions have altered the effects of human activities on Earth's system.	3 Analyzing

Priority Standard: 6-8.ESS3.C.2 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will propose a solution to a problem related to human impact on the environment, using scientific information and principles to generate a design solution incorporating technologies that can help monitor or minimize the results of the particular human activity.	4 Evaluating
Students will define and quantify, criteria and constraints for the solution, including; individual or societal needs and desires, and constraints imposed by economic conditions (e.g., costs of building and maintaining the solution).	4 Evaluating
Students will define and quantify, criteria and constraints for the solution, including; individual or societal needs and desires, and constraints imposed by economic conditions (e.g., costs of building and maintaining the solution).	4 Evaluating
Students will identify limitations of the use of technologies employed by the solution to an environmental problem.	4 Evaluating

Priority Standard: 6-8.ETS1.B.2 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will organize given data (e.g., tables, charts, graphs) from tests intended to determine the effectiveness of three or more alternative solutions to a problem.	3 Analyzing
Students will use analysis techniques to identify relationships within data sets, including relationships between the design solutions and the given criteria and constraints.	3 Analyzing
Students will analyze data to identify evidence of similarities and differences in features of the solutions.	3 Analyzing
Students will make a claim for which characteristics of each design best meet the given criteria and constraints based on the data analysis.	4 Evaluating
Students will use the analyzed data to identify the best features in each design that can be compiled into a new (improved) redesigned solution.	4 Evaluating

Priority Standard: 6-8.ETS1.B.3 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a model in which they identify the components relevant to testing ideas about the designed system, including the problem being solved, criteria, and constraints.	3 Analyzing
Students will identify the limitations of the model with regards to representing the proposed solution.	4 Evaluating
Students will describe how the data generated by a given model can be used to optimize the design solution through iterative testing and modification.	4 Evaluating

Priority Standard: 6-8.ESS3.D Analyze evidence of the factors that have caused the change in global temperatures over the past century.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will examine a claim and supporting evidence as a basis for formulating questions.	3 Analyzing
Students will ask questions that identify and clarify the evidence of relevant ways in which natural processes and/or human activities may have affected the patterns of change in global temperatures over the past century.	3 Analyzing

Students will ask questions that identify and clarify the evidence of the influence of natural processes and/or human activities on a gradual or sudden change in global temperatures in natural systems (e.g., glaciers and arctic ice, plant and animal seasonal movements, life cycle activities).	3 Analyzing
Students will ask questions that identify and clarify the evidence of the influence of natural processes and/or human activities on changes in the concentration of carbon dioxide and other greenhouse gasses in the atmosphere over the past century.	3 Analyzing
Students will use evidence to identify patterns in data that connect natural processes and human activities to changes in global temperatures over the past century and connect the changes in natural processes and/or human activities related to greenhouse gas production to changes in the concentrations of carbon dioxide and other greenhouse gasses in the atmosphere.	3 Analyzing

Essential Questions:

1. How have humans impacted the ecosystem and how can this impact be minimized?
2. How can humans identify and address human impacts on the environment?
3. How can data from several design solutions be used to create an improved solution?
4. When developing or using a model what factors are used to modify to improve the model?
5. What factors have caused changes in global temperatures over the past century?

Enduring Understanding/Big Ideas:

1. Human activities have altered the biosphere, sometimes damaging it, although changes to environments can have different impacts for different living things. Activities and technologies can be engineered to reduce people's impacts on Earth.
2. Human activities are impacting the environment, using scientific principles the impacts can be monitored and minimized.
3. Data analysis can be used to identify the best characteristics to create an improved design solution.

4. Improving a model requires evaluation of the problem being solved, criteria and constraints on the model, and interactive testing and modification to the model as seen in the Engineering and Design Process.
5. Human activities affect global warming. Decisions to reduce the impact of global warming depend on understanding climate science, engineering capabilities, and social dynamics.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
● consumption ● environment ● natural resources ● per capita ● population	● biosphere ● climate change ● extinction ● fossil fuel ● global warming ● greenhouse gases ● habitat ● human activity ● species

Resources for Vocabulary Development:
STEMscopedia & Picture Vocabulary

Engaging Scenario

An Engaging Scenario is a culminating activity tied to the unit's priority standards, that includes the following components: situation, challenge, specific roles, audience, product, or performance.

Engaging Scenario 2 blocks
Students address the effects of global warming on living systems by preparing an argument explaining why different groups should not have their water supply reduced and by participating in a debate with other groups to present their arguments.

Topic 1: Human Impact on the Environment

Engaging Experience

Title: Human Impact on the Environment
Suggested Length of Time: 5 blocks

Standards Addressed:

Priority Standard: 6-8.ESS3.C.1 Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's System.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will develop a logical argument to support or refute the claim that Earth's systems are affected by increases in the size of the human population and per-capita consumption of natural resources.	3 Analyzing
Students identify evidence to support a claim that changes in the size of human population(s) in a given region or ecosystem over a given timespan affects Earth's systems.	3 Analyzing
Students identify evidence to support a claim that per-capita consumption of resources by humans in a given region or ecosystem over a given timespan affects Earth's systems.	3 Analyzing
Students identify evidence to support a claim that changes in Earth systems in a given region or ecosystem over a given timespan affect Earth's systems.	3 Analyzing
Students identify evidence to support a claim that engineered solutions have altered the effects of human activities on Earth's system.	3 Analyzing

Priority Standard: 6-8.ESS3.C.1 Analyze data to define the relationship for how increases in human population and per-capita consumption of natural resources impact Earth's System.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will propose a solution to a problem related to human impact on the environment, using scientific information and principles to generate a design solution incorporating technologies that can help monitor or minimize the results of the particular human activity.	4 Evaluating
Students will identify relationships between the human activity and the negative environmental impact based on scientific principles and distinguish between causal and correlational relationships to facilitate the design of the solution.	4 Evaluating
Students will define and quantify, criteria and constraints for the solution, including; individual or societal needs and desires, and constraints imposed by economic conditions (e.g., costs of building and maintaining the solution).	4 Evaluating
Students will identify limitations of the use of technologies employed by the solution to an environmental problem.	4 Evaluating

Priority Standard: 6-8.ETS1.B.2 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will organize given data (e.g., tables, charts, graphs) from tests intended to determine the effectiveness of three or more alternative solutions to a problem.	3 Analyzing
Students will use analysis techniques to identify relationships within data sets, including relationships between the design solutions and the given criteria and constraints.	3 Analyzing
Students will analyze data to identify evidence of similarities and differences in features of the solutions.	3 Analyzing
Students will make a claim for which characteristics of each design best meet the given criteria and constraints based on the data analysis.	4 Evaluating
Students will use the analyzed data to identify the best features in each design that can be compiled into a new (improved) redesigned solution.	4 Evaluating

Priority Standard: 6-8.ETS1.B.3 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a model in which they identify the components relevant to testing ideas about the designed system, including the problem being solved, criteria, and constraints.	3 Analyzing
Students will identify the limitations of the model with regards to representing the proposed solution.	4 Evaluating
Students will describe how the data generated by a given model can be used to optimize the design solution through iterative testing and modification.	4 Evaluating

Engage	Explore	Explain	Elaborate	Evaluate
Mission Briefing (in Mission Log) Student Introduction Letter (found in Bundle Resources) Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Tuva - Air Pollution and population Explore 2: Ocean Acidification	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (Civil Engineer) Science Today: Watch It!	Vocabulary Quiz (with Human Activities and Global Climate Change) Assessment using a mix of multiple-choice short answers, and a CER. (With Human Activities and Global Climate Change) Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use elaborate activities throughout the instructional unit to supplement and reinforce student learning.
Explore 2 - begin at the end of class and not over a weekend! 36-48 hours for the egg to be affected by the acid.

Topic 2: Human Activities and Global Climate Change

Engaging Experience

Title: Human Activities and Global Climate Change

Suggested Length of Time: 6 blocks

Standards Addressed:

Priority Standard: 6-8.ESS3.D Analyze evidence of the factors that have caused the change in global temperatures over the past century.

Learning Targets	Webb's DOK Level Bloom's Level
Students will examine a claim and supporting evidence as a basis for formulating questions.	3 Analyzing
Students will ask questions that identify and clarify the evidence of relevant ways in which natural processes and/or human activities may have affected the patterns of change in global temperatures over the past century.	3 Analyzing
Students will ask questions that identify and clarify the evidence of the influence of natural processes and/or human activities on a gradual or sudden change in global temperatures in natural systems (e.g., glaciers and arctic ice, plant and animal seasonal movements, life cycle activities).	3 Analyzing
Students identify evidence to support a claim that changes in Earth systems in a given region or ecosystem over a given timespan affect Earth's systems.	3 Analyzing
Students will ask questions that identify and clarify the evidence of the influence of natural processes and/or human activities on changes in the concentration of carbon dioxide and other greenhouse gasses in the atmosphere over the past century.	3 Analyzing

Students will use evidence to identify patterns in data that connect natural processes and human activities to changes in global temperatures over the past century and connect the changes in natural processes and/or human activities related to greenhouse gas production to changes in the concentrations of carbon dioxide and other greenhouse gasses in the atmosphere.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Investigative Phenomena Accessing Prior Knowledge Hook	Explore 1: Climate Science Explore 2: Tuva - Global Climate Change Explore 3: Human Activity Causes and Solutions	STEMscopedia Linking Literacy Picture Vocabulary	Scientist Spotlight Career Connections (Political Leader) Science Today: Watch It! PHET Simulation - Molecules and Light	Vocabulary Quiz (with Human Impact on the Environment) Assessment using a mix of multiple-choice short answers, and a CER. (With Human Impact on the Environment) Mission Log

Instructional Notes:
Graphic Organizer is a resource for notetaking. Content Connections is optional.
Use the elaborate activities throughout the instructional unit to supplement and reinforce student learning.

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Human Impact on the Environment	Human activities can have positive and negative impacts on the environment.	5 blocks
2	Human Activities and Global Climate Change	Human activities have caused a rise in global temperatures over the past century.	6 blocks
Engaging Scenario		Students address the effects of global warming on living systems by preparing an argument explaining why different groups should not have their water supply reduced and by participating in a debate with other groups to present their arguments.	2 blocks

Unit of Study Terminology

Appendices: All Appendices and supporting material can be found in this course's shell course in the District's Learning Management System.

Assessment Leveling Guide: A tool to use when writing assessments in order to maintain the appropriate level of rigor that matches the standard.

Big Ideas/Enduring Understandings: Foundational understandings teachers want students to be able to discover and state in their own words by the end of the unit of study. These are answers to the essential questions.

Engaging Experience: Each topic is broken into a list of engaging experiences for students. These experiences are aligned to priority and supporting standards, thus stating what students should be able to do. An example of an engaging experience is provided in the description, but a teacher has the autonomy to substitute one of their own that aligns to the level of rigor stated in the standards.

Engaging Scenario: This is a culminating activity in which students are given a role, situation, challenge, audience, and a product or performance is specified. Each unit contains an example of an engaging scenario, but a teacher has the ability to substitute with the same intent in mind.

Essential Questions: Engaging, open-ended questions that teachers can use to engage students in learning.

Priority Standards: What every student should know and be able to do. These were chosen because of their necessity for success in the next course, the state assessment, and life.

Supporting Standards: Additional standards that support the learning within the unit.

Topic: These are the main teaching points for the unit. Units can have anywhere from one topic to many, depending on the depth of the unit.

Unit of Study: Series of learning experiences/related assessments based on designated priority standards and related supporting standards.

Unit Vocabulary: Words students will encounter within the unit that are essential to understanding. Academic Cross-Curricular words (also called Tier 2 words) are those that can be found in multiple content areas, not just this one. Content/Domain Specific vocabulary words are those found specifically within the content