Park Hill School District

Building Successful Futures • Each Student • Every Day

8th Grade Science Curriculum

Course Description: Students will engage in units related to three core areas in science: matter and energy, Earth's processes, and living things. Throughout the units, students will develop models to describe their learning, construct scientific explanations based on evidence, analyze and interpret data and evidence, and construct, test, and modify a device to illustrate concepts.

Curriculum Standards: Missouri Department of Elementary and Secondary Education (DESE)

Scope and Sequence:

Timeframe	Unit	Instructional Topics
40 blocks	1: Foundations of Science (Force, Motion & Energy)	Topic 1: Foundations of Science Topic 2: Changes in Force & Motion Topic 3: Newton's Third Law of Motion Topic 4: Potential Energy Topic 5: Kinetic Energy Topic 6: Electric & Magnetic Forces
16 blocks	2: Waves	Topic 1: Introduction to Properties of Waves Topic 2: Modeling Waves through Various Mediums Topic 3: Properties of Visible Light Topic 4: Modeling Light Waves
14 blocks	3: Fundamentals of Space	Topic 1: Gravitational Forces Topic 2: Formation &Motion of Galaxies & Gravity Topic 3: The Solar System Topic 4: Earth, Sun, & Moon System
10 blocks	4: Evolution Explains Life's Unity & Diversity	Topic 1: Natural Selection Topic 2: Artificial Selection Topic 3: Geologic History of Earth & Fossil Record

Curriculum Revision Tracking

Spring 2026

- Adjusted scope and sequence to best support conceptual development

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

- Unit 3: Physical Bundle 5--Energy Transfer in Temperature
    - Topic 1: Thermal Energy Transfer
        - Omit Explore 4
    - Topic 2: Energy Transfer and Temperature
        - Omit Explore 4
- Unit 4: Earth Bundle 3--Earth's Materials, Systems and Natural Hazards
    - Topic 1: Earth's Materials
        - Omit Explore 3
    - Topic 4: Natural Hazards Predictions
        - Added Teaching Notes to the Engage: Hook-Natural Disasters

Unit 1: Foundations of Science (Force, Motion, & Energy)

Subject: Science
Grade: 8
Name of Unit: Foundations of Science (Force, Motion, & Energy)
Length of Unit: 40 blocks
Overview of Unit: Study how forces can cause objects to move and discover how this knowledge can be applied to our world.

Unit 1 Storyline Summary
Anchoring phenomena: How do unbalanced forces cause sports injuries? Students interact with a video of a dog skateboarding. **Culminating mission:** Students diagram and label the impact that forces have on sports injuries, including collisions, quick stops, and gravity, and design a device to help each patient through the rehabilitation process and/or prevent the injury from happening again.

Priority Standards for unit:

- 6-8.ETS1.A.1 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 solution
- 6-8.PS2.A.1 Apply physics principles to design a solution that minimizes the force of an object during a collision and develop an evaluation of the solution.
- 6-8.ETS1.B.1 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- 6-8.PS2.A.2 Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- 6-8.PS3.A.2 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.
- 6-8.PS3.A.1 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.
- 6-8.PS3.B 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.
- 6-8.PS2.B.1 Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces.

- 6-8.PS2.B.3 Conduct an investigation and evaluate the experimental design to provide evidence that electric and magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.

Priority Standards Unwrapped

NGSS Science and Engineering Practice 3: Planning and carrying out investigations. Plan an investigation and identify the independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify equipment and units of measure to use for measuring mass, volume, distance, and force	1 Understanding
Students will measure mass, volume, distance, and force.	1 Apply
Students will Plan an investigation, experiment to gather	3 Evaluating
Students will construct a hypothesis and identify independent, dependent, and constant variables	3 Apply
Students will will create and interpret graphs with scale, units, labels for axes, and titles of graphs,	3 Evaluating

Priority Standard: 6-8.PS2.A.1 Apply physics principles to design a solution that minimizes the force of an object during a collision and develop an evaluation of the solution.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify the factors, in physics, affecting a collision between two objects.	1 Remembering
Students will design a test to identify and minimize the forces between two objects in a collision.	4 Creating

Priority Standard: 6-8.ETS1.B.1 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify scientific knowledge related to the problem and each proposed solution.	1 Understanding
Students will describe criteria and constraints for a design solution	1 Understanding
Students will use evidence to make a claim about the effectiveness of proposed solutions based on the strengths and weaknesses of each.	3 Analyzing

Priority Standard: 6-8.PS2.A.2 Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Learning Targets	Webb's DOK Level Bloom's Level
Students will describe how variables will be identified and controlled when planning and conducting an investigation.	1 Understanding
Students will identify balanced and unbalanced forces and describe ways that unbalanced forces cause changes in motion (Newton's First Law).	1 Apply
Students will apply Newton's Second Law to describe the relationship between forces, mass, and changes in motion.	2 Apply

Priority Standard: 6-8.PS3.A.2 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will use a model to identify the forces (electric, magnetic, gravitational) through which two objects interact.	2 Applying
Students will use a model to describe how as the position of two interacting objects changes the amount of potential energy in the system changes.	2 Applying
Students will use a model to describe changes in	2

potential energy.	Applying
Students will construct arguments to support the claim that when kinetic energy of an object changes, energy is transferred to or from the object, changing the amount of potential energy.	4 Creating

Priority Standard: 6-8.PS3.A.1 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will analyze and interpret data to show the relationship between kinetic energy and the mass of an object in motion and its speed.	3 Analyzing
Students will make a prediction of the proportional relationships of kinetic energy.	3 Analyzing

Priority Standard: 6-8.PS3.B 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will explain the effect of a change in kinetic energy.	2 Applying
Students will prove that as an object's kinetic energy increases or decreases, the energy of other objects also changes, proving that energy was transferred.	4 Evaluating

Priority Standard:6-8.PS2.B.1 Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will evaluate the experimental design of an investigation designed to provide evidence that electric and magnetic fields exist and that objects exert forces on each other do not have to be in contact with each other.	3 Analyzing
Students will explain that electric forces can be repulsive or attractive.	1 Understanding
Students will explain that electric and magnetic forces are dependent on the magnitude of the charges and distance between objects.	1 Understanding
Students will make and record observations and data regarding motion of objects, such as a push or pull exerted on the hand of an observer holding an object.	2 Applying
Students will distinguish between electric and magnetic forces.	1 Understanding

Priority Standard: 6-8.PS2.B.3 Conduct an investigation and evaluate the experimental design to provide evidence that electric and magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.

Learning Targets	Webb's DOK Level Bloom's Level
Students will analyze data to determine factors that affect the strength of electric and magnetic forces	3 Analyzing
Students will create models of interacting objects to show gravitational interactions depend on the mass.	4 Creating
Students will analyze data to determine how mass affects gravitational interactions.	3 Analyzing
Students will conduct and evaluate an investigation to show the forces that exist between two objects not in contact.	4 Evaluate

Essential Questions:

1. How can we design and carry out an investigation to conduct a fair test?
2. How can we minimize the force of an object?
3. How can we accurately test design solutions?
4. How can motion change?
5. What factors affect potential energy?
6. What is the relationship of mass and speed to kinetic energy?
7. What happens to the energy when kinetic energy changes?
8. How can invisible forces be detected, described, and mapped using their effects on objects?
9. How can objects influence one another without direct contact?

Enduring Understanding/Big Ideas:

1. A fair test is achieved by intentionally changing only one variable, controlling all other conditions, and using consistent procedures to collect reliable data. Careful planning, clear variables, and thoughtful analysis ensure that results can be trusted to answer the investigation's question.
2. The motion of an object is determined by the sum of the forces acting on it, therefore, minimization requires the minimizing of other forces acting on it.
3. Design solutions should be supported with claims, evidence, and additional evidence such as knowledge of how similar problems were solved in the past.
4. The motion of an object is determined by the sum of forces acting on it; if the total force on the object is not zero, its motion will change.
5. Potential energy depends on the mass and height of an object.
6. Motion of energy is called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed.
7. When kinetic energy changes, there is a transfer of energy to or from the object.
8. Forces that act at a distance (e.g., electric, magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (e.g., a charged object, ball).
9. Electric, magnetic, and gravitational forces all act at a distance between objects.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Interact	Net Force
Direction	Acceleration
System	Collide
Action	Newton's Laws of Motion
Reaction	Newton, N
Motion	Kinetic Energy
Energy	Law of Conservation of Energy
Force	Potential Energy
Mass	Relative Position
Weight	Magnetism
Speed	Charged Object
Gravity	Charged Particle
Velocity	Current
Metric measurement (vs. Imperial)	Electric Force
Density	Electromagnetic Force
Graduated cylinder	Magnetic Field
Triple beam balance	Interacting Objects
Beaker	Magnitude
Thermometer	Repulsive
Meter stick	Attract/Attractive
Meters	Volume
Liters	Inertia
Grams	Friction
Celsius	Frame of Reference
Balanced	At rest
Unbalanced	

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 blocks

(Found in Teacher Guide as "Action Plan" in STEMScopes)

Students diagram and label the impact that forces have on sports injuries, including collisions, quick stops, and gravity, and design a device to help each patient through the rehabilitation process and/or prevent the injury from happening again.

Topic 1: Foundations of Science

Engaging Experience

Title: Foundations of Science

Suggested Length of Time: 7 blocks

Standards Addressed

NGSS Science and Engineering Practice 3: Planning and carrying out investigations. Plan an investigation and identify the independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how much data is needed to support a claim.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify equipment and units of measure to use for measuring mass, volume, distance, and force	1 Understanding
Students will measure mass, volume, distance, and force.	1 Apply
Students will Plan an investigation, experiment to gather	3 Evaluating
Students will construct a hypothesis and identify independent, dependent, and constant variables	3 Apply
Students will create and interpret graphs with scale, units, labels for axes, and titles of graphs,	3 Evaluating

Engage	Explore	Explain	Elaborate	Evaluate

Explore 3 of Changes in Motion Stemscopes	Graphing practice CER practice Equipment, measure- ment, and units Annotation practice	Stem Scopes Nature of Science PhysicsTeacher Toolbox- Safety Field Guide to Lab Equipment Plasma Games Reconnaissance Report Graphing Skills Plasma Games Field Guide Motion Graphs Plasma Games Field Training Data and Graphs Plasma Games	Lab Safety Math Connections	Performance Task
Instructional Notes: ● Other activities can be substituted to cover needed skills for upcoming labs.				

Topic 2: Changes in Force & Motion

Engaging Experience

Title: Changes in Force & Motion

Suggested Length of Time: 8 blocks

Standards Addressed

Priority Standard: 6-8.PS2.A.2 Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Learning Targets	Webb's DOK Level Bloom's Level
Students will describe how variables will be identified and controlled when planning and conducting an investigation.	1 Understanding
Students will identify balanced and unbalanced forces and describe ways that unbalanced forces cause changes in motion (Newton's First Law).	2 Apply
Students will apply Newton's Second Law to describe the relationship between forces, mass, and changes in motion.	2 Apply

Engage	Explore	Explain	Elaborate	Evaluate
Hook - Newton Knew that Mass Matters: Part I (¼ block)	Explore 1- Balanced and Unbalanced Forces (1 block) Newton's 2nd Law Investigation (1 block)	STEMScopedia- Changes in Force and Motion	Math Connections (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment

				(½ block review, ½ block assess)

Instructional Notes:

- **Hook**– Complete Part II only if needed for further instruction
- **Explore 1**: Wooden device with eye hooks can be used in place of rubber bands
- **Newton's 2nd Law Investigation**– Calculating the speed and acceleration of different toy cars with different masses.
- **Evaluate**–Choose 1 activity to assess based on student need
- Consider using mission logs

Topic 3: Newton's Third Law of Motion

Engaging Experience

Title: Newton's Third Law of Motion

Suggested Length of Time: 8 blocks

Standards Addressed

Priority Standard: 6-8.PS2.A.1 Apply physics principles to design a solution that minimizes the force of an object during a collision and develop an evaluation of the solution.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify the factors, in physics, affecting a collision between two objects.	1 Remembering
Students will design a test to identify and minimize the forces between two objects in a collision.	4 Creating

Priority Standard: 6-8.ETS1.B.1 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify scientific knowledge related to the problem and each proposed solution.	1 Understanding
Students will describe criteria and constraints for a design solution	1 Understanding

Students will use evidence to make a claim about the effectiveness of proposed solutions based on the strengths and weaknesses of each.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Hook - What Is a System? (¼ block)	Explore 1- How can we measure forces? (½ block) Explore 2- Action-Reaction Contact Forces Lab (1 block) Explore 3- Shock Absorber (1 block)	STEMScopedia- Newton's Third Law of Motion Communicate Science- Creative Skit (½ block)	Math Connections (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ assessment)

Instructional Notes:

- **Explore 1**–Sand can be omitted for a different material.
- **Explore 2**–Omit station "Recoiling Slingshot."
- **Explore 2**–Station "Newton's Body Surfing" can easily be done in a chair with wheels rather than a scooter.
- **Explore 2**– Complete stations as demos as needed
- **Evaluate**–Choose 1 activity to assess based on student need
- Consider using mission logs

Topic 4: Potential Energy

Engaging Experience

Title: Potential Energy

Suggested Length of Time: 6 blocks

Standards Addressed

Priority Standard: 6-8.PS3.A.2 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.

Learning Targets	Webb's DOK Level / Bloom's Level
Students will use a model to identify the forces (electric, magnetic, gravitational) through which two objects interact.	2 / Applying
Students will use a model to describe how as the position of two interacting objects changes the amount of potential energy in the system changes.	2 / Applying
Students will use a model to describe changes in potential energy.	2 / Applying
Students will construct arguments to support the claim that when kinetic energy of an object changes, energy is transferred to or from the object, changing the amount of potential energy.	4 / Creating

Engage	Explore	Explain	Elaborate	Evaluate
Accessing Prior Knowledge (¼ block) Hook- Rubber Band Energy (½	Explore 3: Energy in a Skate Park (½ block) Explore 4: Engineering	STEMScopedia Linking Literacy–During & Post Reading (½ block)	Math Connections (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment

block)	Solution: Half-Pipe Design (1.5 block) Explore 1: Scientific Investigation - Potential Predictions (½ blocks)			Multiple Choice Assessment (½ block review, ½ block assess)
<u>Instructional Notes:</u> ● **Graphic Organizer–** Good note taking resource ● **Explore 3 & 4** can be coupled together. ● **Evaluate**–Choose 1 activity to assess based on student need				

Topic 5: Kinetic Energy

Engaging Experience

Title: Kinetic Energy

Suggested Length of Time: 6 blocks

Standards Addressed

Priority Standard: 6-8.PS3.A.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will analyze and interpret data to show the relationship between kinetic energy and the mass of an object in motion and its speed.	3 Analyzing
Students will make a prediction of the proportional relationships of kinetic energy.	3 Analyzing

Priority Standard: 6-8.PS3.B 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will explain the effect of a change in kinetic energy.	2 Applying
Students will prove that as an object's kinetic energy increases or decreases, the energy of other objects also changes, proving that energy was transferred.	4 Evaluating

Engage	Explore	Explain	Elaborate	Evaluate
Hook - Dominoes Accessing Prior Knowledge- Baseball (½ block for both)	Explore 1: Activity - Speed and Motion (½ block) Explore 2: Scientific Investigation - The Effect of Mass (1 block)	STEMScopedia– Kinetic Energy' Linking Literacy (½ block)	No specific Elaboration–use STEMScopes resources based on student need.	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

- **Explore 2–** Skip teacher pre-lab demonstration.
- **Evaluate**–Choose 1 activity to assess based on student need
- Consider using mission logs

Topic 6: Electric and Magnetic Forces

Engaging Experience

Title: Electric and Magnetic Forces

Suggested Length of Time: 4 blocks

Standards Addressed

Priority Standard:6-8.PS2.B.1 Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces.

Learning Targets	Webb's DOK Level Bloom's Level
Students will evaluate the experimental design of an investigation designed to provide evidence that electric and magnetic fields exist and that objects exert forces on each other do not have to be in contact with each other.	3 Analyzing
Students will explain that electric forces can be repulsive or attractive.	1 Understanding
Students will explain that electric and magnetic forces are dependent on the magnitude of the charges and distance between objects.	1 Understanding
Students will make and record observations and data regarding motion of objects, such as a push or pull exerted on the hand of an observer holding an object.	2 Applying
Students will distinguish between electric and magnetic forces.	1 Understanding

Priority Standard: 6-8.PS2.B.3 Conduct an investigation and evaluate the experimental design to provide evidence that electric and magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.

Learning Targets	Webb's DOK Level Bloom's Level
Students will analyze data to determine factors that affect the strength of electric and magnetic forces	3 Analyzing
Students will create models of interacting objects to show gravitational interactions depend on the mass.	4 Creating
Students will analyze data to determine how mass affects gravitational interactions.	3 Analyzing
Students will conduct and evaluate an investigation to show the forces that exist between two objects not in contact.	4 Evaluate

Engage	Explore	Explain	Elaborate	Evaluate
Accessing Prior Knowledge (Pre-discussion activity)	Station Rotation including: ● Hook: Electromagnetic Straw ● Explore 1: Magnetic Fields (½ block) ● Explore 2: Electrical Force (½ block) (1 block total) Explore 3: Electromagnetic	STEMScopedia Linking Literacy–During & After (½ block)	Math Connections (½ block)	Claim-Evidence-Reasoning Open-Ended Assessment Multiple Choice Assessment (½ block review, ½ block assess)

	Strength (1 block)			

Instructional Notes:

- **Accessing Prior Knowledge**– Can be done verbally or in other form
- **Hook**– Complete as a teacher demonstration
- **Hook, Explore 1, and Explore 2** could be done together as station rotations.
- **Evaluate**–Choose 1 activity to assess based on student need

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Foundations of Science	Students discover the tools and skills needed to carry out a fair investigation.	7 blocks
2	Changes in Force & Motion	Students discover why some objects require more force to move than others	8 blocks
3	Newton's Third Law of Motion	Students discover what happens when two objects collide	8 blocks
4	Potential Energy	Students discover variables that change the amount of potential energy in an object.	6 blocks
5	Kinetic Energy	Students explore the relationship of mass and speed to kinetic energy	6 blocks
6	Electric & Magnetic Forces	Students investigate how to increase the strength of an electric or magnetic force.	4 blocks
Engaging Scenario		Students diagram and label the impact that forces have on sports injuries, including collisions, quick stops, and gravity, and design a device to help each patient through the rehabilitation process and/or prevent the injury from happening again.	1 block

Unit 2: Waves

Subject: Science
Grade: 8
Name of Unit: Waves
Length of Unit: 16 blocks
Overview of Unit: Examining and explaining the characteristics of waves such as sound and light. Students use this understanding to describe how these characteristics shape their reality.

Unit 4 Storyline Summary
Anchoring phenomena: How can interpreting waves be used to measure biodiversity? Students watch a video about morse code and generate questions about what type of waves are used in Morse code and how we can use waves to collect data. **Culminating mission:** You are an ecological researcher, and you want to study the bats and dolphins near a remote island. You do not want to disturb the natural order of the island, so you must design a device to detect the number of different species. Both types of animals use waves to communicate. Dolphins chirp to each other through analog waves, and bats use a type of digital wave called echolocation.

Priority Standards for unit:

- 6-8.PS4.A.1 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.
- 6-8.PS4.A.2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Priority Standards Unwrapped

Priority Standard: 6-8.PS4.A.1 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.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will identify the characteristics of a simple mathematical wave model of a phenomenon, including: ● Frequency ● Amplitude ● Wavelength	1 Understanding

Students will use a mathematical wave model to identify how the wave model characteristics correspond with physical observations.	2 Applying

Priority Standard: 6-8.PS4.A.2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will develop a model and identify the type of wave, various materials through which the waves are reflected, absorbed, or transmitted, and relevant characteristics of the wave after it has interacted with a material (frequency amplitude, and wavelength).	4 Creating
Students will design a model to show that waves are reflected, absorbed, or transmitted through various materials.	4 Creating
Students will draw images of reflection, absorption and transmission.	2 Applying

Essential Questions:

1. What are the parts and patterns of a wave?
2. How are waves reflected, absorbed, and transmitted through various materials?

Enduring Understanding/Big Ideas:

1. A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude.
2. When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific
Energy Transfer Direction Motion Absorb Horizontal Perpendicular Vertical Speed Temperature Expand Behavior Brightness Color	Wave Simple Wave Transverse Waves Longitudinal Waves Sound Waves Electromagnetic Waves Rarefactions Compression Amplitude Crest Frequency Pitch Sound Energy Trough Vibration Wavelength Absorption Medium Reflect Refract Transmit Diffraction Diffusion Light Energy Lumens Transparent Electromagnetic Spectrum

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
(Found in Teacher Guide as "Action Plan" in STEMScopes)

You are an ecological researcher, and you want to study the bats and dolphins near a remote island. You do not want to disturb the natural order of the island, so you must design a device to detect the number of different species. Both types of animals use waves to communicate. Dolphins chirp to each other through analog waves, and bats use a type of digital wave called echolocation.

Topic 1: Introduction to Properties of Waves

Engaging Experience

Title: Introduction to Properties of Waves

Suggested Length of Time: 4 blocks

Standards Addressed

Priority Standard: 6-8.PS4.A.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify the characteristics of a simple mathematical wave model of a phenomenon, including: ● Frequency ● Amplitude ● Wavelength	1 Understanding
Students will use a mathematical wave model to identify how the wave model characteristics correspond with physical observations.	2 Applying

Engage	Explore	Explain	Elaborate	Evaluate
Hook - Making Waves (¼ block)	Explore 1: Activity - Spring Waves (½ block) Explore 2: Activity - Patterns in Simple Waves (½ block)	STEMscopedia Linking Literacy- Before & During Reading Activities (½ block)	Math Connections (½ block) PhET Simulation- Waves Intro (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

- **Hook–** Can use objects other than a slinky for modification.
- **Linking Literacy–** Change headers as needed, may include a column for pictures.
- **Acceleration**– Science Art-Sound it Out is a fun extension activity if time allows.
- **Evaluate**–Choose 1 activity to assess based on student need

Topic 2: Modeling Waves through Various Mediums

Engaging Experience

Title: Modeling Waves through Various Mediums

Suggested Length of Time: 3 blocks

Standards Addressed

Priority Standard: 6-8.PS4.A.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify the characteristics of a simple mathematical wave model of a phenomenon, including: ● Frequency ● Amplitude ● Wavelength	1 Understanding
Students will use a mathematical wave model to identify how the wave model characteristics correspond with physical observations.	2 Applying

Engage	Explore	Explain	Elaborate	Evaluate
Accessing Prior Knowledge (¼ block) Hook- Can You Hear That? (¼ block)	Explore 1- Visualizing Sound (½ block) Explore 2- Sound of Science (½ block) Explore 3- Geologists and Waves (1 block)	STEMScopedia Communicate Science- Demonstrative Speech (1 block)	No specific Elaboration–use STEMScopes resources based on student need.	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block assess)

Instructional Notes:

- **Evaluate**–Choose 1 activity to assess based on student need
- **Explore 3**- Real life application video: Turkey Earthquake

Topic 3: Properties of Visible Light

Engaging Experience

Title: Properties of Visible Light

Suggested Length of Time: 4 blocks

Standards Addressed

Priority Standard: 6-8.PS4.A.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify the characteristics of a simple mathematical wave model of a phenomenon, including: ● Frequency ● Amplitude ● Wavelength	1 Understanding
Students will use a mathematical wave model to identify how the wave model characteristics correspond with physical observations.	2 Applying

Priority Standard: 6-8.PS4.A.2 Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Learning Targets	Webb's DOK Level Bloom's Level
Students will develop a model and identify the type of wave, various materials through which the waves are reflected, absorbed, or transmitted, and relevant characteristics of the wave after it has interacted with a material (frequency amplitude, and wavelength).	4 Creating

Students will design a model to show that waves are reflected, absorbed, or transmitted through various materials.	4 Creating
Students will draw images of reflection, absorption and transmission.	2 Applying

Engage	Explore	Explain	Elaborate	Evaluate
Accessing Prior Knowledge (¼ block) Hook- Laser Light Maze (½ block)	Explore 1- Simulating Light (½ block) Explore 2- What Color is That? (½ block) Explore 3- Interactions of Light Waves (½ block) Explore 4- Lights Out (2 blocks)	STEMScopedia Linking Literacy- During and After Reading Activities (½ block)	Math Connections (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block assess)

Instructional Notes:

- **Hook–** Many ways to adapt to a whole class activity, such as the teacher holding the laser and groups of students working together to reach the target
- **Evaluate**–Choose 1 activity to assess based on student need

Topic 4: Modeling Light Waves

Engaging Experience

Title: Modeling Light Waves

Suggested Length of Time: 3 blocks

Standards Addressed

Priority Standard: 6-8.PS4.A.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will identify the characteristics of a simple mathematical wave model of a phenomenon, including: ● Frequency ● Amplitude ● Wavelength	1 Understanding
Students will use a mathematical wave model to identify how the wave model characteristics correspond with physical observations.	2 Applying

Engage	Explore	Explain	Elaborate	Evaluate
Hook - Splitting Light (¼ block)	Explore 1: Activity - Frequency and Refraction (½ block) Explore 2: Scientific Investigation - Brightness (½ block)	STEMscopedia Linking Literacy During Reading- (¼ block) Communicate Science - Creative Story (1 block)	Math Connections (½ block) PhET: Simulation Practice - Bending Light (¼ block) Career Connections - Eye Doctor (¼ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block assess)

Instructional Notes:

- **Elaborate**– Multiple PhET Simulations in Scope. Choose PhET based on student need.

- **Evaluate**–Choose 1 activity to assess based on student need

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Introduction to Properties of Waves	Students discover the relationship between the amplitude and energy of waves.	4 blocks
2	Modeling Waves through Various Mediums	Students explore how sound waves interact with various materials.	3 blocks
3	Properties of Visible Light	Students investigate the properties of visible light.	4 blocks
4	Modeling Light Waves	Students explore how light waves interact with various materials.	3 blocks
Engaging Scenario		You are an ecological researcher, and you want to study the bats and dolphins near a remote island. You do not want to disturb the natural order of the island, so you must design a device to detect the number of different species. Both types of animals use waves to communicate. Dolphins chirp to each other through analog waves, and bats use a type of digital wave called echolocation.	2 blocks

Unit 3: Fundamentals of Space

Subject: Science
Grade: 8
Name of Unit: Fundamentals of Space
Length of Unit: 14 blocks
Overview of Unit: Studying the causes of cyclical changes in the appearance of the Moon, the role gravity plays in an object's motion, how an object can influence the motion of another object without touching it, and how this knowledge can be applied to our world.

Unit 2 Storyline Summary
Anchoring phenomena: How can an object influence the motion of another object without touching it? Students interact with a video of a person using a compass **Culminating mission:** Students are part of a shuttle crew completing a one-year (365-day) journey in space to collect data. Their primary duty is to create a video log of significant discoveries they make throughout their journey.

Priority Standards for unit:

- 6-8.PS2.B.2 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects.
- 6-8.ESS1.A.1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.
- 6-8.ESS1.A.2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.
- 6-8.ESS1.A.3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
- 6-8.ESS1.B.1 Analyze and interpret data to determine scale properties of objects in the solar system.

Priority Standards Unwrapped

Priority Standard: 6-8.PS2.B.2 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will be able to describe how gravitational interactions depend on the mass of interacting objects	1 Describe
Students will be able to analyze data, graphs, or charts to use as evidence that gravitational forces depend on the masses of objects.	4 Evaluating
Students will be able to create a graph that supports their scientific claims.	4 Creating

Priority Standard: 6-8.ESS1.A.1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will explain the cyclic patterns of lunar phases and eclipses of the sun and moon.	1 Understanding
Students will identify relevant components including the Earth, Sun, Moon, and Solar energy in a model.	1 Remembering
Students will describe the relationship between the Earth-Moon system and the sun.	2 Applying

Students will provide reasoning for events such as moon phases.	3 Analyzing

Priority Standard: 6-8.ESS1.A.2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will demonstrate how the Earth's tilt causes seasons.	2 Applying
Students will explain the effect of the directional angle of the sunlight.	2 Applying

Priority Standard: 6-8.ESS1.A.3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will create a model that displays gravity as the force that binds the solar system and galaxies together.	4 Creating
Students will demonstrate the use of gravity in determining orbital movements within both the solar system and galaxies.	2 Applying

Priority Standard: 6-8.ESS1.B.1 Analyze and interpret data to determine scale properties of objects in the solar system.

Learning Targets	Webb's DOK Level Bloom's Level
Students will describe how different representations illustrate different characteristics of objects in the solar system, including differences in scale.	3 Analyze
Students will determine scale properties of objects in the solar system.	1 Understanding

Priority Standard:6-8.PS2.B.1 Analyze diagrams and collect data to determine the factors that affect the strength of electric and magnetic forces.

Learning Targets	Webb's DOK Level Bloom's Level
Students will evaluate the experimental design of an investigation designed to provide evidence that electric and magnetic fields exist and that objects exert forces on each other do not have to be in contact with each other.	3 Analyzing
Students will explain that electric forces can be repulsive or attractive.	1 Understanding
Students will explain that electric and magnetic forces are dependent on the magnitude of the charges and distance between objects.	1 Understanding
Students will make and record observations and data regarding motion of objects, such as a push or pull exerted on the hand of an observer holding an object.	2 Applying

Students will distinguish between electric and magnetic forces.	1 Understanding

Priority Standard: 6-8.PS2.B.3 Conduct an investigation and evaluate the experimental design to provide evidence that electric and magnetic fields exist between objects exerting forces on each other even though the objects are not in contact.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will analyze data to determine factors that affect the strength of electric and magnetic forces	3 Analyzing
Students will create models of interacting objects to show gravitational interactions depend on the mass.	4 Creating
Students will analyze data to determine how mass affects gravitational interactions.	3 Analyzing
Students will conduct and evaluate an investigation to show the forces that exist between two objects not in contact.	4 Evaluate

Essential Questions:

1. How does gravity organize and influence the motion of objects in the solar system?
2. How does gravity organize and influence the motion of objects in the solar system?
3. How do forces act over distances between objects without touching?
4. Why do lunar phases and eclipses occur in repeating patterns?
5. Why do we experience different seasons on Earth?

Enduring Understanding/Big Ideas:

1. The solar system consists of the Sun and a collection of objects (planets, moons, asteroids) held in orbit by gravitational forces. Gravity explains planetary motion, tides, and eclipses.
2. The mass of an object determines the strength of its gravitational interaction with other objects.
3. Electric, magnetic, and gravitational forces act over distances, even without direct contact.
4. The Earth–Moon–Sun system moves in predictable cycles that produce lunar phases and eclipses.
5. Earth's seasons result from the tilt of Earth's axis and the changing intensity of sunlight over the course of a year.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific	
Energy Force System	Axis Rotation Revolution Galaxy Milky Way Ellipse Eclipse Lunar Phase Lunar Eclipse Earth's Tilt Waning Waxing Gibbous Crescent Solar Eclipse Star Planet	Inner/Outer Planets Dwarf Planet Sun Orbit Moon Solar System Universe Big Bang Theory Dust Gas Gravity Gravitational Pull Electromagnetic Spectrum Geocentric Heliocentric Electromagnetic Force Interacting Objects Magnitude

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
(Found in Teacher Guide as "Action Plan" in STEMScopes)

Students are part of a shuttle crew completing a one-year (365-day) journey in space to collect data. Their primary duty is to create a video log of significant discoveries they make throughout their journey.

Topic 1: Gravitational Forces

Engaging Experience

Title: Gravitational Forces

Suggested Length of Time: 3 Blocks

Standards Addressed

Priority Standard: 6-8.PS2.B.2 Create and analyze a graph to use as evidence to support the claim that gravitational interactions depend on the mass of interacting objects.

Learning Targets	Webb's DOK Level Bloom's Level
Students will be able to describe how gravitational interactions depend on the mass of interacting objects	1 Describe
Students will be able to analyze data, graphs, or charts to use as evidence that gravitational forces depend on the masses of objects.	4 Evaluating
Students will be able to create a graph that supports their scientific claims.	4 Creating

Engage	Explore	Explain	Elaborate	Evaluate
Engage- Accessing Prior Knowledge (¼ block)	Explore 1- Mass and Gravitational Force (¼ block) Explore 2- Gravitational Force Between Objects (½ block) Explore 3- Gravitational Forces in Space (½ block)	STEMscopedia: Gravitational Forces	Math Connections (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

Explore 1–Have all students hold one sheet and demonstrate activity. Could be used as an engaging scenario

- **Explore 2–** Students can graph recorded data
- **Explore 2 & 3**– Could be combined in a single block
- **Evaluate**–Choose 1 activity to assess based on student need
- Consider using mission logs

Topic 2: Formation & Motion of Galaxies & Gravity

Engaging Experience

Title: Formation & Motion of Galaxies & Gravity

Suggested Length of Time: 2 blocks

Standards Addressed

Priority Standard: 6-8.ESS1.A.3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

Learning Targets	Webb's DOK Level Bloom's Level
Students will create a model that displays gravity as the force that binds the solar system and galaxies together.	4 Creating
Students will demonstrate the use of gravity in determining orbital movements within both the solar system and galaxies.	2 Applying

Engage	Explore	Explain	Elaborate	Evaluate
Hook - Formation of Our Solar System Timeline Cards (¼ block) Accessing Prior Knowledge- Your place in the Universe (¼ block)	Explore 2: Activity - Gravity's Pull (½ block) Explore 3: Activity - To the Milky Way and Beyond! (½ block)	STEMScopedia Content Connections Video - Formation And Motion Of Galaxies (¼ block)	Science Art- One Revolution, One Year (½)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

- **Evaluate**–Choose 1 activity to assess based on student need

Topic 3: The Solar System

Engaging Experience

Title: The Solar System

Suggested Length of Time: 5 blocks

Standards Addressed

Priority Standard: 6-8.ESS1.A.3 Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

Learning Targets	Webb's DOK Level Bloom's Level
Students will create a model that displays gravity as the force that binds the solar system and galaxies together.	4 Creating
Students will demonstrate the use of gravity in determining orbital movements within both the solar system and galaxies.	2 Applying

Priority Standard: 6-8.ESS1.B.1 Analyze and interpret data to determine scale properties of objects in the solar system.

Learning Targets	Webb's DOK Level Bloom's Level
Students will describe how different representations illustrate different characteristics of objects in the solar system, including differences in scale.	3 Analyze
Students will determine scale properties of objects in the solar system.	1 Understanding

Engage	Explore	Explain	Elaborate	Evaluate
APK- Scaling Solar System (¼ block) APK Extension: Graphic Organizer (½ block)	Explore 1: Our Solar System (1 block) Explore 5: Research-Comparing Solar System Objects (see revision below) (2 blocks)	STEMScopedia Content Connections Video - The Solar System (¼ block)	SEP Simulations - Solar System (½ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

- **Evaluate**–Choose 1 activity to assess based on student need
- **Explore 5**– Can alter the end product. For example, students can choose one of the options and create a "travel brochure" and take notes over the other destinations from other students.

Topic 4: Earth, Sun, & Moon System

Engaging Experience

Title: Earth, Sun, & Moon System

Suggested Length of Time: 4 blocks

Standards Addressed

Priority Standard: 6-8.ESS1.A.1 Develop and use a model of the Earth-sun-moon system to explain the cyclic patterns of lunar phases and eclipses of the sun and moon.

Learning Targets	Webb's DOK Level Bloom's Level
Students will explain the cyclic patterns of lunar phases and eclipses of the sun and moon.	1 Understanding
Students will identify relevant components including the Earth, Sun, Moon, and Solar energy in a model.	1 Remembering
Students will describe the relationship between the Earth-Moon system and the sun.	2 Applying
Students will provide reasoning for events such as moon phases.	3 Analyzing

Priority Standard: 6-8.ESS1.A.2 Develop and use a model of the Earth-sun system to explain the cyclical pattern of seasons, which includes the Earth's tilt and directional angle of sunlight on different areas of Earth across the year.

Learning Targets	Webb's DOK Level Bloom's Level
Students will demonstrate how the Earth's tilt causes seasons.	2 Applying
Students will explain the effect of the directional angle of the sunlight.	2 Applying

Engage	Explore	Explain	Elaborate	Evaluate
Hook: Lunar Phase Cards (APK incorporation) (½ block)	Explore 1: Lunar Cycle (1 block) Explore 2: Seasonal Tilt and Whirl (½ block) Explore 3: Eclipses (Modified, see below) (½ block)	STEMScopedia Linking Literacy–After (½ block)	No specific Elaboration–use STEMScopes resources based on student need.	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

- **Hook–** Incorporate the Accessing Prior Knowledge discussion question into the Hook activity
- **Evaluate**–Choose 1 activity to assess based on student need
- **Explore 3**–Better to use physical models (such as clay balls, ping pong ball and golf ball, etc.)
- Better to utilize STEMScopedia before Explore 3: Eclipses.
- Explore 2 with hands-on globes, Simulate other planets

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Gravitational Forces	Students explore what causes the amount of gravitational force to change	3 blocks
2	Formation & Motion of Galaxies & Gravity	Students discover how gravity affects galaxies.	2 blocks
3	The Solar System	Students explore how big the objects are in the solar system.	4 blocks
4	Earth, Sun, & Moon System	Students discover patterns that are caused by the Earth, Sun, and Moon system.	4 blocks
Engaging Scenario		Students are part of a shuttle crew completing a one-year (365-day) journey in space to collect data. Their primary duty is to create a video log of significant discoveries they make throughout their journey.	1 block

Unit 4: Evolution Explains Life's Unity & Diversity

Subject: Science
Grade: 8
Name of Unit: Evolution Explains Life's Unity & Diversity
Length of Unit: 10 blocks
Overview of Unit: Studying the history of Earth using evidence of evolution and discovering how this knowledge can be applied to our world As well as investigating how organisms are similar and diverse due to natural and artificial selection.

Unit 4 Storyline Summary
Anchoring phenomena: How does the history of Earth and evidence of evolution give us clues about how Earth evolved and how species are similar and diverse? Students interact with a video of an embryo. **Culminating mission:** Students create original organisms, determine how they evolved and added unity and diversity to life through the help of natural selection, and explain how science can predict an organism's age and environment based on clues from rocks and fossils.

Priority Standards for unit:

- 6-8.ESS1.C.1 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history.
- 6-8.LS4.A Analyze and interpret evidence from the fossil record to infer patterns of environmental change resulting in extinction and changes to life forms throughout the history of the Earth.
- 6-8.LS4.B.1 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.
- 6-8.LS4.C.1 Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
- 6-8.LS4.B.2 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.

Priority Standards Unwrapped

Priority Standard:6-8.ESS1.C.1 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Use observations to determine the sequence of events and relative age of rock strata.	2 Applying
Analyze rock strata and the fossil record within a model to determine the relative age of rock layers.	3 Analyzing
Construct a scientific explanation for events in the geologic record based on the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	4 Creating

Priority Standard: 6-8.LS4.A Analyze and interpret evidence from the fossil record to infer patterns of environmental change resulting in extinction and changes to life forms throughout the history of the Earth.	
Learning Targets	**Webb's DOK Level** **Bloom's Level**
Utilizing sedimentary layers and rock ages, group the appearances of specific fossil kinds in the fossil record according to their appearances over time.	2 Applying
Relate population variety and changes in structure to the surroundings and times they lived in.	3 Analyzing

Identify and analyze patterns in the fossil record that show the development of various living things over the course of Earth's history.	3 Analyzing

Priority Standard: 6-8.LS4.B.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will investigate how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	2 Applying
Students will 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.	4 Creating
Students will analyze how natural selection may lead to increases and decreases of specific traits in populations over time.	3 Analyze

Priority Standard: 6-8.LS4.C.1 Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Learning Targets	Webb's DOK Level Bloom's Level
Students will construct an explanation based on evidence for how natural selection leads to adaptation of populations.	4 Evaluating

Students will define natural selection and related concepts, such as overproduction, variation, selection, and adaptation.	1 Remembering
Students will analyze graphical representations and create an explanation of how natural selection may lead to increases and decreases of specific traits in populations over time.	3 Analyzing

Priority Standard: 6-8.LS4.B.2 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in Organisms.

Learning Targets	**Webb's DOK Level** **Bloom's Level**
Students will obtain information about technologies that changed the way humans influence trait variation in plants and animals.	1 Recall
Students will evaluate and communicate information about technologies that changed the way humans influence trait variation.	4 Evaluate
Students will evaluate how natural selection changes organisms over several generations.	4 Evaluate

Essential Questions:

1. How do genetic variations increase the likelihood that some organisms will survive and reproduce?
2. How do genetic variations increase the likelihood that some organisms will survive and reproduce?
3. How does technology and human intervention influence the inheritance of traits in organisms?
4. How can rock strata be used to organize and interpret Earth's history?
5. What can layers of rock tell us about the environments and organisms that existed in the past?

Enduring Understanding/Big Ideas:

1. The proportion of organisms with advantageous genetic variations increases over generations because those individuals are more likely to survive and reproduce.
2. The process of natural selection causes favorable traits to become more common and less favorable traits to become less common over time.
3. Human practices such as artificial selection, genetic modification, and selective breeding can influence the inheritance of traits.
4. Major events in Earth's history can be inferred from rock strata, including changes in climate, landforms, and living organisms.
5. Rock layers provide evidence about past environments and the organisms that lived in them.

Unit Vocabulary:

Academic Cross-Curricular Words	Content/Domain Specific	
Time	Fossil	Favorable Trait
Layers	Index Fossil	Competition
Diversity	Fossil Record	Population
Extinction	Sedimentary Layers	Generation
Organism	Geological Time Scale	Species
Age	Law of Superposition	Gene
Environment	Rock Strata	Genetic Engineering
Reproduce	Era	Natural Selection
Offspring	Adaptation	Artificial Selection
Inherit	Trait	Selective Breeding

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
(Use this Action Plan document, modified from STEMScopes)

Students create original organisms, determine how they evolved and added unity and diversity to life through the help of natural selection, and explain how science can predict an organism's age and environment based on clues from rocks and fossils.

Topic 1: Natural Selection

Engaging Experience

Title: Natural Selection

Suggested Length of Time: 4 blocks

Standards Addressed

Priority Standard: 6-8.LS4.B.1 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.

Learning Targets	Webb's DOK Level Bloom's Level
Students will investigate how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.	2 Applying
Students will 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.	4 Creating
Students will analyze how natural selection may lead to increases and decreases of specific traits in populations over time.	3 Analyze

Priority Standard: 6-8.LS4.C.1 Interpret graphical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.

Learning Targets	Webb's DOK Level Bloom's Level
Students will construct an explanation based on evidence for how natural selection leads to adaptation of populations.	4 Evaluating

Students will define natural selection and related concepts, such as overproduction, variation, selection, and adaptation.	1 Remembering
Students will analyze graphical representations and create an explanation of how natural selection may lead to increases and decreases of specific traits in populations over time.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Hook- Conditions for Natural Selection (¼ block)	Explore 1- Survival of the Fittest (½ block) Explore 2- The Finches of Daphne Island (½ block) Explore 3- Genetic Variations and Survival (½ block) Explore 4- Adaptations for Survival (1 block)	STEMScopedia Linking Literacy: During Reading Activity (½ block) Communicate Science- Socratic Dialogue (1 block)	Science Today- Read It! (¼ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block assess)
Instructional Notes: ● **Evaluate**–Choose 1 activity to assess based on student need				

Topic 2: Artificial Selection

Engaging Experience

Title: Artificial Selection

Suggested Length of Time: 2 blocks

Standards Addressed

Priority Standard: 6-8.LS4.B.2 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in Organisms.

Learning Targets	Webb's DOK Level Bloom's Level
Students will obtain information about technologies that changed the way humans influence trait variation in plants and animals.	1 Recall
Students will evaluate and communicate information about technologies that changed the way humans influence trait variation.	4 Evaluate
Students will evaluate how natural selection changes organisms over several generations.	4 Evaluate

Engage	Explore	Explain	Elaborate	Evaluate
Hook - How Did We Get Here? (¼ block)	Explore 1: Activity - Artificially Selecting Dogs (1 block) Explore 2: Research - Human Influence of Desired Traits (2 blocks)	STEMscopedia Communicate Science- Student Debate (2 blocks) Linking Literacy- Post Reading Activity (½ block)	Career Connections- Farmer (¼ block) Reading Science A - Corn, Dogs, and Genes (¼ block)	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block assess)

Instructional Notes:

- **Explore 2**– Give students options on how to present research. Example: Foldable, online tools, poster, etc.
- **Evaluate**–Choose 1 activity to assess based on student need, can assess Topic 1 & 2 together

Topic 3: Geologic History of Earth & Fossil Record

Engaging Experience

Title: Geologic History of Earth & Fossil Record

Suggested Length of Time: 4 blocks

Standards Addressed

Priority Standard:6-8.ESS1.C.1 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's history.

Learning Targets	Webb's DOK Level Bloom's Level
Use observations to determine the sequence of events and relative age of rock strata.	2 Applying
Analyze rock strata and the fossil record within a model to determine the relative age of rock layers.	3 Analyzing
Construct a scientific explanation for events in the geologic record based on the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.	4 Creating

Priority Standard: 6-8.LS4.A Analyze and interpret evidence from the fossil record to infer patterns of environmental change resulting in extinction and changes to life forms throughout the history of the Earth.

Learning Targets	Webb's DOK Level Bloom's Level
Utilizing sedimentary layers and rock ages, group the appearances of specific fossil kinds in the fossil record according to their appearances over time.	2 Applying

Relate population variety and changes in structure to the surroundings and times they lived in.	3 Analyzing
Identify and analyze patterns in the fossil record that show the development of various living things over the course of Earth's history.	3 Analyzing

Engage	Explore	Explain	Elaborate	Evaluate
Hook- Solving a Mystery (¼ block) Google Form	Explore 1- Law of Superposition (½ block) Digital Slides Rocks, Fossils, & The Law of Superposition Notes and Activity (½ block) Explore 2: Digging Through the Past (½ block) Geological Timeline Activity Mass Extinction Reference Sheet Fossil Cards (1 block)	STEMScopedia Paleozoic Era PowerPoint, Notes Mesozoic Era PowerPoint, Notes Cenozoic Era PowerPoint, Notes (1 ½ blocks) STEMScopedia	Geological Era Postcard	Claim-Evidence-Reasoning Open-Ended Response Assessment Multiple Choice Assessment (½ block review, ½ block assess)

Instructional Notes:

- **Explain–Eras notes and PowerPoints Source**
- **Evaluate**–Choose 1 activity to assess based on student need, or omit and assess after Topic 2: Fossil Record
- **Evaluate**–Choose 1 activity to assess based on student need, can assess Topic 1 & 2 together

Summary of Engaging Learning Experiences for Topics

Topic	Engaging Experience Title	Description	Suggested Length of Time
1	Natural Selection	Students investigate why some traits of the same species vary.	4 blocks
2	Artificial Selection	Students explore how humans pick traits of organisms.	2 blocks
3	Geologic History of Earth & Fossil Record	Students discover the approximate age of Earth. Students discover how long it takes a bone to become a fossil.	3 blocks
Engaging Scenario		Students create original organisms, determine how they evolved and added unity and diversity to life through the help of natural selection, and explain how science can predict an organism's age and environment based on clues from rocks and fossils.	1 block

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 the 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.