Bristol Public Schools

Office of Teaching & Learning

Department	K-5 Science
Department Philosophy	Bristol Public Schools science program provides students with knowledge of the science and engineering practices, crosscutting concepts, and core ideas of science and engineering to engage in public discussions on science related issues, to be critical consumers of scientific information related to their everyday lives, and continue to learn science throughout their lives. To ensure this level of scientific literacy, Bristol Public Schools anchor science units in phenomena, this practice promotes student ownership of learning and supports student application of science content as it pertains to the real world. In each science unit, students work to explain phenomena through the applications of the three dimensions of the Next Generation Science Standards: (1) science and engineering practices, (2) disciplinary core ideas, and (3) cross cutting concepts. Bristol's use phenom-based units and the three dimensions ensure that students connect with and build a deep conceptual understanding of science concepts. Throughout the kindergarten through grade 12 experience, this philosophy provides all Bristol students with the skills and concepts to be scientifically literate adults.
Course	Grade 3 NGSS Science
Course Description for Program of Studies	The performance expectations in third grade help students formulate answers to questions such as: What is typical weather in different parts of the world and during different times of the year? How can the impact of weather-related hazards be reduced? How do organisms vary in their traits? How are plants, animals, and environments of the past similar or different from current plants, animals, and environments? What happens to organisms when their environment changes? How do equal and unequal forces on an object affect the object? How can magnets be used?" Third grade performance expectations include PS2, LS1, LS2, LS3, LS4, ESS2, and ESS3 Disciplinary Core Ideas from the NRC Framework. Students are able to organize and use data to describe typical weather conditions expected during a particular season. By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a

	design solution that reduces the impacts of such hazards. Students are expected to develop an understanding of the similarities and differences of organisms' life cycles. An understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops, is acquired by students at this level. In addition, students are able to construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments. Third graders are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. Students are able to determine the effects of balanced and unbalanced forces on the motion of an object and the cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. They are then able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the third grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems; developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas. **Items in bold are a priority**
Grade Level	3

District Learning Expectations and Standards	**Unit 1**	**Unit 2**	**Unit 3**
3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	x		
3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	x		
3-PS2-3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.	x		

3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets	x		
3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	x		
3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.		x	x
3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.		x	
3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.		x	
3-LS4-1 Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.		x	
3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.			x
3-LS2-1 Construct an argument that some animals form groups that help members survive.			x
3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.			x
3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all			x
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.			x
3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.			x
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.			x
3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.			x

3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.			x

UNIT 1: Secret Agents-Motion Detection

UNWRAPPED STANDARDS

Standard	Dimensions of the NGSS Standard		Skills/Concepts	Academic Vocabulary
3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.	**SEP**	**Planning and Carrying Out Investigations** ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Skills ● Plan and conduct an investigation ● Produce data from fair tests Concepts ● Each force acts on an object and has both strength and direction ● An object at rest has multiple forces acting on it but add zero net force on the object ● Forces that do not sum to zero can cause a change in the object's speed or direction of motion ● Objects in contact exert forces on each other ● Fair tests with controlled variables and trials produce data that will serve as evidence	● Plan ● Conduct ● Investigation ● Data ● Evidence ● Variables ● Fair test ● Trials ● Controlled ● Force ● Strength ● Direction ● Net force ● Speed ● Motion ● Exert
	DCI	**PS2.A: Forces and Motion** ● Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. **PS2.B: Types of Interactions** ● Objects in contact exert forces on each other.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified.		
3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.	**SEP**	**Planning and Carrying Out Investigations** ● Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.	Skills ● Make observations or measurements to produce data ● Test a design solution ● Provide explanations using data and evidence Concepts ● Patterns of an object's motion in various situations can be observed and measured ● Past motion with a regular pattern can predict future motion ● Patterns of change can be used to make predictions	● Observe ● Measure ● Phenomenon ● Design solution ● Pattern ● Prediction
	DCI	**PS2.A: Forces and Motion** ● The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it.		
	CCC	**Patterns** ● Patterns of change can be used to make		

		predictions.		
3-PS2-3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.	**SEP**	**Asking Questions and Defining Problems** ● Ask questions that can be investigated based on patterns such as cause and effect relationships.	Skills ● Ask questions that can be investigated ● Identify cause and effect relationships ● Explain change from tests Concepts ● Electric and magnetic forces between a pair of objects do not require that the object be in contact ● Sizes of the forces in each situation depends on the objects properties and distance apart ● The orientation relative to each other affects the forces between two magnets	● Cause and effect ● Relationships ● Electric ● Magnetic ● Properties ● Magnets ● Orientation ● Relative to
	DCI	**PS2.B: Types of Interactions** ● Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depends on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified, tested, and used to explain change.		
3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.	**SEP**	**Asking Questions and Defining Problems** ● Define a simple problem that can be solved through the development of a new or improved object or tool.	Skills ● Define a simple problem ● Design a tool or improved object Concepts ● Electric and magnetic forces between a pair of objects do not require for them to be in contact ● Sizes of the forces in each situation depends on the objects properties and distance apart ● The orientation relative to each other affects the forces between two magnets	● Problem ● Tool ● Distance ● Orientation ● Magnetic Forces
	DCI	**PS2.B: Types of Interactions** ● Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other.		
	CCC	**N/A**		
3-5-ETS1-3 Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	**SEP**	**Planning and Carrying Out Investigations** ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	Skills ● Plan and conduct an investigation ● Produce data from tests Concepts ● Tests are designed to identify failure points or difficulties ● Failures suggest improvements need to be made ● Different solutions need to be tested to determine the	● Data ● Trials ● Controlled ● Failure points ● Difficulties ● Elements ● Design ● Criteria ● Constraints
	DCI	**ETS1.B: Developing Possible Solutions** ● Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.		

		ETS1.C: Optimizing the Design Solution ● Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	best solution	
	CCC	**N/A**		

Possible Common Core State Standards Connections:

ELA/Literacy -

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-PS2-1),(3-PS2-3)
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-PS2-3)
- RI.3.8 Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence). (3-PS2-3)
- W.3.7 Conduct short research projects that build knowledge about a topic. (3-PS2-1),(3-PS2-2)
- W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-PS2-1),(3-PS2-2)
- W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-3)
- W.5.8 Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources. (3-5-ETS1-3)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (3-5-ETS1-3)
- SL.3.3 Ask and answer questions about information from a speaker, offering appropriate elaboration and detail. (3-PS2-3)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (3-PS2-1)(3-ESS2-1)(3-5-ETS1-3)
- MP.4 Model with mathematics .(3-ESS2-1)(3-5-ETS1-3)
- MP.5 Use appropriate tools strategically. (3-PS2-1)(3-ESS2-1)(3-5-ETS1-3)
- 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-PS2-1)(3-ESS2-1)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs. (3-ESS2-1)

UNIT 1 DETAILS

Unit Phenomenon: The Case of Odd Motion

Storyline:
Students are introduced to three instances of odd motion; acting as secret agents, the students work towards solving the causes of these motions as they gain an understanding of forces and motion. Students investigate the role of strength and direction of forces on resulting motion. They will explore how properties of the object itself impact motion and the amount of force needed to set the object in motion from a resting position. Students investigate and observe both gravitational and electrostatic forces in order to develop working definitions and understandings for each. Finally, students investigate cause and effect relationships of magnet strength, distance and orientation and material interaction. To finalize the unit, the secret agents from the motion detection division complete their evidence logs and go to present their findings to the chief inspector when a new case comes into the division. Students will use their evidence and understandings from the anchor phenomena to solve this new case of odd motion.

Unit Essential Questions:
- What makes objects move the way they do?
- How do different strengths of forces affect motion? How does the direction of a force affect motion?
- How do the properties of an object affect how an object moves when a force is applied?
- How can some unseen forces that act on an object be investigated and explained?
- What can magnetic forces do? How can we use the properties of magnets to solve a problem?
- What forces caused this new case of odd motion?

Learning Sequence # Essential Question	**Learning Targets:** I can (bold are priority)	**Assessment Strategy** SR - Selected Response CR - Constructed Response P - Performance O - Observation (behavioral)	**Priority NGSS Dimensions**			**Assessment**
(1) What makes objects move the ways they do?	I CAN ● **Make observations and ask questions about cause and effect relationships of motion-CR**		**SEP**	**DCI**	**CCC**	● Record-share notice/wonder on template
			● SEP: Ask questions that can be investigated based on patterns such as cause and effect relationships. ● DCI: (PS2.A)- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (PS2.B)- Objects in contact exert forces on each other. ● CCC: Cause and effect relationships are routinely identified.			
(2)	I CAN		**SEP**	**DCI**	**CCC**	● Use performance task template

How do different strengths of forces affect motion? How does the direction of a force affect motion?	• **Plan and conduct an investigation-P** • **Measure and collect data on the strength and direction of forces and their outcome on objects motion-P** • **Analyze data for similarities and differences to identify patterns-P** • **Use patterns to predict an object's motion-P** • **Investigate the impact of friction on an object's motion-P** • **Develop an explanatory model to demonstrate an understanding of the strength and direction of forces-CR** • **Experience and explain balanced and unbalanced forces-CR**	• SEP: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • SEP: Make measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. • SEP: Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. • DCI: (PS2.A)- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum zero can cause changes in the object's speed or direction of motion. The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. • CCC: Patterns of change can be used to make predictions.	to plan and conduct investigation with cars and/or ping pong balls • Share and analyze data to determine motion patterns and make predictions. • Develop an explanatory model of impact of strength and direction of motion • Explain impact of friction with investigation evidence • Explain balanced and unbalanced forces with Push and Pull with hands demonstration
(3) How do the properties of an object affect how an object moves when a force is applied?	I CAN • **Design a method to move various items 2 inches-P** • Compare and contrast object properties and predict how that may affect their movement-P • **Conduct an experiment to observe how the properties of objects affect the size of the force needed to move it-P** • **Analyze data for similarities and differences to identify patterns-P** • **Explain how properties of an object affect how it moves when a force is applied-CR**	**SEP** | **DCI** | **CCC** • SEP: Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. • SEP: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. • DCI: (PS2.B)- Objects in contact exert forces on each other. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (PS2.A)- The patterns of an object's motion in various situations can be observed and	• Design a test method to move various object 2 inches-Performance Task to investigate and explain force and property relationships • Explain how the properties of two different footballs effect how they move when a force is applied

		measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. ● CCC: Cause and effect relationships are routinely identified. ● CCC: Patterns of change can be used to make predictions.	
(4) How can some unseen forces that act on an object be investigated and explained?	I CAN ● **Observe and investigate the effects of gravitational and electrostatic forces on objects-P** ● **Analyze data to determine patterns and cause and effect relationships for gravity and electrostatic forces-P** ● **Use academic vocabulary and evidence from investigations to explain the unseen forces of gravity and static electricity-CR**	**SEP** | **DCI** | **CCC** ● SEP: Ask questions that can be investigated based on patterns such as cause and effect relationships. ● DCI: (PS2.B)- Objects in contact exert forces on each other. (PS2.B)- Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (ETS1.B)- Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (ETS1.C)- Different solutions need to be tested in order to determine which of them best solves the problem, give the criteria and the constraints. ● CCC: Cause and effect relationships are routinely identified.	● Use Sky is Falling template to investigate, record observations, and explain cause and effect relationships for gravity and electrostatic forces-performance task ● Create class anchor charts to record vocabulary that applies to each unseen force ● Develop explanatory models for gravity and electrostatic forces
(5) What can magnetic forces do? How can we use the properties of magnets to solve a problem? What forces cause the new case of odd motion?	I CAN ● **Investigate magnet cause and effect relationships at stations-P** ● **Identify how strength, distance, and orientation of a magnet impacts the force it exerts on another object (including another magnet)-P** ● **Demonstrate and explain how magnetic forces work-CR** ● **Define a simple design problem that can be solved by applying scientific ideas about magnets and model the solution-P** ● **Use evidence log from explained cases of odd motion to identify and explain the forces acting on this new case of odd motion-P (culminating task)**	**SEP** | **DCI** | **CCC** ● SEP: Ask questions that can be investigated based on patterns such as cause and effect relationships. ● SEP: Define a simple problem that can be solved through the development of a new or improved object or tool. ● DCI: (PS2.A)- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (PS2.B)-	● Use magnet station templates to record observations to explain relationships-performance task; Review data to Identify relationships and force behavior of magnets ● Build class anchor chart on magnetism with academic vocabulary and drawings ● Show and Tell on magnet behavior ● Define magnet problem and identify possible solution-template ● Explain new case of odd motion

		Objects in contact exert forces on each other. (PS2.B)- Electric, and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. ● CCC: Cause and effect relationships are routinely identified.	with Scene Analysis template

ADDITIONAL CONSIDERATIONS

COMMON MISCONCEPTIONS	PRIOR KNOWLEDGE NEEDED TO MASTER STANDARDS FOR THIS UNIT	ADVANCED STANDARDS FOR STUDENTS WHO HAVE DEMONSTRATED PRIOR MASTERY
Possible Preconceptions/Misconceptions: ● The terms "energy" and force are interchangeable ● If an object is at rest, no forces act on it ● Force is a property of an object ● Large objects always exert a greater force than smaller objects ● Friction always hinders motion, thus reducing friction is always desired ● An object a person is sitting or standing on doesn't push back with equal force ● If something is moving, there must be a greater force on it ● The faster an object is moving the greater force on it ● Force is a property of an object. An object has force, and when it runs out of force, it stops moving ● All things fall down due to gravity but heavy things always fall fastest	K.PS2. A-C: Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion and start or stop it. When objects touch or collide, they push on one another and change motion. A bigger push or pull makes things speed up or slow down more quickly. K-2 ETS1.1: A situation people want to change or create can be approached as a problem to be solved through engineering. Such problems will have many acceptable solutions.	3-5 ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost. 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. 3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

RESOURCES

Sample: Bundle Inventory-Case of Odd Motion

UNIT 2: Secret Agents-Paleontology Division

UNWRAPPED STANDARDS

Standard	Dimensions of the NGSS Standard		Skills/Concepts	Academic Vocabulary
3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.	**SEP**	**Developing and Using Models** ● Develop models to describe phenomena.	Skills ● Develop models to describe life cycles ● Make Predictions Concepts ● Reproduction is essential to the existence of every kind of organism ● Plants and animals have unique and diverse life cycles ● Patterns of change can be used to make predictions	● Models ● Phenomena ● Reproduction ● Existence ● Organism ● Plant ● Animal ● Unique ● Diverse ● Life Cycle ● Patterns ● Predictions
	DCI	**LS1.B: Growth and Development of Organisms** ● Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.		
	CCC	**Patterns** ● Patterns of change can be used to make predictions.		
3-LS3-1 Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.	**SEP**	**Analyzing and Interpreting Data** ● Analyze and interpret data to make sense of phenomena using logical reasoning.	Skills ● Analyze and interpret data ● Use logical reasoning to make sense of phenomena Concepts ● Characteristics of organisms are inherited from their parents ● Organisms vary in how they look and function because of inherited information ● Patterns can be used to sort and classify phenomena	● Analyze ● Interpret ● Data ● Logical Reasoning ● Characteristics ● Inherited ● Parents ● Function ● Sort ● Classify
	DCI	**LS3.A: Inheritance of Traits** ● Many characteristics of organisms are inherited from their parents. **LS3.B: Variation of Traits** ● Different organisms vary in how they look and function because they have different inherited information.		
	CCC	**Patterns** ● Similarities and differences in patterns can be used to sort and classify natural phenomena.		
3-LS3-2 Use evidence to support the explanation that traits can be influenced by the environment.	**SEP**	**Constructing Explanations and Designed Solutions** ● Use evidence (e.g., observations, patterns) to support an explanation.	Skills ● Use evidence to support explanations ● Identify cause and effect relationships Concepts ● Interactions in the environment result in other characteristics ● Characteristics involve both inheritance and	● Evidence ● Interactions ● Environment ● Diet ● Traits ● Cause/ effect
	DCI	**LS3.A: Inheritance of Traits** ● Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and		

		environment. **LS3.B: Variation of Traits** ● The environment also affects the traits that an organism develops.	environment ● Environment affect the traits that organisms develop ● Cause and effect relationships are used to explain change	
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change.		
3-LS4-1 Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.	**SEP**	**Analyzing and Interpreting Data** ● Analyze and interpret data to make sense of phenomena using logical reasoning.	Skills ● Analyze and interpret data ● Use logical reasoning to make sense of phenomena Concepts ● Some plants and animals that once lived on earth are no longer found anywhere ● Fossils provide evidence about organisms that lived long ago ● Fossils provide evidence about the nature of their environments ● Onservative phenomena exist from short to very long periods of time	● Earth ● Fossils ● Organisms ● Environment
	DCI	**LS4.A: Evidence of Common Ancestry and Diversity** ● Some kinds of plants and animals that once lived on Earth are no longer found anywhere. ● Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments.		
	CCC	**Scale, Proportion, and Quantity** ● Observable phenomena exist from very short to very long time periods.		

Possible Common Core State Standards Connections:

ELA/Literacy —

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS3-1) (3-LS3-2) (3-LS4-1)
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. (3-LS3-1) (3-LS3-2) (3-LS4-1)
- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. (3-LS3-1) (3-LS3-2) (3-LS4-1)
- RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons. (3-LS4-1)
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (3-LS3-1) (3-LS3-2) (3-LS4-1)
- W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. (3-LS4-1)
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS3-1)(3-LS3-2)
- SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)

Mathematics —

- MP.2 Reason abstractly and quantitatively. (3-LS3-1) (3-LS3-2)(3-LS4-1)(3-ESS2-1)
- MP.4 Model with mathematics .(3-LS3-1)(3-LS1-1)(3-LS3-2)(3-LS4-1)(3-ESS2-1)
- MP.5 Use appropriate tools strategically. (3-LS4-1) (3-ESS2-1)
- 3.NBT Number and Operations in Base Ten (3-LS1-1)
- 3.NF Number and Operations—Fractions (3-LS1-1)
- 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-ESS2-1)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs. (3-ESS2-1)

UNIT 2 DETAILS

Unit Phenomenon: The Case of Harper's Fossil Find

Storyline: In this unit, the phenomenon is presented under the guise of figuring out the Case of Harper's Fossil Find as students pose as secret agents from the paleontology division. Students look at different fossil types and use their observations to uncover the diet and environment needed for Harper's fossil to survive. Through text and identification of similarities and differences between organisms of different time periods, the students research and explore how paleontologists study and identify relative species through traits. Students have to understand the scale of time and its role in the change in living things as they identify traits found in Harper's fossil to traits found in present day organisms. Students compare and contrast the life cycles of a variety of different living things in order to make a claim about which (present day) life cycle they believe best represents the life cycle of the fossil. By the end of the unit, students will develop a detailed account of the oviraptor fossil and apply learning to describe a new mystery fossil using evidence and traits.

Unit Essential Questions:

- What can we learn from this fossil find?
- What are fossils and what can we learn from them?
- How are organisms today similar and different from their ancestors?
- What patterns can be described in various organism's life cycles?
- Why do offspring look similar to their parents?
- How do environmental conditions impact an organism's traits?

Learning Sequence # Essential Question	**Learning Targets:** I can (bold are priority)	**Assessment Strategy** SR - Selected Response CR - Constructed Response P - Performance O - Observation (behavioral)	**Priority NGSS Dimensions**			**Assessment**
(1) What can we learn from this fossil find?	I CAN ● **Make observations and generate questions to begin to understand the organism and its environment-CR**		**SEP**	**DCI**	**CCC**	● Record observations and questions-organize to class masterquestion board ● Begin class summary table
			● SEP: Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. ● DCI: (LS4.A)- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. ● CCC: Patterns of change can be used to make predictions.			
(2)	I CAN		**SEP**	**DCI**	**CCC**	● Generate predictions about a

What are fossils and what can we learn from them?	• Use fossil clues to make predictions about its life-CR • **Explain different types of fossils-CR** • **Analyze fossils images and present day organisms to identify patterns in skull structure , teeth and tracks-CR** • **Predict what a fossil image organism ate-CER-CR** • **Show dinosaur behavior with a trace fossil track model-P** • **Identify parts of Harper's Fossil Find as trace or true fossils-CR**	• SEP: Analyze and interpret data to make sense of phenomena using logical reasoning. • SEP: Use evidence (e.g., observations, patterns) to support an explanation. • DCI: (LS4.A)- Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. • CCC: Patterns of change can be used to make predictions. • CCC: Similarities and differences in patterns can be used to sort and classify natural phenomena.	fossil organism's life on template provided • Build fossil anchor chart to include class generated definitions of types of fossils-add examples • Match teeth type to diet for organisms • Make a Claim with evidence and reasoning on mystery fossil diet • Generate track models to show and explain behaviors • Identify with reasoning zoom out box template on Harper's Find as trace or true fossils • Add to class summary table
(3) How are organisms today similar and different from their ancestors?	I Can • Use characteristics to make connections between fossils and present day organisms-CR • **Explain inheritance-CR** • **Identify similarities and differences in appearance and function of inherited traits in fossils and present day organisms-CR**	**SEP** / **DCI** / **CCC** • SEP: Use evidence (e.g., observations, patterns) to support an explanation. • DCI: (LS4.A)- Fossils provide evidence about the types of organisms that lived long ago (*and also about the nature of their environments.)* (LS3.B)- Different organisms vary in how they look and function because they have different inherited information. • CCC: Similarities and differences in patterns can be used to sort and classify natural phenomena. • CCC: Observable phenomena exist from very short to very long time periods.	• Match fossil cards to present day organism cards with evidence and reasoning on similarities • Generate a simple class definition on inheritance with examples • Make a claim (CER) about the relationship between two organisms from two different time periods based on inherited characteristics • Add to class summary table
(4) What patterns can be described in various organism's life cycles?	I CAN • **Observe and record data on the life cycle of a living organism-P** • Obtain information to explain a researched organism's life cycle-CR • **Create an explanatory model of the class organism's life cycle-P** • **Identify similarities and differences in various life cycles-CR** • **Describe common patterns in the life cycles of all living things-CR**	**SEP** / **DCI** / **CCC** • SEP: Develop models to describe phenomena. • SEP:Obtain and combine information from books and other reliable media to explain phenomena. • DCI: (LS1.B)- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. • CCC: Patterns of change can be used to make predictions. • CCC: Similarities and differences in patterns can be used to sort and classify natural phenomena.	• Observe and record data on class organism • Obtain information, mini-research on an organism's life cycle • Generate an explanatory model for an organism's life cycle • Compare organism life cycle with Venn Diagram • Summarize common patterns to all living organisms • Add to class summary table

(5) Why do offspring look similar to their parents?	I CAN ● Identify some common inherited traits-CR ● **Analyze and interpret images of organisms to identify inherited characteristics and variation among offspring-P** ● **Predict what offspring would look like based on parent appearance-P** ● **Claim if the eggs found in the fossilized nest are baby oviraptors or a different dinosaur species using traits as evidence-CER-CR**	**SEP**	**DCI**	**CCC**
		● SEP: Analyze and interpret data to make sense of phenomena using logical reasoning. ● SEP: Use evidence (e.g., observations, patterns) to support an explanation. ● DCI: (LS3.B)- Different organisms vary in how they look and function because they have different inherited information. ● CCC: Patterns of change can be used to make predictions. ● CCC: Similarities and differences in patterns can be used to sort and classify natural phenomena. ● CCC: Cause and effect relationships are routinely identified and used to explain change.		
		● Build class list of simple traits that are passed from parent to offspring ● Use patterns of similarities and differences in organism slides and dog simulation as evidence of variation in inherited traits ● Draw a prediction of "monster offspring" based on parents ● Make a claim with evidence on whether the baby in egg belongs to the parent ● Add to class summary table		
(6) How do environmental conditions impact an organism's traits?	I CAN ● **Describe a cause and effect relationship resulting from an environmental influence on a trait-CR** ● **Differentiate between inherited traits vs acquired traits-CR** ● **Explain how learned behaviors are acquired and have an effect on the development and characteristics of an organism-CR** ● **Use evidence of egg color and texture to support a claim that the oviraptor is more similar to a bird or reptile-CR** ● **Write a descriptive, evidence based final report on the life of the oviraptor and of a new mystery fossil-P (culminating task)**	**SEP**	**DCI**	**CCC**
		● SEP: Use evidence (e.g., observations, patterns) to support an explanation. ● DCI: (LS3.A)- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. ● CCC: Cause and effect relationships are routinely identified and used to explain change.		
		● Identify the cause and effects in resulting from the impact of environment (diet, sunlight, interaction with peers, learned behavior) ● Generate a list of examples of inherited traits vs acquired traits; Sort trait cards with rationale ● Explain how learned behaviors are acquired through post video reflection questions ● Support a claim with evidence on which organism the oviraptor is more similar to ● Add to class summary table ● Write a detailed report on how a fossil organism may have lived (culminating task)		

ADDITIONAL CONSIDERATIONS

COMMON MISCONCEPTIONS	PRIOR KNOWLEDGE NEEDED TO MASTER STANDARDS FOR THIS UNIT	ADVANCED STANDARDS FOR STUDENTS WHO HAVE DEMONSTRATED PRIOR MASTERY
Students may believe that:	1.LS3.A-B: Young animals are very much, but nt exactly like, their parents. Plants are also very much, but not exactly like their parents. Individuals of the same kind of plant or animal are recognizable as similar but can also vary in many ways.	3-5 ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost.

• All fossilized creatures died long ago and nothing like that lives now • All fossils were dinosaurs • Fossils are only animals • Fossils only represent plants/animals that are extinct • Fossils are hard to find • Fossils are only found in a few places • Fossils are pieces of dead animals and plants • Fossils of tropical plants cannot be found in cold or dry areas • Fossils only represent bones and shells of extinct animals. Soft tissue can never be fossilized • All animal offspring look like their parents		3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. 3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

RESOURCES

Bundle Inventory-Case of Harper's Fossil Find

UNIT 3: Secret Agents-Missing Monarchs

UNWRAPPED STANDARDS

Standard	Dimensions of the NGSS Standard		Skills/Concepts	Academic Vocabulary
3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. * **this is just revisited from unit 2*	**SEP**	**Developing and Using Models** ● Develop models to describe phenomena.	Skills ● Develop models ● Make predictions Concepts ● Reproduction is essential to the existence of every kind of organism ● Plants and animals have unique and diverse life cycles ● Patterns of change can be used to make predictions	● Models ● Phenomena ● Reproduction ● Existence ● Organism ● Plant ● Animal ● Unique ● Diverse ● Life Cycle ● Patterns ● Predictions
	DCI	**LS1.B: Growth and Development of Organisms** ● Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles.		
	CCC	**Patterns** ● Patterns of change can be used to make predictions.		
3-LS2-1 Construct an argument that some animals form groups that help members survive.	**SEP**	**Engaging in Argument from Evidence** ● Construct an argument with evidence, data, and/or a model.	Skills ● Construct arguments with evidence ● Explain change with cause and effect relationships Concepts ● Being part of a group helps animals survive ● Groups serve different functions and vary in size ● An argument can be supported with evidence, data, and/or a model ● Cause and effect relationships can be used to explain change	● Argument ● Evidence ● Data ● Defend ● Cope ● Function ● cause/effect
	DCI	**LS2.D: Social Interactions and Group Behavior** ● Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change.		
3-LS4-2 Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	**SEP**	**Constructing Explanations and Designing Solutions** ● Use evidence (e.g., observations, patterns) to construct an explanation.	Skills ● Use evidence to construct an explanation ● Explain change with cause and effect relationships Concepts ● Sometimes the differences in characteristics between individuals of same species provides survival advantages	● Observation ● Explanation ● Characteristics ● Species ● Survive ● Reproduce
	DCI	**LS4.B: Natural Selection** ● Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.		

	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change.	● Cause and effect relationships can be used to explain change	
3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	**SEP**	**Engaging in Argument from Evidence** ● Construct an argument with evidence.	Skills ● Construct an argument with evidence ● Explain change with cause and effect relationships Concepts ● Some organisms survive well, some survive less well, and some cannot survive at all in any particular environment ● Cause and effect relationships can be used to explain change	● Environment
	DCI	**LS4.C: Adaptation** ● For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change.		
3-LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.	**SEP**	**Engaging in Argument from Evidence** ● Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	Skills ● Make a claim about the merit of a solution ● Describe a system with its components and their interaction Concepts ● Environment changes can affect a place's physical characteristics, temperature, or availability of resources ● When the environment changes, some organisms survive, some move to new locations, some move into the transformed environment, and some die ● Populations live in a variety of habitats ● Change in habitats affects organisms that live there ● Solutions to problems are evaluated by how they meet criteria and constraints ● Systems are described by components and their interactions	● Claim ● Merit ● Problem ● Solution ● Relevant ● Criteria ● Constraints ● Physical characteristics ● Resources ● Transformed ● Populations ● Habitat ● System ● Components ● Interactions
	DCI	**LS2.C: Ecosystem Dynamics, Functioning, and Resilience** ● When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. **LS4.D: Biodiversity and Humans** ● Populations live in a variety of habitats, and change in those habitats affects the organisms living there.		
	CCC	**Systems and System Models** ● A system can be described in terms of its components and their interactions.		
3-ESS2-1 Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.	**SEP**	**Analyzing and Interpreting Data** ● Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.	Skills ● Represent data in tables and graphs to show patterns and relationships	● Weather

	DCI	**ESS2.D: Weather and Climate** ● Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	● Make predictions Concepts ● Scientists record patterns of weather in different areas at different times to make weather predictions ● Data reveals patterns and relationships ● Patterns can be used to make predictions	
	CCC	**Patterns** ● Patterns of change can be used to make predictions.		
3-ESS2-2 Obtain and combine information to describe climates in different regions of the world.	**SEP**	**Obtaining, Evaluating, and Communicating Information** ● Obtain and combine information from books and other reliable media to explain phenomena.	Skills ● Obtain and combine information to describe climate in different regions of the world ● Make predictions Concepts ● Climate describes a range of an area's typical weather conditions over years ● Combined information from text and reliable media explain phenomena ● Patterns can be used to make predictions	● Climate ● Typical
	DCI	**ESS2.D: Weather and Climate** ● Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years.		
	CCC	**Patterns** ● Patterns of change can be used to make predictions.		
3-ESS3-1 Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.	**SEP**	**Engaging in Argument from Evidence** ● Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.	Skills ● Make a claim about the merit of a design solution that reduces impact of weather related hazard Concepts ● A variety of natural hazards result from natural processes ● Humans cannot eliminate natural hazards but can take steps to reduce their impacts ● Solutions to problems are evaluated by how they meet criteria and constraints ● Cause and effect relationships can be used to explain change	● Natural hazard ● impact
	DCI	**ESS3.B: Natural Hazards** ● A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified, tested, and used to explain change.		
3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on	**SEP**	**Asking Questions and Defining Problems** ● Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several	Skills ● Define a simple design problem ● Solve a problem and	● Design ● Proposals

materials, time, or cost.		criteria for success and constraints on materials, time, or cost.	evaluate the solution based on its success criteria and constraints Concepts ● Possible solutions to problems are limited by available materials and resources (constraints) ● The success of a design solution are determined by desired features (criteria) ● Different proposals for solutions can be compared based on how they meet success criteria and constraints ● People's needs and wants can change over time	
	DCI	**ETS1.A: Defining and Delimiting Engineering Problems** ● Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.		
	CCC	**Influence of Science, Engineering, and Technology on Society and the Natural World** ● People's needs and wants change over time, as do their demands for new and improved technologies.		
3-5-ETS1-2 Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	**SEP**	**Constructing Explanations and Designing Solutions** ● Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem.	Skills ● Generate and compare multiple solutions to a problem based on criteria and constraints Concepts ● Research on a problem should be carried out before designing a solution ● Testing a solution involves investigating how it performs under a range of conditions ● Communicating with peers about proposed solutions is an important part of the design process ● Sharing ideas can lead to improved designs ● Engineers improve existing technologies or develop new ones to increase benefits, decrease risk, and meet societal demands	● Conditions ● Engineers
	DCI	**ETS1.B: Developing Possible Solutions** ● Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. ● At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.		
	CCC	**Influence of Science, Engineering, and Technology on Society and the Natural World** ● Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks and meet societal demands.		

Possible Common Core State Standards Connections:

ELA-

- RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. (3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea.

(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)(3-LS2-1)

- RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)
- RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons.(3-LS4-1),(3-LS4-3),(3-LS4-4)(3-LS2-1)
- W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.(3-LS4-1),(3-LS4-2),(3-LS4-3),(3-LS4-4)
- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace. (3-LS4-2),(3-LS4-3),(3-LS4-4)
- SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)

Mathematics —

- MP.2 Reason abstractly and quantitatively. (3-ESS2-1),(3-LS4-3),(3-LS4-4)
- MP.4 Model with mathematics. (3-ESS2-1),(3-LS4-3),(3-LS4-4),(3-LS2-1),(3-LS1-1)
- MP.5 Use appropriate tools strategically. (3-ESS2-1)(3-LS4-3),(3-LS4-4)
- 3.NBT Number and Operations in Base Ten. (3-LS2-1)(3-LS1-1)
- 3.NF Number and Operations—Fractions (3-LS1-1)
- 3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-ESS2-1)
- 3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in bar graphs. (3-ESS2-1)(3-LS4-3)(3-LS4-4)

UNIT 3 DETAILS

Unit Phenomenon: The Case of the Missing Monarchs

Storyline: The unit begins by introducing the case of the missing monarchs to the students. The students preview media and data on the monarch butterfly population to generate questions about the monarch's survival needs and recent population decline, and will ultimately become "experts" in possible causes and effects behind the declining monarch butterfly population. The monarch butterfly has an immense habitat range, and migrates significant distance following daylight and temperature cues. Students will investigate and analyze weather and climate data in monarch habitats and other different regions. They will examine how the monarch and various organisms use adaptive traits and behaviors allowing them to survive, find and mate, and reproduce in specific habitats. Finally, students examine non-weather and weather related changes to environments and how these changes impact organisms to consider how humans can reduce the impacts for positive solutions and outcomes.

Unit Essential Questions:

- How and why is the Monarch population changing?
- Why does the Monarch Butterfly migrate?
- What is the difference between weather and climate? How can climate be described in different regions of the world?
- How do specific traits and behaviors help an organism survive?
- How can non-weather changes to environments impact the monarch butterfly? What can humans do to reduce these changes and impacts?
- How can weather related hazards change environments? How can humans reduce the impact of a drought on the monarch butterfly?

Learning Sequence # Essential Question	**Learning Targets:** I can (bold are priority)	**Assessment Strategy** SR - Selected Response CR - Constructed Response P - Performance O - Observation (behavioral)	**Priority NGSS Dimensions**	**Assessment**
(1) How and why is the monarch population changing?	I Can ● **Identify patterns of changes in monarch butterfly population from data-CR** ● **Generate and organize questions on the declining monarch population-CR**		**SEP** / **DCI** / **CCC** ● SEP: Ask questions that can be investigated based on patterns such as cause and effect relationships. ● CCC: Patterns of change can be used to make predictions.	● Analyze monarch data for patterns ● Build driving question board to group class questions
(2) Why does the Monarch	I Can ● Identify the stages of the monarch butterfly life cycle-CR ● **Represent and analyze data to understand patterns of monarch migration-P**		**SEP** / **DCI** / **CCC** ● SEP: Represent data in tables and various graphical displays (bar graphs	● Sketch and label the monarch life cycle in evidence log ● Use maps and data charts on Journey North website to explain

Butterfly migrate?	• **Use multiple texts/media resources to gather information and scientific vocabulary to help understand monarch migration-CR** • **Make a claim with evidence on monarch migration-CR (CFA)**	and pictographs) to reveal patterns that indicate relationships. • SEP: Construct an argument with evidence. • DCI: (LS1.B)- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (LS4.C)- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (ESS2.D)- Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. • CCC: Patterns of change can be used to make predictions. • CCC: Cause and effect relationships are routinely identified and used to explain change.	monarch migratory patterns; complete month maps to relate temperature and daylight as part of cause and effect relationship for migration • Define key unit vocabulary in evidence logs from bundle IRAs and media resources • Use Agree/Disagree line to develop ideas prior to completing individual CER(CFA)
(3) What is the difference between weather and climate? How can climate be described in different regions of the world?	I Can • **Explain the difference between weather and climate-CR (CFA at end of sequence 3)** • **Record and analyze the weather data, to understand patterns and make predictions about weather-P** • **Obtain and present information to describe climate zones and habitats from different regions of the world-CR** • **Compare climate zones to identify patterns in temperature and precipitation-CR**	**SEP** / **DCI** / **CCC** • SEP: Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. • SEP:Obtain and combine information from books and other reliable media to explain phenomena. • SEP: Use evidence (e.g., observations, patterns) to construct an explanation. • DCI: (ESS2.D)-Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. • CCC: Patterns of change can be used to make predictions. • CCC: Cause and effect relationships are routinely identified and used to explain change.	• Class-use venn diagram and evidence logs to record vocabulary and concepts on weather and climate. Individual-exit ticket (CFA) in Evaluate • Record, graph local weather data over the course of one week to explain patterns and make prediction-weather journal template • Use habitat slideshows for groups to identify and record climate zone information • Present habitat information, template guide • Compare climates, identify patterns, follow up to group presentations
(4)	I Can • Make predictions about desirable survival traits per habitat-CR	**SEP** / **DCI** / **CCC**	• List survival predictions plant and animal with reasoning on thinking

How do specific traits and behaviors help an organism survive in a particular habitat?	• **Explain how an organism's adaptive traits help it survive-CR** • **Describe how an adaptive behavior helps an organism survive in a particular environment-CR** • **Explain and act out how being part of a group helps an animal survive-CR** • **Use evidence to explain that variation in traits of the same species may provide a survival advantage-CR.** • **Construct an argument from evidence that in a particular habitat, an organism can or cannot survive-CR (CFA)**	• SEP: Use evidence (e.g., observations, patterns) to construct an explanation. • SEP: Construct an argument with evidence. • DCI: (LS4.B)- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (LS4.C)- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.(LS2.D)-Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. • CCC: Cause and effect relationships are routinely identified and used to explain change.	frame for specific habitat • Identity and explain organism adaptive survival traits and behaviors in a given climate zone habitat • Explain and act out group behavior for survival • Explain with evidence how certain species traits provide survival advantage • Use picture prompts to construct an argument with evidence that the organism can or cannot survive in a given habitat.
(5) How can non-weather changes to environments impact the monarch butterfly? What can humans do to reduce these changes and impacts?	I Can • List and sort possible causes of environmental change -CR • **Explain the cause and effect relationships of non-weather related changes to the monarch's various habitats-P** • **Generate multiple solutions for positive outcomes for the monarch population-P** • **Make a claim on the merit of a solution-P** • Make a claim on the effect of fire on a habitat and its organisms-CR	**SEP** / **DCI** / **CCC** • SEP:Obtain and combine information from books and other reliable media to explain phenomena. • SEP: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. • SEP: Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. • SEP: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. • DCI: (LS2.C)-When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others movie into the transformed environment, and some die. (LS4.D)-Populations live in a variety of habitats, and change in those habitats affects the organisms that live there.	• Use picture prompt slide to record and then sort causes of environmental change, man made or non-man made • Performance Task: Explain cause and effect relationships of non weather related changes to monarch habitat with possible solution • Identify merit of one solution identified by the class that could help local monarchs, considering criteria and constraints • Use CER to explain effect of fire on habitat

		(ESS3.B**)**-A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. ● CCC: Cause and effect relationships are routinely identified and used to explain change.	
(6) How can weather related hazards impact environments? How can humans reduce the impact of a drought on the monarch butterfly?	I Can ● **Identify weather related hazards and their possible impacts to environments-CR** ● **Explain how a drought would impact the monarch butterfly-CR** ● **Define a problem with criteria, and constraints-P** ● **Follow the steps of the design process-P** ● **Make a claim about the merit of a design solution that reduces the impact of drought on the monarch butterfly-P** ● **Develop an explanatory model for the migration and decline of the eastern monarch butterfly-P (culminating task)**	**SEP** / **DCI** / **CCC** ● SEP:Obtain and combine information from books and other reliable media to explain phenomena. ● SEP: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. ● SEP: Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. ● SEP: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. ● DCI: (LS2.C)-When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (LS4.D)-Populations live in a variety of habitats, and change in those habitats affects the organisms that live there. (ESS3.B**)**-A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (ETS1.A)**-**Possible solutions to a problem are limited by the available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the	● Build a concept map on weather related hazards and impacts to environment ● Explain how drought could impact the monarch butterfly ● Performance task: Following the engineering cycle, design, build and test a solution for reducing the impact of drought on butterflies ● Develop an explanatory model of monarch migration (culminating task)

		specified criteria for success or how well each takes the constraints into account. (ETS1.B)-Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. ● CCC: Cause and effect relationships are routinely identified and used to explain change. ● CCC: Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks and meet societal demands.	

ADDITIONAL CONSIDERATIONS

COMMON MISCONCEPTIONS	PRIOR KNOWLEDGE NEEDED TO MASTER STANDARDS FOR THIS UNIT	ADVANCED STANDARDS FOR STUDENTS WHO HAVE DEMONSTRATED PRIOR MASTERY
Possible Misconceptions: ● Butterflies do not travel very far ● All living things can survive in the same environment ● Weather and climate mean the same thing ● Climate is similar in different parts of the world ● Volcanoes that do not produce lava are not dangerous ● All wildfires are bad all of the time ● All wildfires occur naturally ● Humans do not play a role in reduction of habitat or species	K.ESS3.A: Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. K.ESS2.D: Weather is the combination of sunlight, wind, show or rain, and temperature in a particular region at a particular time. People measure these conditions to describe and record the weather and to notice patterns over time. K.ETS1.A: Asking questions, making observations, and gathering information are helpful in thinking about problems. A situation people want to change or create can be approached as a problem to be solved through engineering. Such problems will have many acceptable solutions. 2.LS2A: Plants depend on water and light to grow. 2.LS4D: There are many different kinds of living things in any area, and they exist in different places on land and in water.	3-5 ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time or cost. 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. 3-5-ETS1-3: Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

RESOURCES		
Bundle Inventory-Case of Missing Monarchs		