Bristol Public Schools

Office of Teaching & Learning

Department	K-5 Science
Department Philosophy	Bristol Public Schools science programing provides students with knowledge of the science and engineering practices, crosscutting concepts, and the 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 the 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 5 NGSS Science
Course Description for Program of Studies	The performance expectations in fifth grade help students formulate answers to questions such as: When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, season to season? Fifth grade performance expectations include PS1, PS2, PS3, LS1, LS2, ESS1, ESS2, and ESS3 Disciplinary Core Ideas from the NRC Framework. Students are able to describe that matter is made of particles too small to be seen through the development

	of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas. **Items in bold are a priority.**
Grade Level	5
Pre-requisites	
Credit (if applicable)	

District Learning Expectations and Standards	**Unit 1**	**Unit 2**	**Unit 3**
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.	x		
5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	x		
5-PS1-3. Make observations and measurements to identify materials based on their properties.	x		

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	x		
5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.	x		
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.	x	x	x
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.		x	
5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.		x	
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.		x	
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.		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	
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.			x
5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.			x
5-ESS2-2. Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.			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: Shooting Stars

UNWRAPPED STANDARDS

Standard	Dimensions of the NGSS Standard		Skills/Concepts	Academic Vocabulary
5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen.	**SEP**	**Developing and Using Models** ● Use models to describe phenomena.	Skills ● Develop a working model of the phases of matter Concepts ● All matter can be subdivided into particles too small to be seen ● We detect matter with evidence ● A gas model, like an inflated balloon, can explain particle behavior ● Natural objects exist from very small to immensely large ● Models are useful to describe and explain phenomena	● Model ● Phenomena ● Matter ● Solid ● Liquid ● Gas ● Plasma ● Particle ● Observation ● Effects ● Air ● Immense
	DCI	**PS1.A: Structure and Properties of Matter** ● Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.		
	CCC	**Scale, Proportion, and Quantity** ● Natural objects exist from the very small to the immensely large.		
5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.	**SEP**	**Using Mathematics and Computational Thinking** ● Measure and graph quantities such as weight to address scientific and engineering questions and problems.	Skills ● Measure and graph quantities to address questions and problems ● Use mathematical evidence to support conservation of matter Concepts ● Matter is conserved when is changes form ● Matter is conserved in chemical reactions ● Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume	● Measure ● Graph ● Quantity ● Heating ● Cooling ● Mixing ● Substances ● Conservation ● Form ● Evidence ● Chemical reactions ● Standard units ● Weight ● Time ● Temperature ● Volume ● Scientific Questions ● Engineering questions ● Problems
	DCI	**PS1.A: Structure and Properties of Matter** ● The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. **PS1.B: Chemical Reactions** ● No matter what reaction or the total weight of the substances does not change .(Boundary: Mass and weight are not distinguished at this grade level.)		
	CCC	**Scale, Proportion, and Quantity** ● Standard units are used to measure and describe physical quantities such as weight,		

		time, temperature, and volume.		
5-PS1-3. Make observations and measurements to identify materials based on their properties.	**SEP**	**Planning and Carrying Out Investigations** ● Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.	Skills ● Make observations and measurements to produce data ● Use data/evidence to explain phenomena Concepts ● We use evidence/data to explain phenomena ● Measurements of a variety of properties can be used to identify materials ● Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume	● Data ● Explain ● Properties
	DCI	**PS1.A: Structure and Properties of Matter** ● Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)		
	CCC	**Scale, Proportion, and Quantity** ● Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.		
5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.	**SEP**	**Planning and Carrying Out Investigations** ● 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 ● Conduct an investigation to produce data ● Use fair tests, considering controlled variables and multiple trials Concepts ● When substances are mixed, a new substance with different properties MAY be formed ● Cause and effect relationships can be identified and used to explain change	● Investigation ● Fair Test ● Variable ● Control ● Trial ● Substance ● Cause/Effect Relationship ● Change
	DCI	**PS1.B: Chemical Reactions** ● When two or more different substances are mixed, a new substance with different properties may be formed.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change.		
5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth.	**SEP**	**Engaging in an Argument from Evidence** ● Support an argument with evidence, data or a model.	Skills ● Support an argument with evidence, data, or a model Concepts ● The sun is a star ● The sun appears brighter than other stars because it is closer to Earth ● Stars vary in their distance from earth ● Natural objects exist from the very small to the	● Argument ● Sun ● Star ● Earth ● Brighter ● distance
	DCI	**ESS1.A: The Universe and its Stars** ● The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth.		
	CCC	**Scale, Proportion, and Quantity**		

		● Natural objects exist from the very small to the immensely large.	immensely large	
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky* **Ongoing throughout the year*	**SEP**	**Analyzing and Interpreting Data** ● Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	Skills ● Represent data in various graphical displays to show Earth's relationships and patterns Concepts ● The orbits of Earth around the sun and the moon are observable patterns ● The rotation of Earth about its axis is an observable pattern ● Such patterns include: Day and night, changes in daily length and direction of shadows, positions of the sun, moon and stars at different times of the year ● Patterns can be used to sort, classify, communicate, and analyze changes for natural phenomena ● We use graphical displays to help us understand patterns and relationships	● Graphical Display ● Bar Graph ● Pictograph ● Pie Chart ● Patterns ● Orbit ● Revolution ● Moon ● Axis ● Rotation ● North/South Pole ● Length ● Shadow ● Positions ● Day/Night ● Month ● Year ● Seasons ● Sort ● Classify ● Communicate ● Analyze
	DCI	**ESS1.B: Earth and the Solar System** ● The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.		
	CCC	**Patterns** ● Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.		

Possible Common Core State Standards Connections:

ELA/Literacy -

- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)
- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-ESS1-1)
- RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)(5-ESS1-1)
- W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-ESS1-1)
- W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (5-PS1-2)(5-PS1-3)(5-PS1-4) (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. (5-PS1-2)(5-PS1-3)(5-PS1-4)(5-ESS1-1)(3-5-ETS1-3)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-PS1-2)(5-PS1-3)(5-PS1-4)(5-ESS1-1)(3-5-ETS1-3)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (5-PS1-1)(5-PS1-2)(5-PS1-3)(5-ESS1-1)(5-ESS1-2) (3-5-ETS1-3)
- MP.4 Model with mathematics. (5-PS1-1)(5-PS1-2)(5-PS1-3)(5-ESS1-1)(5-ESS1-2)(3-5-ETS1-3)
- MP.5 Use appropriate tools strategically. (5-PS1-2)(5-PS1-3)(3-5-ETS1-3)
- 5.NBT.A.1Explain patterns in the number of zeros of the product when multiplying a number by powers of

10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)(5-ESS1-1)

- 5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- 5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
- 5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)
- 5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real-world problems. (5-PS1-2)
- 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)

UNIT 1 DETAILS

Unit Phenomenon: Shooting Stars

Storyline: In this unit, Students will explore the phenomena of shooting stars to learn more about stars, patterns in space, conservation of matter, and the states of matter. They are presented with a discovery question and video resources to consider, "Are shooting stars really stars?" Students explore and refine their answer to the question throughout the unit. In the culminating task, students will develop explanatory models to showcase similarities and differences between shooting stars and stars.

Unit Essential Questions:

- Is a shooting star really a star?
- What is a star?
- What are the patterns of the Earth, sun, moon, and shooting stars?
- What happens when we mix substances together? Is matter lost or destroyed when a meteoroid enters Earth's atmosphere?
- What is matter? What state of matter is a star?

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) Is a shooting star really a star?	I Can ● **Make observations and ask questions on shooting stars-CR**		**SEP** / **DCI** / **CCC** ● SEP: Make observations to serve as the basis for evidence for an explanation of a phenomenon. ● SEP: Identify scientific (testable) and non-scientific (non-testable) questions. *(This SEP is not specific to any of the PE's listed on the unit overview)* ● DCI: (ESS1.A)- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze natural phenomena.	● Record observations and share initial thinking on shooting stars with Agree/Disagree line ● Generate and organize shooting star questions, post to top of class summary table

(2) What is a star?	I Can ● **List characteristics of stars from a variety of sources-CR** ● **Generate a simple definition of a star-CR** ● **Explain that the sun appears larger and brighter than other stars because it is closer using evidence from flashlight activity-CR** ● **Make a claim about whether or not a shooting star is a star using the characteristics of stars, including size-CR**	**SEP** / **DCI** / **CCC** ● SEP: Support an argument with evidence, data, or a model. ● SEP: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ● SEP: Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. ● DCI: (ESS1.A)- The sun is a star that appears larger and brighter than other stars because it is closer. Stars range greatly in their distance from Earth. ● CCC: Natural objects exist from the very small to the immensely large. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	● Use star web to record ideas and generate class master list of characteristics ● Develop a class definition and record on summary table ● Explain how the whiteboard/flashlight activity helps us understand the relative distance of the sun ● Use evidence from this learning sequence to support or revise the thinking on the original claim, is a shooting star really a star? ● Add to class summary table
(3) What are the patterns of the Earth, sun, moon, and shooting stars?	I Can ● **Explain the rotation of the Earth about an axis as the pattern of day and night-CR** ● **Use evidence to explain the changing patterns of sun-related shadows throughout the day-CR** ● **Explain what causes the phases of the moon-CR** ● **Use evidence to connect moon cycle to our monthly calendar-CR** ● **Demonstrate with a simulation the regular patterns of the orbit of the Earth around the sun and the orbit of the moon around the earth-P** ● **Explain that shooting stars are really predictable patterns of meteor showers-CR**	**SEP** / **DCI** / **CCC** ● SEP: Support an argument with evidence, data, or a model. ● SEP: Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ● DCI: (ESS1.B)- The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon and stars at different times of the day, month, and year. ● CCC: Similarities and difference in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	● Explain and show the regular pattern of day/night ● Explain and show changing shadow patterns in relation to position of the sun ● Explain cause of moon phase patterns ● Develop connection with data/evidence to monthly calendar ● Describe/show patterns of movement of sun, moon, and earth with explanatory models ● Develop whole class CER on predictable patterns of meteor showers ● Add to class summary table
(4)	I Can ● **Identify and provide examples of the three common states of matter-CR** ● **Describe common materials by their physical properties-P**	**SEP** / **DCI** / **CCC** ● SEP: Use models to describe	● Sort substances as a class for examples of solids, liquids, and gases ● Describe substances by

What happens when we mix substances together? Is matter lost or destroyed when a meteoroid enters Earth's atmosphere?	• **Plan and conduct investigations involving changing states of matter-P** • **Plan and conduct an investigation to determine if mixing two substances results in a new substance-P** • **Record data and represent it with a graph to show a relationship** • **Use data to determine if matter is conserved-CR** • **Explain what happens when a meteoroid hits earth's atmosphere with a model-P** • **Use physical properties of a meteorite to identify specimens-P**	phenomena. • SEP: Represent data in graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. • DCI: (PS1.A)-Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects. Measurements of a variety of properties can be used to identify materials.The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.(PS1.B)-No matter what reaction or change in properties occurs, the total weight of the substances does not change. • CCC: Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. • CCC: Matter is transported into, out of, and within systems. • CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. • CCC: Natural objects exist from the very small to the immensely large.	their physical properties • Record data for Explore changing states and conservation of matter • Record data for Explore mixing substances and conservation of matter • Represent data in graphs for Explore investigations to determine conservation of matter • Use Claim/Pass data activity to support a class claim on conservation of matter • Complete individual CER as a CFA on conservation of matter • Develop a class explanatory model to extend conservation of matter to the "shooting star" • Determine which samples are meteorites based on physical properties • Add to class summary table
(5) What is matter? What state of matter is a star?	• **Describe the 3 states of matter and provide examples-CR** • **Identify the fourth state of matter, plasma, in a star-CR** • **Demonstrate understanding of particle arrangement and behavior with an explanatory model of the four states of matter-P** • **Generate and present an explanatory model that represents the similarities and differences between a star and a "shooting star"(culminating task)-P**	**SEP** | **DCI** | **CCC** • SEP: Support an argument with evidence, data, or a model. • DCI: (PS1.A)-Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many	• Identify and describe 3 common states of matter with examples • Describe the fourth state of matter, plasma • Build and present 3D explanatory models of 4 states of matter using rubric • Present similarities and differences between a star

		observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects; Measurements of a variety of properties can be used to identify materials. ● CCC: Matter is transported into, out of, and within systems. ● CCC: Natural objects exist from the very small to the immensely large.	and a shooting star in an explanatory model-culminating task

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 Sun is not a star ● The Sun disappears at night ● The surface of the Sun is without visible features ● The Sun rises exactly in the east and sets exactly in the west every day ● All stars are the same brightness in space ● The Sun is very close to Earth ● Stars are a similar distance away from Earth ● The height the sun reaches in the sky on any given day is the same everywhere on earth ● The highest point the sun reaches in the sky is the same throughout the year ● The number of hours of daylight is the same anywhere on earth ● The number of hours of daylight a place receives is due to how far the earth is from the sun ● Mass is not conserved during chemical reactions ● New mass is created during chemical reactions ● Mass can become lighter or less in a chemical reaction ● Matter that we can't see has disappeared ● Air does not take up space ● Matter exists only when we can see or feel it ● Particles of a solid, liquid or gas are not moving ● The gaseous state of a substance weighs less than its liquid or solid form ● If two substances share a characteristic property, they are the same substance	1.ESS1.A-B: Patterns of the motion of the Sun, Moon, and stars in the sky can be observed, described, and predicted. Seasonal patterns of sunrise and sunset can be observed, described, and predicted. 2.PS1.A-B: Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.	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-Shooting Stars

UNIT 2: Golden Jellyfish

UNWRAPPED STANDARDS

Standard	Dimensions of the NGSS Standard		Skills/Concepts	Academic Vocabulary
5-PS3-1. Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.	**SEP**	**Developing and Using Models** ● Use models to describe phenomena.	Skills ● Use models to describe energy flow from the sun to animals' food Concepts ● We can use a model to describe phenomena ● The energy released from food was once energy from the sun ● Sun energy is captured by plants in a chemical process that forms plant matter from air and water ● Food provides animals with the material they need for body repair, growth, warmth, and motion ● Energy can be transferred in various ways between objects	● Models ● Phenomena ● Energy ● Repair ● Growth ● Motion ● Body Warmth ● Food ● Chemical Process ● Plant ● Air ● Water ● Transferred
	DCI	**PS3.D: Energy in Chemical Processes and Everyday Life** ● The energy released [from] food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). **LS1.C: Organization for Matter and Energy Flow in Organisms** ● Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. *(secondary)*		
	CCC	**Energy and Matter** ● Energy can be transferred in various ways and between objects.		
5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.	**SEP**	**Engaging in Argument from Evidence** ● Support argument with evidence, data, or a model.	Skills ● Support an argument with evidence that plants get the materials they need from air and water Concepts ● Plants acquire their material for growth chiefly from air and water ● Matter is transported into, out of, and within systems	● Support ● Argument ● Systems ● Matter
	DCI	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● Plants acquire their material for growth chiefly from air and water.		
	CCC	**Energy and Matter** ● Matter is transported into, out of, and within systems.		
5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.	**SEP**	**Developing and Using Models** ● Develop a model to describe phenomena.	Skills ● Develop a model to describe matter movement in an ecosystem Concepts ● We can use a model to	● Decomposers ● Environment ● Ecosystem ● Organisms ● Food Web
	DCI	**LS2.A: Interdependent Relationships in Ecosystems**		

		● The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. **LS2.B: cycles of Matter and Energy Transfer in Ecosystems** ● Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.	describe phenomena ● The food of almost any kind of animal can be traced back to plants ● Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants ● Fungi and bacteria break down dead organisms, operating as decomposers ● Decomposition eventually recycles some materials back to the soil ● Organisms can only survive in environments in which their particular needs are met ● A healthy ecosystem has multiple species of different types each able to meet the in needs in a stable web of life ● Newly introduced species can damage the balance of an ecosystem ● Matter cycles between air, soil, plants, animals and microbes as they live and die ● Organisms obtain gases and water from the environment and release water matter back to the environment ● Waste matter can be in solid, liquid or gas form ● A system can be described by its components and their interactions	● Fungi ● Bacteria ● Recycle ● Survive ● Healthy ● Stable ● Species ● Balance ● Microbes ● Components ● Interactions
	CCC	**Systems and System Models** ● A system can be described in terms of its components and their interactions.		
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.* **Ongoing throughout the year*	**SEP**	**Analyzing and Interpreting Data** ● Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	Skills ● Represent data in various graphical displays to show Earth's relationships and patterns Concepts ● The orbits of Earth around the sun and the moon are observable patterns ● The rotation of Earth about	● Graphical Display ● Bar Graph ● Pictograph ● Pie Chart ● Patterns ● Orbit ● Revolution ● Moon ● Axis
	DCI	**ESS1.B: Earth and the Solar System** ● The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and		

		South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.	its axis is an observable pattern • Such patterns include: Day and night, changes in daily length and direction of shadows, positions of the sun, moon and stars at different times of the year • Patterns can be used to sort, classify, communicate, and analyze changes for natural phenomena • We use graphical displays to help us understand patterns and relationships	• Rotation • North/South Pole • Length • Shadow • Positions • Day/Night • Month • Year • Seasons • Sort • Classify • Communicate • Analyze
	CCC	**Patterns** • Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.		
5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	**SEP**	**Obtaining, Evaluating, and Communicating Information** • Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.	Skills • Obtain and combine information from books and media to explain phenomena or solutions to problems • Organize information on ways communities can protect Earth's environment Concepts • Human activities in agriculture, industry, and everyday life have had major effects on land, vegetation, streams, ocean, air and outer space • Individuals and communities are doing things to help protect Earth's resources and environment • A system can be described by its components and their interactions	• Protect • Problems • Solutions • Organize • Information • Communities • Individuals • Human Activities • Agriculture • Industry • Major Effects • Land • Vegetation • Streams • Ocean • Air • Outer Space
	DCI	**ESS3.C: Human Impacts on Earth Systems** • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.		
	CCC	**Systems and System Models** • A system can be described in terms of its components and their interactions.		
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.	**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 criteria for success and constraints on materials, time, or cost.	Skills • Define a simple design problem • Consider specified criteria for success and constraints on materials, time, or cost Concepts • Possible solutions to a problem are limited by available materials and	• Criteria • Constraints • Success • Proposal • Compared • Demands • Improved • Technologies
	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.	resources (constraints) ● The success of a designed solution is determined by considering desired features (criteria) ● Different proposals for solutions can be compared on how well they meet success criteria and constraints ● People's needs and wants change over time, as do demands for new and improved technologies	
	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.		

Possible Common Core State Standards Connections:
ELA/Literacy -

- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-LS1-1)(5-ESS3-1)
- RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)(5-PS3-1) (5-LS2-1)(5-ESS3-1)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-LS1-1)(5-ESS3-1)
- W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-LS1-1)
- W.5.7 Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic. (3-5-ETS1-1)
- 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. (5-ESS3-1)(3-5-ETS1-1)
- W.5.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (5-ESS3-1)(3-5-ETS1-1)
- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-PS3-1)(5-LS2-1)(5-ESS1-2)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (5-PS1-1)(5-LS1-1)(5-LS2-1)(5-ESS1-2)(5-ESS3-1)(3-5-ETS1-1)
- MP.4 Model with mathematics. (5-PS1-1)(5-LS1-1) (5-LS2-1) (5-ESS1-2)(5-ESS3-1)(3-5-ETS1-1)
- MP.5 Use appropriate tools strategically. (5-LS1-1)(3-5-ETS1-1)
- 5.NBT.A.1 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
- 5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- 5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems. (5-LS1-1)
- 5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
- 5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)
- 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)
- 3-5.OA Operations and Algebraic Thinking (3-ETS1-1)

UNIT 2 DETAILS

Unit Phenomenon: Golden Jellyfish of Lake Palau

Storyline:
This unit is designed to build student's understanding of life on Earth and the factors which allow species to survive and thrive and humanity's role in this. Students study the Golden Jellyfish of Lake Palau as an anchoring phenomena. The Jellyfish of Lake Palau are a non stinging jellyfish that have evolved in isolation in Lake Palau's salt lake. The jellyfish has a symbiosis with a zooxanthellae (algae). The zooxanthellae lives in the tissues of the Jelly and converts sunlight to sugar using photosynthesis. This sugar is the food source for both the zooxanthellae and the jelly. Because of the zooxanthellae's need for direct sunlight, the Golden Jellyfish travel across lake Palau daily to guarantee direct sunlight.
In the culminating performance task, students show their understanding of ecosystem dynamics by developing a final model of how the Golden Jellyfish survives and thrives in Lake Palau.

Unit Essential Questions:
- How do the Golden Jellyfish survive?
- What do species need to survive and thrive?
- What is an ecosystem? How does matter and energy move through the systems?
- How do the predictable patterns of the Sun affect living things, including zooxanthellae and Golden Jellyfish, on Earth?
- What impact are human activities having on the Earth and what can humans do to protect the Earth and the Earth's resources?

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 do the Golden Jellyfish survive?	I Can ● Share experiences and current understandings of jellyfish-CR ● **Make observations and ask questions about the Golden Jellies of Lake Palau-CR** ● **Identify patterns from the Golden jellies that are the same or different from current understandings on jellyfish-CR**		**SEP** / **DCI** / **CCC** ● SEP: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a 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.	● Build concept map of what class thinks they know about jellyfish ● Record Golden Jellies noticings; prepare and sort questions using QFT ● Compare jellyfish ideas-identify patterns that are the same or different ● Begin class summary table

		● DCI: (PS3.D)- The energy released (from) food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (LS1.C)- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (LS1.C)- Plants acquire their material for growth chiefly from air and water. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	
(2) What do species need to survive and thrive?	I Can ● **Define ecosystem and apply related unit vocabulary-CR** ● Compare healthy and unhealthy ecosystems to begin to understand what they need to thrive-CR ● Obtain information on local plant or animal-P ● **Show how a local organism fits in its ecosystem, with focus on abiotic factors-P** ● **Identify the role the sun plays in ecosystems-CR**	**SEP** / **DCI** / **CCC** ● SEP: Use models to describe phenomena. ● SEP: Support an argument with evidence, data, or a model. ● SEP: Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ● SEP: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ● DCI: (LS1.C)- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (LS1.C)- Plants acquire their material for growth chiefly from air and water. (LS2.A)- Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (PS3.D)- The energy released (from) food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). ● CCC: Natural objects exist from the very	● Build class ecosystem anchor chart ● Use ecosystem images for comparison to consider what might be impacting them ● Complete mini-research on local plant or animal, using graphic organizer for abiotic factors ● Develop explanatory model to show how an organism gets what it needs to survive ● Use Write-Pass strategy to support how the sun and abiotic factors contribute to health of all ecosystems ● Add to class summary table

		small to the immensely large. ● CCC: Energy can be transferred in various ways and between objects. ● CCC: Matter is transported into, out of, and within systems. ● CCC: A system can be described in terms of its components and their interactions. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	
(3) What is an ecosystem? How does matter and energy move through systems?	I Can ● Identify key factors that work together in an ecosystem though Readers Theatre-P ● **Obtain information on the how the Golden Jellies interact with biotic and abiotic factors-CR** ● **Create an explanatory model to show how matter and energy move through the Golden Jelly ecosystem and at least one other ecosystem-P** ● **Compare the Golden Jelly Ecosystem to a different ecosystem-P**	**SEP** / **DCI** / **CCC** ● SEP: Use models to describe phenomena. ● SEP: Support an argument with evidence, data, or a model. ● SEP: Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ● SEP: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ● DCI: (PS3.D)- The energy released (from) food was once energy from the sun that was captured by plants in the chemical process that forms plant matter (from air and water). (LS1.C)- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (LS1.C)- Plants acquire their material for growth chiefly from air and water. (LS2.A)- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as “decomposers.” (LS2.A)- Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only	● Add vocabulary from Readers Theatre to class anchor chart; create a food chain poster based Ecosystem Reader’s Theater ● Build organizers with notes during ecosystem research ● Develop ecosystem models with key unit vocabulary ● Identify similarities and differences between ecosystems ● Add to class summary table

		in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. (LS2.B)- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. ● CCC: Natural objects exist from the very small to the immensely large. ● CCC: Energy can be transferred in various ways and between objects. ● CCC: Matter is transported into, out of, and within systems. ● CCC: A system can be described in terms of its components and their interactions. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	
(4) How do the predictable patterns of the Sun affect living things, including zooxanthellae and Golden Jellyfish, on Earth?	● **Identify patterns of how organisms respond to sunlight-CR** ● **Explain the connections between the living things and the sun-P** ● **Explain the necessary pattern of movement of the Golden Jellies across Lake Palau-CR** ● Explain why all living things need food-CR ● **Explain what would happen to Jellies and their ecosystem if there was interruption to the sunlight-CR** ● **Explain how the predictable patterns of sun affect living things-CR (CFA prompt)**	**SEP** / **DCI** / **CCC** ● SEP: Use models to describe phenomena. ● SEP: Support an argument with evidence, data, or a model. ● SEP: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ● DCI: (ESS1.B)- The orbits of Earth around the sun together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, at different times of the day. (LS1.C)- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. ● CCC: Energy can be transferred in	● Identify similarities and differences in response to sunlight ● Groups act out organism interdependent relationships to sun ● Create explanatory models of jellyfish to show its dependence on the sun ● Build list with examples of why living things need food ● Use what if scenarios and posters to build explanations of impact to ecosystems ● Individual written response to sun prompt-CFA ● Add to class summary table

		various ways and between objects. ● CCC: Matter is transported into, out of, and within systems. ● CCC: A system can be described in terms of its components and their interactions. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	
(5) What impact are human activities having on the Earth and what can humans do to protect the Earth and the Earth's resources?	I Can ● **Define and research a problem that relates to human interference with ecosystems-P** ● **Explain what humans are doing to solve ecosystem problems-P** ● **Identify which part (biotic or abiotic) is most disrupted in various ecosystem problems and how that will impact the rest of the ecosystem-CR** ● Investigate clean up methods through oil spill simulation-P ● **Develop a final explanatory model of how the Golden Jellyfish survives and thrives in Lake Palau-P (culminating task)**	**SEP** / **DCI** / **CCC** ● SEP: Use models to describe phenomena. ● SEP: Support an argument with evidence, data, or a model. ● SEP: Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ● SEP: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem. ● SEP: Define a simple design problem that can be solved through the development of an object, tool, process, orsystem and includes several criteria for success and constraints on materials, time or cost. ● DCI: (LS1.C)- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion. (LS1.C)- Plants acquire their material for growth chiefly from air and water. (LS2.A)- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operatie as "decomposers." (LS2.A)- Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in	● Conduct ecosystem research with peers in problem/solution format ● Present research to peers ● Audience responds to what part is most impacted prompt during presentations ● Investigate, record and analyze oil spill simulation data to determine best method and how that could apply to real world ● Complete class summary table ● Create final explanatory model

		which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. (ESS3.C)- Human activities in agriculture, industry, and everyday life have had a major effect on the land, vegetation, streams, ocean, air and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. (PS1.A)- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. ● CCC: Matter is transported into, out of, and within systems. ● CCC: A system can be described in terms of its components and their interactions. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	

ADDITIONAL CONSIDERATIONS

COMMON MISCONCEPTIONS	PRIOR KNOWLEDGE NEEDED TO MASTER STANDARDS FOR THIS UNIT	ADVANCED STANDARDS FOR STUDENTS WHO HAVE DEMONSTRATED PRIOR MASTERY
Students may think that ● All jellyfish only live in saltwater ● Jellyfish are fish ● The jellyfish were placed in Lake Palau ● Humans have no impact on the environment ● All jellyfish are dangerous	K.LS1.C: All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow. K-2.ETS1.A:Asking questions, making observations, and gathering information are helpful in thinking about problems. 1.ESS1.A-B: Patterns of the motion of the Sun, Moon, and stars in the sky can be observed, described, and predicted. Seasons patterns of sunrise and sunset can be observed, described, and predicted. 2.LS24.D: There are many different kinds of living things in any area, and they exist in different places on land and in water. 4.ESS3.B: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. 4.PS3.A, D: Energy can be moved from place to place by moving objects or through sound, light, or electric currents. The expression “produce energy” typically refers to the conversion of stored energy into a desired form for practical use.	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-Golden Jellie

UNIT 3: Expedition Antarctica

UNWRAPPED STANDARDS

Standard	Dimensions of the NGSS Standard		Skills/Concepts	Academic Vocabulary
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.	**SEP**	**Engaging in Argument from Evidence** ● Support an argument with evidence, data, or a model.	Skills ● Support an argument with evidence, data, or model Concepts ● The gravitational force of Earth acting on an object pulls it down (toward Earth's center) ● Cause and effect relationships can be identified and used to explain change	● Support ● Argument ● Evidence ● Data ● Gravity ● Earth ● Earth's Center ● Cause/Effect Relationship ● Change ● Iceberg
	DCI	**PS2.B: Types of Interactions** ● The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.		
	CCC	**Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change.		
5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky* **Ongoing throughout the year*	**SEP**	**Analyzing and Interpreting Data** ● Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.	Skills ● Represent data in graphical displays to show Earth's relationships and patterns Concepts ● The orbits of Earth around the sun and the moon are observable patterns ● The rotation of Earth about its axis is an observable pattern ● Such patterns include: Day and night, changes in daily length and direction of shadows, positions of the sun, moon and stars at different times of the year ● Patterns can be used to sort, classify, communicate, and analyze changes for natural phenomena ● We use graphical displays to help us understand patterns and relationships	● Graphical Display ● Bar Graph ● Pictograph ● Pie Chart ● Patterns ● Orbit ● Revolution ● Moon ● Axis ● Rotation ● North/South Pole ● Antarctica ● Length ● Shadow ● Positions ● Day/Night ● Month ● Year ● Seasons ● Sort ● Classify ● Communicate ● Analyze
	DCI	**ESS1.B: Earth and the Solar System** ● The orbits of Earth around the sun and the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year.		
	CCC	**Patterns** ● Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.		

5-ESS2-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.	**SEP**	**Developing and Using Models** ● Develop a model using an example to describe a scientific principle.	Skills ● Develop a model using examples to describe the scientific principles of sphere interactions Concepts ● Earth's major systems are the geosphere(solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). ● Earth's systems interact in multiple ways to affect processes and materials ● Oceans support a variety of ecosystems and organisms, shapes landforms, and influences climate ● Wind and clouds in the atmosphere interact with landforms to determine weather patterns ● A system can be described by its components and their interactions	● Interactions ● Systems ● Geosphere ● Molten Rock ● Sediment ● Soil ● Hydrosphere ● Water ● Ice ● Atmosphere ● Air ● Biosphere ● Living Things ● Processes ● Materials ● Ecosystem ● Organism ● Shapes/Landforms ● Influence ● Climate ● Wind ● Clouds ● Weather ● Components ● Interactions
	DCI	**ESS2.A: Earth Materials and Systems** ● Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. Winds and clouds in the atmosphere interact with the landforms to determine patterns of weather.		
	CCC	**Systems and System Models** ● A system can be described in terms of its components and their interactions.		
5-ESS2-2. Describe and graph the amounts of saltwater and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.	**SEP**	**Using Mathematics and Computational Thinking** ● Describe and graph quantities such as area and volume to address scientific questions.	Skills ● Describe and graph Earth's fresh and saltwater distribution Concepts ● Nearly all of Earth's available water is in the ocean ● Most fresh water is in glaciers or groundwater ● Only a tiny fraction of fresh water is in streams, lakes, wetlands, and the atmosphere ● Standard units are used to measure and describe physical quantities ● Scientific questions can be	● Describe ● Graph ● Freshwater ● Saltwater ● Groundwater ● Distribution ● Physical Quantities ● Area ● Volume ● Weight ● Glaciers ● Compression ● Melting ● Wetlands ● Standard Units
	DCI	**ESS2.C: The Roles of Water in Earth's Surface Processes** ● Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.		
	CCC	**Scale, Proportion, and Quantity** ● Standard units are used to measure and describe physical quantities such as weight and volume.		

			effectively addressed with graphs	
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 multiple solutions to a problem ● Compare solutions based on how well they meet the criteria and constraints ● Research a problem ● Test a solution ● Communicate and share ideas with peers during the design process Concepts ● There are multiple solutions to a problem ● Solutions can be tested and compared based on how well they meet specified criteria and constraints ● A problem should be researched before beginning the solution design ● Sharing ideas can lead to an improved design ● Engineers improve technologies or develop new ones to increase benefits, decrease rists, and meet societal demands	● Condition ● Test ● Design ● Research ● Improve ● Engineer ● Risk ● Benefit
	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/Literacy -

- RI.5.1 Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text. (5-PS2-1)(3-5-ETS1-2)
- RI.5.7 Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently. (5-PS1-1)(5-ESS2-1)(5-ESS2-2)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (5-PS2-1)
- RI.5.9 Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably. (3-5-ETS1-2)
- W.5.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (5-PS2-1)
- 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. (5-ESS2-2)
- SL.5.5 Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to enhance the development of main ideas or themes. (5-ESS1-2)(5-ESS2-1)(5-ESS2-2)

Mathematics -

- MP.2 Reason abstractly and quantitatively. (5-PS1-1)(5-ESS1-2) (5-ESS2-1)(5-ESS2-2)(3-5-ETS1-2)
- MP.4 Model with mathematics. (5-PS1-1)(5-ESS1-2)(5-ESS2-1)(5-ESS2-2)(3-5-ETS1-2)
- MP.5 Use appropriate tools strategically.(3-5-ETS1-2)
- 5.NBT.A.1 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10. (5-PS1-1)
- 5.NF.B.7 Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. (5-PS1-1)
- 5.MD.C.3 Recognize volume as an attribute of solid figures and understand concepts of volume measurement. (5-PS1-1)
- 5.MD.C.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. (5-PS1-1)
- 5.G.A.2 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. (5-ESS1-2)(5-ESS2-1)

UNIT 3 DETAILS

Unit Phenomenon: Students pose as members on an Antarctic expedition research team, applying scientific thinking to understand and survive in a challenging environment

Storyline: Students begin this learning sequence on an expedition research team headed to Antarctica. Due to weather complications, their expedition team was not able to reach base camp at McMurdo Station; the team must hike to base camp with limited supplies. They must use tools, scientific thinking and discoveries along the way to make their way to safety. Throughout the unit, students encounter a unique series of situations requiring them to explore and apply scientific knowledge in a coordinated effort. In the culminating task, students explain phenomena encountered and how they accomplished the trek in a survival log.

Unit Essential Questions:

- What resources and knowledge will we need to survive in Antarctica?
  - How does the movement of the Earth affect day/night and seasons in Antarctica?
  - How much of the water on Earth is freshwater or saltwater? How can we engineer fresh drinking water?
  - How do glaciers form and what conditions impact them? How do earth's systems work together?
  - Why do icebergs flip? How can I create a survival log for future Antarctic explorers?

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 resources and knowledge will we need to survive in Antarctica?	I Can ● **Locate Antarctica on a map and identify possible challenges of exploration in Antarctica-CR** ● **Review the provided survival supplies and explore the purpose unfamiliar items-CR** ● Identify *additional* survival items with reasoning-CR ● **Generate questions on how to survive the trek from emergency drop off point to McMurdo Station-CR**		**SEP**	**DCI**	**CCC**	● Locate Antarctica on map/globe ● Record challenges and questions regarding Antarctic trek in scientific notebook ● Identify purpose of survival supplies and preferred additional items for expedition
			● SEP: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. ● DCI: (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: NA			
(2)	I Can ● **Describe patterns of daylight hours in CT and**		**SEP**	**DCI**	**CCC**	● Identify patterns and graph data, daylight hours in CT

How does the movement of the Earth affect day/night and seasons in Antarctica?	**Antarctica-CR** ● **Graph and compare the hours of daylight in CT and Antarctica-P** ● **Use the data to develop an explanation for the extended daylight hours during the Antarctic summer-P** ● **Describe the pros and cons of how the extended daylight hours impact the Antarctic trek-CR**	● SEP: Develop a model using an example to describe a scientific principle. ● SEP: Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ● DCI:(PS2.B)-The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. (ESS1.B)-The orbits of Earth around the sun and of the moon around Earth, together with the rotation of Earth about an axis between its North and South poles, cause observable patterns. These include day and night; daily changes in the length and direction of shadows; and different positions of the sun, moon, and stars at different times of the day, month, and year. ● CCC: Cause and effect relationships are routinely identified and used to explain change. ● CCC: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena. ● CCC: A system can be described in terms of its components and their interactions.	and Antarctica ● Explain the daylight data of 2 locations, noting similarities and differences in the two locations ● Develop a class explanatory model for the extended winter daylight in Antarctica ● Identify pros/cons of extended daylight on the expedition
(3) How much of the water on Earth is freshwater or saltwater?	I Can ● Make observations on the water supply around the world-CR ● **Identify freshwater and saltwater reservoirs-CR** ● **Make predictions on the percentages of water in reservoirs-P** ● **Use nonfiction text/media resources to record and compare water distribution data to predictions-P** ● **Represent fresh and salt water distribution on earth with a graph or a model-P** ● Explain how Bristol gets it water supply-CR	**SEP** / **DCI** / **CCC** ● SEP: Support an argument with evidence, data, or a model. ● SEP: Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships. ● SEP: Describe and graph quantities such as area and volume to address scientific questions. ● DCI: (ESS2.C)- Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. ● CCC: A system can be described in terms of its components and their interactions.	● Identify water resources as fresh or salt ● Make predictions and compare to actual data on water distribution around the world ● Develop graph or model for visual representation of water data ● Explain how Bristol residents get their water (Bristol water dept field trip extension opportunity)

		● CCC: Standard units are used to measure and describe physical quantities such as weight and volume. ● CCC: Natural objects exist from the very small to the immensely large.	
(4) How can we engineer fresh drinking water?	I Can ● Identify fresh and salt water resources in Antarctica-SR ● **Generate ideas on how to obtain potable water-CR** ● **Use knowledge of states of matter and the water cycle to set up an experimental desalination center-P** ● **Provide evidence that the desalination sets up in the classroom made fresh water-P** ● Describe desalination methods used around the world-CR ● **Identify and explain the preferable method to obtain fresh water in Antarctica given limited supplies-CR**	**SEP** / **DCI** / **CCC** ● SEP: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. ● SEP:Develop a model using an example to describe a scientific principle. ● DCI (ESS2.C)-Nearly all of Earth's available water is in the ocean. Most freshwater is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere. (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: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.	● Record fresh and salt water resource options with ideas on its potability in science notebook ● Draw water cycle in science notebook and how it applies to a homemade desalination set up ● Design a desalination set up ● Prove that desalination set up worked ● Identify and explain method to obtain fresh drinking water on the expedition
(5) How do glaciers form and what conditions impact them? How do earth's systems work together?	I Can ● Make observations and ask questions on glaciers-CR ● **Explain how glaciers form and move-CR** ● **Investigate how light and temperature impact glacier melt with station activity-P** ● **Analyze glacier melt data-P** ● **Develop an explanatory model of a glacier-CR** ● **Identify and describe the four systems (hydrosphere, atmosphere, geosphere, and biosphere) that scientists use to represent Earth-CR** ● **Provide evidence for interactions between the spheres-P**	**SEP** / **DCI** / **CCC** ● SEP: Use models to describe phenomena. ● SEP: Develop a model using an example to describe a scientific principle. ● DCI: (ESS2.A)-Earth's major systems are the geosphere (solid and molten rock, soil, and sediments), the hydrosphere (water and ice), the atmosphere (air), and the biosphere (living things, including humans). These systems interact in multiple ways to affect	● Record glacier notice and wonder in science notebook ● Build class anchor chart on glaciers ● Record investigation predictions and data on Melting Glaciers sheet ● Analyze glacier melt data to understand and explain patterns ● Create an explanatory glacier model

		Earth's surface materials and processes. The ocean supports a variety of ecosystems and organisms, shapes landforms, and influences climate. ● CCC: A system can be described in terms of its components and their interactions. ● CCC: Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.	● Identify and describe 4 spheres ● Use ecosystem images to identify and describe at least 3 sphere interactions
(6) Why do icebergs flip? How can I create a survival log for future Antarctic explorers?	I Can ● Make observations and ask questions on iceberg characteristics and behaviors-CR ● **Investigate iceberg floating and flipping behavior-P** ● **Explain why an iceberg flips-P** ● **Create an explanatory model to show the "life" of an iceberg-CR** ● **Provide evidence to which sphere the iceberg (hydrosphere) most closely interacts with-CR** ● **Generate and share a travel log from Expedition Antarctica-P (culminating task)**	**SEP** / **DCI** / **CCC** ● SEP: Describe and graph quantities such as area and volume to address scientific questions. ● SEP: Support an argument with evidence, data, or a model. ● DCI: (PS2.B)-The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center. ● CCC: Cause and effect relationships are routinely identified and used to explain change. ● CCC: Standard units are used to measure and describe physical quantities such as weight and volume.	● Record iceberg notice and wonder in science notebook ● Build class anchor chart on icebergs ● Make and investigate mini-icebergs ● Generate a Before-During-After explanatory iceberg model ● Identify and provide reasoning for iceberg sphere relationship ● Create an expedition travel log with scientific explanations of Antarctic phenomena

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: ● Sunlight does not warm the land ● The seasons in Antarctica are the same as they are in the northern hemisphere ● Freshwater is plentiful ● The equator always has the most hours of daylight; the north and south poles always have the fewest hours of daylight ● The number of hours of daylight on a given day is the same everywhere on earth	K-2-ETS1.A: A situation that people want to change or create can be approached as a problem to be solved through engineering. Such problems may have many acceptable solutions. Asking questions, making observations and gathering information are helpful in thinking about problems. Before beginning to design a solution, it is important to clearly understand the problem. (B) Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (C Because there is always more than one	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.

• All water is drinkable • You can drink salt water to survive • Freshwater is more prevalent than saltwater • Wind and water cannot wear away the solid rock of a mountain • Landforms look similar today as they did many millions of years ago. For example, a river on earth today hasn't changed over time • Landforms can change in size, but not by the motion of wind and water • A passive (stationary) object cannot exert a force	possible solution to a problem, it is useful to compare and test designs. 1-ESS1.A-B: Patterns of the motion of the Sun, Moon, and stars in the sky can be observed, described, and predicted. Seasonal patterns of sunrise and sunset can be observed, described, and predicted. 2-ESS2.A: Wind and water can change the shape of land. 2-ESS2.C: Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. 3-ESS2.D: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. 3-PS2.A: Each force acts on one particular object and has both strength and direction. 4-ESS2.A-Rainfall helps to share the land and affects the types of living things found in a region. Water, ice, wind, living organisms and gravity break down rocks, soils, and sediments into smaller particles and move them around.	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-Expedition Antarctica