HILLSBOROUGH TOWNSHIP SCHOOL DISTRICT

SCIENCE CURRICULUM

GRADE 4

AUGUST 2021

Grade 4
Science Course Overview

The Fourth Grade science curriculum of Hillsborough Township Public Schools aims to educate students in the areas of Physical Sciences, Life Sciences, as well as Earth and Space Sciences by building on their elementary experiences and helping them make sense of their world. The fourth grade science program helps students formulate answers to questions such as: What are waves and what are some things they can do? How can water, ice, wind and vegetation change the land? What patterns of Earth's features can be determined with the use of maps? How do internal and external structures support the survival, growth, behavior, and reproduction of plants and animals? What is energy and how is it related to motion? How is energy transferred? How can energy be used to solve a problem?

Students will use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and to understand that waves can cause objects to move. Students will develop an understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They will apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes by humans. In order to describe patterns of Earth's features, students will analyze and interpret data from various maps. Students will develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, students will explain that an object can be seen when light reflected from its surface enters the eye. Students will use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students will develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They will apply their understanding of energy to design, test, and refine a device that converts energy from one form to another.

The crosscutting concepts of patterns, cause and effect, energy and matter, systems and system models, interdependence of science, engineering, and technology, and influence of engineering, technology, and science on society and the natural world are used for organizing concepts for these disciplinary core ideas.

In line with fourth grade performance expectations, students will demonstrate grade-appropriate proficiency in the practices of science and engineering by asking questions, 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 will use these practices to demonstrate understanding of the core ideas.

The fourth grade science curriculum meets the requirements of the New Jersey Student Learning Standards for Science. It also helps to prepare students to meet and exceed the standards assessed by the New Jersey State administered assessments through higher order application of various skills required for complete understanding and sensemaking of science phenomena at the fourth grade level.

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Unit Title	**Time Frame/Pacing**
Energy	30 Days

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Phenomenon:

- Roller Coaster Video (first 3 minutes) with question: How do roller coaster cars move if they don't have an engine? / Where do they get their energy from?

Essential Questions:

- What is distance and how do we measure it?
- How do we measure motion?
- How does energy flow?
- How are energy and motion related?
- What is the relationship between energy and unbalanced/balanced forces?
- How do we convert one form of energy into electric energy?

Enduring Understandings

- How to measure the distance between two stationary objects before measuring the distance an object travels. Ability to determine how long it takes an object to travel a given distance to reinforce the concept that the faster something travels, the less time it takes to cover the same distance.
- While there is no attempt to precisely define energy at the fourth grade level, children become aware of the pervasive presence of energy in their everyday lives. The relationship between a change in motion and a change in energy. The more massive the object, the greater the energy required to move it.
- The relationship between energy and balanced/unbalanced forces.
- Energy can be stored and transferred. Converting energy from one form to another. The differences between renewable and non-renewable sources of energy. Build a set of projects related to the production or the use of electrical energy.

NJ Standards/NGSS Performance Expectations Taught and Assessed
Students who demonstrate understanding can:

- 4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.
- 4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.
- 4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

- 4-ESS3-1 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
- 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.

3-Dimensional Learning Components

Science and Engineering Practices	Disciplinary Core Ideas (DCI)	Crosscutting Concepts
Asking Questions and Defining Problems • Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. (4-PS3-3) **Planning and Carrying Out Investigations** • Make observations to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (4-PS3-2) **Constructing Explanations and Designing Solutions**. • Use evidence (e.g., measurements, observations,patterns) to construct an explanation. (4-PS3-1) • Apply scientific ideas to solve design problems. (4-PS3-4)	**PS3.A: Definitions of Energy** • The faster a given object is moving, the more energy it possesses. (4-PS3-1) • Energy can be moved from place to place by moving objects or through sound, light, or electric currents. (4-PS3-2), (4-PS3-3) **PS3.B: Conservation of Energy and Energy Transfer** • Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2), (4-PS3-3) • Light also transfers energy from place to place. (4-PS3-2) • Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been	**Patterns; Scale, Proportion, and Quantity; Cause and Effect: Mechanism and Explanation** • Students use measurement to quantify the distance between objects, the distance between two stationary objects, the distance an object travels, and the time it takes that object to travel. They observe patterns of motion related to time (i.e., the length of time it takes to move a specified distance at multiple speeds) and affirm that the faster something moves, the less time it takes to travel the same distance. **Energy and Matter** • Students conduct investigations that illustrate that energy can be transferred in various ways and between objects. The ability to examine and model energy transfer is a tool that students can apply to physical, life, and earth/space sciences. **Energy and Matter; Systems and System Models** • Students' further their understanding of

	produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2), (4-PS3-4) **PS3.C: Relationship Between Energy and Forces** • When objects collide, the contact forces transfer energy so as to change the objects' motions. (4-PS3-3) **PS3.D: Energy in Chemical Processes and Everyday Life** • The expression "produce energy" typically refers to the conversion of stored energy into a desired form for practical use. (4-PS3-4) **ETS1.A: Defining 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. (secondary to 4-PS3-4)	the energy cycle. Using springs as models, students complete activities that examine the transfer and storage of energy. They are building foundational tools that they can use across all areas of science and engineering. **Energy and Matter; Systems and System Models** • Students research various ways in which energy can be stored and transferred for practical use in their daily lives. Students also use models (Snap Circuits Kit) to understand how one form of energy can be converted to another. Understanding these conversions will prepare them for a more complex examination of energy in the middle school years.

Interdisciplinary Connections: Math, ELA, and Computer Science and Design Thinking

Math

- 3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot where the horizontal scale is marked off in appropriate units- whole numbers halves or quarters.
- MP.2 Reason abstractly and quantitatively. (4-ESS3-1)
- MP.4 Model with mathematics. (4- ESS3-1)
- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as

many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3-1)

- 4.OA.A.3 Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. (4-PS3-4)

ELA

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-PS3-1)
- RI.4.3 Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text. (4- PS3-1)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS3-1)
- W.4.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. (4-PS3-1)
- W.4.7 Conduct short research projects that build knowledge through investigation of different aspects of a topic. (4-PS3-2), (4-PS3-3), (4-PS3-4)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-PS3-1), (4-PS3-2), (4-PS3-3), (4-PS3-4)
- W.4.9 Draw evidence from literary or informational texts to support analysis, reflection, and research. (4-PS3-1)

Computer Science and Design Thinking

- 8.2.5.ED.2 Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3 Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.
- 8.2.5.ED.4 Explain factors that influence the development and function of products and systems (e.g., resources, criteria, desired features, constraints).
- 8.2.5.ED.5 Describe how specifications and limitations impact the engineering design process.
- 8.2.5.ED.6 Evaluate and test alternative solutions to a problem using the constraints and tradeoffs identified in the design process.

Career Readiness, Life Literacies, and Key Skills

- 9.3. ST-ET.2 Display and communicate STEM information.
- 9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.

Social-Emotional Learning Competencies

- **Social Awareness:**
  - Demonstrate an understanding of the need for mutual respect when viewpoints differ.
  - Recognize and identify the thoughts, feelings, and perspectives of others.

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- **Responsible Decision-Making Skills:**
  - Develop, implement, and model effective problem-solving and critical thinking skills.
- **Relationship Skills:**
  - Utilize positive communication and social skills to interact effectively with others.

Learning Targets	Investigations/Resources	Formative Assessment
Review of Distance and Motion • Explain that distance is the separation between two objects. • Measure the distance between two objects • Identify an object's initial and final positions. • Measure the distance an object travels in two dimensions. • Measure in seconds how long it takes an object to travel a specified distance. • Explain that the faster an object moves over a specified distance, the less time it takes.	Review of Distance and Motion Students measure the distance between two stationary objects before measuring the distance an object travels, as well as determine how long it takes an object to travel a given distance based on its speed. • Times Scores	Review of Distance and Motion Formative: Journal response: What is distance and how do we measure it? Summative: Distance and timing activity: design an activity to determine how it takes an object to travel a specific distance. Chart the results.
Energy and Motion • Explain that energy can be transferred from one object to another. • Argue from evidence that the more massive an object, the more the energy required to move it.	Energy and Motion Students gather evidence regarding the relationship between a change in motion and a change in energy. • Forms of Energy • Exploring Energy Kit • Motion Machine Kit • Which is Faster? • Mystery Science: What Makes Roller Coasters Go So Fast?	Energy and Motion Formative: Motion Machine Investigation-predict how long the five balls will take to travel from launcher to end of the plastic tube. Summative: CER Response. How are energy and motion related?
Energy and Forces • Construct an argument, using evidence, to	Energy and Forces Students use springs to investigate the relationship	Energy and Forces Formative: Journal response: What is the

show that when forces are balanced, energy is stored. • Construct an argument, using evidence, to show that when forces are unbalanced, energy is transformed into motion.	between energy and balanced/ unbalanced forces. • Tug-of-War Cone Kit • Motion Machine Kit • Energy at Work	relationship between energy and balanced/unbalanced forces? Summative: Activity Sheet 1 Energy at Work: connect text describing energy transformation to images. Common Assessment: Energy in Motion Performance Task
Producing Electrical Energy • Explain how mechanical energy is converted into electrical energy. • Explain that electricity is our most prominent form of energy because it can be stored and transferred easily and over long distances. • Construct projects related to the production or use of electrical energy.	Producing Electrical Energy Students demonstrate converting energy from one form to another. • Solenoid Kit • Making Electricity • Snap Circuit Kit • Electrical Circuits • Mystery Science: What if There Were No Electricity? • Generation Genius: Energy Transfer	Producing Electrical Energy Formative: Journal response: How do you think we produce electrical energy? Summative: CER Response: describe how the school could reduce the amount of energy it uses in a paragraph.

Instructional Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate

- Read articles and/or directions to students to help with comprehension
- Teacher provided scaffolding for designing investigations, one-on-one or in small groups
- Provide access to anchor charts and classroom labels relevant to science concepts
- Scribe for students or allow students to use talk-to-text feature on Chromebooks when responding to questions
- Provide access to articles and books further exploring the topic of study
- Any other modification as per student IEP or 504 plan

Common Assessment(s)	**Assessment Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate**
• **Energy in Motion Performance Task** (4-PS3-1), (4-PS3-2), (4-PS3-3)	• Provide modifications per IEPs, Word Bank

○ Directions/Scoring Rubric *Mystery Science: What Makes Roller Coasters Go So Fast?*	

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Unit Title	**Time Frame/Pacing**
Waves	30 days

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Phenomenon:

- Waves in Lake Video - Students develop questions to figure out what causes this change in the water.

Essential Questions:

- How does light travel?
- How does our eye process light information?
- How can light and waves be used to communicate?
- How is coding related to communication and information transfer?

Enduring Understandings

- Understand the concept of waves and wave properties. Experience a wave and move to producing waves with an oscillating Slinky. Model waves graphically and label their salient features. Engineer a wave generator and investigate waves.
- Light is the principal way we know about our world and everything in it. Unless an object emits its own light (e.g., the sun, fire, a light bulb, and so on) it must reflect light in order to be seen. Light can move in different ways, it can bend (refract) and it can bounce (reflect) off surfaces.
- Waves transfer information. Sometimes people transfer information using a code.

NJ Standards/NGSS Performance Expectations Taught and Assessed
Students who demonstrate understanding can:

- 4-PS4-1 Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.
- 4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- 4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.
- 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.

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3-Dimensional Learning Components		
Science and Engineering Practices	**Disciplinary Core Ideas (DCI)**	**Crosscutting Concepts**
Developing and Using Models • Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (4-PS4-1) • Develop a model to describe phenomena. (4-PS4-2) **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 solution. (4-PS4-3)	**PS4.A: Wave Properties** • Waves, which are regular patterns of motion, can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach. (Note: This grade band endpoint was moved from K–2.) (4-PS4- 1) • Waves of the same type can differ in amplitude (height of the wave) and wavelength (spacing between wave peaks). (4-PS4-1) **PS4.B: Electromagnetic Radiation** • An object can be seen when light reflected from its surface enters the eyes. (4-PS4-2) **PS4.C: Information Technologies and Instrumentation** • Digitized information can be transmitted over long distances without significant degradation. High-tech devices, such as computers or cell phones, can receive and decode information—convert it from digitized form to voice—and vice versa. (4-PS4-3) **ETS1.C: Optimizing The Design Solution** • Different solutions need to be tested in	**Patterns; Cause and Effect: Mechanism and Explanation** • Students notice patterns in periodic waves and learn how to describe such waves. They construct a wave generator that allows them to assess how the amount of displacement affects the amplitude and wavelength of periodic waves. **Cause and Effect: Mechanism and Explanation; System and System Models** • Students participate in activities that help them understand how light travels and how visible light behaves (refraction and reflection). They construct a simple model of an eye to study the basic principles of human sight. **2.3: Patterns; Cause and Effect: Mechanism and Explanation** • Students discover how patterns of letters, numbers, or symbols can be used to transmit information, and learn the role that waves play in communication between a sender and a recipient. Their understanding that waves can be used for communication purposes paves the way for a more sophisticated understanding that digitalized signals are a more reliable way to encode and transmit information.

	order to determine which of them best solves the problem, given the criteria and the constraints. (secondary to 4-PS4-3)	

Interdisciplinary Connections: Math, ELA, and Computer Science and Design Thinking

Math

- MP.4 Model with mathematics. (4- PS4-1)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-1)

ELA

- RI.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-PS4-3)
- RI.4 Determine the meaning of general academic and domain specific words or phrases in a text relevant to a grade 4 topic or subject area.
- RI.07 Interpret information presented visually orally or quantitatively (e.g. in charts, graphs, diagrams, timelines, animations or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-PS4-3).
- SL.1.A Come to discussions prepared having read or studied required material explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.
- SL.1.C Pose and respond to specific questions to clarify or follow up on information and make comments that contribute to the discussion and link to the remarks of others.
- SL.1.D Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas.

Computer Science and Design Thinking

- 8.1.5.NI.1 Develop models that successfully transmit and receive information using both wired and wireless methods.
- 8.1.5.DA.1 Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.5 Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
- 8.2.5.ED.2 Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3 Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

Career Readiness, Life Literacies, and Key Skills

- 9.3. ST-ET.2 Display and communicate STEM information.
- 9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.

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- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.

Social-Emotional Learning Competencies

- **Social Awareness:**
  - Demonstrate an understanding of the need for mutual respect when viewpoints differ.
  - Recognize and identify the thoughts, feelings, and perspectives of others.
- **Responsible Decision-Making Skills:**
  - Develop, implement, and model effective problem-solving and critical thinking skills.
- **Relationship Skills:**
  - Utilize positive communication and social skills to interact effectively with others.

Learning Targets	Investigations/Resources	Formative Assessment
Amplitude and Wavelength • Describe waves using scientific vocabulary. • Model waves graphically. • Explain that waves are caused by repetitive motion. • Construct a wave generator.	Amplitude and Wavelength Students produce waves with an oscillating Slinky to model and label their features, as well as build a wave generator. • Wave - Phenomenon • Making Waves • Making a Wave Generator • Wave Generator Kit • Generation Genius Wave Property Video	Amplitude and Wavelength Formative: Journal response: What are waves? Summative: Waves Common Assessment (See link below - Give after lesson 2.1)
How We See • Explain that light travels in a straight line. • Explain that light bends. • Explain that light reflects off objects. • Construct a simple model of the human eye.	How We See Students construct a model of an eye in order to understand how light makes vision possible and understand how light moves through refraction (bend) and reflection (bounce) off surfaces. • How Light Travels Kit • Camera Kit • How to Make an Eye	How We See Formative: Think, pair, share: How does light travel? Summative: Construct a model of the eye and explain how light makes vision possible.

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Using Waves to Transfer Information • Explain what a code is. • Create a code to send information to a recipient. • Decode a coded message from a sender. • Observe the role of waves in transmitting information.	Using Waves to Transfer Information Students explore the role of waves in the transfer of information using a code and engage in activities that allow them to transmit information to one another. • Codes, one for each student • Snap Circuit Kit • Codes • Spy work	Using Waves to Transfer Information Formative: Journal response: What is a code?

Instructional Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate
• Read articles and/or directions to students to help with comprehension • Teacher provided scaffolding for designing investigations, one-on-one or in small groups • Provide access to anchor charts and classroom labels relevant to science concepts • Scribe for students or allow students to use talk-to-text feature on Chromebooks when responding to questions • Provide access to articles and books further exploring the topic of study • Any other modification as per student IEP or 504 plan

Common Assessment(s)	**Assessment Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate**
• Waves Common Assessment (4-PS4-1)	• Provide modifications per IEPs

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Unit Title	**Time Frame/Pacing**
Earth's Surface Processes	55 Days

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Phenomena:

- Seaside Heights Beach Photos (before and after Hurricane Sandy) with question: What caused the change to the landscape?
- Changing Rivers with question: What causes the river to change over time?
- The Grand Canyon
- Wind Erosion with questions: What do you see? Think? Wonder?

Essential Questions:

- How can we create a model of Earth's internal structure?
- How do geologists use core sampling to learn about the Earth?
- How can we create a model of Pangaea?
- What do fossils tell us about life long ago?
- How can we make models of different types of fossils?
- How does geologic time represent Earth's history?
- How does soil form?
- How can we create models of different types of weathering?
- Where does acid rain come from?
- How does a glacier change Earth' s surface?
- How are the four main types of mountains formed?
- How are landforms represented on maps?
- How are topographic maps used to model Earth's features?
- What causes "fast changes" in Earth's features?
- How can we create models of natural disasters?
- How can we build an "earthquake proof" structure?

Enduring Understandings

- In order to understand this history, it is essential that students have a fundamental understanding of Earth's internal structure. Students will review and build upon their background knowledge of the internal structure of the Earth.
- Earth scientists use the structure, sequence, and properties of rock layers, sediments, and fossils to reconstruct events in Earth's history. Students will explore how rocks and fossils tell the story of Earth's history.

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- The Earth is a complex system of interacting subsystems: the geosphere, the hydrosphere, the atmosphere, and the biosphere. All of the Earth's processes are a result of energy flow and matter cycles which cause physical and chemical changes in rocks, water, air, plants, and animals. Students will understand that these changes lead to soil production as well as the fundamentals of soil structure.
- The Earth is a complex system of interacting subsystems: the geosphere, the hydrosphere, the atmosphere, and the biosphere. All of the Earth's processes are a result of energy flow and matter cycles which cause physical and chemical changes in rocks, water, air, plants, and animals. Students will understand the processes of weathering and erosion that help to shape the land by means of water, ice, wind, living organisms, and gravity. Rocks, soil, and sediments are broken down into smaller particles and moved around Earth's geosphere.
- Earth's lithosphere is made up of tectonic plates. All of Earth's natural features, both continental and oceanic, are part of these tectonic plates. The plates are constantly in motion, sometimes pushing together and sometimes pulling apart. This movement results in changes in landforms, forming mountains, deep ocean trenches, or mid-ocean ridges. Various types of maps show details about Earth's features and their locations relative to one another. The purpose of this lesson is to familiarize students with various ways to represent Earth's features on maps.
- Earthquakes and volcanoes occur in patterns, mostly along tectonic plate boundaries. The plates are constantly in motion, sometimes pushing together and sometimes pulling apart. Often this movement goes unnoticed, but other times it results in natural hazards or disasters. Sometimes these events are preceded by geological activities that allow for reliable predictions and preventive measures. The purpose of this lesson is to provide students with foundational knowledge about earthquakes, volcanoes, and tsunamis, as well as their causes and relationships to each other and their effects on humans.

NJ Standards/NGSS Performance Expectations Taught and Assessed
Students who demonstrate understanding can:

- 4-ESS1-1 Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.
- 4-ESS2-1 Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- 4-ESS2-2 Analyze and interpret data from maps to describe patterns of Earth's features.
- 4-ESS3-2 Generate and compare multiple solutions to reduce the impacts of natural Earth processes and climate change have on humans.
- 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.

3-Dimensional Learning Components

Science and Engineering Practices	Disciplinary Core Ideas (DCI)	Crosscutting Concepts
Planning and Carrying Out Investigations	**ESS1.C: The History of Planet Earth**	**Patterns; Scale, Proportion, and Quantity;**

• Make observations and/or measurements to produce data to serve as the basis for evidence. **Analyzing and Interpreting Data** • Analyze and interpret data to make sense of phenomena using logical reasoning. (4-ESS2-2) **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 solution. (4-ESS3-2)	• Local, regional, and global patterns of rock formations reveal changes over time due to earth forces, such as earthquakes. The presence and location of certain fossil types indicate the order in which rock layers were formed. (4-ESS1-1) **ESS2.A: Earth Materials and Systems** • Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around. (4-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interaction** • The locations of mountain ranges, deep ocean trenches, ocean floor structures, earthquakes, and volcanoes occur in patterns. Most earthquakes and volcanoes occur in bands that are often along the boundaries between continents and oceans. Major mountain chains form inside continents or near their edges. Maps can help locate the different land and water features areas of Earth. (4-ESS2-2) **ESS2.E: Biogeology** • Living things affect the physical characteristics of their regions. (4- ESS2-1) **ESS3.B: Natural Hazards** • A variety of hazards result from natural processes (e.g., earthquakes, tsunamis,	**Systems and System Models** • Students look for patterns that lead to an understanding of the organization of Earth's layers. They begin to get an idea of the magnitude of the Earth. They create a model to assist them in understanding concepts that are not readily observable. **Patterns; Scale, Proportion, and Quantity; Systems and System Models** • Students will begin to understand how patterns found in rock layers and fossils provide information about Earth's history. They will create models to assist them in understanding concepts that are not readily observable as they begin to form ideas about the magnitude of Earth's geologic history. **Patterns; Scale, Proportion, and Quantity; Systems and System Models** • Students look for patterns that lead to an understanding of Earth's soil layers through reading, looking at diagrams, and making direct observations of soil samples. They begin to get an idea of the magnitude of Earth and the interconnectedness of Earth's systems. **Patterns; Cause and Effect; Scale, Proportion, and Quantity; Systems and System Models** • Students look for cause and effect patterns that lead to an understanding of the processes of weathering and erosion. They create models to represent each type of

	volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2) (Note: This Disciplinary Core Idea can also be found in 3.WC.) **ETS1.B: Designing Solutions to Engineering Problems** • Testing a solution involves investigating how well it performs under a range of likely conditions. (secondary to 4-ESS3-2)	weathering and erosion and recognize how these processes are part of the interconnectedness of Earth's systems. **Patterns; Cause and Effect; Scale, Proportion, and Quantity; Systems and System Models** • Students look for patterns that lead to an understanding of continental and oceanic landforms and how they can be represented on various types of maps. They create models to represent types of mountains to understand concepts on a larger scale. **Patterns; Cause and Effect; Scale, Proportion, and Quantity; Systems and System Models; Stability and Change** • Students look for patterns of cause and effect that lead to a foundational understanding of volcanoes, earthquakes, and tsunamis and how they relate to one another. They create models in order to understand these concepts on a larger scale and realize that Earth's surface is constantly changing.

Interdisciplinary Connections: Math, ELA, and Computer Science and Design Thinking

Math

- MP.2 Reason abstractly and quantitatively. (4-ESS1-1), (4- ESS2-1), (4- ESS3-2)
- MP.4 Model with mathematics. (4- ESS1-1), (4-ESS2-1), (4-ESS3-2)
- MP.5 Use appropriate tools strategically. (4-ESS2-1)
- 4.MD.A.1 Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two column table. (4-ESS1-1), (4- ESS2-1)
- 4.MD.A.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money,

including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. (4-ESS2-1), (4-ESS2-2)

- 4.OA.A.1 Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations. (4-ESS3- 2)

ELA

- RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)
- RI.3 Explain events, procedures, ideas or concepts in a historical scientific or technical text including what happened and why based on specific information in the text.
- RI.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS2-2)
- RI.4.9 Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably. (4-ESS3-2)
- W.4.7 Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears. (4-ESS1-1), (4-ESS2-2)
- W.4.8 Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources. (4-ESS1-1)

Computer Science and Design Thinking

- 8.1.5.DA.1 Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.5 Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
- 8.2.5.ED.2 Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3 Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

Career Readiness, Life Literacies, and Key Skills

- 9.3. ST-ET.2 Display and communicate STEM information.
- 9.3.ST-SM.1 Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.

Social-Emotional Learning Competencies

- **Social Awareness:**
  - Demonstrate an understanding of the need for mutual respect when viewpoints differ.
  - Recognize and identify the thoughts, feelings, and perspectives of others.

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- **Responsible Decision-Making Skills:**
  - Develop, implement, and model effective problem-solving and critical thinking skills.
- **Relationship Skills:**
  - Utilize positive communication and social skills to interact effectively with others.

Learning Targets	Investigations/Resources	Formative Assessment

Beneath Our Feet
 	
• Identify Earth's layers and the characteristics of each.
• Create models of Earth's internal structure.
• Understand how and why geologists use core sampling.
• Comprehend and respond to nonfiction texts.
	Beneath Our Feet
	
	Students build upon their background knowledge of the internal structure of the Earth and create a model of Earth's internal structure.
	• Session 1: What is it like inside the Earth?
	  ○ What Do You Know?
	  ○ Earth's Layers
	• Session 2: How can we create a model of Earth's internal structure?
	  ○ Earth Layers Model
	  ○ Core Sampling
		Beneath Our Feet
		
		Formative: Journal response- What do you already know about Earth and its layers?
		
		Summative: Create models of Earth's internal structure.

Fossils Tell a Story (Pangaea map)
 	
• Recognize that fossils provide evidence about organisms that lived long ago.
• Explain how fossils provide evidence about the nature of the environment at any time in history .
• Create models to better understand plate tectonics and fossil records.
• Understand how Earth's history is represented through geologic time.
• Comprehend and respond to nonfiction texts.
	Fossils Tell a Story (Pangaea map)
	
	Students explore how rocks and fossils tell the story of Earth's history.
	• Session 1: What is Pangaea?
	  ○ Pangaea
	• Session 2: How can we create a model of Pangaea?
	  ○ Pangaea Puzzle
	• Session 3: What are the main types of fossils?
	  ○ Fossils!
	• Sessions 4-5: How can we make models of different types of fossils?
		Fossils Tell a Story (Pangaea map)
		
		Formative: Journal response- What do you already know about Pangaea?
		
		Summative: Create models of fossils.

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	○ Make a Fossil • Session 6: How does geologic time represent Earth's history? ○ Geologic Time	
What is Soil? • Identify and describe soil layers. • Observe properties of soil samples. • Comprehend and respond to nonfiction texts.	What is Soil? Students identify layers of soil and understand the fundamentals of soil structures. • Session 1: What is soil? ○ What is soil? • Session 2: What is in soil? ○ Soil Samples	What is Soil? Formative: Journal response- Record observations and compare and contrast soil samples.
Weather and Erosion • Compare the processes of weathering and erosion. • Create models to represent and understand various types of weathering and erosion. • Understand the impacts of weathering and erosion on humans. • Comprehend and respond to nonfiction texts.	Weather and Erosion Students experience the processes of weathering and erosion in Earth's geosphere. • Session 1: What is weathering? ○ Weathering Reading • Session 2: How can we create models of different types of weathering? (Part 1) ○ Bottle Weathering ○ Robust Roots ○ Shake, Rattle, and Roll • Session 3: How can we create models of different types of weathering? (Part 2) ○ Bottle Weathering ○ Acid Rain Reading ○ Acid Rain Lab • Session 4: What is erosion? ○ Erosion Reading ○ Motivation Video prior to Expert Groups • Sessions 5-6: Erosion Expert Groups ○ Erosion Expert Groups	Weather and Erosion Formative: Journal response- What is weathering? What is erosion? Summative: Create a model of weathering by water, ice and living things (plants).

	• Session 7: How does a glacier change Earth's surface? ○ Make a Glacier	

Patterns in Earth's Features
 	
• Give examples of Earth's continental and oceanic landforms.
• Compare types of maps that show Earth's features.
• Explain how topographic maps represent contour and elevation.
• Comprehend and respond to nonfiction texts.
	Patterns in Earth's Features
	
	Students represent Earth's features on maps through various ways.
	• Session 1: Where are Earth's landforms found?
	  ○ Landforms and More
	• Session 2: How are the four types of mountains formed?
	  ○ Mighty Mountains
	• Session 3: How are landforms represented on maps?
	  ○ Mapping Earth's Features
	• Session 4: What are topographical maps?
	  ○ Topographical Maps
		Patterns in Earth's Features
		
		Formative: Students create models of the four types of mountains using clay and record observations.

Volcanoes, Tsunamis and Earthquakes- Oh My!
 	
• Understand the ways in which tectonic plates move.
• Explain how volcanoes, earthquakes, and tsunamis form and describe their relationship to each other.
• Give examples of preventive measures humans can take to reduce the impacts of these natural hazards.
• Understand how engineers design and construct buildings to withstand earthquake damage.
• Comprehend and respond to nonfiction texts.
	Volcanoes, Tsunamis and Earthquakes- Oh My!
	
	Students understand the defining characteristics of earthquakes, volcanoes, and tsunamis, as well as their causes and relationships to each other and their effects on humans.
	• Session 1: What causes "fast changes" in Earth's features?
	  ○ Fast Changes
	• Session 2: How can we create models of natural disasters?
	  ○ Disaster Demonstrations
	  ○ Natural Disasters Kit
	• Sessions 3-4: How can we build an earthquake proof structure?
	  ○ Earthquake Challenge
		Volcanoes, Tsunamis and Earthquakes- Oh My!
		
		Formative (optional): Earthquake Challenge (see Online Resources document).
		
		Common Assessment: Explanation from Evidence (CER) Performance Task: Construct an explanation to discuss one force that changes structures slowly and one force that changes structures quickly.

	○ My Structural Engineer's Journal (optional) ○ Earthquake Proof Structure Kit • Additional Sessions (Optional): Natural Disaster Research - ***CAN USE IN CONJUNCTION WITH NONFICTION READING AND WRITING UNITS (Reading the Weather, Reading the World)*** ○ Research Outline ○ Activity Sheet 5: Natural Disaster Outline	

Instructional Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate
• Read articles and/or directions to students to help with comprehension • Teacher provided scaffolding for designing investigations, one-on-one or in small groups • Provide access to anchor charts and classroom labels relevant to science concepts • Scribe for students or allow students to use talk-to-text feature on Chromebooks when responding to questions • Provide access to articles and books further exploring the topic of study • Any other modification as per student IEP or 504 plan

Common Assessment(s)	**Assessment Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate**
• Explanation from Evidence (CER) Performance Task: Construct an explanation to discuss one force that changes structures slowly and one force that changes structures quickly.	• Provide modifications per IEP/504

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Unit Title	**Time Frame/Pacing**
Animal Structure and Function	40 Days

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Phenomenon:

- Basilisk Lizard: How does this behavior/physical trait help the lizard survive? / What is that called?

Essential Questions:

- How do we classify living things?
- How can we group animals by their body coverings?
- How can we group invertebrates?
- How can we use notes and a graphic organizer to summarize and compare animal groups?
- How do an animal's physical structures help it to survive?
- How do an animal's senses help with survival?
- How can we compare natural and classroom habitats?
- How do animals respond to changes in temperature?
- How do animals respond to seasonal changes?

Enduring Understandings

- All animals have common basic needs: food (nutrients) and water for energy; air to breathe; shelter or space to shield offspring; and protection from heat and cold. Scientists classify living things in order to study them better. They group animals into two main categories: vertebrates (animals with backbones) and invertebrates (animals without backbones). The purpose of this lesson is for students to learn the characteristics of the main vertebrate and invertebrate animal groups.
- All animals have external structures that help them survive. These body parts take in food, water, and air; allow the animal to move around; and provide the animal with protection. Animals sense their surroundings in different ways using their physical structures. The purpose of this lesson is for students to explore and understand how animals' physical structures and behaviors help them survive.

NJ Standards/NGSS Performance Expectations Taught and Assessed
Students who demonstrate understanding can:

- 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and

respond to the information in different 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.
- 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.

3-Dimensional Learning Components

Science and Engineering Practices	Disciplinary Core Ideas (DCI)	Crosscutting Concepts
Developing and Using Models • Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) **Engaging in Argument from Evidence** • Construct an argument with evidence, data, and/or a model. (4-LS1-1)	**LS1.A: Structure and Function** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) **LS1.D: Information Processing** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)	**Patterns; Systems and System Models; Structure and Function** • In lesson 4.1, students notice patterns that allow them to classify animals as vertebrates or invertebrates. Students construct models of animal backbones and body coverings. This fosters a beginning understanding of animal classification based on observable similarities and differences in structure and function. **Systems and System Models; Structure and Function; Cause and Effect; Scale, Proportion, and Quantity** • In lesson 4.2, The indoor crayfish habitat is a model for a natural habitat. Students observe the crayfish's structures and functions and relate these to their role in the animal's survival. They also observe how physical structures work as a system within the animal. Students can determine cause and effect when they observe the responses and behaviors of their crayfish. Scale, proportion, and quantity relate to

		the measurement of crayfish length, weight, and strength.

Interdisciplinary Connections: Math, ELA, and Computer Science and Design Thinking

Math

- MP.4 Model with mathematics. (4- PS4-2)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)
- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

ELA

- RI.01 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI.04 Determine the meaning of general academic and domain specific words or phrases in a text relevant to a grade 4 topic or subject area.
- RI.07 Interpret information presented visually orally or quantitatively (e.g. in charts, graphs, diagrams, timelines, animations or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2),(4-LS1-2)

Computer Science and Design Thinking

- 8.1.5.DA.1 Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.5 Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
- 8.2.5.ED.2 Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3 Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

Career Readiness, Life Literacies, and Key Skills

- 9.3. ST-ET.2 Display and communicate STEM information.
- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.
- 9.3.ST.3 Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.

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Social-Emotional Learning Competencies		

• **Social Awareness:**
  ○ Demonstrate an understanding of the need for mutual respect when viewpoints differ.
  ○ Recognize and identify the thoughts, feelings, and perspectives of others.
• **Responsible Decision-Making Skills:**
  ○ Develop, implement, and model effective problem-solving and critical thinking skills.
• **Relationship Skills:**
  ○ Utilize positive communication and social skills to interact effectively with others.		

Learning Targets	**Investigations/Resources**	**Formative Assessment**

Animal Classification
 	
• Compare and review traits of living and nonliving things.
• Compare traits of vertebrates and invertebrates.
• Explain how animals' physical structures and body coverings may be used to classify them.
• Identify and compare observable characteristics of each major vertebrate group.
	Animal Classification
	
	Students understand the defining characteristics of the main vertebrate and invertebrate animal groups.
	• Session 1: What defines a living thing?
	  ○ Sorting Cards
	  ○ Basic Needs
	• Session 2: What does a backbone do?
	  ○ Make a Backbone
	• Sessions 3-4: How can we group animals by their body coverings?
	  ○ Animals Coverings
	• Session 5: How are invertebrates grouped?
	  ○ Invertebrates Content Reading
	• Session 6: How can we use notes and a graphic organizer to summarize and compare animal groups?
	  ○ Animal Groups
	  ○ Animal Groups Cards (cut and paste) or Activity Sheet 8: Animal Groups Organizer
		Animal Classification
		
		Formative: Use graphic organizers to assign animals into their correct categories: mammals, birds, reptiles, amphibians, fish, invertebrates.
		
		Summative: Explain what you have learned about how animals are categorized.

Physical Structures, Survival, and Crayfish	Physical Structures, Survival, and Crayfish	Physical Structures, Survival, and Crayfish

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• Associate the physical structures of animals with basic needs.
• Associate animal senses with survival behaviors.
• Identify, describe, and associate the physical structures and behaviors of crayfish with their basic needs.
• Design and construct a "prosthetic device" to replace a lost crayfish physical structure.
	Students explore and understand how animals' physical structures and behaviors help them survive.
	
	• Session 1: How do we prepare for crayfish?
	  ○ What are you thinking?
	  ○ Tips for a Successful Crayfish Lesson
	  ○ Crayfish Student Journal
	• Session 2: How can we safely observe crayfish?
	  ○ Crayfish Student Journal
	• Session 3: What are a crayfish's physical structures?
	  ○ Crayfish Student Journal
	• Session 4: How do an animal's physical structures help it to survive?
	  ○ Survival Structures
	  ○ Survival Structures Cards
	• Session 5: How can we measure crayfish length and weight?
	  ○ Crayfish Student Journal
	• Session 6: How do crayfish weight and strength compare?
	  ○ Crayfish Student Journal
	• Session 7: What do crayfish like to eat? (optional)
	  ○ Crayfish Student Journal
	• Session 8: How do crayfish behave?
	  ○ Crayfish Student Journal
	• Session 9: How do an animal's senses help with survival?
	  ○ Senses and Survival Reading/Comprehension Questions
	• Session 10: How can we compare natural and classroom crayfish habitats?
	  ○ Crayfish Student Journal
		Formative: Journal Response- How do the physical structures of animals help them meet their basic needs?
		
		Common Assessment (2 parts scored separately):
		
		Common Assessment (Part 1) - Crayfish Prosthetic
		
		Common Assessment (Part 1) - Crayfish Prosthetic RUBRIC
		
		Common Assessment (Part 2) Animal Structure/Crayfish Assessment
		
		Common Assessment (Part 2) Animal Structure/Crayfish Assessment ANSWER KEY

	COMMON ASSESSMENT: (See Links)
	• Sessions 11-13: Crayfish Prosthetic Device
	  ○ Crayfish Prosthetics
	• Session 14: Summative Assessments and Projects
	  ○ Animal Structures/Crayfish Test
	  ○ Crayfish Projects	

Instructional Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate

- Read articles and/or directions to students to help with comprehension
- Teacher provided scaffolding for designing investigations, one-on-one or in small groups
- Provide access to anchor charts and classroom labels relevant to science concepts
- Scribe for students or allow students to use talk-to-text feature on Chromebooks when responding to questions
- Provide access to articles and books further exploring the topic of study
- Any other modification as per student IEP or 504 plan

Common Assessment(s)	**Assessment Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate**
• Common Assessment (2 parts scored separately): • Common Assessment (Part 1) - Crayfish Prosthetic • Common Assessment (Part 1) - Crayfish Prosthetic RUBRIC • Common Assessment (Part 2) Animal Structure/Crayfish Assessment • Common Assessment (Part 2) Animal Structure/Crayfish Assessment Answer Key	• Provide modifications per IEPs

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Unit Title	**Time Frame/Pacing**
Plant Structure and Function	25 Days

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Phenomenon:

- Venus Fly Trap: Why do some plants eat bugs?
- Crab Phenomenon: Why is this happening?

Essential Questions:

- How do we classify living things?
- How can we compare natural and classroom habitats?
- How does a plant meet its basic needs for survival?
- How do plant structures work together for plant survival?
- How do plants respond to changes in temperature?
- How do different types of plants respond to the seasons?

Enduring Understandings

- Plants have internal and external structures that help them survive, grow, and reproduce. Some structures take in nutrients, water, and air. Some structures are for reproduction and some are designed to provide the plant with protection. The purpose of this lesson is for students to explore and understand how a plant's physical structures help it survive.
- Plants and animals are suited to living in their own particular habitat where they can meet their basic needs for survival. These basic needs are met through a combination of physical structures and behaviors. Sometimes an environment or habitat changes. The change may be part of a seasonal cycle. For example, the temperature and availability of food and water change with the seasons. Both plants and animals have adaptations, physical and behavioral patterns, which allow them to respond to these seasonal changes. The purpose of this lesson is for students to understand how plants and animals respond to seasonal changes through adaptations, thus allowing them to survive.

NJ Standards/NGSS Performance Expectations Taught and Assessed
Students who demonstrate understanding can:

- 4-LS1-1 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-LS1-2 Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

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3-Dimensional Learning Components		
Science and Engineering Practices	**Disciplinary Core Ideas (DCI)**	**Crosscutting Concepts**
Developing and Using Models • Use a model to test interactions concerning the functioning of a natural system. (4-LS1-2) **Engaging in Argument from Evidence** • Construct an argument with evidence, data, and/or a model. (4-LS1-1)	**LS1.A: Structure and Function** • Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. (4-LS1-1) **LS1.D: Information Processing** • Different sense receptors are specialized for particular kinds of information, which may be then processed by the animal's brain. Animals are able to use their perceptions and memories to guide their actions. (4-LS1-2)	**Patterns; Systems and System Models; Scale, Proportion, and Quantity; Structure and Function** • Students observe and relate plant structures and functions to plant survival. They recognize the plant itself as a system whose parts work together. Students may use standard measurement to record plant growth. When comparing similar structures from a variety of plants, students look for patterns among the structures and begin to classify plants into various groupings. Though the focus is on plants in this lesson, students are preparing to recognize that all living things have structures that satisfy their basic needs. **Patterns; Cause and Effect: Mechanism and Explanation; Systems and System Models; Stability and Change** • Students recognize plant and animal seasonal responses as a repeating pattern or cycle. They recognize cause and effect in terms of why plants and animals engage in their own specific seasonal behaviors. Students recognize how plants and animals are part of a larger cyclic system that is largely stable and predictable.
Interdisciplinary Connections: Math, ELA, and Computer Science and Design Thinking		

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Math

- MP.4 Model with mathematics. (4- PS4-2)
- 4.G.A.1 Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures. (4-PS4-2)
- 4.G.A.3 Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded across the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. (4-LS1-1)

ELA

- RI.01 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
- RI.04 Determine the meaning of general academic and domain specific words or phrases in a text relevant to a grade 4 topic or subject area.
- RI.07 Interpret information presented visually orally or quantitatively (e.g. in charts, graphs, diagrams, timelines, animations or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.
- W.4.1 Write opinion pieces on topics or texts, supporting a point of view with reasons and information. (4-LS1-1)
- SL.4.5 Add audio recordings and visual displays to presentations when appropriate to enhance the development of main ideas or themes. (4-PS4-2), (4-LS1-2)

Computer Science and Design Thinking

- 8.1.5.DA.1 Collect, organize, and display data in order to highlight relationships or support a claim.
- 8.1.5.DA.5 Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
- 8.2.5.ED.2 Collaborate with peers to collect information, brainstorm to solve a problem, and evaluate all possible solutions to provide the best results with supporting sketches or models.
- 8.2.5.ED.3 Follow step by step directions to assemble a product or solve a problem, using appropriate tools to accomplish the task.

Career Readiness, Life Literacies, and Key Skills

- 9.3. ST-ET.2 Display and communicate STEM information.
- 9.3.ST-SM.2 Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
- 9.3.ST-SM.3 Analyze the impact that science and mathematics has on society.
- 9.3.ST.3 Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.

Social-Emotional Learning Competencies

- **Social Awareness:**
  - Demonstrate an understanding of the need for mutual respect when viewpoints differ.
  - Recognize and identify the thoughts, feelings, and perspectives of others.

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- **Responsible Decision-Making Skills:**
  - Develop, implement, and model effective problem-solving and critical thinking skills.
- **Relationship Skills:**
  - Utilize positive communication and social skills to interact effectively with others.

Learning Targets	Investigations/Resources	Formative Assessment

Plant Structures and Survival
 	
• Associate the physical structures of plants (roots, stems, leaves, flowers, and fruits) with basic needs of plants.
• Associate the physical structures of plants with their specific functions and explain how these structures work together as a system in the plant.
• Observe and compare characteristics of plant structures in a variety of plants.
• Comprehend and respond to nonfiction texts.
	Plant Structures and Survival
	
	Students explore and understand how a plant's physical structures help it survive.
	• Session 1: How does a plant meet its basic needs for survival?
	  ○ Basic Needs of Plants
	• Session 2: What is the function of plant leaves?
	  ○ Leaves Breathe
	  ○ Plant Observation Journal
	• Session 3: What is the function of plant roots?
	  ○ Comparing Roots
	  ○ Plant Observation Journal
	• Session 4: What is the function of plant stems?
	  ○ Stems are Like Straws
	  ○ Plant Observation Journal
	• Session 5: What is the function of flowers?
	  ○ Flower Power
	  ○ Plant Observation Journal
	• Session 6: How do plant structures work together?
	  ○ Plant Parts: Who Am I?
		Plant Structures and Survival
		
		Formative Assessment: Plant journal entries recording observations about leaves, roots, stems, and flowers. Optional: Students work in cooperative groups to become "Plant Part Experts."
		
		Summative Assessment: Draw and label a plant with the 4 basic structures. Plants have different physical structures that help them survive. Name four specific plant parts and explain how their function supports a plant's survival.(paragraph)
		
		Common Assessment: Plant Structures Rubric and Answer Key
		Common Assessment Plants Student Copy

Plant and Animal Seasonal Responses • Describe how adaptations of plants allow them to respond to seasonal changes.	Plant and Animal Seasonal Responses Students understand how plants and animals respond to seasonal changes through different	Plant and Animal Seasonal Responses Formative Assessment: Journal entry- give examples of how plants respond to seasonal

• Carry out a guided inquiry about the effects of temperature on plants. • Describe how adaptations of animals allow them to respond to seasonal changes. • Compare seasonal behaviors of migration, hibernation and staying active. • Carry out a guided inquiry about the effects of temperature on animals. • Recognize and understand that conducting science investigations requires safe practices. • Comprehend and respond to nonfiction texts.	adaptations. • Session 1: How do plants respond to changes in temperature? ○ It's Chilly in There! Investigation ○ It's Chilly in There! Inquiry ○ Optional: Plant Observation Journals • Session 2: How do different types of plants respond to the seasons? ○ Plants and Trees Through the Year ○ Plant Chromatography • Session 3: How do crickets respond to changes in temperature? ○ Cool Crickets • Session 4: How do animals respond to seasonal changes? ○ It's Cold! Now What? • Session 5+: Culminating Activity: Interview ○ Interview Role-Play	change. Summative Assessment: Choose a plant that you learned about to interview. Write at least 4 questions for a plant and responses from that plant regarding how it responds to changes in seasons.

Instructional Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate

- Read articles and/or directions to students to help with comprehension
- Teacher provided scaffolding for designing investigations, one-on-one or in small groups
- Provide access to anchor charts and classroom labels relevant to science concepts
- Scribe for students or allow students to use talk-to-text feature on Chromebooks when responding to questions
- Provide access to articles and books further exploring the topic of study
- Any other modification as per student IEP or 504 plan

Common Assessment(s)	**Assessment Modifications and/or Accommodations (ELL, Special Education, Gifted, At-Risk of Failure, 504) When Appropriate**
• Draw and label a plant with the 4 basic structures. Plants have different physical structures that help them survive. Name four specific plant parts and explain how	• Provide modifications per IEP/504

their function supports a plant's survival.(paragraph) • Common Assessment: Plant Structures Rubric and Answer Key • Common Assessment Plants Student Copy	