HILLSBOROUGH TOWNSHIP SCHOOL DISTRICT

SCIENCE CURRICULUM

GRADE 2

AUGUST 2021

Grade 2
Science Course Overview

Second Graders will continue to build on their elementary experiences by exploring their world through collaborative investigations, projects, and observations. The second 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. The performance expectations in second grade help students formulate answers to questions such as: "How does land change and what are some things that cause land to change? What are the different kinds of land and bodies of water? How are materials similar and different from one another, and how do the properties of the materials relate to their use? What do plants need to grow? How many types of living things live in a place?"

Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students are also expected to compare the diversity of life in different habitats. An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials. Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change. Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth.

The crosscutting concepts of patterns, cause and effect, energy and matter, structure and function, stability and change, and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas.

In the second grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in the practices of science and engineering by developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

During their explorations of fast and slow changes of the Earth's landforms and water features students will have the opportunity to demonstrate their comprehensive knowledge and skills by designing a solution to halt erosion. For the project, they will need to rely on their understanding of the science concepts learned in each unit, as well as use technology and math concepts to solve each problem. In addition, students will be assessed on their ability to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and

interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information.

The second 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 second grade level.

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Unit Title	**Time Frame/Pacing**
Matter & Materials	12 weeks

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Anchoring Phenomenon:
"The 10 Most Useful Legos Bricks" Give students different lego bricks to play and explore with.

- How are different lego pieces used to make certain objects?
- Why are some more common than others?

Essential Questions:

- What are the states of matter?
- What are the observable properties of solids, liquids, and gases?
- How can we compare a solid, liquid, and gas?
- How does matter change?

Enduring Understandings

- Matter exists in various states.
- The differences between a solid, a liquid, and a gas can be explained in terms of the arrangement of small particles.
- Heating or cooling matter can change its structure.
- Changes in matter can be reversible or irreversible (physical or chemical).
- The structure of matter is not directly observable, but a model can be used to make explicit what is normally invisible.
- Tiny particles make up all the substances in the universe.

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

- 2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.
- 2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.
- 2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.
- 2-PS1-4 Construct an argument with evidence that some changes are caused by heating or cooling can be reversed and some cannot.

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3-Dimensional Learning Components

Science and Engineering Practices	Disciplinary Core Ideas (DCI)	Crosscutting Concepts
Planning and Carrying Out Investigations • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-PS1-1) **Analyzing and Interpreting Data** • Analyze data from tests of an object or tool to determine if it works as intended. (2-PS1-2) **Constructing Explanations and Designing Solutions** • Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena. (2-PS1-3) **Engaging in Argument from Evidence** • Construct an argument with evidence to support a claim. (2-PS1-4)	**PS1.A: Structure and Properties of Matter** • 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. (2-PS1-1) • Different properties are suited to different purposes. (2-PS1-2), (2-PS1-3) • A great variety of objects can be built up from a small set of pieces. (2-PS1-3) **PS1.B: Chemical Reactions** • Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not. (2-PS1-4)	**Patterns** • Patterns in the natural and human designed world can be observed. (2-PS1-1) **Cause and Effect** • Events have causes that generate observable patterns. (2-PS1-4) • Simple tests can be designed to gather evidence to support or refute student ideas about causes. (2-PS1-2) **Energy and Matter** • Objects may break into smaller pieces and be put together into larger pieces, or change shapes. (2-PS1-3)

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

Math

- MP.2 Reason abstractly and Quantitatively (2-PS1-2)
- MP.4 Model with mathematics. (2-PS1-1), (2-PS1-2).
- MP.5 Use appropriate tools strategically. (2-PS1-2)
- 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-PS1-1), (2-PS1-2)

ELA

- SL.1 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
- SL.2 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.
- RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4)
- RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4)
- RI.2.8 Describe how reasons support specific points the author makes in a text. (2-PS1-2), (2-PS1-4)
- W.2.1 Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4)
- W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-1), (2-PS1-2), (2-PS1-3)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a
- question. (2-PS1-1), (2-PS1-2), (2-PS1-3)

Computer Science and Design Thinking

- 8.1.2.DA.1 Collect and present data, including climate change data, in various visual formats.
- 8.1.2.DA.4 Make predictions based on data using charts or graphs.
- 8.1.2.AP.4 Break down a task into a sequence of steps.
- 8.2.2.ED.3 Select and use appropriate tools and materials to build a product using the design process.
- 8.2.2.NT.2 Brainstorm how to build a product, improve a designed product, fix a product that has stopped working, or solve a simple problem.

Career Readiness, Life Literacies, and Key Skills

- 9.1.2.CR.1 Recognize ways to volunteer in the classroom, school and community,

Social-Emotional Learning Competencies

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

Learning Targets	Investigations/Resources	Formative Assessment
Use dichotomous sorting to classify a set of attributes.	Students sort various solids by their attributes and explain the properties shared by the objects.	Exit ticket: Write two ways you can sort your lego bricks.

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Plan an investigation to determine which material is best suited to a specific task.	Develop and perform an inquiry to test the absorbency of sponges.	Journal entry: Which sponge is best for cleaning up spills? Why?
Recognize that all matter takes up space and has mass.	Explore items commonly found at the beach. Make observations to describe the ways they can take up space. Identify items as solid, liquid, or gas.	Exit ticket: Is sand a solid, liquid, or gas?
Differentiate between solids, liquids, and gases, based on observable properties.	Investigate how water changes shape when poured into different shaped containers, and compare the mass of water and objects using a pan balance. Investigate different solid materials and determine whether or not they can be deformed, and of those objects, which return to their original shape and which do not. Compare the mass of solids and objects using a pan balance. Investigate how gas has mass by using a digital scale to measure weight of a ball when inflated or deflated. Use an inverted cup in water to demonstrate how gas takes up space. Chart the properties of solids, liquids, and gases. Use the chart to compare and contrast properties of matter.	Exit ticket: Name two properties of [solids, liquids, or gases]. Journal entry: Imagine you are building a cave for a small stuffed bear. Which material would you choose out of the following, and why? (Clay, Lego, or sand) Journal entry: How are solids and liquids the same? How are they different?
Describe and explain how temperature can cause water to change from one state to another.	Observe ice cubes changing from solid to liquid over course of time. Children should check periodically with a thermometer.	Journal entry: Why do you think the ice cubes became water?
Describe how heating/cooling can cause reversible/irreversible changes.	Explore baked goods (cookies, brownies, cakes). Explain how these items have changed due to heat, and cannot be changed back. Discuss how some heat / cooling is reversible / irreversible.	Exit ticket: Is building a tower out of Lego a reversible or irreversible change? How do you know?
Explore how a structure made of separate pieces can	Discuss chemical vs physical changes. Conduct	Exit Slip: Multiple choice defining chemical and

be rearranged to form a new one.	following experiments to determine whether the change was chemical or physical. Experiment 1: Baking soda and vinegar mix. Observe how it is a solid, liquid. After mixing, there will be bubbles and a gas released. Experiment 2: Mixing sand and water. Solid and liquid. Students will explore how it can be separated back to its original properties. Experiment 3: Provide students with a set number of legos (any 25 bricks of their choice per structure). Have them build one structure. Challenge students to make a different structure using the same amount of legos.	physical change. Experiment 1: Student journal. Throughout the process, students will conduct hypotheses, observations, and conclusions. Experiment 2: Student journal. Throughout the process, students will conduct hypotheses, observations, and conclusions. Experiment 3: Student Journal. Create a tally chart showing the most commonly used Lego bricks. Why do you think that ___ brick was the most commonly used?

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**
• Structure and Properties of Matter	• Provide verbal directions to assessment questions. • Scribe for students or allow typing / talk to text feature to assist in recording responses.

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Unit Title	**Time Frame/Pacing**
Ecosystems	12 Weeks

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Anchoring Phenomena:

Present students with Bald Eagle cam periodically.

- How and why has the Bald Eagle population increased over the last several decades?

Essential Questions:

- What does a plant need to survive?
- What are the plants, and what does each part do?
- What happens if plants' basic needs are not met?
- What is a habitat?
- What are similarities and differences between various ecosystems (woodland, rainforest, desert, tundra, ocean water, freshwater)?
- How do you meet your basic needs in each of the ecosystem?
- What are adaptations for eating?
- How can body parts and behaviors help protect an animal?
- How can plants and animals help each other?
- How do adaptations help living things in its own habitat?
- Can we match living things to their specific ecosystems?
- How am I part of a food chain?
- How are predators and prey related?
- What is an herbivore, carnivore, omnivore or decomposer?
- How can I show relationships in a food chain?
- What happens when food chains and food webs change?
- What is a food web?
- What are some ways a habitat can change naturally?
- How do humans and animals live together?
- What are helpful and harmful changes to a habitat or ecosystem?
- How do human decisions affect an ecosystem?
- How can we help care habitats?

Enduring Understandings

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- Plants take in nutrients, exchange gases, reproduce, eliminate waste, and die.
- Plants and animals need air, water, food (nutrients) and space or shelter in order to live and grow.
- Plants also need light to live and grow.
- Through examination of the basic needs of plants, analyze the contribution of plants' structures to plants' overall health and begin to generalize the relationship between structure and function in the natural world.
- The characteristics of different types of ecosystems and discuss how they provide habitats for the plants and animals that live in them. Recognize patterns through exploration and comparison of characteristics of ecosystems. This pattern recognition leads to classification of ecosystems by overall temperature, rainfall, plants, and animals.
- Recognize cause and effect in terms of why plants and animals are able to survive in the specific habitat where they live.
- Begin to develop an understanding of scale, proportion, and quantity by understanding the relationship between living and nonliving parts of a habitat and ecosystem (smaller and bigger).
- Recognize how the living and nonliving parts of a habitat or ecosystem interact as parts of a much larger system and that there is a range of conditions within each ecosystem (temperature, rainfall) which remain fairly stable and thus allow survival of its inhabitants.
- Understand how various types of physical and behavioral adaptations assist animals and plants in survival.
- Recognize patterns through exploration and comparison of physical structures of plants and animals and animal behaviors. This pattern recognition leads to classification in categories such as eating, defense or protection, or overall basic needs.
- Recognize cause and effect in terms of how plants and animals use adaptations to survive in the specific habitat where they live.
- Begin to develop an understanding of scale, proportion, and quantity by understanding the relationship between plants and animals living in a habitat and ecosystem (smaller and bigger). Additionally, there is a range of conditions within each ecosystem (temperature, rainfall) which remain fairly stable to allow survival of its inhabitants.
- Some adaptations have developed as a response to seasonal changes within certain ecosystems.
- Understand the essential connection between plants and animals for food and for survival.
- Producers and consumers serve different roles in a food chain, food web, and ecosystem.
- Recognize patterns through exploration and comparison of characteristics of plants as producers and animals as consumers, which leads to classification of each and their roles in a food chain.
- Recognize cause and effect in terms of how plants and animals are interdependent.
- Begin to develop an understanding of scale, proportion, and quantity by constructing food chains and understanding the relationship between plants and animals in food chains and larger food webs in a habitat.
- Recognize how the living things in a habitat interact as parts of a much larger system that allows them to meet their basic needs for survival.
- Plants and animals interact with other living things in their habitat, but also nonliving things such as soil and water.
- Plants and animals require space to grow and find food.
- Plants, animals, and the nonliving parts of any habitat or ecosystem are interconnected.
- Natural and human factors may positively or negatively influence the stability of a habitat.
- We all have a responsibility for being good stewards of the land.

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

- 2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.
- 2-LS2-2 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.
- 2-LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.

3-Dimensional Learning Components

Science and Engineering Practices	Disciplinary Core Ideas (DCI)	Crosscutting Concepts
Developing and Using Models • Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) **Planning and Carrying Out Investigations** • Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. (2-LS2-1) • Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)	**LS2.A: Interdependent Relationships in Ecosystems** • Plants depend on water and light to grow. (2-LS2-1) • Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) **ETS1.B: Developing Possible Solutions** • 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. *(secondary to 2-LS2-2)* **LS4.D: Biodiversity and Humans** • There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)	**Cause and Effect** • Events have causes that generate observable patterns. (2-LS2-1) **Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

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

Math
- MP.2 Reason abstractly and quantitatively. (2-LS2-1)

- MP.4 Model with mathematics. (2-LS2-1), (2-LS2-2)
- MP.5 Use appropriate tools strategically. (2-LS2-1)
- 2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-LS2-2)

ELA

- RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text.
- RI.2.2 Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text
- RI.2.4 Determine the meaning of words and phrases in a text relevant to a grade 2 topic or subject area
- RI.2.7 Explain how specific illustrations and images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
- W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1), (2-LS4-1)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1), (2-LS4-1)
- SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)

Computer Science and Design Thinking

- 8.1.2.CS.1 Select and operate computing devices that perform a variety of tasks accurately and quickly based on user needs and preferences.
- 8.1.2.DA.4 Make predictions based on data using charts or graphs.
- 8.2.2.ED.1 Communicate the function of a product or device.
- 8.2.2.ED.2 Collaborate to solve a simple problem, or to illustrate how to build a product using the design process.
- 8.2.2.ED.3 Select and use appropriate tools and materials to build a product using the design process.
- 8.2.2.ITH.3 Identify how technology impacts or improves life.
- 8.2.2.ITH.4 Identify how various tools reduce work and improve daily tasks.
- 8.2.2.ETW.4 Explain how the disposal of or reusing a product affects the local and global environment.

Career Readiness, Life Literacies, and Key Skills

- 9.1.2.CR.1 Recognize ways to volunteer in the classroom, school and community.
- 9.1.2.RM.1 Describe how valuable items might be damaged or lost and ways to protect them.

Social-Emotional Learning Competencies

- **Social Awareness:** Demonstrate an awareness of the expectations for social interactions in a variety of settings.
- **Responsible Decision-Making:** Identify the consequences associated with one's actions in order to make constructive choices.

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Learning Targets	Investigations/Resources	Formative Assessment
Explain that all of a plant's basic needs must be met in order for it to live and grow.	Read a book about plants growing in space and identify cause and effect between a plant's environmental factors and its ability to survive.	Journal entry: How might the plant's survival be different if there were animals that might want to eat the tomatoes?
Describe the roles that a plant's roots, stems, and leaves played in its food production and survival.	Read about and diagram the parts of a plant.	Journal entry: Which part of the plant do you think is the most important? Why?
Plan and carry out a guided inquiry about the basic needs of plants.	Design investigations of what happens to plants if they do not have access to a basic need: light, water, or space to grow. Observe differences in how the plants grow in comparison to a plant that has access to light, water, and space to grow.	Journal entry: What do you think will happen to plants if they do not have access to all of their basic needs? Ongoing plant observation journals
Analyze and interpret data from the inquiry. Communicate ideas about observations both verbally and in writing.	Compare and contrast the plants from the inquiry. Measure plants and compare plant heights.	Journal entry: What patterns did you notice between the different plants we grew? What does this tell you about the needs of plants?
Compare characteristics of the following ecosystems: woodland forest and rainforest; desert and polar (tundra); and fresh and saltwater.	Using stations, have students explore the ecosystems. Provide books based on the ecosystem, pictures, and videos. Day 1: Woodland forest (include ongoing observations of Bald Eagles) and Rainforest Day 2: Desert and Polar Tundra Day 3: Fresh and Saltwater	Daily Exit Ticket: Students explain one similarity and one difference in the ecosystem per day.
Give examples of animals and plants that live in each ecosystem. Locate main idea and details in content-based nonfiction text using text features.	In small groups students will read nonfiction texts about an ecosystem. Provide guided questions regarding animals and plant life. Students will share their findings as a class.	As students present findings, peers will record different animals and plants in ecosystems in science journals.
Understand that within each ecosystem there are	As a class, make a graphic organizer explaining the	Teacher will collect suitcases for each student

many habitats which are able to support the plants and animals suited specifically to living there.	main characteristics of each ecosystem. Students will then work to "Pack a bag" if they traveled to each ecosystem. Students determine which items would be best suited for the ecosystem.	inorder to check student understanding of the topic.
Differentiate between structural and behavioral adaptations. Classify adaptations in terms of basic needs: taking in water and nutrients, breathing, defense and protection from predators, finding shelter, and managing body temperature.	Explain why animals might need to protect themselves. Identify different structural adaptations as a class. Example: Predatory and Prey eye shape. Create class anchor chart on different structural features. Explain how animals have adapted behavior in order to protect themselves. Use an anchor chart as a guide. Examples: playing dead, puffing up to look bigger, hiding in packs. Sort adaptations into structural or behavioral categories. Match adaptations to the basic needs they fulfill.	Exit Slip: What are some ways the Bald Eagle has adapted to its surroundings to protect themselves and their babies? Journal entry: Explain the use of Bald Eagle beaks, talons, and size. Exit slip: A bird's beak has adapted to break open seeds or search and eat insects easily. What basic need does this adaptation fulfill?
Communicate examples of external structures and information processing systems which are suited to a particular ecosystem.	Explain why certain adaptations are best suited for a particular ecosystem. Students will match animals to different ecosystems based on their structural adaptation.	Activity: Students will create an animal that would be well suited for a specific ecosystem and will explain how the adaptations help the animal survive.
Explain interdependent relationships between animals and plants in any given ecosystem (pollination, seed dispersal, food, and shelter).	Explain interdependence as a class and provide definition. Brainstorm different things we are dependent on. Identify different animals that live in interdependent relationships.	Journal Entry: Students will identify three examples of interdependent relationships.
Differentiate between and give examples of producers and consumers.	Brainstorm different foods children commonly eat, and sort the foods into categories of plants, animals, and unsure. Use a diagram to show how energy passes through plants and animals to become food. Introduce terms producer and consumer.	Exit ticket: Give two examples of producers and consumers.

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Differentiate between and give examples of herbivore, carnivore, omnivore, decomposer, predator, and prey.	Play predator freeze tag to introduce the concept of predators and prey. Read nonfiction text to learn and define terms (herbivore, carnivore, omnivore, decomposer, predator, prey). Complete fill-in-the-blank riddles to identify producers, consumers, and decomposers.	Journal entry: Are you a carnivore, omnivore, or herbivore? How do you know? What is a Bald Eagle? How do you know?
Construct a food chain that correctly shows the relationship among the sun, producers, consumers, and decomposers.	Explain the roles of the sun, producers, consumers, and decomposers in a food chain using anchor chart. Engage students in an activity where they order the relationship roles in an example food chain. Example: Use images of sun, grass, mouse, snake, worm. Students will order the process with arrows.	Fill in the Blank. Students will identify each role in the food chain based on a description.
Explain how the members of any food chain or food web are connected to, or dependent upon, each other.	Compare and contrast the difference between food chains and food webs. Explain how food webs include multiple food chains. Use images and arrows to show the relationship between plants and animals in a food web. Discuss how some members depend on each other for food. Activity: Distribute food web cards showing different members of a food web. Read about what each member eats or is eaten by. Students will use arrows to connect the different members, making a food web.	Journal Prompt: What would happen to the Eagle population if fish disappeared?
Explain interdependence within a food web or habitat as a "system."	Discuss the use of pesticides in the environment and how they impacted the Bald Eagle population through interdependancy. Through laws and conservation, how did this increase the population over decades? (The use of DDT used to protect farm crops, through the food chain, caused Eagle egg shells to be too thin, therefore breaking during lay time or	Students will create a flow chart using drawings to show the contamination of water runoff into rivers>bugs>fish>Eagles or river>bugs>frogs>snakes>Eagles.

	incubation).	
Communicate cause and effect examples of natural changes in a habitat: rain or snowfall, flood, drought, wild fire, or other natural disaster.	In small groups students will come up with 2 ways the environment (land, water, plants, animals, insects) is impacted by rain, snowfall, flood, wildfire, drought. Separate into groups by each natural disaster.	Natural Cause and Effect. Guide students to fill in a chart to explain how each natural change might affect local plants and animals (and thus food chains and food webs). How would a tropical storm or hurricane affect a Bald Eagle
Communicate cause and effect examples of human impact on habitats and classify them as positive or negative.	In small guided groups, summarize the details from the reading about helpful human changes and harmful human changes. Students will work together to build a new shopping mall in an area that is part forest, part meadow, and part wetlands. Then they will describe their observations.	Exit Slip: How can changes in any habitat affect both plants and animals? What changes are helpful? What changes are harmful? Journal Entry: What happened to all the trees? Wetlands? Meadow? What happened to all the plants? Animals?
Communicate examples of how people can be good stewards of their local habitat.	Explain and list how people can help habitats and the plants and animals that live in them.	Activity: Brainstorm and create a project that shows how we can help care for habitats (i.e. bird feeders, butterfly houses, recycling, etc.) Name how humans are aiding in the support and education of the Bald Eagle species? Give time to sketch, create, and work on final presentations.

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**

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• Ecosystems	• Provide verbal directions to assessment questions. • Scribe for students or allow typing / talk to text feature to assist in recording responses.

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Unit Title	**Time Frame/Pacing**
Fast and Slow Changes	12 Weeks

Phenomena/Anchoring Activity/Anchoring Question/Essential Questions

Anchoring Phenomenon:
Present students with videos and pictures of the Grand Canyon over time.

- How was the Grand Canyon formed?

Essential Questions:

- Maps are flat, so how do cartographers show the different properties of land and water?
- What does Earth really look like?
- Where is all the water on Earth?
- What are landforms?
- How can we make a model of Earth's landforms and water features? (Planning, building, and presenting a model)
- How does weathering and erosion shape the Earth's surface?
- How can we make a model of weathering?
- How can we make a model of erosion?
- How do fast changes versus slow changes shape the Earth's surface?
- How do plants affect erosion?
- How can we design a site plan to minimize erosion on a hillside?
- How can we build and test our site plan?
- How can we revise and retest our site plan?
- How can we share our site plan?

Enduring Understandings

- Earth's surface undergoes fast and slow changes resulting in landforms and water features.
- Models are a means to visualize and understand a system (Earth) that is much too big to take in with the naked eye.
- As students construct models of Earth's features they can see patterns such as rivers running from mountains to oceans and mountains sheltering deep valleys that characterize the Earth's physical surface.
- Processes such as weathering and erosion shape Earth's features.
- Fast changes versus slow changes shape Earth's features in different ways.
- Fast and slow changes help Earth cycle its matter for use in different ways.
- Strategies to slow the erosion (a natural change) of a hillside.

- Using a model of the hillside, they test various solutions to understand the role of design in solving human problems.

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

- 2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.
- 2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid or liquid.
- 2-ESS1-1 Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
- 2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- K-2-ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
- K-2-ETS1-3 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

3-Dimensional Learning Components

Science and Engineering Practices	Disciplinary Core Ideas (DCI)	Crosscutting Concepts
Constructing Explanations and Designing Solutions • Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1) • Compare multiple solutions to a problem. (2-ESS2-1) **Developing and Using Models** • Develop a model to represent patterns in the natural world. (2-ESS2-2) • Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2) **Obtaining, Evaluating, and Communicating Information**	**ESS1.C: The History of Planet Earth** • Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1) **ESS2.A: Earth Materials and Systems** • Wind and water can change the shape of the land. (2-ESS2-1) **ESS2.B: Plate Tectonics and Large-Scale System Interactions** • Maps show where things are located. One can map the shapes and kinds of land and water in any area. (2-ESS2-2) **ESS2.C: The Roles of Water in Earth's Surface Processes**	**Stability and Change** • Things may change slowly or rapidly. (2-ESS1-1) **Patterns** • Patterns in the natural world can be observed. (2-ESS2-2), (2-ESS2-3) **Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2)

• Obtain information using various texts, text features (e.g., headings, tables of contents, glossaries, electronic menus, icons), and other media that will be useful in answering a scientific question. (2-ESS2-3) **Asking Questions and Defining Problems** • Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) **Analyzing and Interpreting Data** • Analyze data from tests of an object or tool to determine if it works as intended. (K-2-ETS1-3)	• Water is found in the ocean, rivers, lakes, and ponds. Water exists as solid ice and in liquid form. (2-ESS2-3) **ETS1.C: Optimizing the Design Solution** • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. *(secondary to 2-ESS2-1)* **ETS1.A: Defining and Delimiting Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1) **ETS1.B: Developing Possible Solutions** • 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. (K-2-ETS1-2)	

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

Math
- MP.2 Reason abstractly and quantitatively. (2-ESS1-1), (2-ESS2-1), (2- ESS2-2)
- MP.4 Model with mathematics. (2-ESS1-1), (2-ESS2-1), (2-ESS2-2)

- MP.5 Use appropriate tools strategically. (2-ESS2-1)
- 2.NBT.A Understand place value. (2-ESS1-1)
- 2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form. (2- ESS2-2)
- 2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2-ESS2-1)

ELA

- RI.2.1 Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1)
- RI.2.3 Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1), (2-ESS2-1)
- RI.2.9 Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1)
- W.2.6 With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS1-1), (2-ESS2-3)
- W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1)
- W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2- ESS1-1), (2-ESS2-3)
- SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1)
- SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-ESS2-2)

Computer Science and Design Thinking

- 8.1.2.DA.1 Collect and present data, including climate change data, in various visual formats.
- 8.1.2.DA.4 Make predictions based on data using charts or graphs.
- 8.2.2.ED.1 Communicate the function of a product or device
- 8.2.2.ED.3 Select and use appropriate tools and materials to build a product using the design process.
- 8.2.2.ITH.5 Design a solution to a problem affecting the community in a collaborative team and explain the intended impact of the solution.

Career Readiness, Life Literacies, and Key Skills

- 9.1.2.CR.1 Recognize ways to volunteer in the classroom, school and community.
- 9.1.2.RM.1 Describe how valuable items might be damaged or lost and ways to protect them.

Social-Emotional Learning Competencies

- **Self Management:** Identify and apply ways to persevere or overcome barriers through alternative methods to achieve one's goals
- **Responsible Decision-Making:** Develop, implement, and model effective problem-solving and critical thinking skills.

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- **Relationship Skills:** Utilize positive communication and social skills to interact effectively with others.

Learning Targets	Investigations/Resources	Formative Assessment
Explain how landform maps serve as models of Earth's features.	Discuss what a map is a model of, and what features can you identify. Notice how the Earth is made up of land and mostly water.	Activity Sheet(s): Color and label world map - continent and oceans.
Locate and describe the main types of landform and water features.	Read nonfiction text article, "What are Landforms?" and color code each landform on the drawing.	Exit Slip: Use your hand to identify and remember landforms and water features.
Differentiate between salt and fresh water features.	Perform an investigation of salt water. Place salt water and fresh water into two identical containers. Observe what happens as the water evaporates. Students will draw and explain what they see.	Journal entry: Which container of water could have come from an ocean and which could have come from a pond, and why do you think that?
Create a model to represent landforms and water features.	In small groups, students will work together to plan and build a "relief" map to show different physical features. Include shapes for each feature and different materials.	Planning Sheet and Reflection: Write the steps your group took in the process of building your map and what each part of the map represents. Label where land and water meet.
Explain and give examples of weathering and erosion as a slow change.	Show photo examples of weathering to students in small groups. Have groups generate observations and questions about the photos, and chart them as a class. Define the word weathering as a class. Read nonfiction text about weathering and what causes weathering. Model the effects of weathering from wind and water on land by constructing a sand castle. Simulate wind by blowing through a straw directed at the sand castle, and simulate rain by spraying the castle with a water bottle.	Journal entry: Do you think the weathering of the Grand Canyon happened quickly or took a long time? Why? Journal entry: Revisit the question from the previous lesson. Give an example to support your thoughts. Journal entry: How did the investigation model weathering from wind and rain? Draw and label a diagram to help explain your answer.

	Show photo examples of erosion to students in small groups. Have groups generate observations and questions about the photos, and chart them as a class. Define the word erosion as a class. Read nonfiction text about erosion and what causes erosion. Model the effects of erosion due to water on the following: shoreline/beach, hillside/riverbank, and landslide. Use natural materials such as sand, pebbles, dirt, and water in sloped trays to simulate erosion. Sketch before and after pictures for each investigation, and record observations.	Journal entry: Do you think erosion is a fast or slow change? Why? What kinds of weather do you think helped form the Grand Canyon? Why? Journal entry: Revisit the question from the previous lesson. Give an example to support your thoughts. Journal entry: Choose one of the models we investigated. How might erosion affect people and animals that live in that area?
Explain and give examples of fast changes to Earth's surface.	Read nonfiction text about fast changes to the Earth's surface. Chart wonderings and new learnings as a class.	Exit ticket: Which fast change do you find the most interesting and why?
Differentiate between slow and fast changes to Earth's surface.	Review class charts about weathering, erosion, and fast changes. Share journal entries about fast and slow changes from previous lessons in small groups or partnerships.	Exit ticket: Give two examples of slow changes, and two examples of fast change that helped from the Grand Canyon.
Design and compare multiple solutions designed to prevent or slow water from changing the shape of the land. Create a labeled diagram and physical model to illustrate how the solution solves the given problem.	Investigate how plants affect erosion. Create two models of a hillside in sloped trays: one with just sand, and another with sand and a piece of sod over top. Pour water on both trays and compare the results. Present students with the following scenario: Pretend you are a civil engineer, helping a client determine where on their property to build a house. The land they own is a big hill, so water erosion	Journal entry: Why did the tray with plants in it have less erosion? Hint: think about the parts of a plant and tree canopies/coverings and how they might help! Students will keep ongoing design notes, diagrams, and observations in their journals.

	will be a problem. Decide where on the hill is the safest place to build the house, and design a way to protect the hill from water erosion. Provide students with a variety of materials (tray, paper house, craft sticks, pebbles, sod, etc.). Over multiple sessions, have groups of students work together to create designs of the property by drawing labeled diagrams. Choose one design to construct a physical model of, and test the design.	Journal entry: What is something that went well with your original design? What is something you would like to change?
Analyze observational data from tests of multiple design solutions.	After testing each group's models, chart design elements that were successful or unsuccessful as a class. Allow students to reconvene with their group and make changes to their design plans, and retest new plans.	Journal entry: What do you think is the most successful solution for preventing erosion? Why?
Compare how each design solution performs.	Have groups create a poster of their final design. Groups will present their designs to the class, and explain why their design was successful. As a class, discuss similarities and differences between the designs from each group.	Journal entry: Do you think that building a house alongside the Grand Canyon is a good idea or not? Why?

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**
• Fast and Slow Changes	• Provide verbal directions to assessment questions.

	• Scribe for students or allow typing / talk to text feature to assist in recording responses.