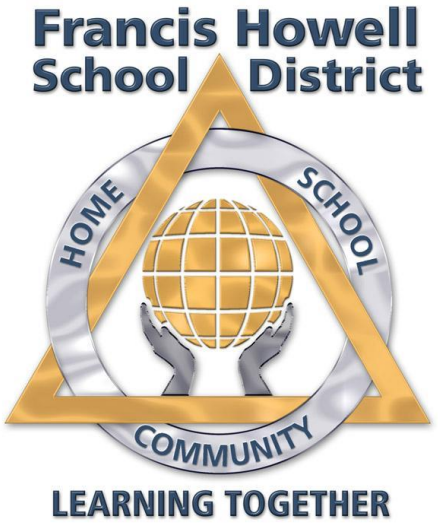
Third Grade

Science Curriculum



Board Approved:
July 19, 2018

Francis Howell School District

Mission Statement

Francis Howell High School is committed to working in partnership with the community (staff, students, parents, and community members) to provide a quality learning environment that promotes continuous improvement for students in achievement, attachment and awareness.

Vision Statement

The Francis Howell High School Community will provide a high-quality educational experience that will result in students possessing the necessary knowledge and skills to become life-long learners and be positive contributors within their community.

The Francis Howell High School Community will provide an environment which develops a sense of personal and school pride, cultural awareness and tolerance.

Values

Francis Howell School District is committed to:

High Expectations
Continuous Improvement
Engagement, Collaboration, and Partnerships
Innovation
Safety
Trust, Respect, and Inclusiveness
Customer Service and Satisfaction
Accountability and Transparency

Francis Howell School District Graduate Goals

Upon completion of their academic study in the Francis Howell School District, students will be able to:

1. Gather, analyze and apply information and ideas.
2. Communicate effectively within and beyond the classroom.
3. Recognize and solve problems.
4. Make decisions and act as responsible members of society.

Science Graduate Goals

Upon completion of their Science study in the Francis Howell School District, students will be able to:

- Use Scientific and Engineering Practices to understand how scientific knowledge develops and the work of engineers, as well as the links between engineering and science. These practices include:
    - Asking questions (for science) and defining problems (for engineering)
    - Developing and using models
    - Planning and carrying out investigations
    - Analyzing and interpreting data
    - Using mathematics and computational thinking
    - Constructing explanations (for science) and designing solutions (for engineering)
    - Engaging in argument from evidence
    - Obtaining, evaluating, and communicating information
- Develop an understanding of, and be able to explain, concepts that bridge disciplinary boundaries, including:
    - Patterns
    - Cause and effect: Mechanism and explanation
    - Scale, proportion, and quantity
    - Systems and system models
    - Energy and matter: Flows, cycles, and conservation
    - Structure and function
    - Stability and change
- Use scientific knowledge to understand the world in four major domains:
    - Physical sciences (Matter and its interactions, Motion and Stability, Energy, Waves and Their Applications)
    - Life sciences (From Molecules to Organisms, Ecosystems, Heredity, Biological Evolution)
    - Earth and space sciences (Earth's Place in the Universe, Earth's Systems, Earth and Human Activity)
    - Engineering, technology, and the applications of science (Engineering Design, Links among Engineering, Technology, Science, and Society)

Rationale for Elementary Science

Science, engineering, and technology permeate nearly every facet of modern life, and they also hold the key to meeting many of humanity's most pressing current and future challenges. The overarching goal of science education is to ensure that all students have some appreciation of the beauty and wonder of science; possess sufficient knowledge of science and engineering to engage in public discussions on related issues; are careful consumers of scientific and technological information related to their everyday lives; are able to continue to learn about science outside of school; and have the skills to enter careers of their choice, including (but not limited to) careers in science, engineering, and technology. Elementary science in Francis Howell School District will develop student understandings and skills which are necessary for them to function productively as problem-solvers in a scientific and technological world, cultivate students' scientific and engineering habits of mind, develop their capability to engage in scientific and engineering practices, and teach them how to reason in the contexts of science, engineering, and technology.

Third Grade Science Course Description

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

K-3 Science Curriculum Team

Curriculum Committee

Sara Abney	Central Elementary
Melissa Barth	Harvest Ridge
Becky Bee	Fairmount
Brittany Booth	Fairmount
Samantha Calise-Moody	Daniel Boone
Teresa Gilstrap	Becky-David
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Melissa Kirchoff	Fairmount
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Rebecca Lewis	Harvest Ridge
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Academics and Administration

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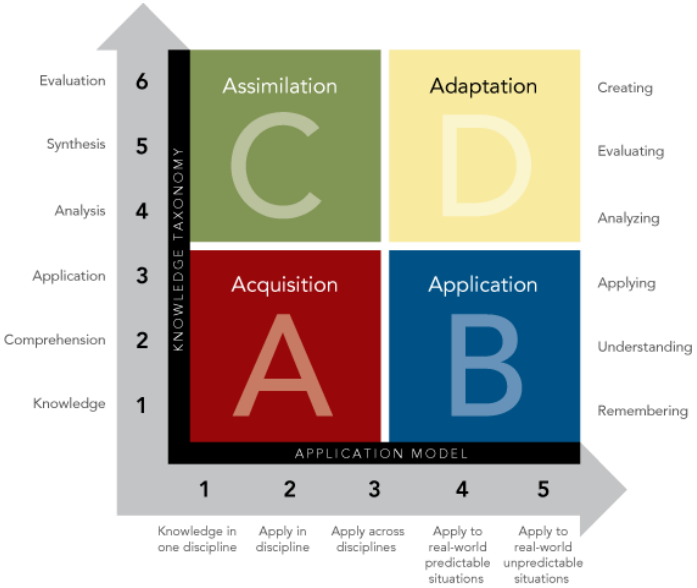
Curriculum Notes

All FHSD performance tasks and sample learning activities are aligned not only to understandings and standards, but also the Rigor and Relevance Framework and 21st Century Skills. Information on these two things is provided below or by clicking on the hyperlinks.

Rigor and Relevance Framework

The Rigor/Relevance Framework is a tool developed by the International Center to examine curriculum, instruction, and assessment along the two dimensions of higher standards and student achievement.



The Rigor/Relevance Framework has four quadrants.
Quadrant A represents simple recall and basic understanding of knowledge for its own sake. Examples of Quadrant A knowledge are knowing that the world is round and that Shakespeare wrote Hamlet.

Quadrant C represents more complex thinking but still knowledge for its own sake. Quadrant C embraces higher levels of knowledge, such as knowing how the U.S. political system works and analyzing the benefits and challenges of the cultural diversity of this nation versus other nations.

Quadrants B and D represent action or high degrees of application. Quadrant B would include knowing how to use math skills to make purchases and count change. The ability to access information in wide-area network systems and the ability to gather knowledge from a variety of sources to solve a complex problem in the workplace are types of Quadrant D knowledge.

A	B	C	D
Students gather and store bits of knowledge and information. Students are primarily expected to remember or understand this knowledge.	Students use acquired knowledge to solve problems, design solutions, and complete work. The highest level of application is to apply knowledge to new and unpredictable situations.	Students extend and refine their acquired knowledge to be able to use that knowledge automatically and routinely to analyze and solve problems and create solutions.	Students have the competence to think in complex ways.

21st Century Skills

These skills have been pared down from 18 skills to what are now called the 4Cs. The components include critical thinking, communication, collaboration, and creativity. Critical thinking is focused, careful analysis of something to better understand and includes skills such as arguing, classifying, comparing, and problem solving. Communication is the process of transferring a thought from one mind to others and receiving thoughts back and includes skills such as choosing a medium (and/or technology tool), speaking, listening, reading, writing, evaluating messages. Collaboration is working together with others to achieve a common goal and includes skills such as delegating, goal setting, resolving conflicts, team building, decision-making, and managing time. Creativity is expansive, open-ended invention and discovery of possibilities and includes skills such as brainstorming, creating, designing, imagining, improvising, and problem-solving.

Standards

Standards aligned to this course can be found:

Science Standards

http://www.nextgenscience.org/overview-topics

https://dese.mo.gov/sites/default/files/curr-mls-standards-sci-k-5-sboe-2016.pdf

National Educational Technology Standards

http://www.iste.org/standards/standards/for-students-2016

Units & Standards Overview

Quarter 1 **Quarter 2** **Quarter 3** **Quarter 4**

Unit 1: May the Force be With You	**Unit 2: Bee the Change**	**Unit 3: The Apple Doesn't Fall Far...**	**Unit 4: Climates of the World**
NGSS 3-PS2-1/MO 4.PS2.A.2 NGSS 3-PS2-2/MO 4.PS2.A.1 NGSS 3-PS2-3/MO 3.PS2.B MO 4.PS.3.C.1 NGSS 3-PS2-4 **CCC1** **CCC2** **CCC3** **SEP1** **SEP2** SEP3	**NGSS 3-LS2-1** NGSS 3-LS4-1 NGSS 3-LS4-3/ MO 3.LS1.A.1& 3.LS3.C.1 **NGSS 3-LS4-4/MO 3.LS3.D.1** **CCC2** **CCC3** CCC4 **SEP1** **SEP2** **SEP4** SEP7	NGSS 3-LS1-1/MO 3.LS1.B.1 NGSS 3-LS3-1//MO 3.LS3.A.1 **NGSS 3-LS3-2/MO 3.LS3.A.1** NGSS 3-LS4-2/MO 3.LS3.B.1 **CCC1** **CCC2** **SEP1** **SEP2** **SEP4** **SEP6**	**NGSS 3-ESS2-1/MO3.ESS.2.D.1** NGSS 3-ESS2-2/MO 3.ESS2.D.2 NGSS 3-ESS3-1/MO 3.ESS3.B.1 **CCC1** **CCC2** **SEP1** **SEP2** **SEP4** SEP7 SEP8
PE Assessment:	**PE Assessment:**	**PE Assessment:**	**PE Assessment:**
Marshmallow Launcher Assessment	Coming Ashore Assessment	Snow Rabbits Assessment	Climate Assessment

Course Map

	Unit Description	PE Standards
Unit 1: May the Force be with You **5 weeks**	Students are able to determine the effects of balanced and unbalanced forces on the motion of an object. They will also be able to determine the cause and effect relationships of electric or magnetic interactions between two objects that are not in contact with each other. They are then able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets.	**3-PS2-1** **CCC1** (patterns) **CCC2** (cause and effect) **CCC3** (scale, proportion, and quantity) **SEP2** (developing and using models) **SEP6** (constructing explanations and designing solutions)
Unit 2: Bee the Change **4-5 weeks**	Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments. Third graders are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die.	**3-LS2-1** **3-LS4-4** **CCC2** (cause and effect) **SEP1** (asking questions and defining problems)
Unit 3: The Apple Doesn't Fall Far... **4-5 weeks**	Students are expected to develop an understanding of the similarities and differences of organisms' life cycles. Students will understand that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops. In addition, students will use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.	3-LS4-2 3-LS3-1 **3-LS3-2** **CCC2** (cause and effect) **SEP6** (constructing explanations and designing solutions)
Unit 4: Climates of the World **4-5 weeks**	Students are expected to organize and use data to describe typical weather conditions during a particular season and to describe climates in different regions. Students are expected to make a claim about the merit of a design solution that reduces the impacts of weather-related hazards, by applying their understanding of such hazards.	**3-ESS2-1** **CCC1** (patterns) **SEP4** (analyzing and interpreting data)

Unit 1: May the Force be With You

Content Area: Science	Course: Third Grade	UNIT: May the Force be With You

Unit Description:	Unit Timeline:
Students are able to determine the effects of balanced and unbalanced forces on the motion of an object. They will also be able to determine the cause and effect relationships of electric or magnetic interactions between two objects that are not in contact with each other. They are then able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets. **Link to anchor chart:** May the Force Be With You Chart	5 weeks

DESIRED Results
Transfer Goal - ***Students will be able to independently use their learning to……*** 1. **Ask questions and define problems**: Ask questions that can be investigated based on patterns such as cause and effect relationships. Define a simple problem that can be solved through the development of a new or improved object or tool. 2. **Develop and use models:** Develop a model using an analogy, example, or abstract representation to describe a scientific principle. 3. **Plan and carry out investigations:** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution.

Understandings (Cross Cutting Concepts) – *Students will understand... (Big Ideas)*

1. (Patterns) Patterns of change can be used to make predictions.
2. (Cause and Effect) Cause and effect relationships are routinely identified, tested, and used to explain change.
4. (Systems & System Models) A system can be described in terms of its components and their interactions.

<u>Essential Questions</u>: *Students will keep considering…*

An Essential Question is meant to:

- How do equal and unequal forces on an object affect the object?
- How can patterns be used to predict future motion?
- How can magnets be used to solve problems?
- How can magnets interact between two objects that are not in contact?
- How are simple machines used?

STANDARDS ADDRESSED

Students who demonstrate understanding can:
NGSS 3-PS2-1/MO 4.PS2.A.2: Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

NGSS 3-PS2-2/MO 4.PS2.A.1: Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a seesaw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]

NGSS 3-PS2-3/MO 3.PS2.B.1: Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paper clips, and the force exerted by one magnet versus the force exerted by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.]

MO 4.PS.3.C.1: Use models to explain that simple machines change the amount of effort force and/or direction of force. [Clarification Statement: memorization of a simple machine is not the focus, concept builds on the application of force and motion.]

NGSS 3-PS2-4: Define a simple design problem that can be solved by applying scientific ideas about magnets. [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]

Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
PS2.A: Forces and Motion Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that	**CCC2: Cause and Effect** ● Cause and effect relationships are routinely identified. (3-PS2-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Ask questions that can be investigated

do not sum to zero can cause changes in the object's speed or direction of motion. (3-PS2-1) PS2.B: Types of Interactions Objects in contact exert forces on each other. (3-PS2-1)		based on patterns such as cause and effect relationships. (3-PS2-3) <u>SEP3: Planning and Carrying Out Investigations</u> Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1)
PS2.A: Forces and Motion The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2)	**<u>CCC1: Patterns</u>** ● Patterns of change can be used to make predictions. (3-PS2-2)	<u>SEP3: Planning and Carrying Out Investigations</u> Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions. ● Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)
PS2.B: Types of Interactions Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-3)	**<u>CCC2: Cause and Effect</u>** ● Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)	**<u>SEP1: Asking Questions and Defining Problems</u>** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Ask questions that can be investigated based on patterns such as cause and effect relationships. (3-PS2-3)

PS3.C: Relationship Between Energy and Forces A simple machine can change the amount of force or distance necessary to do work. (MO 4-PS3C-1)	CCC4: System and System Models ● A system can be described in terms of its components and their interactions. (MO 4-PS3C-1)	**SEP2: Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop a model using an analogy, example, or abstract representation to describe a scientific principle. (MO 4-PS3C-1)
PS2.B: Types of Interactions Electric and magnetic forces between a pair of objects do not require that the objects be in contact. The sizes of the forces in each situation depend on the properties of the objects and their distances apart and, for forces between two magnets, on their orientation relative to each other. (3-PS2-4)	CCC4: System and System Models ● A system can be described in terms of its components and their interactions. (MO 4-PS3C-1) **CCC2: Cause and Effect** ● Cause and effect relationships are routinely identified, tested, and used to explain change. (3-PS2-3)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Define a simple problem that can be solved through the development of a new or improved object or tool. (3-PS2-4)

Unit 1 (May the Force be With You): Assessment

EVIDENCE of LEARNING			
Understanding 2	Standards **3-PS2-1** 3-PS2-2 **CCC1** (patterns) **CCC2** (cause and effect) **CCC3** (scale, proportion, and quantity) **SEP2** (developing and using models) **SEP6** (constructing explanations and designing solutions)	**Unit Performance Assessment**: Marshmallow Launcher 1) Watch the video of the Marshmallow Launcher. 2) **Scoring Guide:** *Performance Task Document*	**R/R Quadrant/ 21 Century** B,C critical thinking, communication, creativity

Unit 1: Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment: Performance Task Document (note the pre and post assessment are the same)
Anchoring Phenomena for this Unit: Levitating Train, Raising a Flag
This curriculum is based off of the Next Generation Science Standards. For clarification on the standards, please visit the Wonder of Science website. Go to the standards tab to find your grade level and unit. After clicking on the unit, you will see a list of standards students should learn that you can click. After clicking on the standard then the evidence link, you will find a clarification statement as well as the practices you should take the standard through. Also included is observable features of student performance by the end of the grade that will help indicate whether or not the student has met the standard. This unit outlines how to take one of the content objectives from each unit through a specific inquiry process using the 3-dimensional learning outlined in our standards and gives sample activities that would ensure the objective is taught to students. Many of the sample activities in these units have *Asking Questions and Defining Problems* and *Developing a Model* in addition to the other scientific practices found in the evidence section. We added these two practices to use as a pre-assessment and to see what the students already know and understand about the standard to guide our instruction. It will be up to you to look at the objectives that are not addressed in this document and make plans accordingly.

Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant: 21C:
2	NGSS 3-PS2-3; MO 3.PS2.B.1 NGSS 3-PS2-4 **CCC2** (cause and effect) **SEP1** (asking questions and defining problems)	**1. Title: Asking Questions and Defining Problem (Levitating Train - first activity)** **Objective:** Students will ask and answer questions about the cause and effect of different types of magnetic forces. **Description:** a. Show the Anchoring Phenomena Levitating Train Video to the whole class. b. In small groups, with one person as recorder, ask students to write down questions they have about what they observed. (5 minutes) Rules for Producing Questions: i. Ask as many questions as you can. ii. Do not stop to discuss, judge or answer the questions. iii. Write down every question exactly as it is stated. iv. Change any statement into a question. c. Categorize Your Questions (5 minutes) In your list, you might have the two types of questions previously mentioned: closed-ended and open-ended. Here are working definitions for closed and open-ended questions: Closed-ended questions can be answered with "yes" or "no" or with one word. Open-ended questions require an explanation and cannot be answered with "yes" or "no" or with one word. Review your list of questions and identify closed and open-ended questions. Mark the open-ended questions with an O and the closed-ended questions with a C. THEN, change questions from one type to another. Go back to your list of questions and change one closed-ended question into an open-ended, and change one open-ended question into a closed-ended one. Make the changes right on the list. d. Choose the three most important questions from your list. Mark them with an "X" and discuss your reasons for selecting those three. **You are not answering any questions. Students should be encouraged to focus on questioning today.** **Appendix Documents:** Levitating Train ; Question Formulation Technique from rightquestion.org	Setting Objectives Non-linguistic	A Communication, Critical Thinking

1 & 2	NGSS 3-PS2-3; MO 3.PS2.B.1 NGSS 3-PS2-4 **CCC2** (cause and effect) **SEP1** (asking questions and defining problems) **SEP2** Developing and using models) SEP3 (planning and carrying out investigations)	**2. Title: Develop & Use Models (Levitating Train - second activity)** **Objective**: Students will create a model to help make predictions of how the Phenomena works. **Description:** 1. Class discussion - review questions from day 1 2. With no talking, each student sketches a model of how they think the train works. 3. Teacher highlights important aspects of creating a model. E.g.: a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions 4. Students revise their model to include some of the elements described. 5. Share models with table/group explaining their thinking. 6. Students revise their own models, then as a team decide on one model to build. 7. Students generate a list of materials they will possibly need to create their model. i. Teachers can use these lists to ask students to bring in necessary objects or send home a request for parent help in gathering the supplies. **Appendix Documents:** **Example of a model (atmosphere model)**	non-linguistic Similarities & Differences Providing Feedback	A ,B Communication, Critical thinking, Collaboration, creativity
1,2, & 4	**NGSS 3-PS2-1/MO 4.PS2.A.2** NGSS 3-PS2-3/ MO 3.PS2.B.1 NGSS 3-PS2-4 **CCC1** (patterns) **CCC2** (cause and effect)	**3. Title: Planning & Carrying out Investigations (Levitating Train - third activity- you may need to take some time before this lesson to ensure students have brought their materials)** **Objective:** Students will develop an investigation that tests the cause and effect relationship of magnetic force. **Description:** 1. Student teams will gather the materials listed from their team discussion after modeling on paper (see Activity 2) and start creating their models. a. The teacher needs to set a time limit (10-15 minutes)	Non-linguistic, Generating & Testing a Hypothesis, Cooperative Learning	B, C, D Critical Thinking, Communication, collaboration, creativity

	SEP3 (planning and carrying out investigations) **SEP4** (analyzing and interpreting data) **SEP6** (constructing explanations and describing solutions) SEP8 (obtaining, evaluating, and communicating information)	2. Teams will share out their models and explain how they work. They will share what went well and what isn't working. a. As it comes up, teachers should be introducing vocabulary terms to fit student ideas. i. E.g. - if students talk about magnets pushing each other away, you would introduce that scientists use the word "repel" instead of "pushing." 3. Students will then give suggestions to the team on how to improve their model. 4. If students haven't come to a reasonable conclusion as to how the levitating train works, allow more time to repeat the model/investigation cycle either today or another day.	Providing Feedback	
1 & 2	Preparatory for MO 4.PS.3.C.1 **CCC1** (patterns) **CCC2** (cause and effect) **SEP1** (asking questions and defining problems)	**4. Title: Asking Questions and Defining Problem (Flag Raising - first activity)** **Objective:** Students will ask and answer questions about the cause and effect relations of types of simple machines. **Description:** a. Show the Anchoring Phenomena (flag raising) to the whole class b. Without talking to each other, students independently write down questions they have about how the flag was raised. Allow about 5 minutes for this. c. Whole class share questions and revise as needed. The teacher can guide students to focus on questions that reflect the cross-cutting concepts and relate to standards. d. Students independently revise questions or ask new questions based on the class conversation. **Appendix Documents:** Raising a Flag Image	Setting Objectives Non-linguistic	A Communication, Critical Thinking
1 & 2	MO 4.PS.3.C.1 **CCC1** (patterns) **CCC2** (cause and effect) **SEP1**	**5. Title: Develop & Use Models (Flag Raising - second activity)** **Objective:** Students will create a model to help make predictions of how the simple machine works. **Description:** 1. Class discussion - review questions from day 1 2. With no talking, each student sketches a model of how they think the flag raising (pulley) works. 3. Whole class gallery walk (no talking).	Non-linguistic	B, C, D Critical Thinking, Communication, collaboration,

	(asking questions and defining problems) **SEP2** Developing and using models) SEP3 (planning and carrying out investigations)	4. Teacher highlights important aspects of creating a model. E.g.: a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions 5. Students revise their model based on what they observed during their gallery walk and class discussion. 6. Share models with table/group explaining their thinking 7. Students revise their own models, then as a team decide on one model to build. 8. Students generate a list of materials they will possibly need to create their model. a. Teachers can use these lists to have materials ready or to ask students to bring in necessary objects.	Similarities & Differences Providing Feedback	creativity
1, 2, & 4	**NGSS 3-PS2-1/MO 4.PS2.A.2,** NGSS 3-PS2-3/ MO 3.PS2.B.1, NGSS 3-PS2-4 **CCC1** (patterns) **CCC2** (cause and effect) **CCC3** (scale, proportion, quantity) **SEP4** (analyzing & interpreting data) **SEP6** (constructing explanations and describing solutions) SEP7 (argument from evidence) SEP8 (obtaining, evaluating, and communicating information)	**6. Title: Planning & Carrying out Investigations (Flag Raising - third activity)** **Objective:** Students will develop an investigation that test the cause and effect relationships of simple machines. **Description:** 1. Student teams will get their materials and start creating their models. a. The teacher needs to set a time limit (10-15 minutes) 2. Teams will share out their models and explain how they work. They will share what went well and what isn't working. a. As it comes up, teachers should be introducing vocabulary terms to fit student ideas. b. Students will then give suggestions to the team on how to improve their model. 3. If students haven't come to a reasonable conclusion as to how the flag raising/pulley works, allow more time to repeat the model/investigation cycle either today or another day.	Non-linguistic, Generating & Testing a Hypothesis, Cooperative Learning Providing Feedback	B, C, D Critical Thinking, Communication, collaboration, creativity

UNIT RESOURCES
Teacher Resources: ● Levitating Train video ● Raising a Flag Image ● Question Formulation Technique from rightquestion.org ● Books: *The attractive story of magnetism with Max Axiom, super scientist, A crash course in forces and motion with Max Axiom, super scientist, Forces and motion: a question and answer book, Forces make things move, Magnetism: a question and answer book, Motion* by Kay Manolis
Student Resources: ● Magnets ● Various materials to test magnetism ● Spools ● Strings ● Pulleys ● Popsicle Sticks ● Rubber Band ● Plastic Water Bottle (Full) ● Books: *The attractive story of magnetism with Max Axiom, super scientist, A crash course in forces and motion with Max Axiom, super scientist, Forces and motion: a question and answer book, Forces make things move, Magnetism: a question and answer book, Motion* by Kay Manolis
Vocabulary: **Vocabulary:** **Push**- to press upon or against (a thing) with force in order to move it away **Pull**- to draw or haul toward oneself or itself, in a particular direction, or into a particular position **Contact forces**- those types of forces that result when the two interacting objects are perceived to be physically contacting each other **Non-contact forces-** those types of forces that act on an object without coming physically in contact with it **Repel**- to drive or force back **Attract**- to draw by a physical force causing or tending to cause to approach, adhere, or unite **Balanced forces**- two forces acting in opposite directions on an object, and equal in size **Unbalanced forces**- forces that cause a change in the motion of an object **Pattern of motion**- the path of movement

Unit 2: Bee the Change

Content Area: Science	Course: Third Grade	UNIT: Bee the Change

Unit Description: Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments. Third graders are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. **Link to anchor chart:** Bee the Change	**Unit Timeline:** 4 - 5 weeks

DESIRED Results

Transfer Goal - ***Students will be able to independently use their learning to……***

1. **Ask questions and define problems**: Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
2. **Develop and use models**: Develop and/or use models to describe and/or predict phenomena.
4. **Analyze and interpret data**: Analyze and interpret data to make sense of phenomena using logical reasoning.
7. **Engage in arguments from evidence**: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. Construct an argument with evidence, data, and/or a model.

Understandings (Cross Cutting Concepts) – *Students will understand... (Big Ideas)*

2. Cause and Effect: Cause and effect relationships are routinely identified and used to explain change.
3. Scale, Proportion and Quantity: Observable phenomena exist from very short to very long time periods.
4. Systems and System Models: A system can be described in terms of its components and their interactions.

Essential Questions: *Students will keep considering…*

1. How do animals survive in an ever-changing environment?
2. How does investigating the past help understand present and future environmental issues?
3. How are animals interdependent?
4. How can we determine a good solution to problematic environment changes that may begin to affect the types of animals and plants in that environment?

STANDARDS ADDRESSED		
Students who demonstrate understanding can: **NGSS 3-LS2-1: Construct an argument that some animals form groups that help members survive.** NGSS 3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago. [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.] NGSS 3-LS4-3/ MO 3.LS1.A.1& 3.LS3.C.1: Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.] **NGSS 3-LS4-4/MO 3.LS3.D.1: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.** [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.] * **Teachers will need to develop sample activities for these performance expectations or cross-cutting concepts (or parts of the expectation), as there are not sample activities in this curriculum document.*		
Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
LS2.D: Social Interactions and Group Behavior Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. (3-LS2-1)	**CCC2: Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change. (3-LS2- 1)	SEP7: Engaging in Argument from Evidence Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ● Construct an argument with evidence, data, and/or a model. (3-LS2-1)
LS4.A: Evidence of Common Ancestry and Diversity Some kinds of plants and animals that once lived on Earth are no longer found	**CCC3: Scale, Proportion, and Quantity** ● Observable phenomena exist from very short to very long time periods. (3-LS4-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative

anywhere. (3-LS4-1) Fossils provide evidence about the types of organisms that lived long ago and also about the nature of their environments. (3-LS4-41)		relationships. ● Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **SEP2: Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop and/or use models to describe and/or predict phenomena. SEP4: Analyzing and Interpreting Data Analyzing data in 3-5 builds on K-2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ● Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS4-1)
LS4.C: Adaptation For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)	**CCC2: Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change. (3-LS4-3)	**SEP2: Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop and/or use models to describe and/or predict phenomena. SEP7: Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds. ● Construct an argument with evidence, data, and/or a model. (3-LS4-3)
LS4.D: Biodiversity and Humans	CCC4: Systems and System Models	SEP7: Engaging in Argument from Evidence

Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)	● A system can be described in terms of its components and their interactions. (3-LS4-4) *	Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed worlds. ● Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)
LS2.C: Ecosystem Dynamics, Functioning, and Resilience When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (secondary to 3-LS4-4)	<u>CCC4: Systems and System Models</u> ● A system can be described in terms of its components and their interactions. (3-LS4-4) *	<u>SEP7: Engaging in Argument from Evidence</u> Engaging in argument from evidence in 3-5 builds on K-2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ● Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-LS4-4)

Unit 2 (Bee the Change): Assessment

EVIDENCE of LEARNING			
Understanding 2	Standards **3-LS2-1** **3-LS4-4** **CCC2** (cause and effect) **SEP1** (asking questions and defining problems)	**Unit Performance Assessment**: Coming Ashore **Scoring Guide:** Performance Task & Scoring Guide	**R/R Quadrant 21 Century** B, C critical thinking communicatio*n*

Unit 2 (Bee the Change): Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment: Unit 2 Assessment Document (note the pre and post assessment are the same)
Anchoring Phenomena for this Unit: Fossils, Endangered Bees, Migration
This curriculum is based off of the Next Generation Science Standards. For clarification on the standards, please visit the Wonder of Science website. Go to the standards tab to find your grade level and unit. After clicking on the unit, you will see a list of standards students should learn that you can click. After clicking on the standard then the evidence link, you will find a clarification statement as well as the practices you should take the standard through. Also included is observable features of student performance by the end of the grade that will help indicate whether or not the student has met the standard. This unit outlines how to take some content objectives through a specific inquiry process using the 3-dimensional learning outlined in our standards and gives sample activities that would ensure the objective is taught to students. Many of the sample activities in these units have *Asking Questions and Defining Problems* and *Developing a Model* in addition to the other scientific practices found in the evidence section. We added these two practices to use as a pre-assessment and to see what the students already know and understand about the standard to guide our instruction. It will be up to you to look at the objectives that are not addressed in this document and make plans accordingly.

Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant: 21C:
2, 3	NGSS 3-LS4-1 **CCC2** (cause and effect) **CCC3** (scale, proportion, and quantity) **SEP1** (asking questions and defining problems) **SEP4** (analyzing and interpreting data)	**1. Title: Asking Questions (Fossils - first activity)** **Objective:** Students will ask questions about fossils and the environment organisms lived in at a previous time. **Description:** 1. Show the Anchoring Phenomena to the whole class on Fossils. 2. In small groups, with one person as recorder, ask students to write down questions they have about what they observed. (5 minutes) Rules for Producing Questions: a. Ask as many questions as you can. b. Do not stop to discuss, judge or answer the questions. c. Write down every question exactly as it is stated. d. Change any statement into a question. 3. Categorize Your Questions (5 minutes) In your list, you might have the two types of questions previously mentioned: closed-ended and open-ended. Here are working definitions for closed and open-ended questions: Closed-ended questions can be answered with "yes" or "no" or with one word. Open-ended questions require an explanation and cannot be answered with "yes" or "no" or with one word. Review your list of questions and identify closed and open-ended questions. Mark the open-ended questions with an O and the closed-ended questions with a C. THEN, change questions from one type to another. Go back to your list of questions and change one closed-ended question into an open-ended, and change one open-ended question into a closed-ended one. Make the changes right on the list. 4. Choose the three most important questions from your list. Mark them with an "X" and discuss your reasons for selecting those three. **You are not answering any questions. Students should be encouraged to focus on questioning today.** **Appendix Documents:** Fossils	Setting Objectives Nonlinguistic Provide Feedback	A Critical Thinking, Communication
3	NGSS 3-LS4-1 **CCC3** (scale, proportion, and	**2. Title: Developing and Using Models (Fossils - second activity)** **Objective:** Students will develop and use models to show their understanding about fossils and the environment organisms lived in at a previous time. **Description:** 1. Ask students to review the questions they developed in activity 1.		C Critical Thinking Communication Collaboration

	quantity) **SEP2** (developing and using models)	2. Ask students to share their questions with a partner or small group. 3. Next, students will select one of the four examples from the phenomena presentation and develop a model to explain what type of organism was found and the environment of the location at the time. Remind students that models should include a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions 4. Students will post their models for others to review. Without talking, students will review other models, using post-it notes to ask questions to help their classmates clarify or adjust. 5. Students will return to their desks with their model and feedback and adjust their model (based on feedback and some other things they may have seen). *Teachers might also consider allowing students to create their models on Chromebooks, laptops, or other devices uses an application such as Google Drawings.*	Generating Hypotheses Non-Linguistic Representations	
2, 3	NGSS 3-LS4-1 **CCC3** (scale, proportion, and quantity) **SEP4** (analyze and interpret data) SEP7 (engaging in argument from evidence)	**3. Title: Constructing Explanations and Engaging in Argument from Evidence (Fossils - third activity-will take multiple days)** **Objective:** Students will construct and engage in arguments from evidence about the environments in which animals lived long ago. **Description:** 1. Review the guiding questions from activity 1: What was the environment like when this animal was living and how can you tell? How has the environment changed and why? Why doesn't the animal live there anymore? 2. Each student selects a fossil from the slides and forms a theory/hypothesis that answers the questions. 3. With a partner, students conduct research to find evidence to support their theory. (see some student resource links in Resource section for this unit) 4. Students that researched the same fossil meet in a group to share & revise their findings.	Setting Objectives Generating Hypothesis	B Communication, Collaboration, Critical Thinking

		5. Each group shares their findings (argument with evidence) with the whole class. 6. The whole class comes to a consensus as to reasons why animals no longer live in a given environment. **Appendix Documents:** Fossils Research		
2	NGSS 3-LS4-3/ MO 3.LS1.A.1& 3.LS3.C.1 **CCC2** (cause and effect) **SEP4** (analyzing and interpreting data)	**4. Title: The Endangered Bee** **Objective:** Students will analyze and interpret data to determine the cause of an organism's (bees) decline in an environment. **Description:** 1. Show the Anchoring Phenomena (Bee Information, 19 Million Year Old Bee, Bee Population Data) to the whole class. 2. Discuss how long bees have been around, but how over time there have been ups and down in the bee population. When we first saw this decline, scientists worked to solve the problem. Some solutions they had included limiting the use of pesticides, supporting organically grown produce, and planting bee friendly gardens. 3. Students select a solution (or use their own) they think will be most effective. 4. Students begin to research and collect evidence to support the solution they chose. They may decide to change their solution or they need to provide evidence that this solution might not work. 5. Share their argument about their solution by stating the claim, providing evidence, and giving reasoning. ● This would be a great opportunity to talk about data and how data can be presented in different ways - and that people can distort data to make it look more or less drastic, depending on their intention (see this webpage, which shows both a limited graph about bee populations, as well as the full graph or this site with many additional graphs). **Appendix Documents:** Bee Information, 19 Million Year Old Bee, Bee Population Graph, **Materials:** *What If There Were No Bees* book	Setting Objectives	B Critical Thinking
2	**NGSS 3-LS2-1** **CCC2** (cause and effect)	**5. Title: Ant Colonies: The Power of Cooperation** (Will take multiple days) **Objective**: Students will construct an argument about the cause and effect relationship among animals living in a group. **Description:**	Setting Objectives	B Communication, Critical Thinking

	SEP7 (engaging in argument from evidence)	1. Let students know we will be investigating why some animals live in groups. 2. Start a Wonder Board where students or teacher can list questions about ants that might come up during the investigation. 3. Students answer these prompts in their journals: Why do you think some animals live in groups? How might living together help these animals survive? 4. Have students share their thoughts from journaling in a small group or with a shoulder partner. Chart the student ideas. 5. Let students know that the investigation will begin by studying ants. The essential question will be: How do ants work together in colonies to help them survive? 6. Remind students that scientists are respectful of the animals they study and don't touch them or disturb their homes. Then go outside, searching for anthills or a place you might find ants. Leave small piles of food nearby (crumbled crackers, banana slices, small apple chunks, sugar, etc.). Leave 5 - 6 small piles of food so that each group of students will have ants to observe. 7. Assign a small group of students to each anthill/pile of food. In their science journal have them a. Predict: What do you think the ants will do with the food? Why do you think this? b. Record their observations by sketching including labels or writing. Be sure to date, time, and location. Optional: photograph instead c. Write about why this (observation) is happening. d. Record any questions. 8. Repeat step 7 three times with about an hour in between each observation. 9. After observations are done, have students share their observations, what they noticed the ants doing, and why they thought they were doing that. Record this information on a chart. 10. Ask: Did any of the observations provide evidence of teamwork? 11. Explain that ants live together in colonies just like people live together in communities. 12. Review the essential question: How do ants work together in colonies to help them survive? Tell students we will gather more evidence by watching video clips of ants. 13. Watch one of the videos making sure students are focusing on	Generating Hypothesis Nonlinguistic Representation Cues, Questions, Advance Organizers	

		gathering evidence to answer the essential question. As they watch, they should jot down their ideas/questions/notes. Pause the videos frequently to discuss. At the end of the video have students share their ideas in a small group/shoulder partner. Add to the chart. 14. Repeat this process with at least 2 more videos. 15. Encourage students to study their notes/evidence looking for common categories (shelter, food, protection). Make a class chart that compiles their evidence into the categories shelter, food, protection. 16. Have students respond to this prompt in writing: Write a claim about how ants work together in a colony to help them survive. Support your claim with evidence that was collected during your class investigation. 17. Refer to the Wonder Board and go over the questions checking if they're answered or unanswered. 18. Allow time for students to use websites and books to research looking for answers to the unanswered questions on the Wonder Board. **Materials/Links:** Ant Colonies The Power of Cooperation Lesson - includes charts, video links (while some of these are quite lengthy, there are a few shorter videos to check out), websites Another good video: Ant Colony Time Lapse,	Similarities and Differences	

Unit 2 (Bee the Change): Resources

UNIT RESOURCES
Teacher Resources: ● *Books - What If There Were No Bees* (from old Unit 3)*; What If There Were No Sea Otters* (from old Unit 3), *What If There Were No Sea Otters?, What If There Were No Bees?, A River Ran Wild, The Great Kapok Tree, The Sea, the Storm, the Mangrove Tangle* ● Suggested Read Aloud Book - *The Wild Robot* by Peter Brown ● Journals ● Websites - Optional Resource for "Fossils" activities: ● 3-D Fossil site (GB3D Type Fossils - image must be downloaded to the teacher's computer, but then can be manipulated) ● Mystery Science: Animals through Time

- Switchzoo website
- Unearthing Fossil Whales: (There is content in the Smithsonian Learning lab for almost all of these concepts in Unit 2.)

Student Resources:
Some websites for students to use to research (activity 3)
Whale fossils in Sahara Desert
Rhino in Nebraska
Trilobite in Grand Canyon- park service
Trilobite in Grand Canyon- Arizona News
Palm Frond in Alaska- Univ of Alaska article
Palm Trees in Alaska Smithsonian article

- Other websites - Switchzoo

Vocabulary:
adaptation - any change in the structure or behavior of a species which helps it to become better fitted to survive and reproduce in its environment
ecosystem - a community of animals and plants interacting with each other and their environment
environment - the air, water, minerals, organisms, and all other external factors surrounding and affecting a given organism at any time
habitat - the natural environment of an organism; place that is natural for the life and growth of an organism
interdependence - when two or more organisms or people rely on each other for survival
organism - an individual living thing, such as a plant, animal, bacterium, protest, or fungus

Unit 3: The Apple Doesn't Fall Far...

Content Area: Science	Course: Third Grade	UNIT: The Apple Doesn't Fall Far...

Unit Description:	Unit Timeline:
Students are expected to develop an understanding of the similarities and differences of organisms' life cycles. Students will understand that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops. In addition, students will use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. **Link to anchor chart: The Apple Doesn't Fall Far... (previous name: Ch-Ch-Changes)**	4-5 weeks

DESIRED Results

Transfer Goal - ***Students will be able to independently use their learning to……***

1. **Ask questions and define problems**: Ask questions about what would happen if a variable is changed. Identify scientific (testable) and non-scientific (non-testable) questions. Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.
2. **Develop and use models**: Develop models to describe phenomena.
4. **Analyze and interpret data**: Analyze and interpret data to make sense of phenomena using logical reasoning.
6. **Construct explanations and design solutions**: Use evidence (e.g., observations, patterns) to support an explanation. Use evidence (e.g., observations, patterns) to construct an explanation.

Understandings (Cross Cutting Concepts) – *Students will understand... (Big Ideas)*

1. (Patterns) Patterns of change can be used to make predictions. Similarities and differences in patterns can be used to sort and classify natural phenomena.
2. (Cause and Effect) Cause and effect relationships are used to explain change.

Essential Questions: *Students will keep considering…*

- What patterns exist in the changes organisms go through in their life?
- What patterns in characteristics exist between parents and offspring? (non-human)
- How can traits be influenced by the environment?
- How do differences in individuals aid in finding mates, reproduction, and survival?

STANDARDS ADDRESSED		
Students who demonstrate understanding can: NGSS 3-LS1-1/MO 3.LS1.B.1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.] NGSS 3-LS3-1/MO 3.LS3.A.1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.] **NGSS 3-LS3-2/MO 3.LS3.A.1: Use evidence to support the explanation that traits can be influenced by the environment.** [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.] NGSS 3-LS4-2/MO 3.LS3.B.1: Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.] **All performance expectations are covered by sample activities in this curriculum document (although some are covered more than others).*		
Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
LS1.B: Growth and Development of Organisms Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)	**CCC1: Patterns** ● Patterns of change can be used to make predictions. (3-LS1-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Ask questions about what would happen if a variable is changed. ● Identify scientific (testable) and non-scientific (non-testable) questions ● Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause

		and effect relationships. **SEP2: Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop models to describe phenomena. (3-LS1-1)
LS3.A: Inheritance of Traits Many characteristics of organisms are inherited from their parents. (3-LS3-1) LS3.B: Variation of Traits Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)	**CCC1: Patterns** ● Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)	**SEP4: Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ● Analyze and interpret data to make sense of phenomena using logical reasoning. (3-LS3-1)
LS3.A: Inheritance of Traits Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2) LS3.B: Variation of Traits The environment also affects the traits that an organism develops. (3-LS3-2)	**CCC2: Cause and Effect** ● Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **SEP2: Developing and Using Models** Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. ● Develop models to describe phenomena. (3-LS1-1) **SEP6: Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 3–5 builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ● Use evidence (e.g., observations, patterns) to support an explanation. (3-LS3-2)
LS4.B: Natural Selection Sometimes the differences in	**CCC2: Cause and Effect** ● Cause and effect	**SEP6: Constructing Explanations and Designing Solutions** Constructing explanations and designing solutions in 3–5

characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing. (3-LS4-2)	relationships are routinely identified and used to explain change. (3-LS4-2)	builds on K–2 experiences and progresses to the use of evidence in constructing explanations that specify variables that describe and predict phenomena and in designing multiple solutions to design problems. ● Use evidence (e.g., observations, patterns) to construct an explanation. (3-LS4-2)

Unit 3 (The Apple Doesn't Fall Far…): Assessment

EVIDENCE of LEARNING

Understanding	Standards		R/R Quadrant 21 Century
2	3-LS4-2 3-LS3-1 **3-LS3-2** **CCC2** (cause and effect) **SEP6** (constructing explanations and designing solutions)	**Unit Performance Assessment**: The Apple Doesn't Fall Far **Scoring Guide:** see Unit 3 Assessment	C critical thinking collaboration communication

Unit 3 (The Apple Doesn't Fall Far…): Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment:Unit 3 Assessment Document (note the pre and post assessment are the same)
Anchoring Phenomena for this Unit: Different Types of Apples , Life Cycles of Cicadas , Himalyan Rabbits
This curriculum is based off of the Next Generation Science Standards. For clarification on the standards, please visit the Wonder of Science website. Go to the standards tab to find your grade level and unit. After clicking on the unit, you will see a list of standards students should learn that you can click. After clicking on the standard then the evidence link, you will find a clarification statement as well as the practices you should take the standard through. Also included is observable features of student performance by the end of the grade that will help indicate whether or not the student has met the standard. This unit outlines how to take some content objectives through a specific inquiry process using the 3-dimensional learning outlined in our standards and gives sample activities that would ensure the objective is taught to students. Many of the sample activities in these units have *Asking Questions and Defining Problems* and *Developing a Model* in addition to the other scientific practices found in the evidence section. We added these two practices to use as a pre-assessment and to see what the students already know and understand about the standard to guide our instruction. It will be up to you to look at the objectives that are not addressed in this document and make plans accordingly.

Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant/ 21C:
1 & 2	**NGSS 3-LS3-2/MO 3.LS3.A.1** NGSS 3-LS4-2/MO 3.LS3.B.1 **CCC2** (cause and effect) **SEP1** (asking questions and defining problems)	**Activity 1- Title: Asking Questions - How Environment Influences Traits** **Objective:** Students will ask questions about the causes of the variation of traits of a species. **Description:** 1. Show the Phenomena to the whole class on the Himalayan Rabbits. 2. In small groups, with one person as recorder, ask students to write down questions they have about what they observed. (5 minutes) Rules for Producing Questions: a. Ask as many questions as you can. b. Do not stop to discuss, judge or answer the questions. c. Write down every question exactly as it is stated. d. Change any statement into a question. 3. Categorize Your Questions (5 minutes) In your list, you might have the two types of questions previously mentioned: closed-ended and open-ended. Here are working definitions for closed and open-ended questions: Closed-ended questions can be answered with "yes" or	Non-linguistic Representation Cooperative Learning Questions Setting Objectives	B communication, critical thinking

		"no" or with one word. Open-ended questions require an explanation and cannot be answered with "yes" or "no" or with one word. Review your list of questions and identify closed and open-ended questions. Mark the open-ended questions with an O and the closed-ended questions with a C. THEN, change questions from one type to another. Go back to your list of questions and change one closed-ended question into an open-ended, and change one open-ended question into a closed-ended one. Make the changes right on the list. 4. Choose the three most important questions from your list. Mark them with an "X" and discuss your reasons for selecting those three. **You are not answering any questions. Students should be encouraged to focus on questioning today.** **Appendix Documents:** Himalayan Rabbits		
1	**NGSS 3-LS3-2/MO 3.LS3.A.1** NGSS 3-LS4-2/MO 3.LS3.B.1 **CCC2** (cause and effect) **SEP2** (developing and using models)	**Activity 2- Title: Developing and Using Models How Environment Influences Traits** **Objective:** Students will develop and use models to develop a hypothesis on the causes/effects of the environment on the variation of traits in a species. **Description:** 1. Ask students to review the questions they developed in activity 1. 2. Ask students to share their questions with a partner or small group. 3. Next, students will independently develop a model to explain the two different colors of fur on the Himalayan Rabbit. Remind students that models should include a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions 4. Students will post their models for others to review. Without talking, students will review other models, using post-it notes to ask questions to help their classmates clarify or make adjustments. 5. Students will return to their desks with their model and feedback and adjust their model (based on feedback and some other things they may have seen).	Generating Hypotheses Non-linguistic Representations	B critical thinking collaboration communication

		Teachers might also consider allowing students to create their models on Chromebooks, laptops, or other devices uses an application such as Google Drawings.		
1	NGSS 3-LS3-1/MO 3.LS3.A.1 CCC1 (patterns) SEP4 (analyzing and interpreting data)	**Activity 3- Title: Analyzing and Interpreting Data Inheritance of Traits** **Objective:** Students will analyze and interpret data to identify patterns within inheritance of traits in a species. **Description:** 1. Explain to students that we are going to look at another kind of organism to see if observing them can help us understand why organisms in a species can have similarities and variation. We will look at a small insect called a fruit fly. 2. This is a photograph (slide 1) of a fruit fly. Fruit flies are tiny, flying insects that live on rotting fruit. Scientists who study organisms often investigate fruit flies to learn about traits because fruit flies have traits that are easy to observe. 3. We will be examining data showing the traits of fruit flies from different fruit fly families. Each slide shows one family. You can see the parents at the top and the offspring at the bottom, connected by lines. (Fruit fly offspring actually don't look like adult fruit flies when they first hatch from eggs. They go through different stages in their life cycle before they reach their adult form. The offspring shown here have grown up.) 4. Ask students to look at the pictures and notice patterns that seem to be true in each family. a. Fruit Fly Family 1: Students may notice that the eye color and body color are the same for all family members. Some of the offspring have long wings like Parent 1, and some have curly wings like Parent 2. b. Fruit Fly Family 2: Students may notice that all the offspring are yellow with black stripes like Parent 1. Some of the offspring have brown eyes like Parent 1, and some have white eyes like Parent 2. All offspring have long wings like Parent 2. c. Fruit Fly Family 3: Students may notice that some offspring have curly wings like Parent 1, while some have long wings like Parent 2. Most offspring have brown eyes like Parent 2, but one has orange eyes like Parent 1. d. Fruit Fly Family 4: Students may notice that all family members have the same eye color and body color and the	Similarities and Differences	B critical thinking communication

		same wing length.		
	NGSS 3-LS3-2/MO 3.LS3.A.1 **CCC2** (cause and effect) SEP6 (constructing explanations)	**Activity 4- Title: Constructing Explanations - How Environment Influences Traits** (this is a 2-day lesson) **Objective:** After conducting a simulation activity, students will construct an explanation to describe how the environment and traits of an organism are in a cause and effect relationship . **Description:** 1. Ask students what have you learned about traits in the last few days. (We have learned about inheritance, variation, and the relationship between parent and offspring. We have learned that environmental influences, such as temperature, can also change traits.). 2. Display slides 1 and 2 from the Environmental Influences Slideshow. Using the dog pictures, explain that there is a relationship between the way traits are expressed, or seen, because of the environment. We have already talked about temperature, but other things can be a factor as well. Say: *"Let's think about two puppies who are siblings but they both go to live in different homes. In one home, a puppy is fed too much food and lots of scraps from the table. In another home, the puppy is given just the right amount of food."* 3. Using a total participation technique, invite responses from the group: *"How has its environment influenced its trait of weight?"* (The environment with more food has the effect of a fatter puppy; the environment with less food has the effect of a skinnier puppy.) *"But even if the dog is put on a strict diet, it will not look EXACTLY like the dog in Picture 3. Why not?"* (Because it is a different dog that inherited different traits from its parents. An environment can't change an organism's traits, but it can influence them.) 4. Arrange students into pre-determined groups of two to four students (1). Post the essential question for this unit, "How can traits be influenced by the environment?" Post and read the Hungry Bullfrog Simulation Student Directions (page 1). Refer to Hungry Bullfrog Simulation Teacher Directions (for teacher reference- page 2) as necessary. Distribute the Hungry Bullfrog Simulation materials (pages 3-5). 5. Remind students that as they play, they need to think about the cause and effect relationships described in the Hungry Bullfrog Simulation cards so they can later explain how environment influences traits.		

		6. Invite students to begin the simulation. As students complete the simulation, monitor time and rotate from group to group to clarify and check for understanding. If time permits, distribute the optional Long Tongue Inherited Trait cards. 7. After 15 minutes, refocus whole group and tell students that now they will measure how much their bullfrog weighs. Allow students to weigh bullfrogs and record the weight in their science notebooks. Day 2 8. Refocus students' attention on the simulation activity from yesterday. *"Which part of the habitat—food, water, shelter or space—would you say the frog was interacting with during the game?"* (Responses will vary. Shelter and food are likely.) *"How was the Hungry Bullfrog Simulation similar to what happens in nature?"* (Frogs eat animals and run away from animals.) *"How is it different?"* (Frogs don't keep getting bigger and bigger but use food to maintain a healthy weight.) 9. Tell students that they will be constructing an explanation based on their findings from the simulation and will use the table and the weight of the frog as evidence to support their explanation. 10. Remind students that a good explanation includes a description of evidence (e.g., measurements, observations, patterns) and identifying how the evidence supports particular points in an explanation. 11. Remind students that through the simulation, they were looking for how the environment can influence an organism's traits. These questions can help them focus their explanation: a. "Can the environment have an effect on a frog's trait of weight?" b. "What evidence did you collect through the simulation to help you argue that there is a cause and effect relationship here? (the weight of the frog and the things in the environment that made it go up and down) c. "Is this enough evidence? Did the frog's weight get affected by the environment?" (yes) d. "What other evidence would help the argument be stronger?" (real data outside of a simulation) 12. After time to complete their explanation, have students find a partner and stand back-to-back with each other, being respectful of space. Ask students the following question and give them 30 seconds to consider how they will respond: "First, does the environment have an effect on a frog's trait of		

		weight?" (Yes, there is a cause and effect relationship between a frog obtaining enough food and its ability to gain enough weight to survive well in an environment.) 13. Invite students to turn face-to-face to share their responses. Have students repeat this process with a new partner for the following questions: a. "What evidence supports your explanation from the Hungry Bullfrog Simulation?" (Students should use the examples of from the table and the weight of the frog in their student science notebook.) b. "How does your evidence support your explanation? Give your scientific reasoning." (Because there were many things in the environment chasing my frog, it lost a lot of weight. Therefore, the environment affected its trait.) c. "Do you have good evidence? What would make your explanation stronger?" 14. Invite students to return to their seats and revise/finalize their explanations as necessary.		
	NGSS 3-LS3-1/MO 3.LS3.A.1 **CCC2** (cause and effect) SEP6 (constructing explanations)	**Activity 5- Constructing Explanations - How Environment Influences Traits** **Objective:** Students will construct explanations of the causes and effect of why apples have variations of traits. **Description:** 1. Teacher will show the phenomena of Different Types of Apples to the class. a. Teacher may bring in a variety of apples to examine and taste. 2. Have the students generate a list of questions about the apples. a. For example: Why do we have so many flavors? Why are they different colored? Why are they shaped differently? Etc. 3. Go over questions as a class. 4. Allow students to revise questions they may have. 5. Teacher will show video on apples. 6. Teacher will go over vocabulary as needed. **Appendix Documents:** Video on Apples		
	NGSS 3-LS3-1/MO 3.LS1.B.1	**Activity 6- Develop a model - Unusual Life Cycles (Multiple Days)** **Objective:** Students will develop a model that shows the patterns in the diverse life cycles of plants and/or animals.		

	CCC1 (patterns) **SEP2** (developing models)	**Description:** 1. Teacher will show the phenomena of cicadas life cycle to the class. 2. Have students generate a list of questions about cicadas' life cycles. a. For example: Why do cicadas go underground for so long? Do all cicadas follow this life cycle pattern? 3. Go over questions as a class 4. Allow students to revise questions they may have 5. Show video of cicada life cycle. What is unique about their life cycle. 6. Teacher will introduce vocabulary as it arises through the lesson. 7. Students will research another plant or animal and create a model to compare the life cycle to the life cycle of a cicada. 8. Remind students of the traits of a good model: a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions *Teachers might also consider allowing students to create their models on Chromebooks, laptops, or other devices uses an application such as Google Drawings.* **Appendix Documents:** Video on Cicadas		

Unit 3 (The Apple Doesn't Fall Far…): Resources

UNIT RESOURCES
Teacher Resources: Himalayan Rabbits Sample Activity 4 online link Fruit Fly Slideshow

Environmental Influences Slideshow
Hungry Bullfrog Simulation materials
Video on Cicadas
Different Types of Apples
Video on Apples
Mystery Science

Student Resources:
Himalayan Rabbits
Objects used as tokens (dry beans, unit cubes or two-color counters from math kits, or collection of some other objects that are equal)
Paper lunch bags or other sacks for each student to hold their tokens
Hungry Bullfrog Simulation materials

Vocabulary:
characteristic - a distinguishing feature or quality
environment - the air, water, minerals, organisms, and all other external factors surrounding and affecting a given organism at any time
genes - instructions for making a living thing that are in cells and are passed from parents to offspring
inherit - to get something that is passed down
offspring - children or young of a particular parent
organism - an individual living thing, such as a plant, animal, bacterium, protest, or fungus
species - a group of organisms that are closely related to one another
trait - something that can be observed about an organism, such as color or size
variation - difference

Unit 4: Climates of the World

Content Area: Science	Course: Third Grade	UNIT: Climates of the World

Unit Description:	Unit Timeline:
Students are expected to organize and use data to describe typical weather conditions during a particular season and to describe climates in different regions. Students are expected to make a claim about the merit of a design solution that reduces the impacts of weather-related hazards, by applying their understanding of such hazards. **Link to anchor chart: Climates of the World**	4 - 5 weeks

DESIRED Results

Transfer Goal - ***Students will be able to independently use their learning to……***

1. **Ask questions and define problems:** Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. Use prior knowledge to describe problems that can be solved. Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.
2. **Develop and use models:** Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.
4. **Analyze and interpret data**: Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.
7. **Engage in arguments from evidence**
8. **Obtain, evaluate, and communicate information**: Obtain and combine information from books and other reliable media to explain phenomena.

Understandings (Cross-Cutting Concepts)– *Students will understand that… (Big Ideas)*

1. (Patterns) Patterns of change can be used to make predictions.
2. (Cause and Effect) Cause and effect relationships are routinely identified, tested, and used to explain change.

Essential Questions: *Students will keep considering…*

- How can I use patterns in weather to help me make decisions?
- Why is it important to collect data on weather and climate?
- How do we know if a solution is effective in reducing the impact of natural hazards?

STANDARDS ADDRESSED		
Students who demonstrate understanding can: **NGSS 3-ESS2-1/MO 3.ESS.2.D.1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.** [Clarification Statement: Examples of data could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.] NGSS 3-ESS2-2/MO 3.ESS2.D.2: Obtain and combine information to describe climates in different regions of the world. NGSS 3-ESS3-1/MO 3.ESS3.B.1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.[Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lightning rods.]		
Disciplinary Core Ideas **Students will know...**	**Cross Cutting Concepts** **Students will understand…**	**Science and Engineering Practice** **Students will be able to...**
ESS2.D: Weather and Climate Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)	**CCC1: Patterns** ● Patterns of change can be used to make predictions. (3-ESS2-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. **SEP4: Analyzing and Interpreting Data** Analyzing data in 3–5 builds on K–2 experiences and progresses to introducing quantitative approaches to collecting data and conducting multiple trials of qualitative observations. When possible and feasible, digital tools should be used. ● Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships. (3-ESS2-1)
ESS2.D: Weather and Climate Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)	**CCC1: Patterns** ● Patterns of change can be used to make predictions. (3-ESS2-2)	SEP8: Obtaining, Evaluating, and Communicating Information Obtaining, evaluating, and communicating information in 3–5 builds on K–2 experiences and progresses to evaluating the merit and accuracy of ideas and methods. ● Obtain and combine information from books and other reliable media to explain phenomena. (3-ESS2-2)

ESS3.B: Natural Hazards A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) *(Note: This Disciplinary Core Idea is also addressed by 4-ESS3-2.)*	**CCC2: Cause and Effect** ● Cause and effect relationships are routinely identified, tested, and used to explain change. (3-ESS3-1)	**SEP1: Asking Questions and Defining Problems** Asking questions and defining problems in grades 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. ● Use prior knowledge to describe problems that can be solved. ● Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or Cost. **SEP 2: Develop and Use Models** ● Develop a diagram or simple physical prototype to convey a proposed object, tool, or process. SEP 7: Engaging in Argument from Evidence Engaging in argument from evidence in 3–5 builds on K–2 experiences and progresses to critiquing the scientific explanations or solutions proposed by peers by citing relevant evidence about the natural and designed world(s). ● Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. (3-ESS3-1) *

**Teachers will need to develop sample activities for these cross-cutting concepts, as there are not sample activities in this curriculum document.*

Unit 4 (Climates of the World): Assessment

EVIDENCE of LEARNING			
Understanding 1	Standards **3-ESS2-1** **CCC1** (patterns) **SEP4** (analyzing and interpreting data)	**Unit Performance Assessment**: Climates of the World Assessment **Scoring Guide:** Climates Around the World Assessment (pre & post)	**R/R Quadrant 21 Century** B, C Critical Thinking, Communication

Unit 4 (Climates of the World): Sample Activities

SAMPLE LEARNING PLAN
Pre-assessment: *What pre-assessments will you use to check student's prior knowledge, skill levels, and potential misconceptions?* Climates Around the World Assessment
Anchoring Phenomena for this Unit: Stilts Video St. Louis Storm Timelapse Video Lightning Storm Timelapse
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Understanding	Standards	Major Learning Activities:	Instructional Strategy:	R/R Quadrant: 21C:
2	NGSS 3-ESS3-1/MO 3.ESS.3.B.1 **CCC2** (cause and effect) **SEP1** (asking questions)	**1. Asking Questions and Defining Problems - Weather Intro** **Objective:** Students will ask and answer questions to describe the cause and effect of solutions created to reduce the impacts of severe weather. **Description:** a. Show the Anchoring Phenomena Stilts Video to the whole class. b. In small groups, with one person as recorder, ask students to write down questions they have about what they observed. (5 minutes) Rules for Producing Questions: i. Ask as many questions as you can. ii. Do not stop to discuss, judge or answer the questions. iii. Write down every question exactly as it is stated. iv. Change any statement into a question. c. Categorize Your Questions (5 minutes) In your list, you might have the two types of questions previously mentioned: closed-ended and open-ended. Here are working definitions for closed and open-ended questions: Closed-ended questions can be answered with "yes" or "no" or with one word. Open-ended questions require an explanation and cannot be answered with "yes" or "no" or with one word. Review your list of questions and identify closed and open-ended questions. Mark the open-ended questions with an O and the closed-ended questions with a C. THEN, change questions from one type to another. Go back to your list of questions and change one closed-ended question into an open-ended, and change one open-ended question into a closed-ended one. Make the changes right on the list. d. Choose the three most important questions from your list. Mark them with an "X" and discuss your reasons for selecting those three. **You are not answering any questions. Students should be encouraged to focus on questioning today.** **Appendix Links/Documents:** Stilts Video ; Experiencing-the-QFT.pdf	Advance Organizers	B Critical thinking Collaboration Communication
2	NGSS 3-ESS3-1/MO 3.ESS.3.B.1 **CCC2** (cause and	**2. Developing and Using Models - Stilt Houses** **Objective:** Students will develop and use models to show their understanding about the cause and effect of the design for stilt houses. **Description:** 1. Ask students to review the questions they developed in activity 1. 2. Next, students will develop a model (paper pencil/drawing) to explain how the		B Critical thinking Collaboration Communication

	effect) **SEP2** (developing and using models)	stilt houses are OR ARE NOT an effective design solution. Remind students that models should include a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions 3. Students will post their models for others to review. Without talking, students will review other models, using post-it notes to ask questions to help their classmates clarify or make adjustments. 4. Students will return to their desks with their model and feedback and adjust their model (based on feedback and some other things they may have seen). *Teachers might also consider allowing students to create their models on Chromebooks, laptops, or other devices uses an application such as Google Drawings.*	Nonlinguistic representations	
1	**NGSS 3-ESS-2-1/MO 3.ESS.2.D.1** NGSS 3-ESS2-2/MO 3.ESS.2.D.2 **CCC1** (patterns) **SEP4** (analyzing data)	**3. Analyzing Data - Reading a Weather Map Part 1 (might take 2-3 days)** **Objective:** Students will analyze and interpret data about the patterns in weather and climatet so that they can predict what type of weather might happen next. **Description:** 1. Build interest and activate prior knowledge by showing a video on severe weather such as: St. Louis Storm Timelapse Video Lightning Storm Timelapse 2. Have students ask questions and share what they notice about the weather report. 3. Teacher asks questions such as: Why is knowing about weather important? How do scientists predict weather? 4. Pass out/display the map. Have students mark the St. Charles/St. Louis area on the map and one other location that is important to them. 5. In science notebooks, have students predict the temperature using words like hot, cold, warm, cool and the amount/type of precipitation for the current season in their location. 6. Share predictions with a partner. Encourage students to ask their partner questions to support and explain their predictions. 7. Let students know we will be investigating: How does weather, specifically temperature and precipitation, change with the seasons?	Setting Objectives Generating and Testing Hypothesis	C Communication Collaboration

		8. You will need devices. Teacher can sign up for a free account at PBS Learning to access the interactive slides for students to use. Before beginning lesson, assign the interactives to students by clicking on Assign on the left side of the lesson plan site, click on assign button to get a url & code for students to use to access the interactive slides. Use Google Classroom or some other method to send the link to students. Students work with a partner or on their own. On slide 3 they will interpret and describe weather for 2 cities on a national weather map. 9. You can also have students make comparisons on their own by using information/data from National Weather Service. Here is an example of St. Louis weather data from recent days (different aspects of weather can be included or excluded), as well as historical data from the last 80 or so years. 10. Share their findings in a small group. **Materials:** student devices (reserve lab or check out a laptop or ipad cart) **Appendix Documents:** Original Lesson, PBS Learning Interactive		
1	**NGSS 3-ESS2-1/MO 3.ESS.2.D.1** NGSS 3-ESS2-2/MO 3.ESS.2.D.2 **CCC1** (patterns) **SEP4** (analyzing data)	**4. Title: Reading a Weather Map Part 2 (might take 2-3 days)** **Objective:** Students will analyze and interpret data about the patterns in weather and climate so that they can predict what type of weather might happen next. **Description:** 1. Students will need devices and access to the interactive slides from Part 1. 2. Students should review the predictions they made in their science journal at the beginning of the Part 1 Lesson. As they work on slides 4 -6 today, they will check their predictions. 3. Introduce students to the average monthly temperature map, making sure they understand how to use the “colorbar” (key) to read the map and the importance of a good title to know what information is on the map. 4. Students complete slides 4 & 5. 5. Whole class ask: How is temperature used to describe seasonal weather? How is precipitation used to describe season weather? Why is it important to keep track of temperature and precipitation data for several years? Where any of your predictions accurate? 6. Put students into pairs. Pass out the Pick Your Location handout and the Tables & Graphs Handout. Have pairs work together to complete the handouts using Slide 6 of the interactive to collect the data. Make sure students work together to interpret the data. 7. Display the Double Bar Graph sample and make sure students understand the parts of a graph and how to create one. 8. Have partners use their data to complete the bar graphs in the Tables 7	Setting Objectives Generate and Test Hypothesis Nonlinguistic Representation Cooperative	C Critical Thinking Communication Collaboration

		Graphs Handout. 9. Have partners use their graphs to answer the questions on page 4 of the handout. 10. Encourage pairs to ask additional questions about their data. These questions can be recorded in their science notebook. 11. Reconvene as a whole class. Refer back to the question: How does weather, specifically temperature and precipitation, change with the seasons? 12. Have partnerships join to form groups of 4-6. Groups share their data, looking for patterns across seasons and locations. 13. Allow each group to share their findings with the class. **Appendix Documents:** Pick Your Location Handout, Tables & Graphs Handout, Double Bar Graph Sample	Learning Similarities and Differences	
1	**NGSS 3-ESS2-1/MO 3.ESS.2.D.1** NGSS 3-ESS2-2/MO 3.ESS.2.D.2 **CCC1** (patterns) **SEP4** (analyzing data)	**5. Analyzing and Interpreting Data - Reading a Weather Map, Make Your Claim** **Objective:** Students will analyze and interpret data about the patterns in weather and climate so that they can predict what type of weather might happen next. **Description:** 1. Have students get out their Tables & Graphs, Handout and Double Bar Graph Sample from the previous lessons and review the findings from the day before. 2. Pass out the Temperature and Precipitation Claim handout. Explain that a claim is a statement about something that is believed to be true. It needs to be supported with evidence. In science the evidence is the data. 3. If needed, model completing the handout. Have students review their data, share their claim with their partner, and then independently complete the handout. 4. Have students share their claim in a small group. Encourage listeners to question the claim using their own evidence or to agree with the claim by adding more evidence. 5. Allow students time to revise their claim. **Appendix Documents:** Temperature and Precipitation Claim Handout	Setting Objectives Questions, Cues, and Advance Organizers	C Communication
2	NGSS 3-ESS3-1/MO 3.ESS.3.B.1 **CCC2**	**6. Developing and Using Models - Design Challenge Part 1: This is My House (2 - 3 days)** **Objective:** Students will develop and use a model to test cause and effect relationships in order to make a claim about the merit of a design solution that reduces the impact of a weather related hazard.	Setting Objectives	A,B Creativity,

	(cause and effect) **SEP2** (developing and using models)	**Description:** 1. Say: Imagine you are in your cozy home on a dreary, rainy day. You are in the middle of playing your favorite video game. You start to hear drip, drip, drip. You realize your roof is leaking. You probably haven't ever thought about your roof much. What types of roofs have you seen? Shapes? Materials? 2. Read aloud the book This Is My House by Arthor Dorros available for free at openlibrary.org. Discuss the different types of houses/roofs and how the climate might affect how houses are built. 3. Have each student jot down questions about roof design. 4. Have students work with a partner to research types of roofs beginning with Types of Roofs site. Allow students to use a safe search engine such as Kidrex or Kiddle to search further types and shapes of roofs if needed. They can take notes using boxes & bullets or whatever structure works best for them. 5. Place students into groups of 3-4 to begin the Design challenge. Each student should sketch a design for their rain proof roof. Remind students of the parts of a good model: a. Title b. Diagram with labels c. Explanation d. Color/color-coding e. Other good features i. Zoom-in bubbles ii. Measurement/Time iii. Questions 6. Then within groups each student shares their design, discussing pros and cons of each one. Groups come to an agreement as to which design to build. 7. Each student can write in their journal making a claim for their roof design. They need to support it with evidence which could include slope for runoff, waterproof material, etc. **Appendix Documents:** Roof Design Challenge	Generating Hypothesis Cooperative Learning Providing Feedback	Critical Thinking, Communication, collaboration
2	NGSS 3-ESS3-1/MO 3.ESS3.B.1	**7. Developing and Using Models - Design Challenge Part 2: This is My House (1 - 2 days)** **Objective:** Students will develop and use a model to test cause and effect relationships in order to make a claim about the merit of a design solution that reduces the impact of a weather-related hazard.	Setting Objectives Testing	B Communication, Critical thinking

	CCC2 (cause and effect) **SEP2** (developing and using models)	**Description:** 1. Each group will build their roof design and adjust as they go. 2. The teacher will help each group test their design by placing the roof on newspaper (optional-place house in tub) and spraying the roof with water or pouring a measured amount on the roof. If the roof is waterproof, the newspaper underneath will be dry. The rest of the students observe and offer feedback. What did they do well? What changes need to be made and why? 3. Assign each group a different group's roof design to write about. Each student will individually write in their journal making a claim with evidence as to the merit of the roof design they were assigned. **Appendix Documents:** Roof Design Challenge	Hypothesis Providing Feedback	
1	NGSS 3-ESS2-2/MO 3.ESS2.D.2 **CCC1** (patterns) SEP8 (obtaining, evaluating, and communicating information)	**8. Obtaining, Evaluating, and Communicating Information - Climates Around the World Postcards (3 - 4 days)** **Objective:** Students will obtain and combine information from different sources to find patterns and make predictions in order to describe climates in different regions of the world. **Description:** 1. Open Grandma's Postcard Lesson on the smartboard. Show students a picture of a tropical climate and a polar climate. Ask what do you think the weather is like in each location and what types of clothes would you wear there. 2. Explain the difference between climate and weather. Optional: Read *Using a Climate Map* from EpicBooks. 3. Pass out the Climate Graphs and explain how to read the graph. Place students in groups of 3-4 to study the graphs, comparing what they notice about each climate. Jot down notes. 4. Pass out and have students complete What I Know About Climate Zones. Share. 5. Tell the class: Your grandmother has always done a lot of traveling. Right now she is traveling around the world. She has been sending you postcards along the way. Can you use the clues in her postcards and what you know about climate zones to figure out which climate zones she has visited? 6. Give each group a copy of Grandmother's Climate Postcards. Each group should study the postcards and their notes from the climate graphs as they try to determine which climate each postcard was from. Complete Climate Zones Worksheet 2.	Setting Objectives Similarities and Differences Summarizing & Notetaking Cues, Questions, Advance Organizers	C Critical Thinking, Collaboration, Communication

		7. Have a whole class discussion about each postcard and make sure everybody agrees about the climate zone it was sent from. 8. Display the Climate Zones Map and have students look for patterns in the location of each climate zone. Have students ask questions about the patterns they found and the Climate Zones Map. 9. Optional Extension: Have students research and try to find answers to their questions about the Climate Zones Map (What causes the pattern in location of different climates?) **Appendix Documents:** Original Lesson- *Reading a Weather Map,* PBS Learning Interactive, Pick Your Location Handout, Tables & Graphs Handout, Double Bar Graph Sample, Temperature and Precipitation Claim Handout , Roof Design Challenge, Grandma's Postcard Lesson, Climate Graphs, What I know About Climate Zones, Climate Postcards, Climate Zones Worksheet 2, Climate Zones Map, Climates Around the World Assessment (pre & post)		

Unit 4 (Climates of the World): Resources

UNIT RESOURCES
Teacher and Student Resources: ● Books: *Using Climate Maps* by Rebecca Hirsch (Getepic), *This is My House* by Arthur Dorros (Open Library), *On the same day in March : a tour of the world's weather, Climate and weather* ● *PBS Learning, Climate Data* ● Appendix Documents - Grandma's Postcard Lesson, Climate Graphs, What I know About Climate Zones, Climate Postcards, Climate Zones Worksheet 2, Climate Zones Map
Vocabulary: Weather – the condition of the environment at any time- such as the temperature, cloud cover, fog conditions, air pressure, humidity and precipitation Climate – a long term pattern of the weather conditions. It is the average pattern of the weather conditions taken over a period of time, say 30 years, for a particular region