Wayne
Township Public Schools

Second Grade
Science Curriculum

Dawn Auerbach, Director of Elementary Education
Lydia Cooper, Assistant Principal
Cathy Gaynor, Assistant Principal

Committee Members

Ashley Berger	Maria Cornetta	Laura Hoogstrate
Sabrina Bialkin	Carolyn DelVicario	Kim Mathisen
Dawn Caporusso	Emilee Duhaime	Marina Michael
Ashley Conklin	Kim Glennon	Elizabeth Morisco

Curriculum Developed
July 2017
Revised
September 2021

Approved by the Board of Education on October 28, 2021

WAYNE TOWNSHIP PUBLIC SCHOOL DISTRICT
ELEMENTARY SCIENCE CURRICULUM (JULY 2017)

I. COURSE OVERVIEW

The Wayne Township Public School elementary science program supports the philosophy of the New Jersey Science Learning Standards. Our students will develop an understanding of the disciplinary core ideas relative to physical sciences, life sciences, and earth and space sciences. and life science through experiential learning and engineering and technology, and through exposure to rich non-fiction text.

II. FRAMEWORK

Instruction is framed around 3-Dimensional learning as outlined in the Next Generation Science Standards including:

a. Disciplinary Core Ideas

i. Physical Sciences
   1. Matter and its interactions
   2. Motion and stability: Forces and interactions
   3. Energy
   4. Waves and their applications in technologies for information transfer

ii. Life Sciences
   1. From molecules to organisms: Structures and processes
   2. Ecosystems: Interactions, energy, and dynamics
   3. Heredity: Inheritance and variation of traits
   4. Biological evolution: Unity and diversity

iii. Earth and Space Sciences
   1. Earth's place in the universe
   2. Earth's systems
   3. Earth and human activity

iv. Engineering, Technology, and Applications of Science
   1. Engineering design
   2. Links among engineering, technology, science, and society

b. Scientific and Engineering Practices

i. Asking questions (for science) and defining problems (for engineering)
ii. Developing and using models
iii. Planning and carrying out investigations
iv. Analyzing and interpreting data
v. Using mathematics and computational thinking
vi. Constructing explanations (for science) and designing solutions (for engineering)
vii. Engaging in argument from evidence

Grade 2 Unit 1

Unit Summary
Where do we find water?
In this unit of study, students use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth. The crosscutting concept of *patterns* is called out as an organizing concept for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *developing and using models* and *obtaining, evaluating, and communicating information*. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 2-ESS2-3 and 2-ESS2-2.
Student Learning Objectives
Obtain information to identify where water is found on Earth and that it can be solid or liquid. (2-ESS2-3)
Develop a model to represent the shapes and kinds of land and bodies of water in an area. *[*Assessment Boundary: Assessment does not include quantitative scaling in models.*]* **(2-ESS2-2)**
See Content Evidence Statements for student performance expectations. **See Evidence Statements for Engineering Design.**

Resources and Activities
Exploring Science: Understanding Maps (builds background), pgs. 100-101; Rivers and Oceans, pgs. 102-103; Lakes and Ponds, pgs. 104-105; Make a Model (Lab), pgs. 106-107b; Ice on Earth, pgs. 108-109; Obtain Information From a Map, pgs. 110-111; Glaciologist, pgs. 112-113.
Mystery Science: Work of Water (Mystery #1)
Additional online resources: Pebble Go Online Research (All About Water), Pebble Go Online Research (Earth Features), Pebble Go Online Research (Landforms), Brain pop Jr. (Land Forms)
Additional Activities:
Schoolwide: Earth Systems: Processes that Shape the Earth
Suggested Reading:
Other:
Suggested Materials For Unit:
Make a Model *Modeling Clay (in kit) *Scissors *Green Construction Paper *Glue *Sturdy Cardboard *Blue Tissue Paper *White Tissue paper
Mystery Science *Spray Bottle *Blue Markers *White Paper

Mathematics

As students collect data about the size of landforms and bodies of water, these numbers can be used to answer questions, make comparisons, or solve problems. For example,

- ✓ If students know that a mountain is 996 feet in height, a lake is 550 feet deep, a river is 687 miles long, and a forest began growing about 200 years ago, have students show each number in three ways using base-ten blocks, number words, and expanded form.
- ✓ A stream was 17 inches deep before a rainstorm and 33 inches deep after a rainstorm. How much deeper did it get during the rainstorm?

As students engage in these types of mathematical connections, they are also modeling with mathematics and reasoning abstractly and quantitatively. When modeling with mathematics, students diagram situations mathematically (using equations, for example) and/or solve addition or subtraction word problems. When students reason abstractly and quantitatively, they manipulate symbols (numbers and other math symbols) abstractly and attend to the meaning of those symbols while doing so.

Modifications

(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.)

- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community.
- Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling).
- Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies).
- Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences).
- Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate their understandings.
- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Grade 2 Science Unit 2: Changes to Earth's Land **Instructional Days: 20**

Grade 2 Unit 2: Changes to Earth's Land

Unit Summary
In what ways do humans slow or prevent wind or water from changing the shape of the land?
In this unit of study, students apply their understanding of the idea that wind and water can change the shape of land to compare design solutions to slow or prevent such change. The crosscutting concepts of *stability and change*; *structure and function*; and *the influence of engineering, technology, and science on society and the natural world* are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *asking questions and defining problems*, *developing and using models*, and *constructing explanations and designing solutions*. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 2-ESS1-1, 2-ESS2-1, K-2-ETS1-1, and K-2-ETS1-2.
Student Learning Objectives
Use information from several sources to provide evidence that Earth events can occur quickly or slowly. *[Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.]* [Assessment Boundary: Assessment does not include quantitative measurements of timescales.] **(2-ESS1-1)**
Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* *[Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]* **(2-ESS2-1)**
Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-5 NJSLS-S, pp.11 and 23) (K-2-ETS1-1)
Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)
See Content Evidence Statements for student performance expectations. See Evidence Statements for Engineering Design.

Connections to Other Units
Grade 2 Unit 5: Relationships in Habitats and **Unit 3: Properties of Matter** • A situation that people want to change or create can be approached as a problem to be solved through engineering. • Asking questions, making observations, and gathering information are helpful in thinking about problems. • Before beginning to design a solution, it is important to clearly understand the problem. • Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. • Because there is always more than one possible solution to a problem, it is useful to compare and test designs. • A situation that people want to change or create can be approached as a problem to be solved through engineering.

Sample of Open Education Resources
How Can Water Change the Shape of the Land? In this lesson plan children investigate water erosion. Students make a sand tower and observe the erosion as they drop water on it. Students observe, illustrate, and record notes about the process. Short videos and a read aloud also further support understanding of the Performance Expectation. How Can Wind Change the Shape of the Land? This lesson builds on another lesson created by Jeri Faber in which students discovered how water changes the earth. For this lesson, students take part in a teacher-led investigation to show how wind changes the land. The children use straws to blow on a small mound or hill of sand. As each child takes a turn, the other students record their detailed observations that will later be used to draw conclusions. Students also watch a short video on wind erosion and discuss the new learning with partners. Finding Erosion at Our School In this lesson, students walk around the school grounds, neighborhood, or another area of their community to locate evidence of erosion. Various problems caused by erosion are discussed and a solution is developed for one of the problems. This lesson is one in a series on erosion by Jeri Faber. A follow-up lesson is available where students compare their erosion design solutions.

Appendix A: NGSS and Foundations for the Unit

Use information from several sources to provide evidence that Earth events can occur quickly or slowly. *[Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.]* [Assessment Boundary: Assessment does not include quantitative measurements of timescales.] **(2-ESS1-1)**

Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.* *[Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.]* **(2-ESS2-1)**

Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-5 NJSLS-S, pp.11 and 23) (K-2-ETS1-1)

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem. (K-2-ETS1-2)

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Constructing Explanations and Designing Solutions • Make observations from several sources to construct an evidence-based account for natural phenomena. (2-ESS1-1) • Compare multiple solutions to a problem. (2-ESS2-1) **Asking Questions and Defining Problems** • Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) • Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1) **Developing and Using Models** • Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)	**ESS1.C: The History of Planet Earth** • Some events happen very quickly; others occur very slowly, over a time period much longer than one can observe. (2-ESS1-1) **ESS2.A: Earth Materials and Systems** • Wind and water can change the shape of the land. (2-ESS2-1) **ETS1.A: Defining and Delimiting Engineering Problems** • A situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1) • Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) • Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)	**Stability and Change** • Things may change slowly or rapidly. (2-ESS1-1) • Things may change slowly or rapidly. (2-ESS2-1) **Structure and Function** • The shape and stability of structures of natural and designed objects are related to their function(s). (K-2-ETS1-2) - ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Engineering, Technology, and Science on Society and the Natural World** • Developing and using technology has impacts on the natural world. (2-ESS2-1) -

	ETS1.B: Developing Possible Solutions ● Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)	***Connections to Nature of Science*** **Science Addresses Questions About the Natural and Material World** ● Scientists study the natural and material world. (2-ESS2-1)

English Language Arts	Mathematics
Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-ESS1-1), (K-2-ETS1-1) **RI.2.1** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS1-1) **RI.2.3** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (2-ESS1-1), (K-2-ETS1-1) **W.2.6** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-ESS1-1) **W.2.7** Recall information from experiences or gather information from provided sources to answer a question. (2-ESS1-1), (K-2-ETS1-1) **W.2.8** Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. (2-ESS1-1) **SL.2.2** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-ESS2-1) **RI.2.3** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (K-2-ETS1-2) **SL.2.5** Compare and contrast the most important points presented by two texts on the same topic. (2-ESS2-1) **RI.2.9**	Reason abstractly and quantitatively. (2-ESS1-1), (2-ESS2-1), (K-2-ETS1-1) **MP.2** Model with mathematics. (2-ESS1-1), (2-ESS2-1) **MP.4** Use appropriate tools strategically. (2-ESS2-1, (K-2-ETS1-1) **MP.5** Understand place value. (2-ESS1-1) **2.NBT.A** Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem. (2-ESS2-1) **2.MD.B.5** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (K-2-ETS1-1) **2.MD.D.10**

Resources and Activities
Exploring Science: Matter, pgs. 4-5; Liquids, pgs. 6-7; Solids, pgs. 8-9; Solids and Liquids, pgs. 10-11; Properties, pgs. 12-13; Color, pgs. 14-15; Texture, pgs. 16-17; Hard and Soft, pgs. 18-19; Bend and Stretch, pgs. 20-21; Sink and Float, pgs. 22-23; Plan and Investigate to Observe and Classify Objects (Lab), pgs. 24-25b; Materials that Absorb, pgs. 26-27; Build It (describe how large objects can be built from small pieces), pgs. 28-29; Making Observations (Lab-describe how objects can be made of many pieces and can be disassembled and made into a new object), pgs. 30-31. **Mystery Science**: Material Magic (**Mysteries #1, #2**,-**Mandatory** and #3) **Additional online resources**: Pebble Go Online Research (Matter),**Additional Activities**: **Schoolwide**: **Suggested Reading**: **Other**: Suggested Material for Unit: **Plan and Investigate to Observe and Classify Objects** *Paper Clips *Rubber Balls *Marbles *Crayons *Erasers *Blocks *Counters *Cubes *Rubber Bands *Rocks *Clay *Shells *Hard Lens (Magnifying Glass) *Paper **Making Observations** *Plastic or Foam Blocks *Legos *Lincoln Logs *Snap Cubes **Materials That Absorb** * Water *Measuring Cup *Plastic Cups *Timer *Paper *Aluminum Foil *Cotton Cloth *Paper Towels **Mystery #1** *Paper Towels *Paper Plates *Paper Lunch Bags * Aluminum Foil *String, Yarn, or Ribbon *Large Rubber Bands

building a house.

- ✓ Work together to brainstorm a list of possible structures that could be built with different materials. For example, students could build bridges or simple roller coasters for marbles.
- ✓ Select one structure from the list and determine the intended purpose of that structure.
- ✓ Select two or three different materials that could be used to build the structure.
- ✓ Investigate the physical properties of the materials, including shape, strength, flexibility, hardness, texture, or absorbency.
- ✓ Collect and analyze data to determine whether or not the given materials have properties that are suited for the intended purpose of the selected structure.
- ✓ In groups, use one of the materials to build the structure. (Teachers should have different groups use different materials.)
- ✓ Test and compare how each structure performs. Because there is always more than one possible solution to a problem, it is useful to compare the strengths and weaknesses of each structure and each material used.

Integration of engineering

In this unit, students investigate the physical properties of a variety of materials, and then build a structure with materials that are best suited for the structure's intended purpose. This process is outlined in greater detail in the previous section.

Unit Sequence

Part A:
- ✓ *How can we sort objects into groups that have similar patterns?*
- ✓ *Can some materials be a solid or a liquid?*

Concepts	Formative Assessments
● Patterns in the natural and human-designed world can be observed. ● Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. ● Matter can be described and classified by its observable properties.	*Students who understand the concepts can:* ● Observe patterns in the natural and human-designed world. ● Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question. ● Plan and conduct an investigation to describe and classify different kinds of material by their observable properties. ✓ Observations could include color, texture, hardness, and flexibility. ✓ Patterns could include the similar properties that different materials share.

Connecting with English Language Arts/Literacy and Mathematics
English Language Arts The CCSS for English Language Arts can be incorporated in this unit in a number of ways. Students can participate in shared research, using trade books and online resources, to learn about the properties of matter. As students explore different types of materials, they can record their observations in science journals, and then use their notes to generate questions that can be used for formative or summative assessment. Students can add drawings or other visual displays to their work, when appropriate, to help clarify their thinking. To teach students how to describe how reasons support specific points an author makes in a text, teachers can model the comprehension skill of main idea and details using informational text about matter. Technology can be integrated into this unit of study using free software programs (e.g., Animoto) that students can use to produce and publish their writing in science. *Mathematics* Throughout this unit of study, students have opportunities to model with mathematics and reason abstractly and quantitatively. During investigations, students can collect and organize data using picture graphs and/or bar graphs (with a single-unit scale). This can lead to opportunities to analyze data and solve simple put together, take-apart, and compare problems using information presented in these types of graphs. Some examples of ways to sort and classify materials in order to create graphs include: ✓ Classifying materials as solids, liquids, or gases. ✓ Classifying materials by color, shape, texture, or hardness. ✓ Classifying materials based on what they are made of (e.g., wood, metal, paper, plastic). ✓ Classifying materials based on potential uses. With any graph that students create, they should be expected to analyze the data and answer questions that require them to solve problems.

Modifications
(Note: Teachers identify the modifications that they will use in the unit. See NGSS Appendix D: All Standards, All Students/Case Studies for vignettes and explanations of the modifications.) ● Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ● Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ● Provide opportunities for students to connect with people of similar backgrounds (e.g. conversations via digital tool such as SKYPE, experts from the community helping with a project, journal articles, and biographies). ● Provide multiple grouping opportunities for students to share their ideas and to encourage work among various backgrounds and cultures (e.g. multiple representation and multimodal experiences). ● Engage students with a variety of Science and Engineering practices to provide students with multiple entry points and multiple ways to demonstrate

their understandings.

- Use project-based science learning to connect science with observable phenomena.
- Structure the learning around explaining or solving a social or community-based issue.
- Provide ELL students with multiple literacy strategies.
- Collaborate with after-school programs or clubs to extend learning opportunities.
- Restructure lesson using UDL principles (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).
- Differentiation Strategies
  - Differentiation Strategies for Special Education Students
  - Differentiation Strategies for Gifted and Talented Students
  - Differentiation Strategies for ELL Students
  - Differentiation Strategies for At Risk Students
  - Differentiation Strategies for Students with a 504

Prior Learning

Kindergarten: Pushes and Pulls (engineering practices)

- A situation that people want to change or create can be approached as a problem to be solved through engineering.
- Asking questions, making observations, and gathering information are helpful in thinking about problems.
- Before beginning to design a solution, it is important to clearly understand the problem.
- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Future Learning

Grade 5: Properties of Matter

- Measurements of a variety of properties can be used to identify materials. *(Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.)*
- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.

Unit Sequence	
Part B: *Can all changes caused by heating or cooling be reversed?*	
Concepts	**Formative Assessment**
● People search for cause-and-effect relationships to explain natural events. ● Events have causes that generate observable patterns. ● Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.	*Students who understand the concepts are able to:* ● Observe patterns in events generated due to cause-and-effect relationships. ● Construct an argument with evidence to support a claim. ● Construct an argument with evidence that some changes caused by heating or cooling can be reversed, and some cannot. ✓ Examples of reversible changes could include materials such as water and butter at different temperatures. ✓ Examples of irreversible changes could include ➢ Cooking an egg ➢ Freezing a plant leaf ➢ Heating paper

Assessments
Formative: See formative assessment options above **Benchmark**: Exploring Science Assessments (after completion of each discipline). Note: Benchmark for Physical Science after Unit 4 on pages 116-123 of the Exploring Science Teacher Manual. **Summative**: Mystery Science Unit and/or Mystery Assessments **Alternative**: Science journal/notebook and digital notebook entries, labs, Stem Gauge Assessments (Google Folder), student self-evaluation rubrics (Exploring Science teacher manual at the conclusion of each lesson)

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Grade 5: Changes to Matter

- When two or more different substances are mixed, a new substance with different properties may be formed.
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. *(Note: Mass and weight are not distinguished at this grade level.)*
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish.

Grade 5: Matter and Energy in Ecosystems

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.

Connections to Other Units
In **Properties of Matter**, students described and classified different kinds of materials based on their observable properties. They also tested different materials to determine which have properties that are best suited for an intended purpose.

Sample of Open Education Resources
STEM in a BOX - Shakin' Up the Classroom: K-3EarthScienceSTEMintheboxprint.docx: In this engaging lesson, the students examine and describe materials and their properties in order to assemble these materials into a strong building that could withstand the earth shaking. The physical science core ideas in the Performance Expectation are met through a larger earth science/earthquake unit that is part of the unit level resource. Go to the resource listed under K-3: k-3EarthScienceSTEMintheboxprint.docx Thousands of tiny pieces can create something big: In this resource which is based on enactment in a second grade classroom and includes videos and examples of student work, the teacher introduces students to Watt's tower, a tower made of many pieces of junk in the neighborhood. Students make their own objects out of many pieces or materials that the teacher provides and the students think about and discuss whether they could use the same set of materials to make something different. Take it apart, put it together: This is a wonderfully supported and creative lesson that involves students taking apart an old appliance and making a new object using the appliance parts. The teacher guides students using a variety of teacher prompts and individual journaling to track their idea development, questions, changing plans, and evidence-based explanations.

English Language Arts	Mathematics
Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (2-PS1-4) **RI.2.1** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text. (2-PS1-4) **RI.2.3** Describe how reasons support specific points the author makes in a text. (2-PS1-4) **RI.2.8** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., because, and, also) to connect opinion and reasons, and provide a concluding statement or section. (2-PS1-4) **W.2.1** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-PS1-3) **W.2.7** Recall information from experiences or gather information from provided sources to answer a question. (2-PS1-3) **W.2.8**	**N/A**
WIDA	**Technology**
ELD Standard 1: The Language of Social and Instructional Language ELD Standard 4: The Language of Science	8.1.2.A.4. Demonstrate developmentally appropriate navigation skills in virtual environments (i.e. games, museums). 8.1.2.B.1. Illustrate and communicate original ideas using multiple digital tools and resources 8.1.2.E.1. Use digital tools and online resources to explore a problem or issue 8.2.2.D.2 Discover how a product works by taking it apart, sketching how parts fit, and putting it back together. 8.2.2.D.3 Identify the strengths and weaknesses in a product or system. 8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.

Grade 2 Unit 5

Unit Summary
Why do we see different living things in different habitats? In this unit of study, students develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students also compare the diversity of life in different habitats. The crosscutting concepts of *cause and effect* and *structure and function* are called out as organizing concepts for these disciplinary core ideas. Students demonstrate grade-appropriate proficiency in *planning and carrying out investigations* and *developing and using models*. Students are also expected to use these practices to demonstrate understanding of the core ideas. This unit is based on 2-LS4-1, 2-LS2-1, 2-LS2-2, and K-2-ETS1-1.
Student Learning Objectives
Make observations of plants and animals to compare the diversity of life in different habitats. *[Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.]* [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.*]* **(2-LS4-1)**
Plan and conduct an investigation to determine if plants need sunlight and water to grow. [*Assessment Boundary: Assessment is limited to testing one variable at a time.*] **(2-LS2-1)**
Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.* (2-LS2-2)
Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-5 NJSLS-S, pp.11 and 23) (K-2-ETS1-1)
See Content Evidence Statements for student performance expectations. **See Evidence Statements for Engineering Design.**

Mystery #1

(Activity Optional)

*Scissors *Pens *Paper Clips *Paper

Mystery #2

(To Be completed After the Labs)

*Worksheet (Printed from Website) *Old CD cases *Paper Towels *Pencil *Radish seeds *Masking Tape *Water

Mystery #3

*Worksheet (Printed from Website) *Ruler *Pen or markers *Popsicle Sticks *Small Rubber Bands * Paper Towels *Paper Plates

*Nylon Knee Socks *Grass Seeds *Cups of Water *Ceramic Coffee Mugs * Paper Plates

Mystery #4

*Grass Head *Worksheet (Print from Website) * Pencil *Paper Plates

Mystery #5

(Optional)

*Plant Cards (Download from Website) *Pencils

Before You Teach
In this unit of study, students explore and compare the diversity of life in different habitats. They develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students learn about cause-and-effect relationships and how an organism's structures are related to the function that each structure performs. Developing and using models plays an important role in students' understanding of structure/function relationships. To begin this unit's progression of learning, students observe a variety of plants and animals from a variety of habitats in order to compare the diversity of life. Using firsthand observations and media resources, students explore and collect data about different habitats that exist in the world and how plants and animals have structures that help them survive in their habitats. Students need many opportunities to observe many different kinds of living things, whether they live on land, in water, or both. As students learn about the diversity of life, they begin to look for patterns and order in the natural world. As scientists, students will begin to notice patterns in the structures that enable organisms to support their existence in specific habitats. For example, webbed feet enable survival in wetlands; gills enable survival in rivers, lakes, and oceans; and blubber enables survival in polar regions. The learning progresses as students' focus changes from diversity to commonalities among plants—what plants need in order to grow. Students need opportunities to observe that plants depend on water and light to grow. As they begin to understand that changes in the amount of water and light can affect the growth of plants, they begin to understand that all cause-and-effect relationships generate observable patterns. For example, some plants require very little water to survive, most plants will not grow without sunlight, and most plants need an adequate amount of water to thrive. Students might also observe patterns such as the effects of too much or too little water on a plant and too much or too little light on a plant. In order for students to develop these understandings, they should plan and conduct investigations and collect data, which should be used as evidence to support the idea that all events have causes that generate observable patterns. Finally, students investigate the roles that animals play in plant reproduction. Students learn that many types of plants depend on animals for pollination and/or for the dispersal of seeds. As students begin to explore the interdependent relationships among plants and animals, they learn that the shape and stability of the structures of organisms are related to their function. For example, ✓ As bees collect nectar, portions of their body are designed to collect and then carry pollen from plant to plant. ✓ Some seeds are designed to stick to animal fur so that animals can carry them from place to place. ✓ Animals eat fruits containing seeds, which are then dispersed through animals' body waste. Second graders will need multiple opportunities to develop an understanding of the important relationship between structure and function, because they are expected to use engineering design to plan and develop simple models that mimic the function of an animal in dispersing seeds or pollinating plants. Students can use sketches, drawings or physical models to illustrate how the shape of the model helps it function as needed, and they should use evidence to support their design choices. Some common examples of models could include the following: ✓ Using Velcro "seeds" and furry material to model how seeds with hooks adhere to animal fur. ✓ Using pipe cleaners to gather and distribute "pollen" in a way similar to bees pollinate flowers. In this unit of study, students learn that designs can be conveyed through sketches, drawings, or physical models, and that these representations are useful in communicating ideas for a problem's solutions to other people. As described in the narrative above, students develop simple sketches, drawings, or models that mimic the function of an animal in dispersing seeds or pollinating plants in order to illustrate how the shape of an object helps it

Unit Sequence	
***Part C:** Why do some plants rely on animals for reproduction?*	
Concepts	**Formative Assessments**
● The shape and stability of structures of natural and designed objects are related to their function. ● Plants depend on animals for pollination or to move their seeds around. ● Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.	*Students who understand the concepts can:* ● Describe how the shape and stability of structures are related to their function. ● Develop a simple model based on evidence to represent a proposed object or tool. ● Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. ● Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Assessments
Formative: See formative assessment options above **Benchmark**: Exploring Science Assessments (after completion of each discipline). Note: Benchmark for Life Science after Unit 5 on pages 124-128 of the Exploring Science Teacher Manual. **Summative**: Mystery Science Unit and/or Mystery Assessments **Alternative**: Science journal/notebook and digital notebook entries, labs, Stem Gauge Assessments (Google Folder), student self-evaluation rubrics (Exploring Science teacher manual at the conclusion of each lesson)

Connecting with English Language Arts/Literacy and Mathematics
English Language Arts/Literacy English Language Arts can be leveraged in this unit in a number of ways. Students can participate in shared research using trade books and online resources to learn about the diversity of life in different habitats or to discover ways in which animals help pollinate plants or distribute seeds. Students can record their findings in science journals or use the research to write and illustrate their own books. Students can also learn to take notes in their journals order to help them recall information from experiences or gather information from provided sources. They can add drawings or other visual displays to their work, when appropriate, to clarify ideas, thoughts, and feelings.

Two Scoops Are Better Than One: This lesson is the second day of an end of the unit task to address the Performance Expectation: Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants. This end of unit task is expected to take 3-4 days to complete. In the previous lesson (http://betterlesson.com/lesson/628130/i-scream-you-scream-we-all-scream-for-vanilla-ice-cream), the students were challenged to brainstorm their version of a vanilla flower pollinator. For this lesson, students work with a partner to choose and develop their engineering plans by drawing a diagram for a vanilla plant pollinator. They also create a list of materials needed for the task.

Improving Our Vanilla Bean Pollinators: This lesson is part of a series of lessons created by Jeri Faber on using the engineering design process to solve a problem. In the Ice Scream, You Scream We All Scream for Vanilla Ice Cream, the students were challenged to design a vanilla flower plant pollinator. For day 2, Two Scoops Are Better Than One, students worked with a partner to determine which design to build for their vanilla plant pollinator. For day 3, Building and Testing Our Vanilla Pollinators, the students constructed and tested the effectiveness of their pollinators based on the design plans. In this lesson, students improve their plant pollinator models and retest the pollinator's effectiveness.

The Bug Chicks-Mission: Pollination (Episode 5): The Bug Chicks' five minute video provides a fun, animated way of learning about the fascinating world of pollination and insects. In this video, the students observe interesting museums and habitats to look at lesser known insect pollinators. The student challenge at the end leads students into their environment to look for other pollinators and encourages them to bring their observations back to the classroom to discuss.

Appendix A: NGSS and Foundations for the Unit		
Make observations of plants and animals to compare the diversity of life in different habitats. *[Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.]* [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.*]* **(2-LS4-1)**		
Plan and conduct an investigation to determine if plants need sunlight and water to grow. [*Assessment Boundary: Assessment is limited to testing one variable at a time.*] **(2-LS2-1)**		
Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.* (2-LS2-2)		
Ask questions, make observations, and gather information about a situation people want to change (e.g., climate change) to define a simple problem that can be solved through the development of a new or improved object or tool. (K-5 NJSLS-S, pp.11 and 23) (K-2-ETS1-1)		
The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
Science and Engineering Practices	**Disciplinary Core Ideas**	**Crosscutting Concepts**
Planning and Carrying Out Investigations ● Plan and conduct investigations collaboratively to produce evidence to answer a question. (1-PS4-1),(2-LS2-1) **Planning and Carrying Out Investigations** ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (2-LS4-1) **Developing and Using Models** ● Develop a simple model based on evidence to represent a proposed object or tool. (2-LS2-2) **Asking Questions and Defining Problems** ● Ask questions based on observations to find more information about the natural and/or designed world(s). (K-2-ETS1-1) ● Define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)	**LS4.D: Biodiversity and Humans** ● There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1) **LS2.A: Interdependent Relationships in Ecosystems** ● Plants depend on water and light to grow. (2-LS2-1) ● Plants depend on animals for pollination or to move their seeds around. (2-LS2-2) **ETS1.B: Developing Possible Solutions** ● Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.*(secondary to 2-LS2-2)* **ETS1.A: Defining and Delimiting Engineering Problems** ● A situation that people want to change or create can be approached as a problem to	**Cause and Effect** ● Events have causes that generate observable patterns. (2-LS2-1) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2), (K-2-ETS1-2) - ***Connections to Nature of Science*** **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (2-LS4-1)

	be solved through engineering. (K-2-ETS1-1) ● Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1) ● Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)	

English Language Arts	Mathematics
Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1) **W.2.7** Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1), (K-2-ETS1-1) **W.2.8** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2) **SL.2.5** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers. (K-2-ETS1-1) **W.2.6** Ask and answer such questions as who, what, where, when, why, and how to demonstrate understanding of key details in a text. (K-2-ETS1-1) **RI.2.1**	Reason abstractly and quantitatively. (2-LS2-1), (K-2-ETS1-1) **MP.2** Model with mathematics. (2-LS2-1),(2-LS2-2), (K-2-ETS1-1) **MP.4** Use appropriate tools strategically. (2-LS2-1), (K-2-ETS1-1) **MP.5** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph. (2-LS2-2) **2.MD.D.10**

WIDA	Technology
ELD Standard 1: The Language of Social and Instructional Language ELD Standard 4: The Language of Science	8.1.2.A.4. Demonstrate developmentally appropriate navigation skills in virtual environments (i.e. games, museums). 8.1.2.B.1. Illustrate and communicate original ideas using multiple digital tools and resources 8.1.2.E.1. Use digital tools and online resources to explore a problem or issue 8.2.2.A.1 Define products produced as a result of technology or of nature. 8.2.2.A.2 Describe how designed products and systems are useful at school, home and work. 8.2.2.A.3 Identify a system and the components that work together to accomplish its purpose. 8.2.2.A.4 Choose a product to make and plan the tools and materials needed. 8.2.2.A.5 Collaborate to design a solution to a problem affecting the community. 8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.

21st Century and Career Readiness

CRP3. Consider the environmental, social and economic impacts of decisions.
CRP4. Demonstrate creativity and innovation.
CRP5. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9. Work productively in teams while using cultural/global competence.