Grade 2 Model Science Unit 1: Relationships in Habitats (date 1.26.16) **Instructional Days: 15**

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 to define a simple problem that can be solved through the development of a new or improved object or tool. (K-2-ETS1-1)

Quick Links

Unit Sequence	
Part A: *How does the diversity of plants and animals compare among different habitats?*	
Concepts	**Formative Assessments**
• People look for patterns and order when making observations about the world. • There are many different kinds of living things in any area, and they exist in different places on land and in water.	*Students who understand the concepts can:* • Look for patterns and order when making observations about the world. • Make observations (firsthand or from media) to collect data that can be used to make comparisons. • Make observations of plants and animals to compare the diversity of life in different habitats. *(Note: The emphasis is on the diversity of living things in each of a variety of different habitats; assessment does not include specific animal and plant names in specific habitats.)*

Unit Sequence	
Part B: *What do plants need to live and grow?*	
Concepts	**Formative Assessments**
• Events have causes that generate observable patterns. • Plants depend on water and light to grow.	*Students who understand the concepts can:* • Observe patterns in events generated by cause-and-effect relationships. • Plan and conduct an investigation collaboratively to produce data to serve as a basis for evidence to answer a question. • Plan and conduct an investigation to determine whether plants need sunlight and water to grow. *(Note: Assessment is limited to one variable at a time.)*

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.

What It Looks Like in the Classroom

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 function as needed to solve a given problem.

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.

Mathematic

Throughout this unit of study, students need opportunities to represent and interpret categorical data by drawing picture graphs and/or bar graphs (with a single-unit scale) to represent a data set with up to four categories. This will lead to opportunities to solve simple put-together, take-apart, and compare problems using information presented in these types of graphs. For example, students could create bar graphs that show the number of seedlings that sprout with and without watering or that document plant growth. They could also create a picture graph showing the number of plant species, vertebrate animal species, and invertebrate animal species observed during a field trip or in a nature photograph. As students analyze the data in these types of graphs, they can use the data to answer simple put-together, take apart, and compare problems. This unit also presents opportunities for students to model with mathematics. They can diagram situations mathematically or solve a one-step addition or subtraction word problems. Data collected in bar graphs and picture graphs can easily be used for this purpose.

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 principals (http://www.cast.org/our-work/about-udl.html#.VXmoXcfD_UA).

Research on Student Learning
Lower elementary-school students can understand simple food links involving two organisms. Yet they often think of organisms as independent of each other but dependent on people to supply them with food and shelter. Students of all ages think that some populations of organisms are numerous in order to fulfill a demand for food by another population (NSDL, 2015).

Prior Learning
Kindergarten Unit 1: Pushes and Pulls • 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. **Kindergarten Unit 4: Basic Needs of Living Things**

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.
- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

Future Learning

Grade 3 Unit 6: Organisms and the Environment

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Grade 3 Unit 7: Using Evidence t Understand Change in the Environment

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Grade 5 Unit 3: Energy and Matter in Ecosystems

- Plants acquire their material for growth chiefly from air and water.
- 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

The following connections to disciplinary core ideas in Engineering, Technology, and Applications of Science occur in **Unit 2, Properties of Matter**, and **Unit 5, Changes to Earth's Land**.

- 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.
- 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.

Sample of Open Education Resources
Do Plants Need Sunlight? Students will explore the importance sunlight for a plant's survival by conducting an investigation. Each group of students will cover parts of plants' leaves with black construction paper and make observations of the plant's leaves over several days. This lesson serves to model the process of investigation. The investigation will take 7 days to complete. Then students can remove the black paper, place the plants back in the sunlight, and view the leaves in a second investigation. *(Note: Chlorophyll is not a necessary concept/vocabulary term to address in this lesson.)*
Who Needs What? Students identify the physical needs of animals. Through classroom discussion, students speculate on the needs of plants. With teacher guidance, students then design an experiment that can take place in the classroom to test whether or not plants need light and water in order to grow. Students conduct the associated activity in which sunflower seeds are planted in plastic cups, and once germinated, are exposed to different conditions. In the classroom setting, students test for the effects of light versus darkness, and watered versus non-watered conditions. During exposure of the plants to these different conditions, students measure growth of the seedlings every few days using non-standard measurement. After a few weeks, students compare the growth of plants exposed to the different conditions, and make pictorial bar graphs that demonstrate these comparisons.I Scream, You Scream, We All Scream for Vanilla Ice Cream! In this lesson students design a vanilla plant pollinator. This is an end-of-the-unit task, taking about 3 days to complete. The students will view an amazing video that tells about the problems with pollinating vanilla by hand. The students pretend to be employees of Ben and Jerry's ice cream company and help to plan and design a pollinator for the vanilla plant so that the great vanilla flavored ice cream can continue to be produced. (This is the first of several lessons created by Jeri Faber on plant pollination at: betterlessons.com/)
Building and Testing Our Vanilla Plant Pollinator: In previous lessons designed by Jeri Faber, students have learned about how animals help pollinate flowers. The students have also planned and designed their own vanilla plant pollinator. In this lesson, students use the engineering design process to build and test the plant pollinator they planned the day before in class.
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.

Teacher Professional Learning Resources
Teaching NGSS in Elementary School—Second Grade The presenters were Carla Sembal-Saul, Professor of Science Education at Penn State University, Mary Starr, Executive Director at Michigan Mathematics and Science Centers Network, and Kathy Renfrew, K-5 Science Coordinator, VT Agency of Education and NGSS Curator introduced the NGSS Web seminar Series for K-5 educators. The seminar was introduced by Ted Willard, NSTA's Director for *NGSS*, on how Elementary School standards - and specifically for the Second Grade - fit into the framework in terms of core ideas and performance expectations. Carla, Mary and Kathy engaged with participants to gauge their familiarity with *NGSS* for the second grade, and provided a number of example activities and videos on how to implement it, e.g., explaining how solids and liquids respond in the presence of a heat source. The web seminar was then wrapped up by Ted Willard, who suggested a number of resources and events for participants to further develop their understanding of *NGSS* for the Second Grade, as well as other grade levels. Visit the resource collection. Continue discussing this topic in the community forums. **NSTA Web Seminar: Teaching NGSS in K-5: Constructing Explanations from Evidence** Carla Zembal-Saul, Mary Starr, and Kathy Renfrew, provided an overview of the *NGSS* for K-5th grade. The web seminar focused on the three dimensional learning of the *NGSS*, while introducing CLAIMS-EVIDENCE-REASONING (CER) as a framework for introducing explanations from evidence. The presenters highlighted and discussed the importance of engaging learners with phenomena, and included a demonstration on using a KLEWS chart to map the development of scientific explanations of those phenomena. To view related resources, visit the resource collection. Continue discussing this topic in the community forums. **NGSS Core Ideas: Earth's Systems** The presenter was Jill Wertheim from National Geographic Society. The program featured strategies for teaching about Earth science concepts that answer questions such as "What regulates weather and climate?" and "What causes earthquakes and volcanoes?" Dr. Wertheim began the presentation by introducing a framework for thinking about content related to Earth systems. She then showed learning progressions for each concept within the Earth's Systems disciplinary core idea and shared resources and strategies for addressing student preconceptions. Dr. Wertheim also talked about changes in the way NGSS addresses these ideas compared to previous common approaches. Participants had the opportunity to submit questions and share their feedback in the chat. Continue the discussion in the community forums.

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 to define a simple problem that can be solved through the development of a new or improved object or tool. (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 be solved	**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)

	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**