Science Curriculum

Kindergarten

The Mission

Our mission is to cultivate science learners who have the foundational knowledge to make ethical, scientifically literate decisions and the ability to apply scientific practices in order to contribute to the needs of society and a changing world.

- **Vision**

  We envision a K-12 science experience that supports and challenges every student in their science learning journey. We will:
  - *Capitalize on diversity by reaching and exciting students at all levels and interests by differentiating learning within classrooms and by offering a robust program of studies.*
  - *Emphasize authentic science and engineering practices and leverage the interdisciplinary nature of science with arts, technology, math, reading, and writing.*
  - *Integrate scientific knowledge and 21st century competencies to prepare students to make informed decisions and take action to address real world problems.*

Elementary Science NGSS Kindergarten - Unit 4: Basic Needs of Living Things

Unit Summary

Where do plants and animals live and why do they live there?

In this unit of study, students develop an understanding of what plants and animals need to survive and the relationship between their needs and where they live. Students compare and contrast what plants and animals need to survive and the relationship between the needs of living things and where they live. The crosscutting concepts of *patterns* and *systems and system models* are called out as organizing concepts for these disciplinary core ideas. Students are expected to demonstrate grade-appropriate proficiency in *developing and using models*, *analyzing and interpreting data*, and *engaging in argument from evidence*. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on K-LS1-1, K-ESS3-1, and K-ESS2-2.

Student Learning Objectives

 Use observations to describe patterns of what plants and animals (~~including humans~~) need to survive. *[Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]* **(K-LS1-1)**

Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. *[Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]* **(K-ESS3-1)**

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. *[Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]* **(K-ESS2-2)**

Quick Links

What It Looks Like in the Classroom

Many students come to class with experience caring for living things such as family pets, houseplants, gardens, and even younger siblings. Teachers can begin IS1 with activities that allow students to share these experiences with one another. By the end of Unit 4, they should be able to relate these anecdotes to a few key principles about living organisms.

The DCIs for this unit are developmentally appropriate for kindergarten. Students learn that plants need water and light to live and grow and that animals need food. Animals obtain food from plants or other animals. Students also learn that organisms survive and thrive in places that have the resources they need. Simply knowing these core ideas is not sufficient for meeting the PE; K-LS1-1 requires that students identify patterns in the needs of different organisms. It is not possible to identify a pattern unless students observe and compare multiple observations of living things. The process of integrating multiple observations and looking for patterns constitutes analyzing data in the K–2 grade band.

Students can observe living things directly in the classroom, in the schoolyard, and through media. Media (including books, print articles, and digital resources) expose students to a wide variety of organisms. Classroom pets such as birds, rodents, reptiles, fish, or even ant farms allow students to notice consistent patterns over time (i.e., the fish needs to be

fed every day or the rodent spends most of its waking time eating). *(Note: With pets, teachers must be mindful of district policies and allergies.)* Students can observe plants, insects, and other critters on their schoolyard. They can also grow their own seeds in cups or in an outdoor garden space.

Once students have identified patterns about what plants need to survive, they can test out their idea by taking several identical plants that have already sprouted and deprive them of water, light, both, or neither. Based on their model of what plants need, which do they predict will survive? Students will plan their own investigation of this question in grade two (2-LS2-1).

While all plants and all animals share common features, there are also important differences between types of organisms. Different plants require different amounts of water (such as a fern that requires lots of water versus a cactus that requires very little). Different animals prefer different types of foods. For example, some animals only eat plants while others only eat animals, and others eat both. Students can use their background knowledge and observations from media to match specific animals to the food sources that they eat. Teachers can then ask questions such as, "What will happen if a deer that eats only grass tries to live in a desert where cacti are the main plants?"

Students should begin to group plants and animals together based upon their similar environmental needs (water, sunlight) and the availability of their preferred food sources. For example, students might read a story about the grasslands of Africa where a gazelle eats grass and then a lion eats the gazelle. Students should be able to explain [SEP-6] why each animal lives in that particular spot in Africa. Their answers should identify a specific need that is met by that location (either an environmental condition such as, "the grass lives there because it gets the sunlight and water that it needs," or a food source such as, "the lion lives there because it eats the gazelles there."). Once students master the relationships of simple groups of organisms like the African grassland, teachers can focus on living things close to their school. What plants grow well in the weather in their city? What animals will eat those plants, and what animals will eat those animals?

Students will build on their model of the relationship between the needs of organisms and their environmental conditions in grade three when they explore what happens when the environment changes (3-LS4-4) and in grade five when they examine the specific flow of energy and matter (5-LS2-1).

<div align="center">Guiding Questions:</div>

<div align="center">*How can you tell if something is alive?*</div>
<div align="center">*What do animals and plants need to survive?*</div>
<div align="center">*Where do organisms live and why do they live there?*</div>
<div align="center">Example Instructional Sequence</div>

The unit should begin with observable phenomena. The purpose of presenting phenomena to students is to start them thinking and wondering about what they observe. After students have observed the event, they can work individually, with partners, or in a small group to develop questions about what they saw. The questions will lead them into investigational opportunities throughout the unit that will help them answer their questions.

The questions students share about this unit will be used to guide them in identifying patterns of what plants and animals need to survive. For example, a pattern may include the types of food that specific organisms eat or that animals consume food but plants do not. Furthermore, students' questions and investigations will also guide them in developing models that reflect their understanding of the inter-relationship between an organism and its environment.

- Prior to starting the unit, display pictures of living and non-living things. Direct students to sort the pictures into two groups: living and non-living. Ask students to explain how they decided which pictures represented living things and which represented non-living things.
- Watch the PBS video "Is It Alive?" Stop after each picture and ask students if it's alive or not. Ask them to explain how they can tell. (This activity will also provide an opportunity to pre-assess students' understandings and/or misconceptions. It will also provide an opportunity for students to think about what having life means.)
- Watch the TeacherTube video "Living or Non-Living?" (This activity provides similar experiences for students as the PBS video. The difference is that after each picture and question, the narrator provides the answer with reasoning.)

In this unit's progression of learning, students first learn that scientists look for patterns and order when making observations about the world and those patterns in the natural world can be observed and used as evidence. Students conduct firsthand and media-based observations of a variety of living things and use their observations as evidence to support the concepts

Plants do not need to take in food, but do need water and light to live and grow.
All animals need food in order to live and grow, that they obtain their food from plants or from other animals, that different kinds of food are needed by different kinds of animals, and that all animals need water.

After determining what plants need to survive, kindergarteners learn that plants are systems, with parts, or structures, that work together, enabling plants to meet their needs in a variety of environments. The vast majority of plants have similar

structures, such as roots, stems, and leaves, but the structures may look different depending on the type or variety of plant. Although there are many varieties of plants, their structures function in similar ways, allowing the plants to obtain the water and light they need to survive. In other words, each variety of plant has structures that are well-suited to the environment in which it lives. As students learn about different types of plants and the environments in which they live, they use models, such as diagrams, drawings, physical replicas, or dioramas, to represent the relationships between the needs of plants and the places they live in the natural world. For example, grasses need sunlight, so they often grow in meadows. Cacti, which live in places subject to drought, have thick, wide stems and modified leaves (spines) that keep water within the plant during long periods without rain.

After determining what animals need to survive, kindergarteners learn that animals are systems that have parts, or structures, that work together, enabling animals to meet their needs in a variety of environments. Many animals have similar structures, such as mouths or mouthparts, eyes, legs, wings, or fins, but the structures may look different, depending on the type or species of animal. Although there are many types of animals, their structures function in similar ways, allowing them to obtain the water and food they need to survive. In other words, each type of animal has structures that are well-suited to the environment in which they live. As students learn about different types of animals and the environments in which they live, they use models, such as diagrams, drawings, physical replicas, or dioramas, to represent the relationships between the needs of animals and the places they live in the natural world. For example, deer eat buds and leaves; therefore, they usually live in forested areas; pelicans eat fish, therefore they live near the shorelines of oceans or seas.

The final portion of the learning progression focuses on the understanding that plants and animals are systems with parts, or structures, that work together. Students use what they have learned about plants and animals to make further observations to determine ways in which plants and animals change their environment to meet their needs. For example:

> Tree roots can break rocks and concrete in order to continue to grow, plants will expand their root systems in search of water that might be found deeper in the earth, and plants can be found growing around and through man-made structures in search of light.
> A squirrel digs in the ground to hide food, and birds collect small twigs to build nests in trees. Students need opportunities to make observations, and then, with adult guidance, to use their observations as evidence to support a claim for how an animal can change its environment to meet its needs.

Students need opportunities to make observations; then, with adult guidance, they can use their observations as evidence to support a claim about how living things can change its environment to meet its needs.

Connecting with English Language Arts/literacy and Mathematics

English Language Arts

After students observe plants and animals in a variety of settings (e.g., ant farms, fish in an aquarium, plants growing, and insects in a jar), the teacher asks them to share their thoughts about what the plants and animals need using expressions like, "I think…" and "I agree with…." To help summarize patterns in the needs of plants and animals, teachers can list all of the "needs" the class has discussed on the board using words and pictures/symbols (e.g., sun, water, food). Students, individually or with a partner, draw a picture of a plant on one half of a piece of paper, and an animal on the other half. Then they draw and/or write the needs of the plant and of the animal next to each picture. Students can verbally complete the sentence frame, "Plants are different from animals because_____." This concept is important because scientists distinguish plants from animals based on what they need: animals need to consume food while plants do not, although plants do need nutrients. Students can represent this idea with a Venn diagram.

ELA/Literacy Standards: W.K.2, 8; SL.K.1, 4, 5; L.K.5c

Mathematics

Kindergarten students use attributes to sort objects (K.MD.3). For example, a large portion of IS1 involves sorting plants and animals based on patterns in their needs. Students can sort organisms based on whether they are a plant or an animal, whether they live on water or land, and whether an animal eats only plants, only animals, or both.

With adult support, kindergarteners use simple measurements to describe various attributes of plants and animals. Kindergarteners can use simple, nonstandard units to measure the height of plants or the amount of water given to plants. For example, they might use Unifix cubes to measure height or count the number of scoops of water given to a plant on a daily or weekly basis. Students should work in groups to measure and record their data. They also take measurements to describe various attributes of animals. Kindergarteners can use simple, nonstandard units to measure such attributes as height, length, or weight. They can also count numbers of appendages or other body parts. They might use Unifix cubes to measure height or length and wooden blocks to measure weight. Students should work in groups to measure and record their data.

With adult guidance and questioning, students can then learn to analyze their data. As students use data to compare the amount of growth that occurs in plants that get varying amounts of water or sunlight, they are given the opportunity to reason abstractly and quantitatively. For example, students can measure and compare the height of a sunflower grown in the shade compared to the height of a sunflower grown in the sun, or they can count and compare the number of leaves on bean plants that receive different amounts of water daily. These investigations will give students evidence to support claims about the needs of plants. Students should also have opportunities to solve one-step addition/subtraction word problems based on their collected data.

Math Standards: MP. 2, K.CC.1-3, K.MD.2-3

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).

Research on Student Learning

N/A

Future Learning

Students will build on their model of the relationship between the needs of organisms and their environmental conditions in grade three when they explore what happens when the environment changes (3-LS4-4) and in grade five when they examine the specific flow of energy and matter (5-LS2-1).

Connections to Other Units

Teachers and students can decorate the four corners of their classrooms to look like the landscape of regional environments. They can read stories (fictional and informational) set in those environments. They can modify the decorations as the seasons change (connecting to IS3).

Sample of Open Education Resources

Read-Aloud Lesson: Where Do Polar Bears Live? Students identify and recall characteristics that allow polar bears to survive in the extremely cold Arctic environment.

"Good Night" & Where Do Polar Bears Live? This is a Paired Text activity that uses the "Where Do Polar Bears Live" read aloud and the non-fiction text "Good Night" which addresses hibernation.

The Needs of Living Things This lesson plan has one level for Grades K-2 and another level for Grades 3-5. Students will learn about what plants and animals need to survive and how habitats support those needs. They will also learn about how organisms can change their environment.

Living Things and Their Needs: This is an excellent resource that provides a Teacher Guide, videos, reading resources, and student activity sheets. The objective of the lessons is for students to learn about living organisms and what they need to survive. These lessons can easily be taught as an interdisciplinary set of learning experiences.

How do living things Interact: This unit plan is about unit plan about living things and environmental interactions

5E Science Lesson Plan: This Prezi presentation describes lesson ideas that support students' understanding of living

organisms. Lessons also provide an opportunity for students to identify patterns that help them determine similarities and differences between plants and animals.

Curious George: Paper Towel Plans: This video from Curious George shows students helping bean seeds sprout outside of soil by meeting their essential needs for moisture, temperature, air, and light. The children place the beans and a wet paper towel inside a zippered plastic bag and leave them undisturbed in a warm, well-lit place. After two weeks, the students return and observe that the beans have sprouted and, like apple seeds, will one day grow to be fully developed plants.

From Seed to Fruit | Everyday Learning: Seed to Fruit takes children through the different stages of growth in the life of a cherry tomato plant. Planting a seed in a cup and watching it grow over time is a wonderful way to introduce the life cycle to young children. This resource is part of the KET Everyday Science for Preschoolers collection. This video is available in both English and Spanish audio, along with corresponding closed captions.

Think Garden: The Importance of Water: This video from KET's Think Garden collection explores why plants need water to survive, and how they tell us they're thirsty. Learn about the signs plants give when they've had too much or too little water and the part water plays in the process of photosynthesis. See a quick, easy-to-understand animation explaining the water cycle and transpiration process. Also find out how to improve water quality with rain gardens and how to conserve water with rain barrels. This video is available in both English and Spanish audio, along with corresponding closed captions.

Think Garden: Plant Structure: This video from KET's Think Garden collection examines plant structure by taking a closer look at the root and shoots systems. Learn about roots, stems, leaves, flowers, seeds, and fruit through engaging illustrations and animations.

Teacher Professional Learning Resources

Webinar: Teaching *NGSS* in K-5: Making Meaning through Discourse

The presenters were Carla Zembal-Saul, (Penn State University), Mary Starr, (Michigan Mathematics and Science Centers Network), and Kathy Renfrew (Vermont Agency of Education). After a brief introduction about the Next Generation Science Standards (*NGSS*), Zembal-Saul, Starr, and Renfrew gave context to the *NGSS* specifically for K-5 teachers, discussing three-dimensional learning, performance expectations, and background information on the *NGSS* framework for K-5. The presenters also gave a number of examples and tips on how to approach *NGSS* with students, and took participants' questions. The web seminar ended with the presentation of a number of recommended NSTA resources for participants to explore. View the resource collection.

Continue discussing this topic in the community forums.

Webinar: Evaluating Resources for *NGSS*: The EQuIP Rubric

The presenters were Brian J. Reiser, Professor of Learning Sciences in the School of Education and Social Policy at Northwestern University, and Joe Krajcik, Director of the CREATE for STEM Institute.

After a brief overview of the *NGSS,* Brian Reiser, Professor of Learning Sciences, School of Education at Northwestern University and Joe Krajcik, Director of CREATE for STEM Institute of Michigan State University introduced the Educators Evaluating Quality Instructional Products (EQuIP) Rubric. The web seminar focused on how explaining how the EQuIP rubric can be used to evaluate curriculum materials, including individual lessons, to determine alignment of the lesson and/or materials with the NGSS. Three-dimensional learning was defined, highlighted and discussed in relation to the rubric and the NGSS. An emphasis was placed on how to achieve the conceptual shifts expectations of NGSS and three-dimensional learning using the rubric as a guide. Links to the lesson plans presented and hard copies of materials discussed, including the EQuIP rubric, were provided to participants. The web seminar concluded with an overview of NSTA resources on the NGSS available to teachers by Ted, and a Q & A with Brian Reiser and Joe Krajcik. View the resource collection.

Continue discussing this topic in the community forums

Webinar: *NGSS* Crosscutting Concepts: Systems and System Models

The presenter was Ramon Lopez from the University of Texas at Arlington. Dr. Lopez began the presentation by discussing the importance of systems and system models as a crosscutting concept. He talked about the key features of a system: boundaries, components, and flows and interactions. Dr. Lopez also described different types of system

models, including conceptual, mathematical, physical, and computational models. Participants discussed their current classroom applications of systems and system models and brainstormed ways to address challenges associated with teaching this crosscutting concept.

Journal Article: Assessing Students' Ideas About Plants: This article contains an interview protocol that will help you gather information about your elementary students' ideas related to plants. By implementing the protocol, you will be able to discover what kinds of organisms your students think are plants and identify what students consider important for plant growth. Reproducible pictures of organisms and items that plants need for growth are included.

Journal Article: The Early Years: The Sun's Energy: Understanding the connection between the Sun's energy and sustaining life is difficult for preschoolers, but learning about these concepts through both long and short-term activities captures children's short attention spans. Activities such as growing plants in sunlight and without light, playing with light and shadow, and making "sun prints" explore light—in this case how the Sun's light is different from lamplight.

Appendix A: NJSLS-S and Foundations for the Unit
Use observations to describe patterns of what plants and animals (including humans) need to survive. *[Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]* **(K-LS1-1)**
Use a model to represent the relationship between the needs of different plants and animals (including humans) and the places they live. *[Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.]* **(K-ESS3-1)**
Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. *[Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]* **(K-ESS2-2)**
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
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. (K-ESS3-1) **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1) **ESS3.A: Natural Resources** ● 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. (K-ESS3-1) **ESS2.E: Biogeology** ● Plants and animals can change their environment. (K-ESS2-2)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) - *Connections to Nature of Science* **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

English Language Arts	Mathematics
Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book. (K-ESS2-2) **W.K.1** Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic. (K-ESS2-2) **W.K.2** Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them). (K-LS1-1) **W.K.7** Add drawings or other visual displays to descriptions as desired to provide additional detail. (K-ESS3-1) **SL.K.5** With prompting and support, ask and answer questions about key details in a text. (K-ESS2-2) **R.K.1**	Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. (K-LS1-1) **K.MD.A.2** Reason abstractly and quantitatively. (K-ESS3-1) **MP.2** Model with mathematics. (K-ESS3-1) **MP.4** Counting and Cardinality (K-ESS3-1) **K.CC**

21st Century Life and Careers/Technology Standards (as applied at grade level):
● Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. ● Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. ● Communicate clearly and effectively and with reason. ● Utilize critical thinking to make sense of problems and persevere in solving them. ● Employ valid and reliable research strategies. ● Demonstrate creativity and innovation. ● Apply appropriate academic and technical skills.

Social Studies
Standard 6.1 U.S. History: America in the World. All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

Quantity	Description	Potential Supplier (item #)
	See Carolina Biological and Insect Lore XLS Order Form	See Carolina Biological and Insect Lore XLS Order Form
4	HexBug Nano Nitro 5 Pack	Hexbug.com # 415-4574
1 per teacher (16)	From Seed to Plant by Gail Gibbons	Barnes and Noble # 9780823410255
1 per teacher	How Do Plants Grow? By Julie Lundgren	Barnes and Noble # 9781617419232

(16)		

Living and Nonliving

Grade/ Grade Band: K	**Topic:** Basic Needs of Living Things	**Lesson #** _1____ **in a series of** _8 **lessons**

Brief Lesson Description:

In this lesson students will evaluate objects to determine if they are living or nonliving. They will decide what category the thing is in and then propose evidence that supports their claim. The teacher will facilitate this process by keeping a list of ideas for characteristics that support classifying something in each category.

Performance Expectation(s):

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Specific Learning Outcomes:

At the end of this lesson students will be able to:
● Confidently sort organisms into living and nonliving categories using a set of life system categories.
● Collaboratively articulate an argument from evidence to support each of their claims.

Narrative / Background Information

Prior Student Knowledge:

Students are expected to know what animals and plants are in general terms.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. (K-ESS3-1) ○ Distinguish between a model and the actual object, process and/or events the model represents. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support	**LS1.C: Organization for Matter and Energy Flow in Organisms** - 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. (K-LS1-1)	**Patterns (K-2) -** Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

a claim. (K-ESS2-2) o Identify arguments that are supported by evidence. o Distinguished between explanations that account for all gathered evidence and those that do not. o Analyze why some evidence is relevant to a scientific question and some is not. o Distinguish between opinions and evidence in one's own explanations. o Listen actively to arguments to indicate agreement or disagreement based on evidence, and/or to retell the main points of the argument. Construct an argument with evidence to support a claim.		

Possible Preconceptions/Misconceptions:
- Anything that moves is alive.
- Plants are less alive than animals.
- Seeds are dead.

EVALUATE: Formative Monitoring (Questioning / Discussion): Initial engagement activity, question and answer

Summative Assessment (Quiz / Project / Report):
- Watch the PBS video "Is It Alive?" Stop after each picture and ask students if it's alive or not. Ask them to explain how they can tell.
- Watch the TeacherTube video "Living or Non-Living?" (This activity provides similar experiences for students as the PBS video. The difference is that after each picture and question, the narrator provides the answer with reasoning.)

Elaborate Further / Reflect: Enrichment:
Math: Identify Living and Nonliving Things
- Identify a specified number of living or nonliving things.
  - Give each student a picture of animals in their habitat. Have them discuss with a partner how many living things they see and how many non-living things they can see.
Art: Make a Living and Nonliving collage
- Make a collage showing favorite living and nonliving things.

Characteristics of Plants: What do they need to survive?

Grade/ Grade Band: K	**Topic:** Basic Needs of Living Things	**Lesson # 2 in a series of 8 lessons**

Brief Lesson Description:
Kindergarteners identify the five basic needs of plants, with more emphasis on water and light. The lesson uses living and dead plants as examples for students to explore plant needs.

Performance Expectation(s):

K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Specific Learning Outcomes:

At the end of this lesson students will be able to:

• Argue from evidence that the needs of a plant include **water, light**, nutrients, air, and space to grow.

Narrative / Background Information

Prior Student Knowledge: Most plants grow in the soil and need water.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1) **ESS3.A: Natural Resources** ● 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. (K-ESS3-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Possible Preconceptions/Misconceptions:

- Plants need to be planted in soil to grow.
- Plants' roots are smaller than their stems.
- The only/ most important role of a plant is to supply oxygen. (The most important local effect plants have on animals is to provide food.)
- Plants do not need oxygen - they can live without air. (They generate more oxygen than they use, but use gases such as carbon dioxide and oxygen.)

EVALUATE:

Formative Monitoring (Questioning / Discussion):

- Teacher observation
- Student discussion/responses
- Student participation

Elaborate Further / Reflect: Enrichment:

- Writing: Make a "Plant Needs" book
  - Identify what plants need and make a book to illustrate its needs.
- Art: Draw "Things That Plants Need"
  - Draw pictures to identify things that plants need.
- Math: Figure out the right amount

○ Use measuring to explore what happens when plants receive varying amounts of water.

Characteristics of Plants: What are some plant parts?

Grade/ Grade Band: K	**Topic:** Basic Needs of Living Things	**Lesson # 3 in a series of 8 lessons**

Brief Lesson Description:
At a developmental level of instruction, kindergartners collect information by observing and recording the external features of plants. They identify the four basic parts of a plant, and describe the function of each part.

Performance Expectation(s):
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Specific Learning Outcomes:
At the end of this lesson students will be able to:
● Construct a model of a plant, showing and naming its parts (leaves, stem, roots, flower), and discuss the relationship of each structure to its function.

Narrative / Background Information

Prior Student Knowledge: Needs of a plant include **water, light**, nutrients, air, and space to grow.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** Use a model to represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1) **ESS3.A: Natural Resources** ● 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. (K-ESS3-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2- ETS1-2) **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Possible Preconceptions/Misconceptions:
● **Plants need to be planted in soil to grow.** ● **Plants' roots are much smaller than their stems.** ● **The only/ most important role of a plant is to supply oxygen. (The most important local effect plants have on animals is to provide food.)** ● **Plants do not need oxygen - they can live without air. (They generate more oxygen than they use, but use gases such as carbon dioxide and oxygen.)** ● **Plants do not need food. (Plants use water, nutrients and light to make their own food.)**

EVALUATE:
Formative Monitoring (Questioning / Discussion): ● Teacher observation ● Student discussion/responses ● Student participation ● Students drawings

Elaborate Further / Reflect: Enrichment:
● Art: Spin and Draw Plant Parts
   ○ Students will spin a plant part (flower, leaf, roots, seeds, and stem) from a teacher-made game board and draw with paper and crayons.
● Math: Measure the amount of water one plant takes in.
   ○ Measure the amount of water a plant takes in through its stem.
      ■ Mark the amount of water on a plastic container with a marker, place a piece of celery or flower in the container, the next day make a new mark with a marker and discuss how much water the plant has taken in.

Characteristics of Plants: How do plants grow and change?

Grade/ Grade Band: K	Topic: Basic Needs of Living Things	Lesson # 4 in a series of 8 lessons (may last a number of days from ~ 6-12 depending on plant growth)

Brief Lesson Description:
At a developmental level of instruction, kindergartners collect information by observing and recording the external features of plants. They identify the four basic parts of a plant, and describe the function of each part. Kindergarten students care for plants by identifying and providing for their needs.

Performance Expectation(s):
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Specific Learning Outcomes:
At the end of this lesson the student will be able to: ● Carry out an investigation to confirm the needs of a plant, by caring for those needs (**water, light,** nutrients, air and space) during plant growth. ● Make, or draw, a model showing the stages of growth of a plant from seed to mature seedling. ● Collect analyze and interpret data on plant growth.

Narrative / Background Information
Prior Student Knowledge: Students are expected to know that the needs of plants include **water, light**, nutrients, air, and space to grow. Recognize that stems, roots, leaves, flowers, and seeds are parts of plants.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2- ETS1-2) **Scientific Knowledge is Based on Empirical Evidence**

		● Scientists look for patterns and order when making observations about the world. (K-LS1-1)
to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)		

Possible Preconceptions/Misconceptions:
- **Plants need to be planted in soil to grow.**
- **Plants' roots are smaller than their stems.**
- **The only/ most important role of a plant is to supply oxygen. (The most important local effect plants have on animals is to provide food.)**
- **Plants do not need oxygen - they can live without air. (They generate more oxygen than they use, but use gases such as carbon dioxide and oxygen.)**
- **Plants do not need to take in food, but do need water and light to live and grow.**

EVALUATE:

Formative Monitoring (Questioning / Discussion):
- Teacher observation
- Student discussion/responses
- Student participation
- Students drawings

Elaborate Further / Reflect: Enrichment:
- Math: Make a plant growth graph
  - Make a vertical string graph to measure and record natural plant growth.

Characteristics of Animals: What do animals need to survive?

Grade/ Grade Band: K	**Topic:** Basic Needs of Living Things	**Lesson #___5____in a series of __8____ lessons**

Brief Lesson Description: At a developmental level of instruction, kindergartners collect information by observing, identifying, and recording the external features of humans and other animals. They identify the external features of animals, and describe the function of each feature. Students argue that plants and animals need the same things to survive. They then explore what animals need to survive making connections between where they live and what they eat and need to survive.
Performance Expectation(s): K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]
Specific Learning Outcomes: **At the end of this lesson the student will be able to:**   ● Argue from evidence that the needs of animals include food, water, air, and shelter in a specific habitat type suitable to that animal.   ● Create a visual model (drawing) that shows an example of an animal using a structure, or behavior, to meet a life need.
Narrative / Background Information

Prior Student Knowledge: Students are expected to be familiar with various types of animals and how they interact with their environment in general terms. They are also expected to recall the basic needs of animals from previous lessons including food, water, shelter and space.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1) **ESS3.A: Natural Resources** ● 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. (K-ESS3-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2- ETS1-2) **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Possible Preconceptions/Misconceptions:
- All animals need to drink water (some animals get water from food).
- Animals can eat a variety of food (some animals can only eat one type of food).
- All animals need permanent shelter.
- All animals need to breathe (all animals need oxygen).

EVALUATE:

Formative Monitoring (Questioning / Discussion):
- Student work: Reflection sheet completed at table
- Teacher observation
- Student discussion/responses
- Student participation

Elaborate Further / Reflect: Enrichment:
- Social Studies: Find out how animals meet their needs
  - Explore how animals' adaptations meet their needs.
    - Show a picture of a polar bear: Discuss how the bear's fur, big feet, and long neck help it walk on snow and swim in icy water to catch food.
    - Show other animals and invite students to discuss in partnerships special adaptations that help them survive in their environment.

Characteristics of Animals: Structures

Grade/ Grade Band: K	Topic: Basic Needs of Living Things	Lesson #___6____ in a series of __8____ lessons

Brief Lesson Description:
Students explore the similarities and differences between the structures of animals, such as mouthparts, eyes, legs, wings, or fins. They then explore how although there are many types of animals, their structures function in similar ways.

Performance Expectation(s): K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Specific Learning Outcomes:
At the end of this lesson the student will be able to:
- Argue from evidence that animals use different structures to meet the same life needs.
- Collect data on similarities and differences between different groups of animals.
- Use animal models (such as pictures or physical models) to sort and group animals according to how they meet their needs for food and shelter.

Narrative / Background Information

Prior Student Knowledge: Students are expected to know that birds generally use feathers for flight and that mammals use fur for warmth. They are also expected to know that birds have beaks that they eat with instead of toothed jaws.

Science & Engineering Practices:	Disciplinary Core Ideas:	Crosscutting Concepts:
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1) **ESS3.A: Natural Resources** ● 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. (K-ESS3-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2- ETS1-2) **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Possible Preconceptions/Misconceptions:
Birds use feathers only for flight (they also provide warmth and protection from the elements).
All animals have bony jaws or beaks (slugs, for example, have only soft mouthparts).

EVALUATE:

Formative Monitoring (Questioning / Discussion):
Observation of student response during discussion
Student sort

Partner discussion/argument

Elaborate Further / Reflect: Enrichment:
Art: Children create a clay model of an animal and explain the structures and how they help the animal survive.
Art and Write: Children draw a picture of two different animals and explain to a partner how the structures are the same or different?

Characteristics of Animals: How do animals grow and change?

Grade/ Grade Band: K	**Topic:** Basic Needs of Living Things	**Lesson # 7 in a series of 8 lessons** **will last a number of days (15-20 days) depending on growth of caterpillar**

Brief Lesson Description:
At a developmental level of instruction, kindergartners collect information by observing, identifying, and recording the external features of the caterpillars and butterflies. They will identify the external features of caterpillars and butterflies, and describe the function of each feature as they present themselves.

They then explore what caterpillars and butterflies need to survive based on what we have already learned about plants and animals.

Performance Expectation(s):
K-LS1-1. Use observations to describe patterns of what plants and animals (including humans) need to survive. [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and, that all living things need water.]

Specific Learning Outcomes:
At the end of this lesson the student will be able to:
- Carry out an investigation to confirm the needs of a caterpillar/butterfly, by caring for those needs (food, water, shelter and air) during the life cycle. Record and interpret data on caterpillar growth.
- Make a model using clay, playdough or model magic to display the different stages from egg to butterfly illustrating the relationship of the structures of each stage with their functions.
- Collect, analyze, interpret, and log data when changes occur.

Narrative / Background Information

Prior Student Knowledge: Students are expected to enter this lesson with mastery of prior learning from this unit, such as the necessities of life for animals including food, water, shelter and space.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● 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. (K-LS1-1)	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1), (K-ESS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2- ETS1-2) **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)		

Possible Preconceptions/Misconceptions:
● **Caterpillars will form a cocoon (painted lady butterflies will emerge from a chrysalis, a specialized exoskeleton, while a cocoon is spun from silk by most moths).** ● **Caterpillars and butterflies are separate animals.** ● **Caterpillars do not have legs.**

EVALUATE:
Formative Monitoring (Questioning / Discussion): ● Teacher observation ● Student discussion/responses ● Student participation ● Students drawings

Elaborate Further / Reflect: Enrichment:
● Writing: Have the students write about a new fact they learned about caterpillars/ butterflies and draw a picture to match their writing.

How Animals and Plants Affect their Environment

Grade/ Grade Band: K	**Topic:** Basic Needs of Living Things	**Lesson # 8 in a series of 8 lessons**
Brief Lesson Description: In this lesson students explore how plants and animals change their environment by seeing a series of short video clips and looking at pictures.		

Performance Expectation(s):
Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs. *[Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.]* (K-ESS2-2)

Specific Learning Outcomes:
At the end of this lesson the student will be able to: ● Argue from evidence that plants and animals change the environment that they live in to meet their needs for light, air, water and space, and air, food, water and space/shelter. ● Create a model (physical or drawing) showing how either a plant or animal interacts with its environment to change the environment to better meet its needs.

Narrative / Background Information
Prior Student Knowledge: Students are expected to know that animals need shelter and to be generally familiar with activities such as birds building nests to hold or shelter their young.

Science & Engineering Practices:	**Disciplinary Core Ideas:**	**Crosscutting Concepts:**
Planning and Carrying Out Investigations ● Make observations (firsthand or from media) to collect data that can	**LS1.C: Organization for Matter and Energy Flow in Organisms** ● All animals need food in order to live and grow. They obtain their food	**Patterns** ● Patterns in the natural and human designed world can be observed and used as evidence. (K-LS1-1) **Systems and System Models** ● Systems in the natural and designed world have parts that work together. (K-ESS3-1),

be used to make comparisons. (K-PS3-1) **Analyzing and Interpreting Data** ● Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (K-LS1-1) **Developing and Using Models** ● Use a model to represent relationships in the natural world. **Engaging in Argument from Evidence** ● Construct an argument with evidence to support a claim. (K-ESS2-2)	from plants or from other animals. Plants need water and light to live and grow. (K-LS1-1) **ESS3.A: Natural Resources** ● 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. (K-ESS3-1)	(K-ESS2-2) **Structure and Function** ● The shape and stability of structures of natural and designed objects are related to their function(s). (K-2- ETS1-2) **Scientific Knowledge is Based on Empirical Evidence** ● Scientists look for patterns and order when making observations about the world. (K-LS1-1)

Possible Preconceptions/Misconceptions:
● **All animals live in homes that exist naturally or that humans need to "take care of them".** ● **Plants are dependent on people to provide water and an appropriate place to live.**

EVALUATE:
Formative Monitoring (Questioning / Discussion): ● Teacher observation ● Student discussion/responses ● Student participation ● Students drawings

Elaborate Further / Reflect: Enrichment:
● <u>Art</u>: Show how animals can change their environment ○ Draw pictures showing how animals can change the environment to meet their needs.

NGSS ONLINE RESOURCES (K-5)

General Information:

1. "Lab Before Blab" - Conducting investigations before explanations. Other PBS education videos are also instructive.
(http://www.thirteen.org/programs/pbs-newshour/lab-before-blab-lights-upelementary-school-science-1392155837/)

2. NJDOE model curricula: a framework of suggested topic sequences, course outlines, guiding questions, links to videos, etc. (http://www.state.nj.us/education/modelcurriculum/sci/)

3. The National Science Teachers Association website. For members and non-members, NGSS resources, conferences, webinars, books, free downloads, videos. (http://www.nsta.org/)

4. Free NGSS digital copies and ancillary materials, videos, curriculum ideas, embedded assessment unit plans.
(www.nextgenscience.org)

5. NGSS Evidence Statements downloadable for every K-12 Performance Expectation. Also: videos and other free materials. (http://nextgenscience.org/evidence-statements)

6. Videos, lessons, NGSS information, and more. (http://www.teachingchannel.org/)

Instruction:

1. Brief summaries of STEM Teaching Tools that encapsulate the practices of NGSS reform. (http://stemteachingtools.org/tools)

2. PD strategies for NGSS. (http://www.cesa4.k12.wi.us/cms_files/resources/NGSS%20Professional%20Development%20Strategies.pdf.)

3. TERC provides online PD programs as part of their Inquiry Project for grades 3-5. The strategies for supporting productive science discourse in the classroom are applicable for higher grades as well. Online materials for the Talk Moves and Talk Science approaches are downloadable. (http://inquiryproject.terc.edu/)

4. Study Jams from Scholastic. Interactive science activities. (https://www.scholastic.com/teachers/activities/teaching-content/matter-9-studyjams-interactive-science-sctivities/

Assessment:
1. Developing assessments for the NGSS. It addresses K-12 including AP courses, explains the research on assessment providing examples, resources, unit outlines, rubrics, and examples of student responses. (http://www.nap.edu/catalog.php?record_id=18409)

2. NAEP interactive assessment tasks for elementary, middle, and high school, with scoring and analyses of student responses. (http://www.nationsreportcard.gov/science_2009/)

3. "Below you will find links to released test items for the New Jersey Student Learning Assessment-Science. Please know that the middle and high school assessments are said to be comprehensive, incorporating standards from physical, life, and earth/space sciences." (April 2018, Bergen County) http://www.state.nj.us/education/aps/cccs/science/assessment.htm https://nj.testnav.com/client/index.html#login?username=LGN))5710830&password=YTDEKPMW http://ct.portal.airast.org/

4. "The URL below is being shared with you by Mike Heinz, Science Coordinator, NJDOE. The link contains the raw drafts of the science assessment tasks that counties have contributed to. **These are in DRAFT form**. They need to be reviewed, formatted, and field tested. This is a compilation of the assessment collaborations that were done since August 2017. When sharing with your teachers, please be sure to indicate that these are **draft tasks**; they have neither been reviewed nor vetted. Teachers **may** want to use them as formative assessment tasks that are **not graded**. Student performance will provide the teacher with some data about how well the task performs without impacting a student's grade. And of course, Mike would appreciate your feedback about the appropriateness and applicability of each task so that continuous improvements may be made." (March 2018, Bergen County) (https://tinyurl.com/draftstasksnj1)

Phenomena:
1. Finding phenomena for lessons, investigations, and/or units can be found at
https://thewonderofscience.com/phenomenal/

2. Finding phenomena for lessons, investigations, and/or units can be found at
www.ngssphenomena.com

CER: Claims – Evidence - Reasoning
1. Audi Commercial "Alien": Is the little girl's father an alien? Watch the video: make a claim, provide evidence, and offer reasons. (http://www.youtube.com/watch?v=89uJz_us4PM)

Authentic Data:
1. MY NASA DATA (MND)'s tools allow access real NASA Earth Science data. Through the use of MND's Live Access Server (LAS) data viewer, one can create a variety of charts, plots, and graphs to explore Earth systems and answer research questions. MY NASA DATA offers a large number of lesson plans, tools, and resources. (https://mynasadata.larc.nasa.gov/)
2. With NOAA's Data in the Classroom, students use real-time ocean data to explore today's environmental issues and develop problem-solving skills employed by scientists. Classroom-ready activities are available. (https://dataintheclassroom.noaa.gov/)
3. US Geological Survey (USGS) Real-time Data. USGS scientists gather information through periodic or continuous measurement in the field to provide a view of current conditions. (https://www.usgs.gov/products/data-and-tools/real-time-data)