2nd Grade Science & Engineering Learning Expectations
Public Schools of Brookline

Overview

The Science & Engineering Learning Expectations (LEs) outline the content that students will learn and skills (practices) that students will be able to do from preK through Grade 8. They have been designed with careful consideration to how students will build their knowledge from grade to grade (learning progressions). As they progress through the grades, students will reinforce what they have learned before, continually learning certain overarching concepts in new ways and with increased sophistication.

Organization of the Learning Expectations

The Learning Expectations are organized into three strands: 1) Earth Science, 2) Life Science, and 3) Physical Science.

While the traditional Physical Science, Life Science, and Earth Science strands are referenced, it is important to be aware that none of these strands are totally separate. In fact, scientists often work in inter-disciplinary teams, across disciplines and/or alongside engineers to answer their questions and solve problems.

In addition, Science Practices (Inquiry and Nature of Science), Engineering and Environmental Education content has been woven throughout the Learning Expectations, illustrating the vital interconnections between these topics. This approach allows students to learn about these disciplines in the context of the science concepts they are learning, instead of as stand-alone, disconnected units.

Guide to This Document

This document shows the progression of Science concepts in the form of Big Ideas (left column) and Learning Expectations (right column). The Big Ideas identify the content that students will learn and the Learning Expectations illustrate what students will know and be able to do in order demonstrate that they have acquired this knowledge.

2nd Grade Earth Science Learning Expectations

EARTH'S SYSTEMS [Future Changes in the Earth Unit & Future Life in a Rotting Log Unit]	
Big Ideas	**Learning Expectations**
Changing Earth • The surface of the Earth is constantly changing. • Some events on Earth occur in cycles, like day and night, and others have a beginning and an end, like a volcanic eruption. Some events, like an earthquake, happen very quickly; others, such as the formation of the Grand Canyon or formation of sand, occur very slowly, over a time much longer than one can observe them. • Water is found in the ocean, rivers, lakes, ponds, and glaciers. • Water exists as solid ice and in liquid form. It carries soil and rocks from one place to another and determines the variety of life forms that can live in a particular location. • Chunks of rocks come in many sizes and shapes, from boulders to grains of sand and even smaller. • Wind and water (including rainfall) can change the shape of the land (including formation of sand and soil from rocks and other materials). The resulting landforms, together with the materials on the land, provide homes for living things. • Soil is made up of living and non-living things. • Rocks, soils, and sand are present in most areas where plants and animals live. There may also be rivers, streams, lakes, and ponds. • Maps show where things are located. One can map the shapes and kinds of land and water in any area.	• Gather evidence to support the claim that water exists in solid and liquid forms on Earth (e.g., oceans, rivers, lakes, ponds, glaciers). • Observe samples of different types of soil gathered from the school grounds using the naked eye, magnifying glasses and a microscope. Draw observations in science notebooks and make claims based on those observations about what soil is made of and how it was formed. • Observe samples of rocks of different sizes and sand using the naked eye, magnifying glasses and a microscope. Describe and illustrate (in science notebooks) the texture, size, color and other properties. Explain how the rock samples and sand samples are alike and how they are different. Make claims based on evidence about how sand is formed. • Create a physical model of a landform to show that wind and water can change the shape of land (e.g., using sand and soil that is subjected to flowing water and blowing air). Explain the difference between the model and the real world. • Through hands-on investigations, gather evidence to show that wind and water can move rock, soil, and other objects from one place to another. • Design, evaluate, and share an engineering solution that prevents wind or water from changing the shape of the land (e.g., using sandbags to prevent coastal erosion, planting trees to prevent soil erosion). • Give examples of how landforms provide homes for living things. • Record and share observations about how some natural events have cycles and patterns (day and night) whereas other natural events have a clear beginning and end (e.g., storms). • Provide evidence to show that the Earth's surface changes over time and may happen over different lengths of time (e.g., rain storms, gusts of wind, volcanoes, erosion, earthquakes, plant growth, etc.) • Describe at least two examples of how living things depend on soil (for habitat, food, etc.). • Identify and locate landforms using maps and globes (mountains, bodies of

	water, etc.) Make observations about these landforms. As a group, make claims based on these observations about how they may have formed. [Social Studies Connection] •
Human Interactions with Earth [Social Studies Connection] • Humans use natural resources for everything they do (e.g., they use soil and water to grow food, wood to burn to provide heat or to build shelters. • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things—for example, by reducing trash through reuse and recycling. • By composting certain types of food waste, people can decrease the amount of trash generated. • Many materials can be recycled and used again, sometimes in different forms	• Explain and illustrate several ways that humans use natural resources from the Earth (trees for paper, rocks for building, etc.). • From first-hand observations, provide evidence to show that composting certain types of food waste in a bin with red wriggler worms recycles food waste and creates rich compost, which will help plants grow. • Explain what it means to be a good Earth citizen.

2nd Grade Life Science Learning Expectations
[Future Life in a Rotting Log Unit and Future Changes in the Earth Unit]

Big Ideas	Learning Expectations
Characteristics of Living Things & Classification • Scientists sort living things based on features they share in order to learn more about them.	• Based on first hand observations and drawings, sort living things found in a rotting log. Explain how they were sorted. • Sort invertebrates and vertebrates, explaining the difference between them. • Demonstrate how scientists classify living things found in a rotting log and explain how they are similar and different (e.g., plants, worms, reptiles, amphibians, insects, fungi, snails, millipedes/centipedes, spiders, pillbugs/sow bugs).
Structure & Function of Living Things • All living things (plants and animals) have parts. These parts (e.g., feet, tails, etc.) can look similar or different depending on the living thing and where it lives. • Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive, grow, and produce more plants. • Animals (including us) have body parts that gather different kinds of information needed for growth and survival—for example, eyes for gathering light (so they can see), ears for sounds, and skin for temperature or touch. Animals respond to the information gathered with their senses with behaviors that help them survive (e.g., find food, run from a predator). Plants also respond to information they gather (e.g., turn leaves toward the sun).	• Describe how the living things in a rotting log use their senses to gather information • Draw and describe living things found in a rotting log. Describe similarities and differences in the way they look and the things that they do.
Needs of Living Things • All living things have needs that must be met for them to stay alive. • Animals need food, water, air, a space to live in (shelter), and the right temperature in order to live and grow. • Plants need light, air, water, space to grow, and minerals in the soil to live and grow.	• Explain how living things found in a rotting log meet their basic needs.
Growth & Development • All living things have a life cycle that includes a beginning (birth for animals, germination for plants), growth, developing into adults, reproduction and death. These life cycles can be unique and diverse.	• Compare the life cycle of an oak tree and a saguaro cactus, focusing on how animals depend on these plants to get what they need to survive.

Ecosystems • Animals depend on their surroundings to get what they need to live and grow, including food, water, shelter, and a favorable temperature. • Animals depend on plants or other animals for food. They use their senses to find food and water, and they use their body parts to gather, catch, eat and chew the food. • Living things obtain the materials they need to grow and survive from the environment. Many of these materials come from living things and are used again by other living things. • A natural recycling process occurs when once-living things are used by other living things (like worms, beetles, mushrooms) as food. Waste from these living things becomes part of the soil.	• Make claims based on evidence showing how plants and animals (in a rotting log or within the soil) depend on their environment and each other (e.g., for food) to meet their needs. • Make a model or diagram of a rotting log showing at least 4 ways that living and nonliving things are connected. Explain.
Adaptations • Living things have features that help them survive in their environment. [These features include physical features (e.g., mouthparts, antennae, wings, etc.) and behaviors (e.g., migration, behaviors to protect their young, hibernation, communication, etc.). • Some kinds of plants and animals that once lived on Earth (e.g., dinosaurs) are no longer found anywhere, although others now living (e.g., lizards) resemble them in some ways.	• Explain how the features of living things help them survive in the rotting log. • Gather evidence that some kinds of animals and plants that once lived on Earth (e.g., trilobites) are no longer found anywhere, although others living now may resemble them (e.g., pillbugs). • Compare the pillbug and a trilobite. Explain how they are similar and how they are different. • Describe the evidence that scientists have gathered about trilobites and the claims they have made based on this evidence (including where they lived). • After observing pillbugs closely, explain how a pill bug is specially adapted to meet its survival needs in its environment.
Biodiversity & Adaptations • Many different types of plants and animals live on Earth and within any specific area. They exist in different places on land, in soil, and in water. • The places where plants and animals live often change, sometimes slowly and sometimes rapidly. Living things can survive only where their needs are met. If some places are too hot or too cold, or have too little water, food or air, plants and animals may not be able to live there.	• Gather and share evidence to show the different types of living things that live in a rotting log, on the schoolyard, a local park or pond, and in the soil on the school grounds. Compare the data. • Create a map of the schoolyard, a local park, or pond showing the locations and shapes of both land and water features. [Social Studies Connection] • Predict what will happen to the plants and animals if the environment that they mapped (school yard, local park or pond) changes (e.g., becomes hotter, drier, food disappears). Gather data if possible to make claims.
Genetics • Young animals are very much, but not exactly, like their parents and also resemble other animals of the same kind. Plants also are very much, but not exactly, like their parents and resemble other plants of the same kind. • Individuals of the same kind of plant or animal are similar but can also vary in	• Compare photos of young and adult living things found in a rotting log. Explain how they are alike and how they are different. • Give examples on how different worms or pillbugs look similar, but can also vary in many ways.

many ways. For instance, not all worms, snails, or oak trees are exactly the same.	

2nd Grade Physical Science Learning Expectations

FORCE AND MOTION [How and Why Do Things Move? Unit]	
Big Ideas	**Learning Expectations**
• Objects pull or push each other when they collide or are connected. • Pushes and pulls can be caused by people (and other animals), water, air, magnets, gravity, and machines (with an energy source). • Pushes and pulls can have different strengths and directions. Pushing or pulling on an object can change the speed or direction of its motion, can start or stop it. • The harder the push or pull is, the greater the change in motion of the object. • A bigger push or pull makes things go faster. Faster speeds during a collision can cause a bigger change in shape of the colliding objects. • An object sliding on a surface or sitting on a slope experiences a pull due to friction on the object due to the surface that opposes the object's motion. • When two objects rub against each other this interaction is called friction. Friction between two surfaces can warm both of them (e.g., rubbing hands together). There are ways to reduce the friction between two objects. • The physical properties of objects and the surfaces that they move on affect how well they move (friction). • Whether an object stays still or moves often depends on the effects of multiple pushes and pulls on it (e.g., multiple players trying to pull an object in different directions). It is useful to investigate what pushes and pulls keep something in place (e.g., a ball on a slope, a ladder leaning on a wall) as well as what makes something change or move. • Things near to the Earth fall to the ground unless something holds them up (gravity).	• Give examples of pushes and pulls that occur in our daily lives and explain what causes them. • Gather and record evidence from first-hand investigations in order to make claims about the cause and effect relationships between pushes and pulls of different directions and strengths, and the resulting motion of objects. • Demonstrate that a bigger push or pull makes things go faster. • Collect evidence and construct an explanation to explain why an object that is being pushed or pulled might not move. • Using evidence gathered during investigations, make claims about the relationships between friction and the motion of objects, and between friction and the production of heat. • Collaborate with others to develop and test a design solution for reducing friction between two objects. [Engineering Connection] • Working collaboratively, explain the motion of a designed object (e.g., rolling pin, scissors, toy cars, etc.) based on pushes and pulls. Explain how the motion relates to the object's function. • Investigate and make claims based on gathered evidence to explain the change in motion and/or shape when objects touch or collide. Share findings with others. • Provide evidence to support the claim that things fall to the ground unless something holds them up.