3rd 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.

3rd Grade Earth Science Learning Expectations [Mammal Detectives Unit]

EARTH SYSTEMS	
Big Ideas	**Learning Expectations**
Changing Earth: Earth's History • Fossils provide evidence about the types of living things, including dinosaurs, that lived long ago and also about the nature of their environments. Fossils can be compared with one another and to living organisms according to their similarities and differences.	• Evaluate claims that fossils provide evidence of the types of living things that have lived on Earth and their environments, citing their similarities and differences to currently living species.
Weather & Climate • Weather is the minute-by-minute to day-by-day variation of the atmosphere's condition on a local scale. Scientists record the patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. Climate describes the ranges of an area's typical weather conditions and the extent to which those conditions vary over years to centuries. • Weather and climate data collected by meteorologists includes: temperature, wind direction and speed, and precipitation.	• Gather information about different climatic areas to compare habitat conditions with mammal adaptations. Explain the effect of climate on mammal adaptations.
Human Interactions with Earth [Social Studies Connection] Extension • Human activities in agriculture, industry, and everyday life have had major effects on living things, the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments. • Some types of animals and plants are diminishing in numbers due to loss of habitat and/or other factors. But there are things that humans can do prevent this from happening.	• Use informational sources to identify endangered mammals. For one endangered mammal, explain where they live and why they have become endangered. • Explain what is being done to help endangered mammals survive. Brainstorm a list of things we can do to help.

3rd Grade Life Science Learning Expectations [Mammal Detectives Unit, Skeletal System Unit and Structures Unit]

Big Ideas	Learning Expectations
Characteristics of Living Things • Scientists sort (classify) living things based on features they share in order to learn more about them. • Living things (plants and animals) share certain characteristics (e.g., they grow and reproduce) • All mammals share certain features [They have a backbone, hair or fur, are warm-blooded, breathe air using lungs, and nurse their young. Most mammals give birth to live young]	• Gather evidence to show that animals can be classified based on their features (e.g., vertebrates have backbones, mammals have hair, insects have six legs). • Explain the difference between vertebrates and invertebrates. Give examples of each. • Describe the common features of mammals and sort animal photos into mammals and not mammals.
Structure & Function of Living Things • Animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction. • Animal structures (e.g., feet, tails, etc.) can look similar or different depending on the living thing and where it lives.	• Use models to analyze how internal and external structures and systems in mammals allow them to grow, survive and reproduce. • Describe the basic structures of mammals and explain their function (e.g., what they do to help the mammal survive in its environment).
Needs of Living Things • Like most other animals, mammals need food, water, air, a space to live in and raise young (shelter), and the right temperature in order to live and grow. • Food provides animals with the materials they need for body repair and growth and is digested to release the energy they need to maintain body warmth and for motion.	• Describe the basic needs of mammals and give examples.
Ecosystems • Mammals live in places that can provide the things they need to live and grow (habitats). • Mammals, like other 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. • When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. • Changes in an organism's habitat are sometimes beneficial to it and sometimes harmful. For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.	• Make claims based on evidence to show that living things can survive only in environments in which their particular needs are met (e.g., mammals that live in the desert, mammals that live in the ocean, etc.). • Explain how a specific mammal's needs are met within its habitat. • Provide evidence that environmental change in a system (e.g., extra water in a normally dry area, pollution or fire) can affect the number and types of living things that live there as some remain, move and/or die. • Show (model) and describe how mammals depend on other living things in their habitat. (ELE) • Compare a human habitat with a beaver's habitat • Give examples to show how changes in a mammal's habitat can affect its survival. • For a certain type of environment (e.g., forest, grassland, desert, etc.),

• Populations of organisms live in a variety of habitats, and change in those habitats affects the organisms living there.	describe the relationship between characteristics of the environment and the mammals that live there.
Adaptations • Mammals have features that help them survive in their environment. [These features include physical adaptations (e.g., feet, teeth, fur, camouflage, etc.) and behavioral adaptations (e.g., migration, behaviors to protect their young, hibernation, communication, etc.). • Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. • Groups can be collections of equal individuals, hierarchies with dominant members, small families, groups of single or mixed gender, or groups composed of individuals similar in age. Some groups are stable over long periods of time; others are fluid, with members moving in and out. Some groups assign specialized tasks to each member; in others, all members perform the same or a similar range of functions.	• Evaluate and communicate information that the characteristics of a group of animals help individual animals survive. • Illustrate how mammals are adapted to live in their environment (desert, tropical forest, temperate forest, grassland, arctic tundra, wetlands, rivers, oceans, mountains). Describe the features of mammals that allow them to live in places others cannot (e.g., polar bear, harbor seal, desert animal, etc.). (ELE) • Compare the adaptations of a snowshoe hare and an antelope jackrabbit. Explain how these features allow the mammal to live in its environment. • Make claims based on evidence to explain why animals may form groups to help them meet their needs and survive (e.g., family groups, pairs, herds).
Growth & Development • Reproduction is essential to the continued existence of every kind of living thing (organism). Plants and animals have unique and diverse life cycles that include a beginning (birth for animals, germination for plants), growing, developing into adults, reproduction, and eventually dying.	• Gather information on the life cycles of a variety of mammals, communicating similarities, differences and patterns in their development. • Compare the life cycle of a mammal and a pillbug.
Biodiversity & Evolution • Fossils provide evidence about the types of organisms (both visible and microscopic) that lived long ago and also about the nature of their environments. Fossils can be compared with one another and to living organisms according to their similarities and differences. • There are many different types of plants and animals on Earth, but only certain types are found naturally at a certain place. • Populations of living things live in a variety of habitats, and change in those habitats affects the organisms living there. Humans, like all other organisms, obtain living and nonliving resources from their environments.	• Gather evidence that some kinds of animals and plants that once lived on Earth (e.g., saber-toothed tigers and wooly mammoths) are no longer found anywhere, although others living now may resemble them. • Compare mammal fossils to one another and to living mammals (scat too). Explain how they are alike and how they are different. • Observe photos of fossils to make claims about the nature of the organisms and the type of environment where they lived, and their similarities to organisms that are alive today. • Give examples of how scientists have used fossils as evidence to make claims about mammals that lived long ago.

3rd Grade Physical Science Learning Expectations

MATTER [Future Mixtures Unit]	
Big Ideas	**Learning Expectations**
Properties of Matter • Objects can be described in terms of the materials they are made of and their physical properties. • Characteristic properties (e.g., hardness, weight) can be used to identify substances. • Some materials are better than others for a particular purpose because of their properties. • A great variety of objects and technologies can be built up from a small set of pieces (e.g., blocks, construction sets).	• Explain how the properties of different natural or manufactured objects suit their purpose (e.g., pillows are made of soft materials, windows are made of clear glass, etc.). • Measure and compare the physical properties (e.g., weight, length) of objects using non-standard and standard units, and explaining the benefits of using standard units.
Chemical Reactions & Mixtures • Scientists investigate to find out about the properties of substances. They use their knowledge of the properties of substances to design mixtures. • When two or more different substances are mixed, a new substance with different properties may be formed; such occurrences depend on the substances and the temperature. When other substances are mixed, the form or appearance may change, but no new substance is formed (the composition of the substances stay the same). • No matter what reaction or change in properties occurs, the total weight of the substances does not change (e.g., sugar in solution). • Dissolving is when a solid mixes with a liquid and breaks apart into tiny pieces too little to see with our eyes.	• Plan and carry out investigations to support the claim that the total weight of a substance does not change when it undergoes physical changes (e.g., change of shape, change from solid to liquid, being dissolved in a liquid). Record data in science notebooks and compile to share with others. • Investigate and gather data to support the claim that the total weight of matter does not change when substances react chemically to form new substances. • Investigate and provide evidence to support the claim that when two or more different substances are mixed, one or more new substances with different properties may be formed (e.g., baking soda and water does not create new substances, but mixing baking soda and vinegar does). • Describe the properties of materials before and after they are mixed. • Research and explain chemical reactions that occur in everyday products (e.g., bread and other foods, epoxy and other reactive adhesives).
FORCE & MOTION (Force & Motion in Structures & Systems) [Structures Unit]	
Big Ideas	**Learning Expectations**
• Objects in contact exert forces on each other (friction, pressure, pushes and pulls). • Each force acts on one particular object and has both strength and a direction.	• Use a model to predict the future motion of an object (e.g., pendulum) based on its regular pattern of motion. • Carry out investigations on objects at rest subject to balanced forces and

An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. • The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. • A system can change as it moves in one direction (e.g., a ball rolling down a hill), shift back and forth (e.g., a swinging pendulum), or go through cyclical patterns (e.g., day and night). • Examining how the forces on and within the system change as it moves can help explain a system's patterns of change. • A system can appear to be unchanging when processes within the system are going on at opposite but equal rates (e.g., water behind a dam is at a constant height because water is flowing in at the same rate that water is flowing out). • Changes can happen very quickly or very slowly and are sometimes hard to see (e.g., plant growth). Conditions and properties of the objects within a system affect how fast or slowly a process occurs (e.g., heat conduction rates). • The materials used (and their characteristics) and the way materials are put together affect the stability of a structure.	measure the relative sizes and directions of these forces (e.g., two horizontal spring scales pulling on a stationary object sitting on a table). • Construct a model of a system in which the forces on an object are balanced to explain how quickly or slowly the system changes when the forces become unbalanced (e.g., heavier and lighter weights on a see saw, pushing or pulling an object with varying force). • Give examples of and demonstrate different ways that parts of structures exert force on one another (including friction, pressure, pushes and pulls). • Demonstrate how the properties and shape of materials used, as well as the way materials are put together, affect the strength of structures.
ENGINEERING [Structures Unit]	
Big Ideas	**Learning Expectations**
• The materials used (and their characteristics) and the way materials are put together affect the strength and stability of a structure. • Structures are systems	• Demonstrate how the properties and shape of materials used, as well as the way materials are put together, affect the strength of structures. • Collaborate with others to design a device built from components to solve a technological problem (e.g., transporting or supporting an object). [Engineering Connection]