Plymouth Public Schools' Science and Technology/Engineering Program Grade 5 Integrated Science Learning Standards

An Introduction to the Massachusetts Department of Elementary and Secondary Education Science and Technology/Engineering Curriculum Framework

Effective teaching and learning in science fosters engagement and has rigor, relevance, and coherence embedded within. It couples practice with content to give the context for performance. A program with these components encourages students to analyze and explain phenomena and experience; engages with practices to build, use, and apply knowledge; and builds a storyline over time and among disciplines. The state standards that form this program are outcomes that reflect what a student should know and be able to do as a result of instruction. Science and engineering practices, which are included in these standards, are not teaching strategies; they are important learning goals and skills to be learned, also as a result of instruction. The standards listed below are not intended to represent an exhaustive list of all that could be included in our district's science program, nor should this list prevent students from going beyond the standards where appropriate. (Excerpts from Curriculum Framework)

Overarching Theme – Connections and Relationships in Systems

In grade 5, students model, provide evidence to support arguments, and obtain and display data about relationships and interactions among observable components of different systems. In doing so, students learn how animals, plants, and their environments are connected to, interact with, and are influenced by each other; how interactive patterns between Earth and other nearby objects in the solar system are seen from Earth; and how the cycling of water and human practices and processes influence the relationships among elements of Earth's systems. Students also learn about the connections and relationships among plants and animals, and the ecosystems within which they live, to show how matter and energy is cycled through these, as well as how their abilities to describe, analyze, and model observable components of different systems is essential to deciphering between the natural and designed world. (Excerpts from Curriculum Framework)

ESS1. Earth's Place in the Universe

5-ESS1-1. Use observations, first-hand and from various media, to argue that the sun is a star that appears larger and brighter than other stars because it is closer to the Earth.

State Assessment Boundary:
Other factors that affect apparent brightness (such as stellar masses, age, or stage) are not expected in state assessment.

5-ESS1-2. Use a model to communicate Earth's relationship to the Sun, Moon, and other stars that explain:

a. why people on Earth experience day and night;
b. patterns in daily changes in length and direction of shadows over a day; and
c. changes in the apparent position of the Sun, Moon, and stars at different times during a day, over a month, and over a year.

Clarification Statement:
Models should illustrate that the Earth, Sun, and Moon are spheres; include orbits of the Earth around the Sun and of the Moon around Earth; and demonstrate Earth's rotation about its axis.

State Assessment Boundary:
Causes of lunar phases or seasons, or use of Earth's tilt are not expected in state assessment.

ESS2. Earth's Systems

5-ESS2-1. Use a model to describe the cycling of water through a watershed through evaporation, precipitation, absorption, surface runoff, and condensation.

State Assessment Boundary:
Transpiration or explanations of mechanisms that drive the cycle are not expected in state assessment.

5-ESS2-2. Describe and graph the relative amounts of salt water in the ocean; fresh water in lakes, rivers, and groundwater; and fresh water frozen in glaciers and polar ice caps to provide evidence about the availability of fresh water in Earth's biosphere.

State Assessment Boundary:
Inclusion of the atmosphere is not expected in state assessment.

ESS3. Earth and Human Activity

5-ESS3-1. Obtain and combine information about ways communities reduce the impact on the Earth's resources and environment by changing an agricultural, industrial, or community practice or process.

Clarification Statement:
Examples of changed practices or processes include treating sewage, reducing the amounts of materials used, capturing polluting emissions from factories or power plants, and preventing runoff from agricultural activities.

State Assessment Boundary:
Climate change or social science aspects of practices such as regulation or policy are not expected in state assessment.

5-ESS3-2(MA). Test a simple system designed to filter particulates out of water and propose one change to the design to improve it.

LS1. From Molecules to Organisms: Structures and Processes

5-LS1-1. Ask testable questions about the process by which plants use air, water, and energy from sunlight to produce sugars and plant materials needed for growth and reproduction.

State Assessment Boundary:
The chemical formula or molecular details about the process of photosynthesis are not expected in state assessment.

LS2. Ecosystems: Interactions, Energy, and Dynamics

5-LS2-1. Develop a model to describe the movement of matter among producers, consumers, decomposers, and the air, water, and soil in the environment to:

a. show that plants produce sugars and plant materials;
b. show that animals can eat plants and/or other animals for food, and
c. show that some organisms, including fungi and bacteria, break down dead organisms and recycle some materials back to the air and soil.

Clarification Statement:
Emphasis is on matter moving throughout the ecosystem.

State Assessment Boundary:
Molecular explanations, or distinctions among primary, secondary, and tertiary consumers are not expected in state assessment.

5-LS2-2(MA). Compare at least two designs for a composter to determine which is most likely to encourage decomposition of materials.

Clarification Statement:
Measures or evidence of decomposition should be qualitative descriptions or comparisons.

PS1. Matter and Its Interactions

5-PS1-1. Use a particle model of matter to explain common phenomena involving gases, and phase changes between gas and liquid and between liquid and solid.

Clarification Statement:
Examples of common phenomena the model should be able to describe include adding air to expand a balloon, compressing air in a syringe, and evaporating water from a salt water solution.

State Assessment Boundary:
Atomic-scale mechanisms of evaporation and condensation or defining the unseen particles are not expected in state assessment.

5-PS1-2. Measure and graph the weights (masses) of substances before and after a reaction or phase change to provide evidence that regardless of the type of change that occurs when heating, cooling or combining substances, the total weight (mass) of matter is conserved.

Clarification Statement:
Assume that reactions with any gas production are conducted in a closed system.

State Assessment Boundary:
Distinguishing mass and weight is not expected in state assessment.

5-PS1-3. Make observations and measurements of substances to describe characteristic properties of each, including color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility.

Clarification Statements:
1. Emphasis is on describing how each substance has a unique set of properties.
2. Examples of substances could include baking soda and other powders, metals, minerals, and liquids.

State Assessment Boundary:
Density, distinguishing mass and weight, or specific tests or procedures are not expected in state assessment.

5-PS1-4. Conduct an experiment to determine whether the mixing of two or more substances results in new substances with new properties (a chemical reaction) or not (a mixture).

PS2. Motion and Stability: Forces and Interactions

5-PS2-1. Support an argument with evidence that the gravitational force exerted by Earth on objects is directed toward the Earth's center.

State Assessment Boundary:
Mathematical representations of gravitational force are not expected in state assessment.

PS3. Energy

5-PS3-1. Use a model to describe that the food animals digest:

a. contains energy that was once energy from the Sun, and
b. provides energy and nutrients for life processes, including body repair, growth, motion, body warmth, and reproduction.

Clarification Statement:
Examples of models could include diagrams and flow charts.

State Assessment Boundary:
Details of cellular respiration, ATP, or molecular details of the process of photosynthesis or respiration are not expected in state assessment.

ETS1. Engineering Design

5.3-5-ETS3-1(MA). Use informational text to provide examples of improvements to existing technologies (innovations) and the development of new technologies (inventions). Recognize that technology is any modification of the natural or designed world done to fulfill human needs or wants.

5.3-5-ETS3-2(MA). Use sketches or drawings to show how each part of a product or device relates to other parts in the product or device.