Grade 6 Science Yearlong Curriculum Plan

Last modified: June 2016

SUMMARY

This curriculum plan is divided into four academic quarters. In Quarter 1, students focus on the scientific process and inquiry as well as properties of matter. Technology standards introduce the engineering and design process. In quarter 2, students learn the importance of providing evidence through the construction and use of models. Knowledge about waves from quarter one will be utilized to connect with the study of the universe and the earth-sun-moon systems. In quarter 3, the focus will transition from the macroscopic to the microscopic (namely cells and their role in the functioning of the body's systems). In quarter four, students are expected to engage in higher-level thinking, analyzing, interpreting and constructing arguments with claims and evidence. The focus will be on how rock layers and fossils provide evidence for evolutionary relationships and the geologic time scale.

How to Use This Yearlong Plan

This yearlong plan (YLP) document, created by teachers and other curriculum leaders throughout the five districts, provides many of the pieces you need to begin planning your school year.

This document includes:

- A **yearlong map** divided into four (4) quarters that shows when standards should be taught
- A **standards overview** from the state outlining the main categories of the content-area standards as well as general practice standards
- **Block-by-block maps** with additional details of the standards, assessment information when possible (e.g., PARCC) and suggested Understanding by Design (UbD) units
- A **guiding document** to help teachers see the 5DP vision for science integration across domains.

FREQUENTLY ASKED QUESTIONS

1. ***Does this mean I no longer have freedom to decide how to plan my year?***
   The 5DP's goal is to generally align curriculum for the sake of our highly mobile student population. The goal is to create a cohesive learning environment and provide teachers with more opportunities to collaborate, not dictate lesson plans.

2. ***Are there pacing guides? How long should I spend on each standard?***
   Some districts have created pacing guides with suggested time frames. Many of these documents are available on the 5DP Server (www.5districts.com/5dp) under the district-specific documents. If your pacing guides are not posted, please discuss with your curriculum director.

3. ***Will this plan align with my textbook and other content resources?***
   It is unlikely that these will align perfectly with any textbook or resource. This YLP was created with no specific textbook in mind and with the understanding that it needed to work for all five districts, each of which has unique resources. Newer textbooks are better aligned to Common Core standards but may not follow the order of this YLP. Check the 5DP Server to see if your school has created supporting documents to help you match resources to standards.

4. ***The end of the year (May & June) has less guidance in some of these yearlong plans. How should I be using that time?***
   This was done purposely to allow teachers to assess their students' needs during this period. The 5DP has created a supporting document (see "End-of-Year Planning: Ideas to Finish the Year Strongly" found on the 5DP website's Resources page) to help teachers think through the best use of this time.

GRADE 6 SCIENCE STANDARDS OVERVIEW				
SCIENCE, TECHNOLOGY & ENGINEERING STANDARDS	**Q1**	**Q2**	**Q3**	**Q4**
Earth's Place in the Universe				
MS-ESS1-1a		X		
MS-ESS1-4				X
MS-ESS1-5(MA)		X		
Earth's Systems				
MS-ESS2-3				X
From Molecules to Organisms: Structures and Processes				
MS-LS1-1			X	
MS-LS1-2			X	
MS-LS1-3			X	
Biological Evolution: Unity and Diversity				
MS-LS4-1				X
MS-LS4-2				X
Matter and Its Interactions				
MS-PS1-6	X			
MS-PS1-7(MA)	X			
MS-PS1-8(MA)	X			
Motion and Stability: Forces and Interactions				
MS-PS2-4		X		
Waves and Their Applications in Technologies for Information Transfer				
MS-PS4-1	X			
MS-PS4-2	X			
MS-PS4-3		X		
Engineering Design				
MS-ETS1-1			X	
MS-ETS1-5(MA)		X		
MS-ETS1-6(MA)				X
Materials, Tools and Manufacturing				
MS-ETS2-1(MA)	X			
MS-ETS2-2(MA)	X			
MS-ETS2-3(MA)		X		

Science Standards Overview

GRADE 6: STRUCTURE AND FUNCTION

In Grade 6 students inquire about the structure and function of the world around them. The integration of earth, life, and physical sciences with technology/engineering gives students relevant and engaging opportunities with natural phenomena and design problems that provide the foundation for more abstract and complex topics through grade 7 and 8. Grade 6 students start with a framework that relates structure and function of the macro and microscopic world and introduces scale and time in all science and technology/engineering domains. Students use models and provide evidence to make claims and explanations about structure-function relationships in different science and technology/engineering domains.

KEY SHIFTS IN THE REVISED SCIENCE AND TECHNOLOGY/ENGINEERING (STE) STANDARDS

The STE standards are intended to drive coherent, rigorous instruction that results in student mastery and application of scientific, technological and engineering knowledge, reasoning, and skills. The revised standards reflect several key shifts from prior Massachusetts standards, a number of which reflect similar shifts in recent mathematics and ELA standards:

1. *Integration of disciplinary core ideas and practices reflect the interconnected nature of science and engineering.*
   The standards integrate disciplinary core ideas (concepts) with scientific and engineering practices (skills). Currently, Massachusetts science and technology/engineering standards focus primarily on content. The integration of rigorous concepts and practices reflects how science and engineering is applied and practiced every day and is shown to enhance student learning of both.

2. *Preparation for post-secondary success in college and careers.*
   The standards articulate key knowledge and skills students need to succeed in entry-level, credit-bearing science, engineering or technical courses in college or university; certificate or workplace training programs requiring an equivalent level of science; or comparable entry-level science or technical courses, as well as jobs and postsecondary opportunities that require scientific and technical proficiency to earn a living wage.

3. *Science and technology/engineering concepts and practices progress coherently from Pre-K to high school.*
   The standards emphasize a focused and coherent progression of knowledge and skills from grade band to grade band, allowing for a dynamic process of knowledge and skill building throughout a student's scientific education. The progression gives students the opportunity to learn more sophisticated material and re-conceptualize their understanding of how the natural and designed world works, leading to the scientific and technical understanding needed for post-secondary success.

4. *Focus on deeper understanding and application of concepts.*
   The standards are focused on a small set of disciplinary core ideas that build across grades and lead to deeper understanding and application of concepts. The standards are written to both articulate the broad concepts *and* key components that specify expected learning.

5. *Each discipline is integrated in grade-by-grade standards Pre-K to grade 8.*
   To achieve consistency across schools and districts and to facilitate collaborative work, resource sharing, and effective education for transient populations, the Pre-K to grade 8 standards are presented by grade level. All four disciplines, including earth and space science, life science, physical science, and technology/engineering are included in each grade to encourage integration across the year and through curriculum, including the use of crosscutting concepts and nature of science themes.

6. *The STE standards are coordinated with the Commonwealth's English Language Arts and Mathematics standards.*

GRADE 6 SCIENCE – QUARTER 1*	
SCIENCE STANDARDS	
MS-PS1-7(MA)	Use a particulate model of matter to explain that density is the amount of matter (mass) in a given volume. Apply proportional reasoning to describe, calculate, and compare relative densities of different materials.
MS-PS1-8(MA)	Conduct and experiment to show that many materials are mixtures of pure substances that can be separated into the component pure substances. *[Clarification Statement:* • *Examples of common mixtures include salt water, oil and vinegar, milk, and air.]*
MS-PS1-6	Plan and conduct an experiment involving exothermic and endothermic chemical reactions to measure and describe the release or abs portion of thermal energy *[Clarification Statement:* • *Emphasis is on describing transfer of energy to and from the environment.* • *Examples of chemical reactions could include dissolving ammonium chloride or calcium chloride.]*
MS-PS4-1	Use diagrams of a simple wave to explain that (a)a wave has a repeating pattern with a specific amplitude, frequency, and wavelength, and (b) the amplitude of a wave is related to the energy of the wave. *(Assessment boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves)*
MS-PS4-2	Use diagrams and other models to show that both light rays and mechanical waves are reflected, absorbed, or transmitted through various materials. *[Clarification Statement:* • *Materials may include solids, liquids, and gasses.* • *Mechanical waves (including sound) need a material (medium) through which they are transmitted.* • *Examples of models could include drawings, simulations, and written descriptions.]* *(Assessment boundary: Assessment limited to qualitative applications)*
TECHNOLOGY & ENGINEERING STANDARDS	
MS-ETS2-1(MA)	Analyze and compare properties of metals, plastics, wood and ceramics, including stiffness, strength, difficulty, hardness, thermal conductivity, electrical conductivity, and melting point.
MS-ETS2.2(MA)	Given a design task, select appropriate materials based on specific properties needed in the construction of a solution. *[Clarification Statement:* • *Examples of materials can include metals, plastics, wood, and ceramics.]*

* See Guiding Document on page 9 for further instructions on integration of these standards.

GRADE 6 SCIENCE – QUARTER 2*	
SCIENCE STANDARDS	
MS-PS4-3	Present qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses representing 0s and 1s) can be used to encode and transmit information. *(Assessment boundary: Assessment does not include binary counting nor the specific mechanism of any given device)*
MS-ESS1-5(MA)	Use graphical displays to illustrate that the Earth and its solar system are one of many in the Milky Way galaxy, which is one of billions of galaxies in the universe. *[Clarification Statement:* • *Graphical displays can include maps, charts, graphs, or data tables.]*
MS-ESS1-1a	Develop and use a model of the Earth-sun-moon system to explain the causes of lunar phases and eclipses of the Sun and Moon. *[Clarification Statement:* • *Examples of models can be physical, graphical, or conceptual and should emphasize relative positions and distances.]*
MS-PS2-4	Use evidence to support the claim that gravitational forces between objects are very attractive and are only noticeable when one or both of the objects have a very large mass. *[Clarification Statement:* • *Examples of objects with very large masses include the Earth, Sun, and other planets.]* *(Assessment Boundary: Assessment does not include Newton's Laws of Gravitation or Kepler's Laws.)*
TECHNOLOGY & ENGINEERING STANDARDS	
MS-ETS1-5(MA)	Create visual representations of solutions to a design problem. Accurately interpret and apply scale and proportion to visual representations. *[Clarification Statement:* • *Examples of visual representations can include sketches, scaled drawings, and orthographic projections.* • *Examples of scale can include ¼" = 1'0", 1 cm = 1 m.]*
MS-ETS2-3(MA)	Choose and safely use appropriate measuring tools, hand tools, fasteners, and common power tools used to construct a prototype. *[Clarification Statement:* • *Examples of measuring tools include a tape measure, a meter stick, and a ruler.* • *Examples of hand tools include a hammer, a screwdriver, a wrench, and pliers.* • *Examples of fasteners include nails, screws, nuts, bolts, stapler, glue, and tape. Examples of common power tools include jigsaw, drill, and sander.]*

* See Guiding Document on page 9 for further instructions on integration of these standards.

GRADE 6 SCIENCE – QUARTER 3*	
SCIENCE STANDARDS	
MS-LS1-1	Provide evidence that organisms (unicellular and multicellular) are made of cells. *[Clarification Statement:* • *Evidence can be drawn from multiple types of organisms, such as plants, animals, and bacteria.]*
MS-LS1-2	Develop and use a model to describe how parts of cells contribute to the cellular functions of obtaining food, water, and other nutrients from its environment, disposing of waste, and providing energy for cellular processes. *[Clarification Statement: Parts of plant or animal cells include:* *a. The nucleus, which contains a cell's genetic material and regulates its activities* *b. Chloroplasts, which produce necessary food (sugar) and oxygen through photosynthesis (in plants)* *c. Mitochondria, which release energy from food through cellular respiration* *d. Vacuoles, which store materials, including water, nutrients, and waste* *e. The cell membrane, which is a selective barrier that enables nutrients to enter the cell and wastes to be expelled* *f. The cell wall, which provides structural support (in plants)]* *(Assessment Boundary: Assessment does not include specific biochemical steps or chemical processes, ATP, or active transport through the cell membrane.)*
MS-LS1-3	Construct an argument supported by evidence that the body systems interact to carry out essential functions of life. *[Clarification Statement:* • *Emphasis is on the functions & interactions of the body systems, not specific body parts or organs.* • *An argument should convey that different types of cells can join together to form specialized tissues, which in turn may form organs that work together as body systems.* • *Body systems to be included are the circulatory, digestive, respiratory, excretory, muscular/skeletal, and nervous systems.* • *Essential functions of life include obtaining food and other nutrients (water, oxygen, minerals), releasing energy from food, removing wastes, responding to stimuli, maintaining internal conditions, and growing/developing.* • *An example of interacting systems could include the respiratory system taking in oxygen from the environment which the circulatory system delivers to cells for cellular respiration, or the digestive system taking in nutrients which the circulatory system transports to cells around the body.* *(Assessment Boundary: Assessment does not include the mechanism of one body system independent of others or the biochemical processes involved in body systems. Also, assessment does not include describing the function/comparing different types of cells, tissues, or organs.)*
TECHNOLOGY & ENGINEERING STANDARDS	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution. Include potential impacts on people and the natural environment that may limit possible solutions.

* See Guiding Document on page 9 for further instructions on integration of these standards.

GRADE 6 SCIENCE – QUARTER 4*	
SCIENCE STANDARDS	
MS-ESS2-3	Analyze and interpret maps showing the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence that Earth's plates have moved great distances, collided, and spread apart. *[Clarification Statement:* • *Maps may show similarities of rock and fossil types on different continents, the shapes of continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches), similar to Wegener's visuals.]* *(Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed. Does not include mechanisms for plate motion.)*
MS-ESS1-4	Analyze and interpret rock layers and index fossils to determine the relative ages of rock formations that result from processes occurring over large periods of time. *[Clarification Statement:* • *Analysis includes Laws of Superposition and Crosscutting Relationships limited to minor displacement faults that offset layers.* • *Processes that occur over long periods of time include changes in rock types through weathering, erosion, heat, and pressure.* *(Assessment Boundary: Assessment does not include strata sequences that have been reordered or overturned, names of specific periods or epochs and events within them, or the identified and naming of minerals or rock types.)*
MS-LS4-1.	Analyze and interpret evidence from the fossil record to describe organisms and their environment, extinctions, and changes to life forms throughout the history of Earth. *[Clarification Statement:* • *Examples of evidence include sets of fossils that indicate a specific type of environment, anatomical structures that indicate the function of an organism in the environment, and fossilized tracks that indicate behavior of organisms.]*
MS-LS4-2	Construct an argument using anatomical structures to support evolutionary relationships among and between fossil organisms and modern organisms. *[Clarification Statement: Evolutionary relationships include:* *a. some organisms have similar traits with similar functions because they were inherited from a common ancestor* *b. some organisms have similar traits that serve similar functions because they live in similar environments* c. *some organisms have traits inherited from common ancestors that no longer serve their original function because over time, their environments have changed.*
TECHNOLOGY & ENGINEERING STANDARDS	
MS-ETS1-6(MA)	Communicate a design solution to an intended user, including design features and limitations of the solution. *[Clarification Statement:* • *Examples of intended users can include students, parents, teachers, manufacturing personnel, engineers, and customers.]*

* See Guiding Document on page 9 for further instructions on integration of these standards.

Guiding Document for Grade 6 Science

Throughout this yearlong plan, "grade 6 students start with a framework that relates structure and function of the macro and microscopic world and introduces scale and time in all science and technology/engineering domains." (STE standards)

QUARTER 1
During the first quarter, students will begin by focusing on the scientific process and inquiry. The technology standards focus on the properties of materials and the tools used to measure those properties. The physical properties standards focus on measuring the properties of matter and how matter changes (endothermic/exothermic reactions as well as waves, which use energy to change matter). Students will collect data via experimentation. This quarter lays the foundations for more complex topics to come.
** This is the quarter that was changed the most. Most of the physical science standards were coupled as to address the scattering of those standards throughout the entire year.**

QUARTER 2
Now that students have an understanding of the scientific process, as well as waves, they can apply their knowledge to the concept of digitized signal. Knowledge about digitized signals will be utilized to connect with the study of the universe and the earth-sun- moon systems. They will focus on providing evidence through the construction and use of models.
** Due to concerns about pacing with several difficult (and in-depth) standards in quarter one, the standard containing digitized signals was shifted to quarter two (as this can bridge the concepts of waves to astronomy)**

QUARTER 3
Here, the focus will transition from the macroscopic to the microscopic. Students will learn about the functions of each cell organelle and how those functions relate to their structures. Students will then apply their understanding of a cell's organelles to how they collectively carry out essential functions of the body's systems. Additionally, students will design a solution to a problem that takes into consideration the ways in which the problem may affect humans.

QUARTER 4
In quarter four, students are expected to engage in higher level thinking, analyzing, interpreting and constructing arguments with claims and evidence. The focus will be on how rock layers and fossils provide evidence for evolutionary relationships and the geologic time scale.

