

Reading Public Schools

Instilling a joy of learning and inspiring the innovative leaders of tomorrow



Science Curriculum Guide

Grade 8

Course Description

Grade 8 students use more robust abstract thinking skills to explain causes of complex phenomena and systems. Many causes are not immediately or physically visible to students. An understanding of cause and effect of key natural phenomena and designed processes allows students to explain patterns and make predictions about future events. In grade 8 these include, for example, causes of seasons and tides; causes of plate tectonics and weather or climate; the role of genetics in reproduction, heredity, and artificial selection; and how atoms and molecules interact to explain the substances that make up the world and how materials change. Being able to analyze phenomena for evidence of causes and processes that often cannot be seen, and being able to conceptualize and describe those, is a significant outcome for grade 8 students.

Eighth Grade Content Standards

Earth and Space Sciences

- ⇒ ESS1. Earth's Place in the Universe
- ⇒ ESS2. Earth's Systems
- ⇒ ESS3. Earth and Human Activity

Life Science

- ⇒ LS1. From Molecules to Organisms: Structures and Processes
- ⇒ LS3. Heredity: Inheritance and Variation of Traits
- ⇒ LS4. Biological Evolution: Unity and Diversity

Grade 8: Physical Science

- ⇒ PS1. Matter and Its Interactions
- ⇒ PS2. Motion and Stability: Forces and Interactions

Grade 8: Engineering/Technology

- ⇒ ETS2. Materials, Tools, and Manufacturing

Expectations: *What are the students doing?*

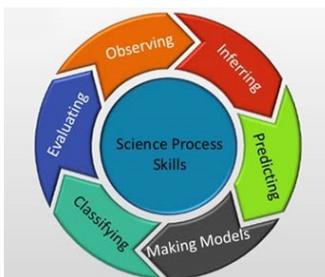
- Persisting when engaging with meaningful scientific tasks
- Using information from observations to construct an evidence based account for natural phenomena
- Constructing explanations using multiple sources of evidence
- Revising models to predict abstract phenomena

Instruction: *What are the students doing?*

- Asking questions that challenge the premise(s) of an argument or the interpretation of data
- Actively incorporating others into discussions about scientific ideas
- Analyzing observations to distinguish between correlation and causation

Assessment: *What are the students doing?*

- Reflecting on how they are progressing toward goals
- Demonstrating learning in multiple ways
- Engaging in challenging learning tasks regardless of learning needs



Concepts	Essential Questions	Resources
ESS1. Earth's Place in the Universe	<ul style="list-style-type: none"> • How do Earth's tilt and the Sun's Intensity explain the cyclical pattern of seasons on different areas of the Earth? • How does gravity affect tides, orbital motions of planets and all objects in our solar system? 	1. Seasons Investigation Lab 2. STEMscopes: Earth, Sun & Moon System 3. "Seasons: Why do We Have Them?" Simulation
ESS2. Earth's Systems	<ul style="list-style-type: none"> • Where does the energy that supplies Earth's processes come from? • Does Earth's processes occur quickly or slowly? What processes cause the cycling of Earth's materials? • What causes changes in weather conditions? • How does the ocean influence weather and climate? • What forces drive the movement of water? • What factors determine local weather patterns? 	STEMscopes: "Earth, Sun, & Moon System", "Motion of Planets", "Earth Materials", "Predicting Weather", & "Ocean Currents" Explore Learning Simulations: Weather Maps - Metric, Coastal Winds and Clouds - Metric Pond Ecosystem,
ESS3. Earth and Human Activity	<ul style="list-style-type: none"> • What activities increase the global temperature • How does consumption of resources alter Earth's climate? • Why are natural resources unevenly distributed on Earth? 	STEMscopes: "Human Activities and Global Climate Change", "Human Dependence on Natural Resources" NASA Climate Change Website
LS1. From Molecules to Organisms: Structures and Processes	<ul style="list-style-type: none"> • What can evidence tell us for how environmental and genetic factors influence the growth of organisms? • How do food molecules break down and rearrange through chemical reactions to form new molecules for cell growth and energy? 	STEMscopes: "Growth of Organisms", "Energy Flow in Organisms" "Genes and Proteins" Gizmos- "Identifying Nutrients"
LS3. Heredity: Inheritance and Variation of Traits	<ul style="list-style-type: none"> • What causes mutations? • How are traits passed to offspring? • Are all illnesses genetically linked? • What are examples of beneficial mutations? 	STEMscopes: "Mutations", "Inheritance & Genetic Variation" Explore Learning Simulations: Fast Plants® 1 - Growth and Genetics Gizmos "Building DNA", Growing Plants, Inheritance, Measuring Trees, Seed Germination, Temperature and Sex Determination - Metric
LS4. Biological Evolution: Unity and Diversity	<ul style="list-style-type: none"> • How do populations change over time? • How do adaptations relate to natural selection? • What is the difference between natural selection and artificial selection? • What types of people can selectively breed organisms? 	STEMscopes: "Natural Selection" & "Artificial Selection" Explore Learning Simulation: Evolution: Natural and Artificial Selection Gizmos: "Natural Selection" & "Evolution: Natural & Artificial Selection"



Concepts	Essential Questions	Resources
PS1. Matter and Its Interactions	<ul style="list-style-type: none"> • What is all matter made of? • What is the difference between physical and chemical properties? • What happens to atoms in chemical reactions? • Describe the law of conservation of mass. 	STEMscopes: "Structure of Matter" "Physical and Chemical Properties" "Modeling Conservation of Mass" "Heat and Matter" , Explore Learning Simulations: Chemical Changes, Melting Points Gizmos "Chemical Changes" Phase Changes Phases of Water Temperature and Particle Motion, Chemical Changes Chemical Equations
PS2. Motion and Stability: Forces and Interactions	<ul style="list-style-type: none"> • What is motion? • How can motion change? • What forces exist in our world? 	STEMscopes: "Newton's Third Law of Motion" "Changes in Force and Mo- tion" Explore Learning Simulations: Fan Cart Physics Force and Fan Carts Free-Fall Laboratory 2D Collisions Air Track, Explore Learning Simula- tions: Fan Cart Physics Force and Fan Carts Free-Fall Laboratory, 2D Collisions Air Track
ETS2. Materials, Tools, and Manufacturing	<ul style="list-style-type: none"> • How do materials maintain their composition under various kinds of physical processing? • How can a product be created using basic processes in manufacturing systems? 	Explore Learning Simulations: Densi- ty Experiment: Slice and Dice
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Curriculum Guide Overview

Curriculum Guide

Curriculum guides are public documents that are aligned with the Massachusetts Department of Education Curriculum Frameworks. They focus on the set of standards that students will learn within certain disciplines at appropriate grade levels. Curriculum Guides are intended for teachers, parents, and the wider school community as an overview document of the course of study for the year.

Curriculum Map

Curriculum maps are internal documents utilized as planning tools for teachers. Curriculum maps keep a focus on the end-of-year standards and chart a course for the teaching and learning over the year. They are typically organized in a grade-level overview organized by month or marking period. Curriculum maps typically include; standards and expectations for the grade/content, essential skills/concepts, methods of assessment, and major content resources. Maps are never “done” as ongoing work of educators include revisions, additions, and revisits to the maps. They provide an overview for the year while also allowing educators to see a vertical picture of how the content develops as students progress through each grade.

Standards

The standards used as the foundation of our curriculum come directly from the Massachusetts Department of Education Curriculum Frameworks. State standards may be viewed here: <http://www.doe.mass.edu/frameworks/>

Science and Engineering Practices

While presented as distinct skill sets, the eight practices intentionally overlap and interconnect. Skills such as those outlined above should be reflected in curricula and instruction that engage students in an integrated use of the practices.

Content Standards

The Content Standards describe what students should know and be able to do within each grade-level.

Essential Questions

Essential questions are questions that are not answerable with an easy answer or a simple instruction. The purpose of essential questions is to provide opportunities for inquiry into the learning and act as an umbrella to anchor the unit/lesson.

Resources

Resources identified in Curriculum Guides are not intended to be exhaustive, nor are they intended to be prescriptive. The resources identified may function as a menu of curriculum resources from which educators identify the most appropriate tools to utilized in their classrooms. More specifics about identified resources are identified within the curriculum map documents.