Eighth Grade Standards

The Science Georgia Standards of Excellence are designed to provide foundational knowledge and skills for all students to develop proficiency in science. The Project 2061's *Benchmarks for Science Literacy* and the follow up work, *A Framework for K-12 Science Education* were used as the core of the standards to determine appropriate content and process skills for students. The Science Georgia Standards of Excellence focus on a limited number of core disciplinary ideas and crosscutting concepts which build from Kindergarten to high school. The standards are written with the core knowledge to be mastered integrated with the science and engineering practices needed to engage in scientific inquiry and engineering design. Crosscutting concepts are used to make connections across different science disciplines.

The Science Georgia Standards of Excellence drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. The standards are a required minimum set of expectations that show proficiency in science. However, instruction can extend beyond these minimum expectations to meet student needs. At the same time, these standards set a maximum expectation on what will be assessed by the Georgia Milestones Assessment System.

Science consists of a way of thinking and investigating, as well a growing body of knowledge about the natural world. To become literate in science, students need to possess sufficient understanding of fundamental science content knowledge, the ability to engage in the science and engineering practices, and to use scientific and technological information correctly. Technology should be infused into the curriculum and the safety of the student should always be foremost in instruction.

The Eighth Grade Georgia Standards of Excellence for science are designed to give all students the necessary skills for a smooth transition from elementary physical science standards to high school physical science standards. The purpose is to give all students an overview of common strands in physical science including, but not limited to, the nature of matter, conservation of energy, energy transformations, conservation of matter, kinematics, and dynamics. These standards are not intended in any way to take the place of the high school physical science standards.

Eighth grade students keep records of their observations, use those records to analyze the data they collect, recognize patterns in the data, use simple charts and graphs to represent the relationships they see, and find more than one way to interpret their findings. They develop conceptual understanding of the laws of conservation of matter and conservation of energy, are able to explain the characteristics of the motion of an object (speed, acceleration) and the way that forces may change the state of motion of an object. They use what they observe to explain the difference between physical and chemical changes and cause and effect relationships between force, mass, and the motion of objects. Students in eighth grade construct explanations based on evidence on the difference and similarities between electromagnetic and mechanical waves. Eighth graders plan and carry out investigations, describe observations, and show information in graphical form. The students replicate investigations and compare results to find similarities and differences.

Physical Science

S8P1. Obtain, evaluate, and communicate information about the structure and properties of matter.

a. Develop and use a model to compare and contrast pure substances (elements and compounds) and mixtures.
(*Clarification statement:* Include heterogeneous and homogeneous mixtures. Types of bonds and compounds will be addressed in high school physical science.)
b. Develop and use models to describe the movement of particles in solids, liquids, gases, and plasma states when thermal energy is added or removed.
c. Plan and carry out investigations to compare and contrast chemical (i.e., reactivity, combustibility) and physical (i.e., density, melting point, boiling point) properties of matter.
d. Construct an argument based on observational evidence to support the claim that when a change in a substance occurs, it can be classified as either chemical or physical.
(*Clarification statement:* Evidence could include ability to separate mixtures, development of a gas, formation of a precipitate, change in energy, color, and/or form.)
e. Develop models (e.g., atomic-level models, including drawings, and computer representations) by analyzing patterns within the periodic table that illustrate the structure, composition, and characteristics of atoms (protons, neutrons, and electrons) and simple molecules.
f. Construct an explanation based on evidence to describe conservation of matter in a chemical reaction including the resulting differences between products and reactants.
(*Clarification statement:* Evidence could include models such as balanced chemical equations.)

S8P2. Obtain, evaluate, and communicate information about the law of conservation of energy to develop arguments that energy can transform from one form to another within a system.

a. Analyze and interpret data to create graphical displays that illustrate the relationships of kinetic energy to mass and speed, and potential energy to mass and height of an object.
b. Plan and carry out an investigation to explain the transformation between kinetic and potential energy within a system (e.g., roller coasters, pendulums, rubber bands, etc.).
c. Construct an argument to support a claim about the type of energy transformations within a system [e.g., lighting a match (light to heat), turning on a light (electrical to light)].
d. Plan and carry out investigations on the effects of heat transfer on molecular motion as it relates to the collision of atoms (conduction), through space (radiation), or in currents in a liquid or a gas (convection).

S8P3. Obtain, evaluate, and communicate information about cause and effect relationships between force, mass, and the motion of objects.

a. Analyze and interpret data to identify patterns in the relationships between speed and distance, and velocity and acceleration.
(*Clarification statement:* Students should be able to analyze motion graphs, but students should not be expected to calculate velocity or acceleration.)
b. Construct an explanation using Newton's Laws of Motion to describe the effects of balanced and unbalanced forces on the motion of an object.
c. Construct an argument from evidence to support the claim that the amount of force needed to accelerate an object is proportional to its mass (inertia).

S8P4. Obtain, evaluate, and communicate information to support the claim that electromagnetic (light) waves behave differently than mechanical (sound) waves.

a. Ask questions to develop explanations about the similarities and differences between electromagnetic and mechanical waves.
(*Clarification statement:* Include transverse and longitudinal waves and wave parts such as crest, trough, compressions, and rarefactions.)
b. Construct an explanation using data to illustrate the relationship between the electromagnetic spectrum and energy.
c. Design a device to illustrate practical applications of the electromagnetic spectrum (e.g., communication, medical, military).
d. Develop and use a model to compare and contrast how light and sound waves are reflected, refracted, absorbed, diffracted or transmitted through various materials.
(*Clarification statement:* Include echo and how color is seen but do not cover interference and scattering.)
e. Analyze and interpret data to predict patterns in the relationship between density of media and wave behavior (i.e., speed).
f. Develop and use a model (e.g., simulations, graphs, illustrations) to predict and describe the relationships between wave properties (e.g., frequency, amplitude, and wavelength) and energy.
g. Develop and use models to demonstrate the effects that lenses have on light (i.e., formation an image) and their possible technological applications.

S8P5. Obtain, evaluate, and communicate information about gravity, electricity, and magnetism as major forces acting in nature.

a. Construct an argument using evidence to support the claim that fields (i.e., magnetic fields, gravitational fields, and electric fields) exist between objects exerting forces on each other even when the objects are not in contact.

b. Plan and carry out investigations to demonstrate the distribution of charge in conductors and insulators.
(*Clarification statement:* Include conduction, induction, and friction.)

c. Plan and carry out investigations to identify the factors (e.g., distance between objects, magnetic force produced by an electromagnet with varying number of wire turns, varying number or size of dry cells, and varying size of iron core) that affect the strength of electric and magnetic forces.
(*Clarification statement:* Including, but not limited to, generators or motors.)