

Grade 8

Overview

The focus of the grade-eight science standards is on providing students with the hands-on experiences that give them the active engagement and the concrete examples they require in order to understand basic science concepts. The development of eighth graders' science skills culminates with their designing an entire controlled scientific investigation, constructing explanations and drawing conclusions from data, and generating questions for further study. Specifically, students explore the life, earth, and physical sciences within the framework of the following topics: "Earth's Biological History" (Earth's biological diversity over time); "Earth's Structure and Processes" (materials and processes that alter the structure of Earth); "Astronomy: Earth and Space Systems" (characteristics, structure, and motions of celestial bodies in the universe); "Forces and Motion" (effects of forces on the motion of an object); and "Waves" (properties and behaviors of waves).

The science standards for grade eight provide the foundation for a course that is based on a rich and wide variety of learning experiences that actively engage students and accommodate a broad range of student learning styles through varied materials and instructional strategies. Students should observe, interact with materials and with people and ask questions as they explore new concepts and expand their knowledge.

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Scientific Inquiry

The skills of scientific inquiry, including knowledge and use of tools, are not taught as separate skills in science, but are embedded throughout because these process skills are fundamental to all science instruction and content. A table of the PK–12 of scientific inquiry standards and Indicators: is provided in appendix A.

Standard:	8Sa:	The student will demonstrate an understanding of technological design and scientific inquiry, including process skills, mathematical thinking, controlled investigative design and analysis, and problem solving.
Indicators:	8Sa.1:	Design a controlled scientific investigation.
	8Sa.2:	Recognize the importance of a systematic process for safely and accurately conducting investigations.
	8Sa.3:	Construct explanations and conclusions from interpretations of data obtained during a controlled scientific investigation.
	8Sa.4:	Generate questions for further study on the basis of prior investigations.
	8Sa.5:	Explain the importance of and requirements for replication of scientific investigations.
	8Sa.6:	Use appropriate tools and instruments (including convex lenses, plane mirrors, color filters, prisms, and slinky springs) safely and accurately when conducting a controlled scientific investigation.
	8Sa.7:	Use appropriate safety procedures when conducting investigations.

Earth's Biological History

Standard:	8Sb:	The student will demonstrate an understanding of Earth's biological diversity over time. (Life Science, Earth Science)
Indicators:	8Sb.1:	Explain how biological adaptations of populations enhance their survival in a particular environment.
	8Sb.2:	Summarize how scientists study Earth's past environment and diverse life-forms by examining different types of fossils (including molds, casts, petrified fossils, preserved and carbonized remains of plants and animals, and trace fossils).
	8Sb.3:	Explain how Earth's history has been influenced by catastrophes (including the impact of an asteroid or comet, climatic changes, and volcanic activity) that have affected the conditions on Earth and the diversity of its life-forms.
	8Sb.4:	Recognize the relationship among the units—era, epoch, and period—into which the geologic time scale is divided.
	8Sb.5:	Illustrate the vast diversity of life that has been present on Earth over time by using the geologic time scale.
	8Sb.6:	Infer the relative age of rocks and fossils from index fossils and the ordering of the rock layers.

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8Sb.7: Summarize the factors, both natural and man-made, that can contribute to the extinction of a species.

Earth's Structure and Processes

Standard: **8Sc:** **The student will demonstrate an understanding of materials that determine the structure of Earth and the processes that have altered this structure. (Earth Science)**

Indicators: **8Sc.1:** Summarize the three layers of Earth—crust, mantle, and core—on the basis of relative position, density, and composition.

8Sc.2: Explain how scientists use seismic waves—primary, secondary, and surface waves—and Earth's magnetic fields to determine the internal structure of Earth.

8Sc.3: Infer an earthquake's epicenter from seismographic data.

8Sc.4: Explain how igneous, metamorphic, and sedimentary rocks are interrelated in the rock cycle.

8Sc.5: Summarize the importance of minerals, ores, and fossil fuels as Earth resources on the basis of their physical and chemical properties.

8Sc.6: Explain how the theory of plate tectonics accounts for the motion of the lithospheric plates, the geologic activities at the plate boundaries, and the changes in landform areas over geologic time.

8Sc.7: Illustrate the creation and changing of landforms that have occurred through geologic processes (including volcanic eruptions and mountain-building forces).

8Sc.8: Explain how earthquakes result from forces inside Earth.

8Sc.9: Identify and illustrate geologic features of regions of the world through the use of imagery (including aerial photography and satellite imagery) and topographic maps.

Astronomy: Earth and Space Systems

Standard: **8Sd:** **The student will demonstrate an understanding of the characteristics, structure, and predictable motions of celestial bodies. (Earth Science)**

Indicators: **8Sd.1:** Summarize the characteristics and movements of objects in the solar system (including planets, moons, asteroids, comets, and meteors).

8Sd.2: Summarize the characteristics of the surface features of the Sun: photosphere, corona, sunspots, prominences, and solar flares.

8Sd.3: Explain how the surface features of the Sun may affect Earth.

8Sd.4: Explain the motions of Earth and the Moon and the effects of these motions as they orbit the Sun (including day, year, phases of the Moon, eclipses, and tides).

8Sd.5: Explain how the tilt of Earth's axis affects the length of the day and the amount of heating on Earth's surface, thus causing the seasons of the year.

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- 8Sd.6:** Explain how gravitational forces are influenced by mass and distance.
- 8Sd.7:** Explain the effects of gravity on tides and planetary orbits.
- 8Sd.8:** Explain the difference between mass and weight by using the concept of gravitational force.
- 8Sd.9:** Recall the Sun's position in the universe, the shapes and composition of galaxies, and the distance measurement unit (light year) needed to identify star and galaxy locations.
- 8Sd.10:** Compare the purposes of the tools and the technology that scientists use to study space (including various types of telescopes, satellites, space probes, and spectroscopes).

Forces and Motion

- Standard:** **8Se:** **The student will demonstrate an understanding of the effects of forces on the motion of an object. (Physical Science)**
- Indicators:** **8Se.1:** Use measurement and time-distance graphs to represent the motion of an object in terms of its position, direction, or speed.
- 8Se.2:** Use the formula for average speed, $v = d/t$, to solve real-world problems.
- 8Se.3:** Analyze the effects of forces (including gravity and friction) on the speed and direction of an object.
- 8Se.4:** Predict how varying the amount of force or mass will affect the motion of an object.
- 8Se.5:** Analyze the resulting effect of balanced and unbalanced forces on an object's motion in terms of magnitude and direction.
- 8Se.6:** Summarize and illustrate the concept of inertia.

Waves

- Standard:** **8Sf:** **The student will demonstrate an understanding of the properties and behaviors of waves. (Physical Science)**
- Indicators:** **8Sf.1:** Recall that waves transmit energy but not matter.
- 8Sf.2:** Distinguish between mechanical and electromagnetic waves.
- 8Sf.3:** Summarize factors that influence the basic properties of waves (including frequency, amplitude, wavelength, and speed).
- 8Sf.4:** Summarize the behaviors of waves (including refraction, reflection, transmission, and absorption).
- 8Sf.5:** Explain hearing in terms of the relationship between sound waves and the ear.
- 8Sf.6:** Explain sight in terms of the relationship between the eye and the light waves emitted or reflected by an object.
- 8Sf.7:** Explain how the absorption and reflection of light waves by various materials result in the human perception of color.

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8Sf.8: Compare the wavelength and energy of waves in various parts of the electromagnetic spectrum (including visible light, infrared, and ultraviolet radiation).