

Essential Learnings - Science

STANDARD (2) : 2B. Energy (3rd, 4th, earth/env, physics)

The student demonstrates an understanding that energy appears in different forms and can be transferred.

GRADE/COURSE (2.3) : Earth/Environmental

ESSENTIAL LEARNING (2.3.1) : Energy transfer in earth systems

Investigates and understands energy transfer mechanisms (e.g., conduction, convection, radiation) on and under the surface of the Earth, in the atmosphere, and in the oceans.

Indicators:

(2.3.1.1) Radiation, convection, and conduction in earth systems

- Explains how radiation, convection, and conduction move energy in the atmosphere.
- Explains how convection currents in the mantle of the Earth move the crustal plates that can result in the earthquakes, volcanoes, mid-ocean ridges, and deep sea trenches.
- Explains how the movement of energy in the atmosphere results in the water cycle and weather.
- Explains how oceans transfer energy: waves, tides, currents, density gradients, convection currents.

(2.3.1.2) Energy transfer related to weather and climate

- Identifies climatic trends based on ocean currents and distribution of land masses (e.g., Ocean currents bringing cold polar water near a land mass result in cooler temperatures. Ocean currents bringing warm tropical water near a land mass result in warmer temperatures).
- Explains how energy transfer processes contribute to local and global weather and climatic patterns.

(2.3.1.3) Natural and man-made conditions impact energy transfer

- Explains how natural and man-made conditions can impact the transfer of energy on the Earth, in the atmosphere, and in the oceans.
- Explains how personal choices may impact the ability of the Earth, oceans, or atmosphere to transfer energy.

(2.3.1.4) Investigates energy transfer in earth systems

- ? Designs and conducts investigations to answer questions such as: “Which holds temperature longer – water or soil?” “How does a greenhouse model affect surface temperature?”

STANDARD (6) : 3C. Ecology (1st, 4th, 7th, earth/env)

The student demonstrates an understanding of how organisms and their environment interact.

GRADE/COURSE (6.4) : Earth/Environmental

Investigates and understands the characteristics that define the health of ecosystems and how the health of ecosystems is impacted by human activity and natural processes

ESSENTIAL LEARNING (6.4.1) : Health of ecosystems

Investigates and understands the characteristics that define the health of ecosystems and how the health of ecosystems is impacted by human activity and natural processes.

Indicators:

(6.4.1.1) Health and stability of ecosystems

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- Describes the health and stability of various ecosystems in terms of population sizes, biodiversity (number and kind of species), and biomass (productivity).
- Explains ecosystems tend to have cyclic fluctuations around a state of rough equilibrium.
- Describes how ecosystem(s) might respond to changes caused by human activity and natural processes (e.g., global warming, deforestation, desertification, depletion of aquifers, human intervention, succession).
- Explains how personal choices may impact the health of ecosystems.

(6.4.1.2) Cycles in ecosystems

- Identifies matter (water, carbon, nitrogen) that is cycled in ecosystems and describes what happens when the cycling of matter is altered (e.g., the carbon cycle in relation to the climate, the nitrogen cycle in relation to agriculture).

(6.4.1.3) Investigates ecosystems

? Designs and conducts investigations to develop and answer questions such as: “How does non-point source pollution (or light, temperature, pH) affect the health of an ecosystem?”

STANDARD (8) : 4A. Earth composition and processes (2nd, 3rd, 6th, earth/env)

The student demonstrates an understanding of the composition of the Earth, its history, and the natural processes that shape it.

GRADE/COURSE (8.4) : Earth/Environmental

Investigates and understands the Earth, ocean, atmosphere, and Sun provide natural resources; people need to evaluate the advantages and disadvantages associated with the use of each resource.

ESSENTIAL LEARNING (8.4.1) : Responsible use of natural resources

Investigates and understands the Earth, ocean, atmosphere, and Sun provide natural resources; people need to evaluate the advantages and disadvantages associated with the use of each resource.

Indicators:

(8.4.1.1) Natural resources and how they are used

- Identifies material and energy resources provided by the Earth (rocks, coal), water (including the oceans - ocean algae contribute most of the oxygen to the atmosphere), atmosphere (protection from radiation), and Sun (energy).
- Identifies ways the material and energy resources are used.

(8.4.1.2) Evaluates the use of natural resources

- Identifies, evaluates and compares the benefits, limitations, costs and consequences involved in using different resources from the Earth, atmosphere, or Sun (e.g., the burning of coal, the use of nuclear reactors and solar panels all provide electrical energy for people).
- Identify and evaluate the benefits, limitations, costs, and consequences of each source of electrical energy.
- Identifies sources of bias that might influence decisions about the use of material and energy resources.

ESSENTIAL LEARNING (8.4.2) : Composition, structure, age of the Earth

Investigates and understands the composition, structure, and age of the Earth.

Indicators:

(8.4.2.1) Relative and absolute dating

- Explains how successive layers of rock and the fossils within them can be used to determine relative age, past geologic environments and life forms.

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- Describes how the absolute age of rock can be determined by studying the chemicals that make up the rock (radiometric dating).
- Explains the oldest rocks on Earth are 4.5 billion years old, suggesting the Earth is also 4.5 billion years old.

(8.4.2.2) Evidence for changes

- Explains how core samples provide evidence for how the Earth has changed or remained the same over short and long periods of time.
- Explains how ice core samples provide evidence for how the Earth's atmosphere has changed or remained the same over short and long periods of time.

(8.4.2.3) Natural and man-made factors impact the Earth

- Explains how natural and man-made factors have changed the Earth and its atmosphere over short and long periods of time.

(8.4.2.4) Studying the structure of the Earth

- Describes the evidence (e.g., movement of the plates suggests the existence of a fluid layer with convection currents, sonar readings suggest the Earth is made of layers of different densities, the presence of a magnetic field suggests the Earth has an iron core) that suggests the Earth is made of layers with distinct characteristics.

STANDARD (10) : 4C. Solar System and Universe (K, 3rd, 6th, earth/env)

The student demonstrates an understanding of the structure of the solar system and the dynamics of the universe

GRADE/COURSE (10.4) : Earth/Environmental

ESSENTIAL LEARNING (10.4.1) : Gravity and the components of the Universe

Investigates and understands the relative size and distance between the components of the Universe and how gravity influences their motion.

Indicators:

(10.4.1.1) Components of the Universe

- Identifies and describes the components (e.g., stars, solar systems, nebulae, galaxies) of the Universe
- Explains the Universe contains galaxies, galaxies contain solar systems, and solar systems contain a star and one or more planets that might have moons.
- Compares the size and distance between objects in the Universe.

(10.4.1.2) Classification of components of the Universe

- Classifies stars and describes the life cycle of stars using the Hertzsprung-Russell diagram.
- Classifies galaxies based on shape (e.g., spiral, elliptical, colliding).

(10.4.1.3) Gravity

- Explains gravitational force is an attraction between masses; it is proportional to the masses and weakens rapidly with increasing distance between two masses.
- Explains how gravity influences the motion of objects in the Universe.

(10.4.1.4) Formation

- States the Big Bang theory of the formation of the Universe and describes some of the evidence (e.g., red shift of galaxies indicates the Universe is expanding) for the Big Bang theory.
- Describes how the Nebular theory explains how our solar system formed.

ESSENTIAL LEARNING (10.4.2) : The changing Universe

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Investigates and understands the origin, motion, and evolution of the Universe.

Indicators:

(10.4.2.1) Formation of Universe

- States the Big Bang theory of the formation of the Universe and describes some of the evidence (e.g., red shift of galaxies indicates the Universe is expanding) for the Big Bang theory. Explains the Universe is expanding causing most objects in it to move further apart.

(10.4.2.2) Formation of solar system

- Describes how the Nebular theory explains how our solar system formed.

(10.4.2.3) Transformation of stars

- Explains how stars are made of hydrogen and helium; over time, these elements are converted to the other, heavier elements.

(10.4.2.4) Measurement

? Explains the solar system is moving within the galaxy and the galaxy is moving in the Universe; actual measurements of galaxies moving were made possible with the technological advancements (e.g., Hubble telescope).