

Grade 7
Science Design for Learning

Life Science

Evolution and Biodiversity

Standard 10

Give examples of ways in which genetic variation and environmental factors are causes of evolution and the diversity of organisms.

- Define adaptation
- Investigate the factors that effect biodiversity including climate, area and diversity of niches

Standard 12

Relate the extinction of species to a mismatch of adaptation and the environment.

- Investigate the results of an introduction of exotic species to an ecosystem
- Describe how decision makers balance different needs and concerns related to species in their environment

Living Things and Their Environment

Standard 13

Give examples of ways in which organisms interact and have different functions within an ecosystem that enable the ecosystem to survive.

- Model a food web with the terms producer, consumer and decomposer
- Evaluate the importance of a keystone species in an ecosystem
- Evaluate the significance of limiting factors on the increase of a population within an ecosystem

Energy and Living Things

Standard 14

Explain the roles and relationships among producers, consumers and decomposers in the process of energy transfer in a food web.

- Define symbiosis
- Compare and contrast the three symbiotic relationships and give examples of each
- Define the energy roles of organisms in an ecosystem

Standard 15

Explain how dead plants and animals are broken down by other living organisms and how this process contributes to the system as a whole.

- Explain what the source of energy for most ecosystems is
- Construct an energy pyramid
- Describe the flow of energy from producer to third level consumer

Standard 16

Life Science continued...

Recognize that producers (plants that contain chlorophyll) use the energy from sunlight to make sugars from carbon dioxide and water through a process called photosynthesis. This food can be used immediately, stored for later use, or used by other organisms.

- Summarize the process of photosynthesis and the production of food energy for producers
- Give possible scenarios for what would happen to an ecosystem without producers
- Explain the role of plants in the carbon cycle

Changes in Ecosystems Over Time

Standard 17

Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions, interactions among organisms, and the actions of humans. Describe how changes may be catastrophes such as volcanic eruptions or ice storms.

- Identify the limiting factors of an ecosystem
- Investigate ecosystems that have been affected by natural disasters

Standard 18

Recognize that biological evolution accounts for the diversity of species developed through gradual processes over many generations.

- Define biodiversity
- Evaluate way in which biodiversity can be protected
- Define evolution and recognize the role of adaptations in the environmental process

Physical Science

Properties of Matter

Standard 1

Differentiate between weight and mass, recognizing that weight is the amount of gravitational pull on an object.

- Distinguish between weight and mass
- Explain the effects of gravity on an object

Standard 2

Differentiate between volume and mass. Define density.

- Define volume, mass and density
- Solve equations to determine volume, mass and density
- Demonstrate an understanding of how each concept relates to one another

Standard 3

Recognize that the measurement of volume and mass requires understanding of the sensitivity of measurement tools (e.g., rulers, graduated cylinders, balances) and knowledge and appropriate use of significant digits.

- Calculate the density of several known substances
- Demonstrate the proper usage of a variety of measurement tools

Elements, Compounds and Mixtures

Physical Science continued...

Standard 5

Recognize that there are more than 100 elements that combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.

- Define element and compound
- Introduce Periodic Table of Elements
- Demonstrate an understanding of the organization of the Periodic Table

Standard 6

Differentiate between an atom (the smallest unit of an element that maintains the characteristics of that element) and a molecule (the smallest unit of a compound that maintains the characteristics of that compound).

- Compare and contrast an atom and a molecule
- Define valence electron
- Construct a 3-D model of an atom

Standard 7

Give basic examples of elements and compounds.

- Explore matter at the beach
- Recognize that sand at the beach is made of 4 elements

Standard 8

Differentiate between mixtures and pure substances.

- Define mixtures and pure substances
- Give examples of mixtures and pure substances

Standard 9

Recognize that a substance (element or compound) has a melting point and a boiling point, both of which are independent of the amount of the sample.

- Give examples of characteristic properties
- Identify the three temperature scales

Standard 10

Differentiate between physical changes and chemical changes.

- Compare and contrast physical and chemical changes
- Given a list, classify each change as either chemical or physical

Motion of Objects

Standard 11

Explain and give examples of how the motion of an object can be described by its position, direction of motion and speed.

- Define speed
- Explain when an object is in motion and how motion is relative to a reference point

Standard 12

Graph and interpret distance vs. time graphs for constant speed.

- Measure distance and time accurately
- Record data in lists or tables
- Apply concepts learned to calculate speed
- Communicate understanding through analyzation of graphs

Forms of Energy

Standard 13

Differentiate between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.

- Compare and contrast potential and kinetic energy
- Give examples of potential and kinetic energy
- List different forms of energy

Heat Energy

Standard 14

Recognize that heat is a form of energy and that temperature change results from adding or taking away heat from a system.

- Define heat
- Recognize the relationship between heat, temperature and thermal energy

Standard 15

Explain the effect of heat on particle motion through a description of what happens to particles during a change in phase.

- Identify the three states of matter
- Recognize that matter will undergo a change of state when thermal energy is added or removed
- Evaluate the particle movement during a change of state

Standard 16

Give examples of how heat moves in predictable ways, moving from warmer objects to cooler ones until they reach equilibrium.

- Demonstrate an understanding of how heat is a transfer of thermal energy from an object at a higher temperature to an object at a lower temperature
- Apply this understanding to the three forms of heat transfer: conduction, convection and radiation

Earth and Space

Heat Transfer in the Earth System

Standard 3

Differentiate among radiation, conduction and convection, the three mechanisms by which heat is transferred through the Earth's system.

- Define radiation, conduction and convection
- Compare and contrast the three forms of heat transfer
- Demonstrate understanding how heat is related to thermal energy

Standard 5

Describe how the movement of the Earth's crustal plates causes both slow changes in the earth's surface (e.g., formation of mountains and ocean basins) and rapid ones (e.g., volcanic eruptions and earthquakes).

- Investigate the slow movement of the Earth's plates
- Calculate the speed at which the Earth's plates are moving

Technology/Engineering

(Select standards will be chosen for grade seven studies)

1. Materials, Tools, and Machines

Central Concept: Appropriate materials, tools, and machines enable us to solve problems, invent, and construct.

- 1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., strength, hardness, and flexibility).
- 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten, and separate, and explain their safe and proper use.
- 1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, sander, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.

2. Engineering Design

Central Concept: Engineering design is an iterative process that involves modeling and optimizing to develop technological solutions to problems within given constraints.

- 2.1 Identify and explain the steps of the engineering design process, i.e., identify the need or problem, research the problem, develop possible solutions, select the best possible solution(s), construct a prototype, test and evaluate, communicate the solution(s), and redesign.
- 2.2 Demonstrate methods of representing solutions to a design problem, e.g., sketches, orthographic projections, multiview drawings.
- 2.3 Describe and explain the purpose of a given prototype.
- 2.4 Identify appropriate materials, tools, and machines needed to construct a prototype of a given engineering design.
- 2.5 Explain how such design features as size, shape, weight, function, and cost limitations would affect the construction of a given prototype.

2.6 Identify the five elements of a universal systems model: goal, inputs, processes, outputs, and feedback.

3. Communication Technologies

Central Concept: Ideas can be communicated through engineering drawings, written reports, and pictures.

- 3.1 Identify and explain the components of a communication system, i.e., source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.
- 3.2 Identify and explain the appropriate tools, machines, and electronic devices (e.g., drawing tools, computer-aided design, and cameras) used to produce and/or reproduce design solutions (e.g., engineering drawings, prototypes, and reports).
- 3.3 Identify and compare communication technologies and systems, i.e., audio, visual, printed, and mass communication.
- 3.4 Identify and explain how symbols and icons (e.g., international symbols and graphics) are used to communicate a message.

4. Manufacturing Technologies

Central Concept: Manufacturing is the process of converting raw materials (primary process) into physical goods (secondary process), involving multiple industrial processes (e.g., assembly, multiple stages of production, quality control).

- 4.1 Describe and explain the manufacturing systems of custom and mass production.
- 4.2 Explain and give examples of the impacts of interchangeable parts, components of mass-produced products, and the use of automation, e.g., robotics.
- 4.3 Describe a manufacturing organization, e.g., corporate structure, research and development, production, marketing, quality control, distribution.
- 4.4 Explain basic processes in manufacturing systems, e.g., cutting, shaping, assembling, joining, finishing, quality control, and safety.

5. Construction Technologies

Central Concept: Construction technology involves building structures in order to contain, shelter, manufacture, transport, communicate, and provide recreation.

- 5.1 Describe and explain parts of a structure, e.g., foundation, flooring, decking, wall, roofing systems.
- 5.2 Identify and describe three major types of bridges (e.g., arch, beam, and suspension) and their appropriate uses (e.g., site, span, resources, and load).
- 5.3 Explain how the forces of tension, compression, torsion, bending, and shear affect the performance of bridges.
- 5.4 Describe and explain the effects of loads and structural shapes on bridges.

6. Transportation Technologies

Central Concept: Transportation technologies are systems and devices that move goods and people from one place to another across or through land, air, water, or space.

- 6.1 Identify and compare examples of transportation systems and devices that operate on or in each of the following: land, air, water, and space.
- 6.2 Given a transportation problem, explain a possible solution using the universal systems model.
- 6.3 Identify and describe three subsystems of a transportation vehicle or device, i.e., structural, propulsion, guidance, suspension, control, and support.
- 6.4 Identify and explain lift, drag, friction, thrust, and gravity in a vehicle or device, e.g., cars, boats, airplanes, rockets.

7. Bioengineering Technologies

Central Concept: Bioengineering technologies explore the production of mechanical devices, products, biological substances, and organisms to improve health and/or contribute improvements to our daily lives.

- 7.1 Explain examples of adaptive or assistive devices, e.g., prosthetic devices, wheelchairs, eyeglasses, grab bars, hearing aids, lifts, braces.
- 7.2 Describe and explain adaptive and assistive bioengineered products, e.g., food, bio-fuels, irradiation, integrated pest management.