Arizona Science Standards - 7th Grade

Three Dimensions of Science

Sensemaking in science occurs with the integration of three essential dimensions.

Science and Engineering Practices

- ask questions and define problems
- develop and use models
- plan and carry out investigations
- analyze and interpret data
- use mathematics and computational thinking
- construct explanations and design solutions
- engage in argument from evidence
- obtain, evaluate, and communicate information

Crosscutting Concepts

- patterns
- cause and effect
- structure and function
- systems and system models
- stability and change
- scale, proportion, and quantity
- energy and matter

Core Ideas

Core Ideas for Knowing Science

Physical Science

P1: All matter in the Universe is made of very small particles.

P2: Objects can affect other objects at a distance.

P3: Changing the movement of an object requires a net force to be acting on it.

P4: The total amount of energy in a closed system is always the same but can be transferred from one energy store to another during an event.

Earth and Space Science

E1: The composition of the Earth and its atmosphere and the natural and human processes occurring within them shape the Earth's surface and its climate.

E2: The Earth and our solar system are a very small part of one of many galaxies within the Universe.

Life Science

L1: Organisms are organized on a cellular basis and have a finite life span.

L2: Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.

L3: Genetic information is passed down from one generation of organisms to another.

L4: The unity and diversity of organisms, living and extinct, is the result of evolution.

Core Ideas for Using Science

U1: Scientists explain phenomena using evidence obtained from observations and or scientific investigations. Evidence may lead to developing models and or theories to make sense of phenomena. As new evidence is discovered, models and theories can be revised.

U2: The knowledge produced by science is used in engineering and technologies to solve problems and/or create products.

U3: Applications of science often have both positive and negative ethical, social, economic, and/or political implications.

Physical Science Standards

Students will explore how cause and effect take place within and between a wide variety of force and motion systems from forces on individual objects to the forces that shape our Earth.

7.P2U1.1	Collect and analyze data demonstrating how electromagnetic forces can be attractive or repulsive and can vary in strength.
7.P2U1.2	Develop and use a model to predict how forces act on objects at a distance.
7.P3U1.3	Plan and carry out an investigation that can support an evidence-based explanation of how objects on Earth are affected by gravitational force.
7.P3U1.4	Use non-algebraic mathematics and computational thinking to explain Newton's laws of motion.

Earth and Space Science Standards

Students develop an understanding of the patterns of energy flow along with matter cycling within and among Earth's systems.

7.E1U1.5	Construct a model that shows the cycling of matter and flow of energy in the atmosphere, hydrosphere, and geosphere.
7.E1U1.6	Construct a model to explain how the distribution of fossils and rocks, continental shapes, and seafloor structures provides evidence of the past plate motions.
7.E1U2.7	Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction.

Phenomena are observable events that can be explained or explored. Science aims to explain the causes of these events, or phenomena, using scientific ideas, concepts, and practices (3-dimensions).

Life Science Standards

Students develop an understanding of the structure and function of cells.

7.L1U1.8	Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things.
7.L1U1.9	Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).
7.L1U1.10	Develop and use a model to explain how cells, tissues, and organ systems maintain life (animals).
7.L1U1.11	Construct an explanation for how organisms maintain internal stability and evaluate the effect of the external factors on organisms' internal stability.
7.L2U1.12	Construct an explanation for how some plant cells convert light energy into food energy.

Key Crosscutting Concepts in 7th Grade

Patterns; Cause and Effect*; Scale, Proportion and Quantity; Systems and System Models; Energy and Matter;* ***Structure and Function****; Stability and Change*

ARIZONA Department of Education

*Optimized for 11x17 printing

Released 11/03/2022

Arizona Science Standards - 7th Grade

Core Ideas for Knowing Science: Elements for Physical, Earth & Space, and Life Science Standards

Elements of Physical Science Standards

7.P2U1.1 Collect and analyze data demonstrating how electromagnetic forces can be attractive or repulsive and can vary in strength.

- Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

7.P2U1.2 Develop and use a model to predict how forces act on objects at a distance.

- Forces that act at a distance (gravitational, electric, and magnetic) can be explained by force fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively). (6.P2U1.4).

Note: Gravitational force is a suggested focus for 6th grade; It is suggested that all 3 forces be focused on in 7th grade.

7.P3U1.3 Plan and carry out an investigation that can support an evidence-based explanation of how objects on Earth are affected by gravitational force.

- All objects on the Earth are affected by gravitational forces. An object which stays at rest on the surface of the Earth has one or more forces acting on it counter balancing the force of gravity

7.P3U1.4 Use non-algebraic mathematics and computational thinking to explain Newton's laws of motion.

- For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first but in the opposite direction.
- The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to change the object's motion. For any given object, a larger force causes a larger change in motion.
- All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.

The elements are not to be used as a check-off list, but rather a useful tool to help educators identify the specific pieces of knowledge and skill that make up the practice, crosscutting concept, or core idea at that grade-band.

Elements of Earth and Space Science Standards

7.E1U1.5 Construct a model that shows the cycling of matter and flow of energy in the atmosphere, hydrosphere, and geosphere.

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials.
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future.
- Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.
- The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.

Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials. This does not include the identification and naming of minerals. Emphasis is also on the ways that water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.

7.E1U1.6 Construct a model to explain how the distribution of fossils and rocks, continental shapes, and seafloor structures provides evidence of the past plate motions.

- Plate tectonics is the unifying theory that explains the past and current movements of the rocks at Earth's surface and provides a framework for understanding its geological history.
- Maps of ancient land and water patterns, based on investigations of rocks and fossils, make clear how Earth's plates have moved great distances, collided, and spread apart.
- Tectonic processes continually generate new ocean seafloor at ridges and destroy old seafloor at trenches.

7.E1U2.7 Analyze and interpret data to construct an explanation for how advances in technology has improved weather prediction.

- Weather and climate are influenced by interactions involving sunlight, the ocean, the atmosphere, ice, landforms, and living things. These interactions vary with latitude, altitude, and local and regional geography, all of which can affect oceanic and atmospheric flow patterns. Because these patterns are so complex, weather can be predicted only probabilistically.

Elements of Life Science Standards

7.L1U1.8 Obtain, evaluate, and communicate information to provide evidence that all living things are made of cells, cells come from existing cells, and cells are the basic structural and functional unit of all living things.

- All living things are made up of cells, which is the smallest unit that can be said to be alive. All the basic processes of life are the results of what happens inside cells. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).
- Cells divide to replace aging cells and to make more cells in growth and in reproduction.

7.L1U1.9 Construct an explanation to demonstrate the relationship between major cell structures and cell functions (plant and animal).

- Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.

Boundary: At this grade level, only a few major cell structures should be introduced.

7.L1U1.10 Develop and use a model to explain how cells, tissues, and organ systems maintain life (animals).

- In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions, such as respiration, digestion, elimination of waste and temperature control.

7.L1U1.11 Construct an explanation for how organisms maintain internal stability and evaluate the effect of the external factors on organisms' internal stability.

- Organisms respond to stimuli from their environment and actively maintain their internal environment.

7.L2U1.12 Construct an explanation for how some plant cells convert light energy into food energy.

- Plants, algae (including phytoplankton) and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use.

*Optimized for 11x17 printing

ARIZONA Department of Education

Released 11/03/2022