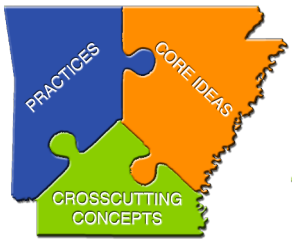


ARKANSAS
K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

Fundamental Science Content

8th Grade

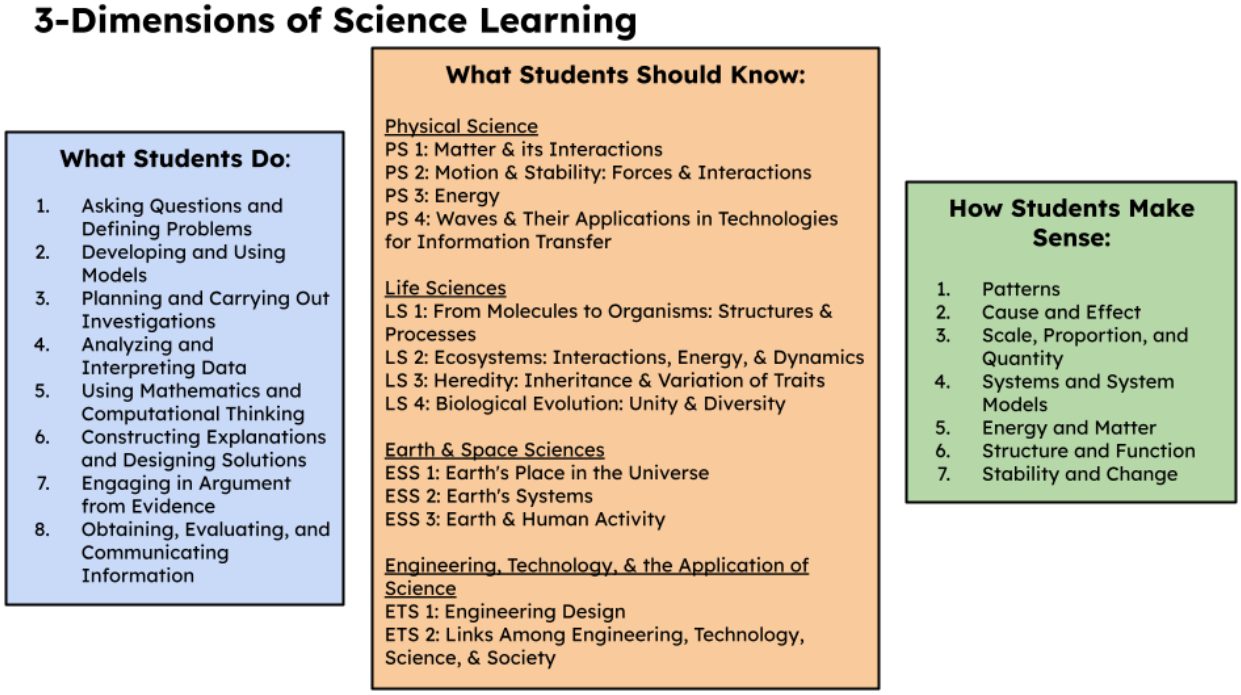
2023

The Arkansas K-12 Science Standards are available here. The standards are three-dimensional, consisting of a Science and Engineering Practice (SEP), a Disciplinary Core Idea (DCI), and a Cross Cutting Concept (CCC). By the end of the grade level, students should be able to demonstrate the full scope of the standard. Example:

The focus of this document is specifically on the science core ideas in 8th grade. In Arkansas K-12 Science Standards, science content is found in the DCI portion of each standard. Three-dimensional learning and assessment best prepares students for success so that students have the opportunity to demonstrate both what they know *and* can do in science. Refer to the full standards document to find the corresponding science and engineering practice and cross cutting concept for each standard. The core ideas are organized into the following domains of science:

- Physical Science
- Life Science
- Earth & Space Science
- Engineering Technology & Applications of Science

Each domain contains core ideas organized into component ideas. By the end of 8th grade, students are expected to know the bulleted information under each component idea. Standards that address the bulleted information are included in parentheses and those with an asterisk include an engineering component.



Physical Science

*Asterisks indicate best opportunities to integrate ETS performance expectations into content.

Motion & Stability
Forces & 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 (Newton's third law). (8-PS2-1*)
• The motion (speed and direction) of an object is determined by the sum of the forces acting on it; if the total force acting on the object is not zero (unbalanced forces), then the object's speed and/or direction will change. More massive objects require greater unbalanced forces to experience the same change in motion. For any given object, a larger force causes a larger change in motion. (8-PS2-2)
• All positions of objects and the directions of forces and motions must be described in a specified reference frame and appropriately chosen units of size. In order to share information with other people, these choices must also be shared. (8-PS2-2)
Types of Interactions
• Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes (sizes) of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (8-PS2-3)
• Gravitational forces are always attractive. There is a gravitational force between any two masses, but it is very small except when one or both of the objects have large mass—e.g., Earth and the sun. (8-PS2-4)
• Forces that act at a distance (electric, magnetic, and gravitational) can be explained by fields that extend through space and can be mapped by their effect on a test object (a charged object, or a ball, respectively). (8-PS2-5)
Energy
Definitions of Energy
• Energy of motion is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (8-PS3-1)
• A system of objects may also contain stored (potential) energy, depending on their relative positions. (8-PS3-2)
Energy & Forces
• When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (8-PS3-2)
Waves
Wave Properties
• A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. (8-PS4-1)
• A sound wave requires a medium through which to travel. (8-PS4-2)

Electromagnetic Radiation
• When light shines on an object, it is reflected, absorbed, or transmitted through the object, depending on the object's material and the frequency (color) of the light. (8-PS4-2)
• The path that light travels can be traced as straight lines, except at surfaces between different transparent materials (e.g., air and water, air and glass) where the light path bends. (8-PS4-2)
• A wave model of light is useful for explaining brightness, color, and the frequency-dependent bending of light at a surface between media. (8-PS4-2)
• However, because light does not need a medium through which to travel, it can travel through a vacuum and cannot be a matter (mechanical) wave, like sound or water waves. (8-PS4-2)
Waves in Information Technology
• Digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. (8-PS4-3)

Life Science

Heredity & Variation of Traits
Inheritance of Traits
• Genes are located in the chromosomes of cells, with each chromosome pair containing two variants of each of many distinct genes. Each distinct gene chiefly controls the production of specific proteins, which in turn affects the traits of the individual. Changes (mutations) to genes can result in changes to proteins, which can affect the structures and functions of the organism and thereby change traits. (8-LS3-1)
Variation of Traits
• In addition to variations that arise from sexual reproduction, genetic information can be altered because of mutations. Though rare, mutations may result in changes to the structure and function of proteins. Some changes are beneficial, others harmful, and some neutral to the organism. (8-LS3-1)
Biological Evolution
Common Ancestry
• The collection of fossils and their placement in chronological order (e.g., through the location of the sedimentary layers in which they are found or through radioactive dating) is known as the fossil record. It documents the existence, diversity, extinction, and change of many life forms throughout the history of life on Earth. (8-LS4-1)
• Anatomical similarities and differences between various organisms living today and between them and organisms in the fossil record, enable the reconstruction of evolutionary history and the inference of lines of evolutionary descent. (8-LS4-2)
• Comparison of the embryological development of different species also reveals similarities that show relationships not evident in the adult anatomy (e.g., whale related to land mammals). (8-LS4-3)

Natural Selection
• In artificial selection, humans have the capacity to influence certain characteristics of organisms by selective breeding. One can choose desired parental traits determined by genes, which are then passed on to offspring. (8-LS4-5)
• Natural selection leads to the predominance of certain traits in a population, and the suppression of others. (8-LS4-4)
Adaptation
• Adaptation by natural selection acting over generations is one important process by which species change over time in response to changes in environmental conditions. Traits that support successful survival and reproduction in the new environment become more common; those that do not become less common. Thus, the distribution of traits in a population changes. (8-LS4-6)

Earth & Space Science

Earth's Place in the Universe
The Universe and its Stars
• Patterns of the apparent motion of the sun, the moon, and stars in the sky can be observed, described, predicted, and explained with models. (8-ESS1-1)
• Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (8-ESS1-2)
Earth and the Solar System
• The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on these objects. (8-ESS1-2),(8-ESS1-3)
• This model of the solar system can explain eclipses of the sun and the moon. Earth's spin axis is fixed in direction over a short period of time but tilted relative to its orbit around the sun. The seasons are a result of that tilt and are caused by the varying intensity of sunlight on different areas of Earth across the year. (8-ESS1-1)
• The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (8-ESS1-2)
The History of Planet Earth
• The geologic time scale interpreted from rock strata provides a way to organize Earth's history. Analyses of rock layers and the fossil record provide only relative dates, not a complete and total scale. (8-ESS1-4)

Engineering, Technology, and Applications of Science

Engineering Design
Defining Engineering Problems
• The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (8-ETS1-1)
Developing Possible Solutions
• A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (8-ETS1-4)
• There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (8-ETS1-2, 8-ETS1-3)
• Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (8-ETS1-3)
• Models of all kinds are important for testing solutions. (8-ETS1-4)
Optimizing the Design Solution
• Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design. (8-ETS1-3)
• The repetitive process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (8-ETS1-4)