ARKANSAS
K-12 SCIENCE STANDARDS
EDUCATION FOR A NEW GENERATION

Fundamental Science Content
Environmental Science

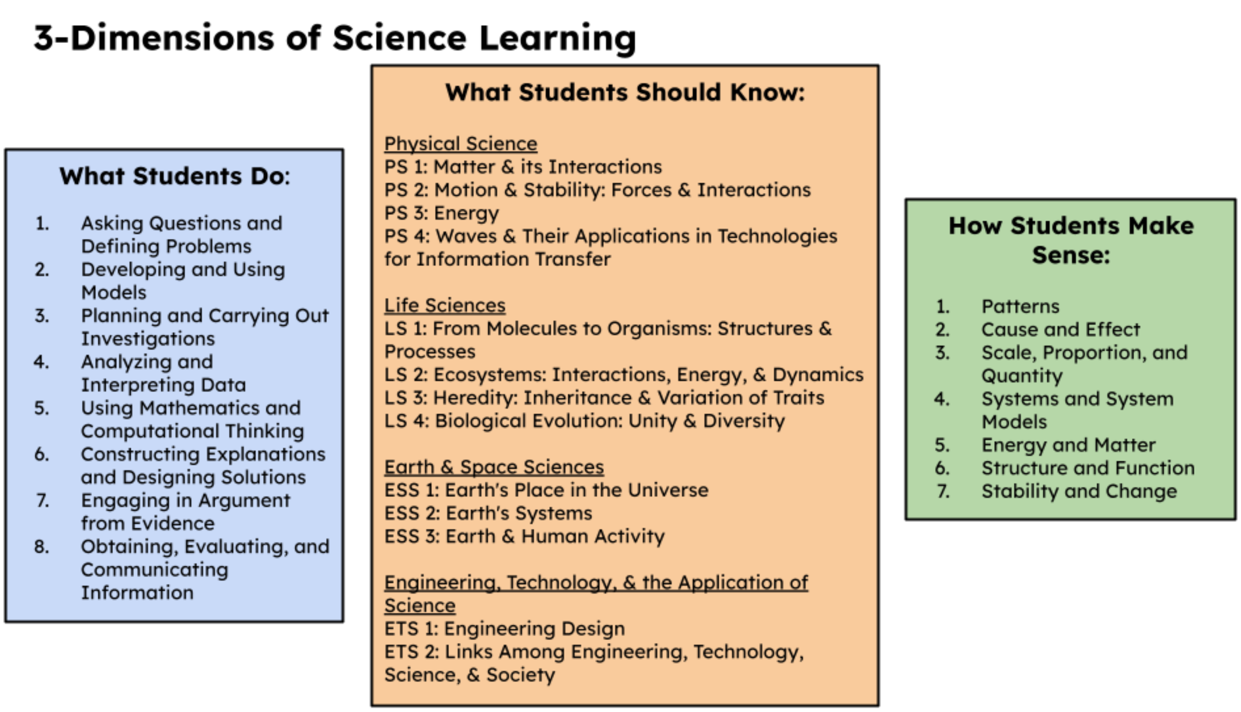
2023

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 Environmental Science. 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 Environmental Science, students are expected to know the bulleted information under each component idea. Standards that address the bulleted information are included in parentheses.



Physical Science

Energy
Definitions of Energy
• Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms. (EVS-PS3-1, EVS-PS3-2)
• At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy. (EVS-PS3-2, EVS-PS3-3)
• These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space. (EVS-PS3-2)
Conservation & Transfer of Energy
• Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system. (EVS-PS3-1)
• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (EVS-PS3-1)
• Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g. relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior. (EVS-PS3-1)
• The availability of energy limits what can occur in any system. (EVS-PS3-1)
• Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems. (EVS-PS3-4)
• Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, and objects hotter than their surrounding environment cool down). (EVS-PS3-4)
Energy in Everyday Life
• Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment. (EVS-PS3-3, EVS-PS3-4)
Waves
Wave Properties
• Geologists use seismic waves and their reflection at interfaces between layers to probe structures deep in the planet. (EVS-ESS2-3)

Life Science

Ecosystems
Interdependent Relationships
• Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. These limits result from such factors as the availability of living and nonliving resources and from such challenges such as predation, competition, and disease. Organisms would have the capacity to produce populations of great size were it not for the fact that environments and resources are finite. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (EVS-LS2-1, EVS-LS2-2)
Ecosystem Dynamics
• A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest biological or physical disturbance to an ecosystem occurs, it may return to its more or less original status (i.e., the ecosystem is resilient), as opposed to becoming a very different ecosystem. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (EVS-LS2-2, EVS-LS2-6)
• Moreover, anthropogenic changes (induced by human activity) in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (EVS-LS2-7)
Social Interactions and Behaviors
• Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (EVS-LS2-8)
Biological Evolution
Adaptation
• Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (EVS-LS4-6)
Biodiversity & Humans
• Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (EVS-LS2-7)
• Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (EVS-LS2-7, EVS-LS4-6)

Earth & Space Science

Earth's Systems
Earth's Materials
• Earth's systems, being dynamic and interacting, cause feedback effects that can increase or decrease the original changes. (EVS-ESS2-2)
• Evidence from deep probes and seismic waves, reconstructions of historical changes in Earth's surface and its magnetic field, and an understanding of physical and chemical processes lead to a model of Earth with a hot but solid inner core, a liquid outer core, a solid mantle and crust. Motions of the mantle and its plates occur primarily through thermal convection, which involves the cycling of matter due to the outward flow of energy from Earth's interior and gravitational movement of denser materials toward the interior. (EVS-ESS2-3)
Plate Tectonics
• The radioactive decay of unstable isotopes continually generates new energy within Earth's crust and mantle, providing the primary source of the heat that drives mantle convection. Plate tectonics can be viewed as the surface expression of mantle convection. (EVS-ESS2-3)
Roles of Water on Earth's Processes
• The abundance of liquid water on Earth's surface and its unique combination of physical and chemical properties are central to the planet's dynamics. These properties include water's exceptional capacity to absorb, store, and release large amounts of energy, transmit sunlight, expand upon freezing, dissolve and transport materials, and lower the viscosities and melting points of rocks. (EVS-ESS2-5)
Weather and Climate
• The foundation for Earth's global climate systems is the electromagnetic radiation from the sun, as well as its reflection, absorption, storage, and redistribution among the atmosphere, ocean, and land systems, and this energy's re-radiation into space. (EVS-ESS2-2)
• Gradual atmospheric changes were due to plants and other organisms that captured carbon dioxide and released oxygen. (EVS-ESS2-6)
• Changes in the atmosphere due to human activity have increased carbon dioxide concentrations and thus affect climate. (EVS-ESS2-6)
• Current models predict that, although future regional climate changes will be complex and varied, average global temperatures will continue to rise. The outcomes predicted by global climate models strongly depend on the amounts of human-generated greenhouse gases added to the atmosphere each year and by the ways in which these gases are absorbed by the ocean and biosphere. (EVS-ESS3-6)
Earth and Human Activity
Natural Resources
• Resource availability has guided the development of human society. (EVS-ESS3-1, EVS-ESS3-2)
Natural Hazards

• Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. (EVS-ESS3-1)
Human Impacts on Earth Systems
• Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (EVS-ESS3-3, EVS-ESS3-4)
Global Climate Change
• Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (EVS-ESS3-6)

Engineering, Technology, and Applications of Science

Engineering Design
Defining an Engineering Problem
• Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them. (EVS1-ETS1-1)
• Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities. (EVS1-ETS1-1)
Developing Possible Solutions
• When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (EVS3-ETS1-3)
• Both physical models and computers can be used in various ways to aid in the engineering design process. Computers are useful for a variety of purposes, such as running simulations to test different ways of solving a problem or to see which one is most efficient or economical; and in making a persuasive presentation to a client about how a given design will meet his or her needs. (EVS-LS4-6)
Optimizing the Design Solution
• Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (trade-offs) may be needed. (EVS2-ETS1-2)