



ARKANSAS

K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

Accelerated Science Course Pathway

Grade 6

2016

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Notes:

1. This is a companion document and instructors are to use the Arkansas K-12 Science Standards for Grades 5-8 document to guide curriculum development.
2. Student Performance Expectations (PEs) or standards may be taught in any sequence or grouping within a grade level. Several PEs are described as being “partially addressed in this course” because the same PE is revisited in a subsequent course during which that PE is fully addressed.
3. An asterisk (*) indicates an engineering connection to a practice, core idea, or crosscutting concept.
4. The clarification statements are examples and additional guidance for the instructor. **AR** indicates Arkansas-specific clarification statements.
5. The assessment boundaries delineate content that may be taught but not assessed in large-scale assessments. **AR** indicates Arkansas-specific assessment boundaries.
6. The examples given (e.g.,) are suggestions for the instructor.

Accelerated Science Course Pathway Overview

Arkansas Accelerated Science Course Pathway allows districts and schools an **option** to maximize opportunities for high-performing students to meet the Arkansas K-12 Science Standards as well as be prepared to pursue advanced level science courses earlier in middle and high school and at a more rapid pace. This accelerated science course pathway is not intended for all students, but for students who have demonstrated advanced academic proficiency in the prerequisite courses and who intend to pursue a specific college and career pathway beyond high school. Science is a quantitative discipline, so it is important for educators to ensure that students' science learning coheres well with their understanding of mathematics. To achieve this alignment, the Arkansas K-12 Science Committee made every effort to ensure that the mathematics standards do not outpace or misalign to the accelerated pathway courses. If this pathway is implemented, it is recommended that a unit of algebra I be earned concurrently with a unit of accelerated physical science-integrated, which requires a Grades 5-8 course approval for both the algebra I and the accelerated physical science-integrated course from the Arkansas Department of Education. Arkansas Accelerated Science Course Pathway details the following optional accelerated courses.

Accelerated Grade 6 Science	Course is an integration of 6th, 7th, and 8th Grade life science, Earth and space science, physical science, and engineering design standards.
Accelerated Grade 7 Science	Course is an integration of 6th, 7th, and 8th Grade life science, Earth and space science, physical science, and engineering design standards.
Accelerated Grade 8/Physical Science - Integrated	Course is an integration of the balance of 8th Grade physical science standards not mapped in the accelerated 6th and 7th Grade models and the high school physical science - integrated standards. *(5-8 course approval for physical science- integrated required)
Accelerated Biology - Integrated	Course is an integration of the biology - integrated standards with additional life science standards and clarification statements written by the Arkansas K-12 Science Committee.
Accelerated Chemistry - Integrated	Course is an integration of the chemistry - integrated course standards with additional chemistry standards and clarification statements written by the Arkansas K-12 Science Committee.

* A course approval for Grades 5-8 is necessary for a high school course to be taught at the middle school level. Teachers must hold the appropriate 7-12 licensure. Contact the ADE Curriculum Support Services unit for more details.

Key: Indicates from which course the standards was originally assigned.	
Grade 8	
Grade 7	
Grade 6	
Engineering Design Grades 6-8	

Accelerated Science Grade 6 Standards by Topic

Topic 1: Energy
A6-PS3-3
A6-PS3-4
A6-PS3-5
A7-PS1-4
A7-PS1-6
A6-ETS1-1
A6-ETS1-3
A6-ETS1-4
Topic 2: Earth Systems
A6-ESS2-4
A7-ESS2-1
A7-ESS2-2
A7-ESS3-1
Topic 3: Weather and Climate
A6-ESS2-5
A6-ESS2-6
A6-ESS3-5
A7-ESS3-2
A7-ETS1-1
A7-ETS1-2
Topic 4: History of Earth
A7-ESS2-2
A7-ESS2-3
A7-ESS3-2
A8-LS4-1
A8-ESS1-4
Topic 5: Growth and Development
A6-LS1-4
A6-LS3-2
Topic 6: Natural Selection
A8-LS4-2
A8-LS4-3
A8-LS4-4
A8-LS4-6

Accelerated Science Grade 6

Topic 1: Energy

Students who demonstrate understanding can:

- A6-PS3-3** Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [AR Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a polystyrene foam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
- A6-PS3-4** Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice have melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]
- A6-PS3-5** Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object. [AR Clarification Statement: Examples of empirical evidence used in arguments could include a diagram, flowchart, or other representation of the energy before and after the transfer in the form of temperature changes or motion of an object.] [Assessment Boundary: Assessment does not include calculations of energy.]
- A7-PS1-4** Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings or diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]
- A7-PS1-6** Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* [AR Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical processes such as dissolving ammonium chloride or calcium chloride or chemical reactions such as burning.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]
- A6-ETS1-1** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. [AR Clarification Statement: Examples could include designing an insulated coffee mug or lunch box or designing an energy efficient home.]
- A6-ETS1-3** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. [AR Clarification Statement: Examples could include determining best materials to use for a building's roof or windows.]
- A6-ETS1-4** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. [AR Clarification Statement: Examples could be using graphs or models to support material choices for a design project.]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grades 6-8.

Accelerated Science Grade 6

Topic 2: Earth Systems

Students who demonstrate understanding can:

- A6-ESS2-4** **Develop a model to describe the cycling of water through Earth’s systems driven by energy from the Sun and the force of gravity.** [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]
- A7-ESS2-1** **Develop a model to describe the cycling of Earth’s materials and the flow of energy that drives this process.** [AR 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. Arkansas specific examples of geologic materials include Karst, bauxite, and diamonds.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]
- A7-ESS2-2** **Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.** [AR Clarification Statement: This PE is partially addressed in Topic 4. Emphasis is on how processes change Earth’s surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features.]
- A7-ESS3-1** **Construct a scientific explanation based on evidence for how the uneven distributions of Earth’s mineral, energy, and groundwater resources are the result of past and current geoscience processes.** [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grades 6-7.

Accelerated Science Grade 6

Topic 3: Weather and Climate

Students who demonstrate understanding can:

- A6-ESS2-5 Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.** [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, or visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]
- A6-ESS2-6 Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.** [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models could be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]
- A6-ESS3-5 Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, or agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence could include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide or methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]
- A7-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** [AR Clarification Statement: This PE is partially addressed in Topic 4. Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
- A7-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.** [AR Clarification Statement: Examples could include designing technologies (such as levees, dams, storm shelters) and determining their ability to mitigate the effects of future weather events.]
- A7-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** [AR Clarification Statement: Examples could include evaluating human technologies (such as levees, dams, storm shelters) and determining their ability to mitigate the effects of future weather events.]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grades 6-7.

Accelerated Science Grade 6

Topic 4: History of Earth

Students who demonstrate understanding can:

- A7-ESS2-2 Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.** [AR Clarification Statement: This PE is partially addressed in Topic 2. Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]
- A7-ESS2-3 Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.** [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, or trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]
- A7-ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.** [AR Clarification Statement: This PE is partially addressed in Topic 3. Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
- A8-LS4-1 Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.** [Clarification Statement: Emphasis is on finding patterns of change in the level of complexity of anatomical structures in organisms or the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]
- A8-ESS1-4 Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.** [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossil of Homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains or ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grades 7-8.

Accelerated Science Grade 6

Topic 5: Growth Development

Students who demonstrate understanding can:

- A6-LS1-4** Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds, and creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]
- A6-LS3-2** Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement: Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grade 6.

Accelerated Science Grade 6

Topic 6: Natural Selection

Students who demonstrate understanding can:

- A8-LS4-2** Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarities or differences of the gross appearance of anatomical structures.]
- A8-LS4-3** Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]
- A8-LS4-4** Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
- A8-LS4-6** Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, or proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grade 8.