



ARKANSAS

K-12 SCIENCE STANDARDS

EDUCATION FOR A NEW GENERATION

Accelerated Science Course Pathway

Grade 7

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 PE was originally assigned.	
8th Grade	
7th Grade	
6th Grade	
Engineering Design Grades 6-8	

Accelerated Science Grade 7 Standards by Topic

Topic 1: Structure and Function	
	A6-LS1-1
	A6-LS1-2
	A6-LS1-3
	A6-LS1-8
Topic 2: Matter and Energy in Organisms	
	A7-PS1-1
	A7-PS1-2
	A7-PS1-5
	A7-PS1-6
	A7-LS1-6
	A7-LS1-7
Topic 3: Growth and Development	
	A6-LS1-5
	A8-LS3-1
	A8-LS4-5
	A8-ETS1-3
Topic 4: Ecosystems	
	A6-ESS3-4
	A7-LS2-1
	A7-LS2-3
	A7-LS2-4
	A7-ETS1-1
Topic 5: Human Impact on Ecosystems	
	A6-ESS3-3
	A7-LS2-2
	A7-LS2-5
	A7-PS1-3
	A8-ETS1-1
	A7-ETS1-2
	A8-ETS1-4
Topic 6: Earth's Place in the Universe	
	A8-PS2-4
	A8-ESS1-1
	A8-ESS1-2
	A8-ESS1-3

Topic 1: Structure and Function

Students who demonstrate understanding can:

- A6-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** [Clarification Statement: Emphasis is on gathering evidence that living things are made of cells, distinguishing between living and non-living things, and understanding that living things may be made of one cell or many and varied cells.]
- A6-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.** [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]
- A6-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.** [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment is limited to circulatory, excretory, digestive, respiratory, muscular, and nervous systems. Assessment does not include the mechanism of one body system independent of others.]
- A6-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.** [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

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

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Topic 2: Matter and Energy in Organisms

Students who demonstrate understanding can:

- A7-PS1-1 Develop models to describe the atomic composition of simple molecules and extended structures.** [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3-D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]
- A7-PS1-2 Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.** [AR Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with hydrochloric acid.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]
- A7-PS1-5 Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.** [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]
- 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.]
- A7-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.** [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]
- A7-LS1-7 Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.** [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

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

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Topic 3: Growth and Development

Students who demonstrate understanding can:

- A6-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.** [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]
- A8-LS3-1 Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism.** [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]
- A8-LS4-5 Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms.** [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, or gene therapy); or, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]
- A8-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 analyzing data (GMO crops, gene therapy, and selective breeding) to determine the success of the technology used.]

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Topic 4: Ecosystems

Students who demonstrate understanding can:

- A6-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.** [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations or the rates of consumption of food and natural resources (such as freshwater, minerals, or energy). Examples of impacts could include changes to the appearance, composition, or structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]
- A7-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.** [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]
- A7-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.** [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]
- A7-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.** [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]
- 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 ways that humans consume resources and design a solution to a problem created by increased human population and consumption.]

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Topic 5: Human Impact on Ecosystems

Students who demonstrate understanding can:

- A6-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** [Clarification Statement: Examples of the design process could include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts could include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
- A7-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.** [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]
- A7-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*** [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, or prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]
- A7-PS1-3 Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.** [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form a synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]
- A8-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: Examples could include designing methods for monitoring human impacts and designing solutions to environmental challenges (water quality testing).]
- 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: Examples could include evaluating a community's designs for protecting ecosystems.]
- A8-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 include exploring the sources of synthetic materials (plastics, toxins, and fertilizers) and their impacts on the society and the environment.]

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Topic 6: Earth's Place in the Universe

Students who demonstrate understanding can:

- A8-PS2-4** **Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.** [Clarification Statement: Examples of evidence for arguments could include charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system or data generated from simulations or digital tools.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]
- A8-ESS1-1** **Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]
- A8-ESS1-2** **Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]
- A8-ESS1-3** **Analyze and interpret data to determine scale properties of objects in the solar system.** [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, or spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust or atmosphere), surface features (such as volcanoes), or orbital radius. Examples of data include statistical information, drawings and photographs, or models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets or other solar system bodies.]

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