ARKANSAS
K-12 SCIENCE STANDARDS
EDUCATION FOR A NEW GENERATION

Accelerated Science Course Pathway

Grade 7

2024

Course/Unit Credit: 1.0
Course Number: 377210
Teacher Licensure: Please refer to the Course Code Management System (https://adedata.arkansas.gov/ccms/) for the most current licensure codes.
Grades: 6/7
Prerequisites: N/A

Accelerated Science Grade 7

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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 the best opportunity to integrate the Engineering, Technology, and Applications of Science PE's (ETS1-1 – ETS1-4).
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 matches the standards in physical science integrated. *(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.

Accelerated Science Grade 7

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: Waves
8-PS4-1
8-PS4-2
8-PS4-3
Topic 2: Forces
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8-PS2-4
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Topic 4: Ecosystems
7-LS2-1
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Topic 5: Natural Selection & Adaptations
8-LS4-1
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8-LS4-5
8-LS4-6
Topic 6: Earth Systems
7-ESS2-1
7-ESS2-2
7-ESS2-3
Topic 7: Earth's Place in Universe
8-ESS1-1
8-ESS1-2
8-ESS1-3
8-ESS1-4

Accelerated Science Grade 7

Topic 1: Waves

Students who demonstrate understanding can:

8-PS4-1 **Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.** [Clarification Statement: Emphasis is on describing waves applying both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]

8-PS4-2 **Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials**. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]

8-PS4-3 **Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals**. [Clarification Statement: Emphasis is on the basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in Wi-Fi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]

The performance expectations above were rearranged using the Arkansas K-12 Science Standards for Grades 7-8. NOTE: View the grade-designated science standard for the foundation boxes.

Topic 2: Forces

Students who demonstrate understanding can:

8-PS2-1* **Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.** [Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]

8-PS2-2 **Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.** [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]

8-PS2-3 **Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.** [Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, and generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

8-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.]

8-PS2-5 **Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact**. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could

include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and is limited to qualitative evidence for the existence of fields.]

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Topic 3: Energy

Students who demonstrate understanding can:

8-PS3-1 **Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.** [AR Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds,rolling different sized rocks downhill, or getting hit by a plastic ball versus a tennis ball.]

8-PS3-2 **Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.** [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include changing the direction/orientation of a magnet, a balloon with static electrical charge being brought closer to a classmate's hair, and the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves. Examples of models could include representations, diagrams, pictures, or written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

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Topic 4: Ecosystems

Students who demonstrate understanding can:

7-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.]

7-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.]

7-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.]

7-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.]

7-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.]

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Topic 5: Natural Selection & Adaptations

Students who demonstrate understanding can:

8-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.]

8-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.]

8-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.]

8-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.**

8-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.]

8-LS4-6 **Use mathematical representations 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.]

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Topic 6: Earth Systems

Students who demonstrate understanding can:

7-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.]

7-ESS2-2 **Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.** [Clarification Statement: 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.]
7-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.]

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Topic 7: Earth's Place in Universe

Students who demonstrate understanding can:

8-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.]
8-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.]
8-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.]
8-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 fossils 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.]

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