

Accelerated Biology-Integrated Year-at-a-Glance

ARKANSAS STATE SCIENCE STANDARDS

FIRST SEMESTER		SECOND SEMESTER		
Unit 1 Ecology, Matter, and Energy	Unit 2 Plants and Animals	Unit 3 Genetics and Natural Selection	Unit 4 Structure and Function	Unit 5 Human Impact
6 weeks	5 weeks	9 weeks	12 weeks	3 weeks
<ul style="list-style-type: none"> ● ABI-LS2-2 ● ABI-LS2-4 ● ABI-LS2-6 ● ABI-LS2-7 ● ABI-ESS2-2 ● ABI-ESS2-4 ● ABI-ESS2-5 ● ABI-ESS2-6 ● ABI-ETS1-1 ● ABI-ETS1-2 ● ABI-ETS1-4 	<ul style="list-style-type: none"> ● ABI-LS2-2AR ● ABI-LS1-2 ● ABI-LS1-3 ● ABI-LS2-1AR 	<ul style="list-style-type: none"> ● ABI-LS1-1 ● ABI-LS1-4 ● ABI-LS2-1 ● ABI-LS2-8 ● ABI-LS3-1 ● ABI-LS3-2 ● ABI-LS3-3 ● ABI-LS4-1 ● ABI-LS4-2 ● ABI-LS4-3 ● ABI-LS4-4 ● ABI-LS4-5 ● ABI-LS4-8AR ● ABI-ESS2-7 ● ABI-ESS3-1 ● ABI-ETS1-4 	<ul style="list-style-type: none"> ● ABI-LS1-5 ● ABI-LS1-6 ● ABI-LS1-7 ● ABI-LS2-2AR ● ABI-LS2-3 ● ABI-LS2-3AR ● ABI-LS2-5 ● ABI-LS4-7AR 	<ul style="list-style-type: none"> ● ABI-LS4-6 ● ABI-ESS3-2 ● ABI-ESS3-3 ● ABI-ESS3-4 ● ABI-ESS3-5 ● ABI-ESS3-6 ● ABI-ETS1-3

Recurring

- **RST.9-10.2** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
- **RST.9-10.5** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).
- **RST.9-10.9** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.
- **WHST.9-10.1** Write arguments focused on discipline-specific content.

[Unit 1](#)

[Unit 2](#)

[Unit 3](#)

[Unit 4](#)

[Unit 5](#)

Unit 1	Ecology, Matter, and Energy	Grade Level	9	Approx length	6 weeks
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CPSD Power Standards with Student Learning Objectives

ABI-LS2-2 Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.

Student-Friendly Objectives:

- I can calculate averages.
- I can calculate percentages.
- I can interpret population growth graphs.
- I can determine the general mathematical trend for a population.
- I can describe changes in an ecosystem and its populations using multiple graphs for data.
- I can identify potential limiting factors of an ecosystem.
- I can predict the effects limiting factors will have on an ecosystem.

Learning Indicators of Power Standards

Students will know...

- The carrying capacity of an ecosystem is the number of organisms and populations the ecosystem can support
- Limiting factors towards carrying capacity may include: availability of living/nonliving resources, predation, disease, and competition
- How populations and diversity are dependent on biotic and abiotic factors
- How mechanisms of evolution (genetic drift, mutations, gene flow, natural selection) contribute to population size and diversity

And be able to...

- Identify limiting factors of an ecosystem and how each factor affects carrying capacity of the ecosystem.
- Relate limiting factors to population size.
- Calculate averages.
- Calculate percentages.
- Create and interpret population growth graphs.

Additional Arkansas State Standards

- **ABI-LS2-4** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
- **ABI-LS2-6** Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.
- **ABI-LS2-7** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
- **ABI-ESS2-2** Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems.

- **ABI-ESS2-4** Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate.
- **ABI-ESS2-5** Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes.
- **ABI-ESS2-6** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.
- **ABI-ETS1-1** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
- **ABI-ETS1-2** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
- **ABI-ETS1-4** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

Unit 2	Plants and Animals	Grade Level	9	Approx Length	5 weeks
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CPSD Power Standards with Student Learning Objectives

ABI-LS2-2AR Develop and use a model to demonstrate the mechanism of cell signaling as a basis of control for cell activities.

Student-Friendly Objectives:

- I can compare and contrast active and passive transport.
- I can model the structure of the plasma membrane.
- I can explain how the structure of the plasma membrane affects its role in cell signaling
- I can predict results from the dysfunctions of a cell signaling pathway.
- I can explain the role of cell signaling in the nervous, endocrine, & immune systems.

Learning Indicators of Power Standards

<p>Students will know...</p> <ul style="list-style-type: none"> ● Proteins regulate cell activities ● Structure of plasma membrane ● Types of cell transport: passive and active ● Cell signaling pathways ● Anatomy of nervous, endocrine, and immune systems 	<p>And be able to...</p> <ul style="list-style-type: none"> ● Describe how dysfunction within cell signaling mechanisms can lead to disorders or complications. ● Identify organs in the nervous, endocrine & immune systems.
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Additional Arkansas State Standards

- **ABI-LS1-2** Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
- **ABI-LS1-3** Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.
- **ABI-LS2-1AR** Develop and use a model to explain a negative feedback loop.

Unit 3	Genetics and Natural Selection	Grade Level	9	Approx Length	9 weeks
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CPSD Power Standards with Student Learning Objectives

ABI-LS1-1 Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.

Student-Friendly Objectives:

- I can build a model of DNA.
- I can use base-pair rules to model DNA replication.
- I can connect a specific type of RNA to its role in protein synthesis.
- I can interpret a codon chart to determine the accurate sequence of amino acids.
- I can describe the structure of proteins and how their structure determines their function.
- I can explain how a mutation in DNA or proteins alters the function of the protein.

ABI-LS3-2 Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.

Student-Friendly Objectives:

- I can compare and contrast sexual and asexual reproduction.
- I can identify the general stages of meiosis.
- I can explain how meiosis leads to genetic variation.
- I can describe how errors during DNA replication contribute to genetic variation.
- I can write and support a claim that inheritable genetic variation may result from meiosis, DNA replication errors, and/or environmental factors.

ABI-LS4-2 Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.

Student-Friendly Objectives:

- I can predict an individual's ability to compete for resources based on genetic variation.
- I can discuss how a population will change as a result of natural selection.
- I can describe how genetic mutations leads to genetic variation and contributes to the process of evolution.
- I can explain the role of natural selection in the process of evolution.
- I can contrast acclimation, adaptation, and evolution.
- I can interpret a graph relating to changes in population size.

- I can identify adaptations and evidence for evolution.

Learning Indicators of Power Standards

Students will know...

- Structure of DNA
- Structure of RNA
- DNA contains regions called genes
- Genes can code for proteins
- Not all DNA codes for a protein
- Types of RNA and their roles in protein synthesis
- The process of transcription and its role in protein synthesis
- The process of translation and its role in protein synthesis
- Structure of proteins (types of chemical bonds)
- Functions of proteins as enzymes, signal molecules, and transport molecules
- Types of DNA mutations
- Cell differentiation
- The steps of meiosis
- Alleles sort independently of one another during meiosis.
- Sexual reproduction gives rise to new genetic combinations and variation between parent and offspring
- During sexual reproduction, chromosomes may swap sections (crossing over) during meiosis, resulting in genetic variation
- Errors that occur during DNA replication lead to mutations, which are another source of genetic variation
- Environmental factors can cause genetic mutations; viable mutations are inherited
- Evolution is genetic change within a population over long periods of time; individual organisms do not evolve
- DNA mutations and sexual reproduction lead to genetic variation
- Natural selection only happens when there is genetic variation between organisms in a population and variation in the expression of that genetic variation
- Variation among expressed traits allows some individuals to reproduce more successfully than others
- Organisms best suited for their environment are more likely to

And be able to...

- Construct a model of DNA.
- Illustrate DNA replication.
- Transcribe a segment of DNA into mRNA.
- Translate a segment of mRNA into an amino acid sequence using a codon chart.
- Describe protein synthesis.
- Research and communicate an explanation of a human disorder(s) due to mutations in DNA and/or protein.
- Compare and contrast sexual and asexual reproduction.
- Model the steps of meiosis.
- Evaluate genetic diagrams to determine chromosome changes (good or bad).
- Construct a scientific argument, using supporting evidence, that genetic variation is a result of genetic recombination, replication errors, and environmental factors.
- Evaluate survival strategies based on limited resources.
- Describe how variation in traits help or inhibit individuals' ability to compete for resources.
- Predict effects of natural selection on a population when its environment changes.
- Relate an increase in species, genetic variation, competition among organisms, and natural selection to the process of evolution.
- Distinguish between acclimation, adaptation, and evolution.
- Identify supported evidences for evolution.
- Use graphical data to account for changes within a population.

survive and reproduce, making their traits more common in the population

- Populations change over time due to competition for resources
- Natural selection leads to adaptation and is on-going
- Adaptation is when the majority of a population is anatomically, behaviorally, and physiologically is best suited for its environment
- Examples of biotic and abiotic factors that contribute to a change in gene frequency over time, leading to adaptation of populations: seasonal temperature ranges, acidity, light, geographic barriers, evolution of other organisms, long-term climate change
- Changes in environment may result in expansion, decline, or extinction of a species or the emergence of a new species

Additional Arkansas State Standards

- **ABI-LS1-4** Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.
- **ABI-LS2-1** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.
- **ABI-LS2-8** Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
- **ABI-LS3-1** Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.
- **ABI-LS3-3** Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
- **ABI-LS4-1** Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.
- **ABI-LS4-3** Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.
- **ABI-LS4-4** Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
- **ABI-LS4-5** Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.
- **ABI-LS4-8AR** Obtain, evaluate, and communicate the claim that eukaryotic cells evolved from prokaryotic cells.
- **ABI-ESS2-7** Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
- **ABI-ESS3-1** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.
- **ABI-ETS1-4** Use a computer simulation to model the impact of proposed solutions to a complex real- world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem

Unit 4	Structure and Function	Grade Level	9	Approx Length	11-12 weeks
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CPSD Power Standards with Student Learning Objectives

ABI-LS2-2AR Develop and use a model to demonstrate the mechanism of cell signaling as a basis of control for cell activities.

Student-Friendly Objectives:

- I can compare and contrast active and passive transport.
- I can model the structure of the plasma membrane.
- I can explain how the structure of the plasma membrane affects its role in cell signaling
- I can predict results from the dysfunctions of a cell signaling pathway.
- I can explain the role of cell signaling in the nervous, endocrine, & immune systems.

ABI-LS2-5 Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.

Student-Friendly Objectives:

- I can explain how carbon cycles between photosynthesis and cellular respiration.
- I can describe the importance of photosynthesis in the carbon cycle.
- I can describe the importance of cellular respiration in the carbon cycle.

Learning Indicators of Power Standards

<p>Students will know...</p> <ul style="list-style-type: none"> ● Proteins regulate cell activities ● Structure of plasma membrane ● Types of cell transport: passive and active ● Cell signaling pathways ● Photosynthesis and cellular respiration provide the majority of the energy for life processes ● The basic biochemical pathways of photosynthesis and cellular respiration ● The carbon in the atmosphere's CO₂ is the same carbon that is in the food we eat ● The CO₂ that we exhale as a product of cellular respiration is the same 	<p>And be able to...</p> <ul style="list-style-type: none"> ● Differentiate between the types of passive and active transport. ● Model the structure of the plasma membrane and describe its role in cell signaling. ● Describe how dysfunction within cell signaling mechanisms can lead to disorders or complications. ● Explain the cyclical relationship between photosynthesis and cellular respiration. ● Create a diagram illustrating the role of photosynthesis and cellular respiration in the cycling of carbon.
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carbon that plants take up for photosynthesis

- The O₂ that we inhale is the same oxygen that plants release as a product of photosynthesis

Additional Arkansas State Standards

- **ABI-LS1-5** Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.
- **ABI-LS1-6** Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.
- **ABI-LS1-7** Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.
- **ABI-LS2-3** Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.
- **ABI-LS2-3AR** Plan and conduct an investigation to determine the relationship between the structure of a plasma membrane and its function.
- **ABI-LS4-7AR** Obtain, evaluate, and communicate the claim that eukaryotic cells evolved from prokaryotic cells.

Unit 5	Human Impact	Grade Level	9	Approx Length	3 Weeks
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Arkansas State Standards

- **ABI-LS4-6** Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.
- **ABI-ESS3-2** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
- **ABI-ESS3-3** Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
- **ABI-ESS3-4** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*
- **ABI-ESS3-5** Analyze geoscience data and the results from global climate models to make an evidence- based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.
- **ABI-ESS3-6** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.
- **ABI-ETS1-3** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade- offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.