Boone County Biology Curriculum Map

Unit 1, Matter and Energy	**Duration**:
Key Essential Questions: ● How do organisms obtain and use the energy they need to live and grow? ● How do matter and energy move through ecosystems?	
Transfer Goals: *Students will be able to use their learning to* ● Construct an explanation based on evidence that energy [from photosynthesis and cellular respiration drives ecosystem interactions, including the cycling of matter.] ● Develop a model (including mathematical representations) demonstrating [the input and outputs of energy and matter in an ecosystem.]	
Performance Expectation	
HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	
HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	
HS-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. **(see note)**	
HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. **(see note)**	
Notes: Notes: The basic foundation of photosynthesis **(HS-LS2-5)** is explored in course 1, Integrated Science, but is explored in greater complexity in Biology. The cyclic ideas of **HS-LS2-5** may also explored in Integrated in terms of the role of photosynthesis in the cycling of matter within ecosystems.	

Unit 2, Cell Structure	**Duration**:
Key Essential Questions: ● How do structures enable life's functions?	
Transfer Goals:	

Students will be able to use their learning to

- Construct an explanation based on evidence about how the structure [of DNA determines proteins that carry out essential life functions. (DNA structure is introduced in this unit but function would not necessarily be assessed in this unit)]
- Use evidence from models and simulations to support explanations [on how matter is converted from one form to another in organisms (sugar molecules to amino acids)]
- Develop and use models to demonstrate how structure and function influence each other [within an organism among different hierarchical levels.]
- Plan and conduct investigations to support explanations [that feedback mechanisms maintain homeostasis.]

Performance Expectation

HS-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.

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-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.

Notes:

Unit 3, DNA and Inheritance	**Duration**:

Key Essential Questions:

- How are the characteristics of one generation related to previous generations?

Transfer Goals:
Students will be able to use their learning to

- Construct an explanation based on evidence about [how the structure of DNA determines proteins that carry out essential life

functions.

- Ask questions arising from examining models illustrating [the role of DNA and the relationship between cellular division and differentiation to understanding the reproduction, growth, and development of organisms.]
- Apply concepts of statistics and probability to explain and predict [the variation of traits in a population.]
- Make and defend an evidence-based claim to explain [the variety of ways a new inheritable trait can be created through genetic variation]

Performance Expectation

HS-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.

HS-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.

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms

Notes:

Unit 4, Natural Selection	**Duration**:

Key Essential Questions:

- How can organisms be so similar and yet still be so diverse?

Transfer Goals:
Students will be able to use their learning to

- Evaluate empirical evidence behind arguments explaining [the role of group behavior on individual survival.]
- Evaluate empirical evidence behind arguments [that environmental conditions affect the disappearance or distribution of traits in a species.]
- Analyze shifts in the numerical distribution [of traits to provide evidence to support explanations of natural selection.]
- Construct an evidence-based explanation that [natural selection leads to adaptation.]

Performance Expectation
HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.
HS-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.
HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations.
HS-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.
Notes:

Unit 5, Evolution	**Duration**:
Key Essential Questions: ● What evidence shows different species are related?	
Transfer Goals: *Students will be able to use their learning to* ● Communicate scientific information explaining phenomena {common ancestry and biological evolution} in multiple formats (orally, graphically, textually, mathematically) ● Construct an evidence-based claims to explain [the factors that influence the process of evolution.] ● Construct evidence-based arguments describing the dynamic causes, effects, and feedbacks [between the biosphere and other earth systems.]	
Performance Expectation	
HS-LS4-1. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	
HS-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.	

HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth.
Notes:

Unit 6, Human Activity and Biodiversity	**Duration**:
Key Essential Questions: ● How do humans depend on Earth's resources? ● How and why do humans impact their environment and what are the results of those interactions?	
Transfer Goals: *Students will be able to use their learning to* ● Design and evaluate solutions supported by multiple student-generated sources to mitigate human activity [impact on ecosystems and biodiversity.] ● Create a computational model or simulation to demonstrate the relationship between [natural resources, human populations and biodiversity.] ● Analyze a global challenge then design and evaluate a solution based on criteria and constraints.	
Performance Expectation	
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.*	
HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*	
HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.	
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*	
HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.	

HS-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.
HS-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.
HS-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.
Notes: