Fresno Unified School District

# 2018-19

**H.S. Biology**

## Biology in the Living Earth

### Semester 1

#### Quarter 1

**Instructional Segment #1: Ecosystem Interactions and Energy**

LS2-1$_3$
LS2-2$_3$
LS2-4$_5$
LS2-8$_2$

**Instructional Segment #2: Earth's Atmosphere-Photosynthesis and Respiration**

LS1-5$_5$
LS1-6$_5$
LS1-7$_5$
LS2-3$_5$
LS2-5$_4$
ESS1-6$_7$
ESS2-6$_5$
ESS2-7$_7$
ESS3-6$_4$*

#### Quarter 2

**Instructional Segment #3: Evidence of Evolution**

LS4-1$_1$
LS4-2$_2$*
LS4-4$_2$
LS4-5$_2$*
ESS1-5$_1$
ESS2-5$_6$
ESS3-1$_2$
ESS3-4$_7$
ETS1-3*

### Semester 2

#### Quarter 3

**Instructional Segment #4: Inheritance of Traits**

LS3-1$_2$
LS3-2$_2$
LS3-3$_3$
LS4-2$_2$*
LS4-3$_1$

**Instructional Segment #5: Structure, Function and Growth (From Cells to Organisms)**

LS1-1$_6$
LS1-2$_6$
LS1-3$_7$
LS1-4$_4$

#### Quarter 4

**Instructional Segment #6: Ecosystem Stability and the Response to Climate Change**

LS2-6$_7$
LS2-7$_7$
LS4-5$_2$*
LS4-6$_2$
ESS3-5$_7$
ESS3-6$_4$*
ETS1-1
ETS1-2
ETS1-3*
ETS1-4$_4$

** = standard is taught more than once within this course*

| Quarter 1 | | Quarter 2 | | Quarter 3 | | Quarter 4 | |
|---|---|---|---|---|---|---|---|
| **EP&Cs Connections:** Principles 2, 3, 4 | **ELD Connections:** ELD.PI.11-12.1,5,6a-b,9,10,11a | **EP&Cs Connections:** Principles 1, 2, 3, 4, 5 | **ELD Connections:** ELD.PI.11-12.1,5,6a-b,9,10,11a | **EP&Cs Connections:** Principles 1, 2, 3, 4 | **ELD Connections:** ELD.PI.11-12.1,5,6a-b,9,10,11a | **EP&Cs Connections:** Principles 1, 2, 3, 4, 5, 6 | **ELD Connections:** ELD.11-12. P1.1, 5, 6a-b, 9, 10, 11a; ELD.9-10.P1.1, 3, 6, 10 |
| **CCSS ELA Connections:** RST.9-10.8; RST.11-12.1,7,8; WHST.9-12.2a-e, 5, 8, 9; SL.11-12.5; | **CCSS Math Connections:** N-Q.1-3; S-ID.1; S-ID.6.a-c; S-IC.1,6; MP.2, MP.4; F.IF.5 | **CCSS ELA Connections:** SL.11-12.4; RST.11-12.1,8, WHST.9-12.2.a-e, 7,9 | **CCSS Math Connections:** MP.2; MP.4 | **CCSS ELA Connections:** RST.11-12.1, 8, 9, WHST.9-12.1.a-e, 2.a-e, 7, 9 | **CCSS Math Connections:** MP.2; MP.4; F-IF.7.a-e; F-BF.1a-c | **CCSS ELA Connections:** RST.9-10.1, 2, 3, 7, 8, 9; RST.11-12. 1, 2, 7, 8; WHST.9-12.1a-e, 2.a-e, 6, 7, 8, 9; W.9-10.1a-f, 6; SL.9-10.1a-d, 4 | **CCSS Math Connections:** MP.1; MP.2; MP.4; MP.7; N-Q.1-3; S-ID.1, 6, 9; S-IC.1,6 |

### Science & Engineering Practices (SEPs)

1.) Asking questions and defining problems
2.) Developing and using models
3.) Planning and carrying out investigations
4.) Analyzing and interpreting data
5.) Using mathematics and computational thinking
6.) Constructing explanations and designing solutions
7.) Engaging in argument from evidence
8.) Obtaining, evaluating and communicating information

**Crosscutting Concepts (CCCs)**

1.) Patterns
2.) Cause and Effect
3.) Scale, Proportion, Quantity
4.) Systems and System Models
5.) Energy and Matter
6.) Structure and Function
7.) Stability and Change

Fresno Unified School District

# 2018-19

**H.S. Biology**

| Guiding Questions | | | | | |
|---|---|---|---|---|---|
| ***Instructional Segment #1: Ecosystem Interactions and Energy*** | ***Instructional Segment #2: Earth's Atmosphere-Photosynthesis and Respiration*** | ***Instructional Segment #3: Evidence of Evolution*** | ***Instructional Segment #4: Inheritance of Traits*** | ***Instructional Segment #5: Structure, Function and Growth (From Cells to Organisms)*** | ***Instructional Segment #6: Ecosystem Stability and the Response to Climate Change*** |
| • What factors affect the size of populations within an ecosystem?<br>• What are common threats to remaining natural ecosystems and biodiversity? How can these threats be reduced? | • How do living things acquire energy and matter for life?<br>• How do organisms store energy?<br>• How are photosynthesis and cellular respiration connected?<br>• How do organisms use the raw materials they ingest from the environment?<br>• How has the cycling of energy and matter changed over Earth's history? | • How do layers of rock form and how do they contain fossils?<br>• Why do we see fossils across the world from each other but living organisms that are very different from each other?<br>• What evidence shows that different species are related?<br>• How did modern day human evolve? | • How are characteristics of one generation passed to the next?<br>• What allows traits to be transmitted from parents to offspring?<br>• How does variation affect a population under selective pressures? | • What happens if a cell in our body dies?<br>• How does the structure of DNA affect how cells look and behave?<br>• How do systems work in multi-celled organisms (emergent properties) and what happens if there is a change in the system?<br>• How do organisms survive even when there are changes in their environment? | • What effects change in ecosystems that ultimately effect populations?<br>• What are the changes that are happening in the climate and what effects are those having on life?<br>• How are human activities impacting Earth's systems and how does that affect life on Earth?<br>• What can humans do to mitigate their negative impact on the environment? |

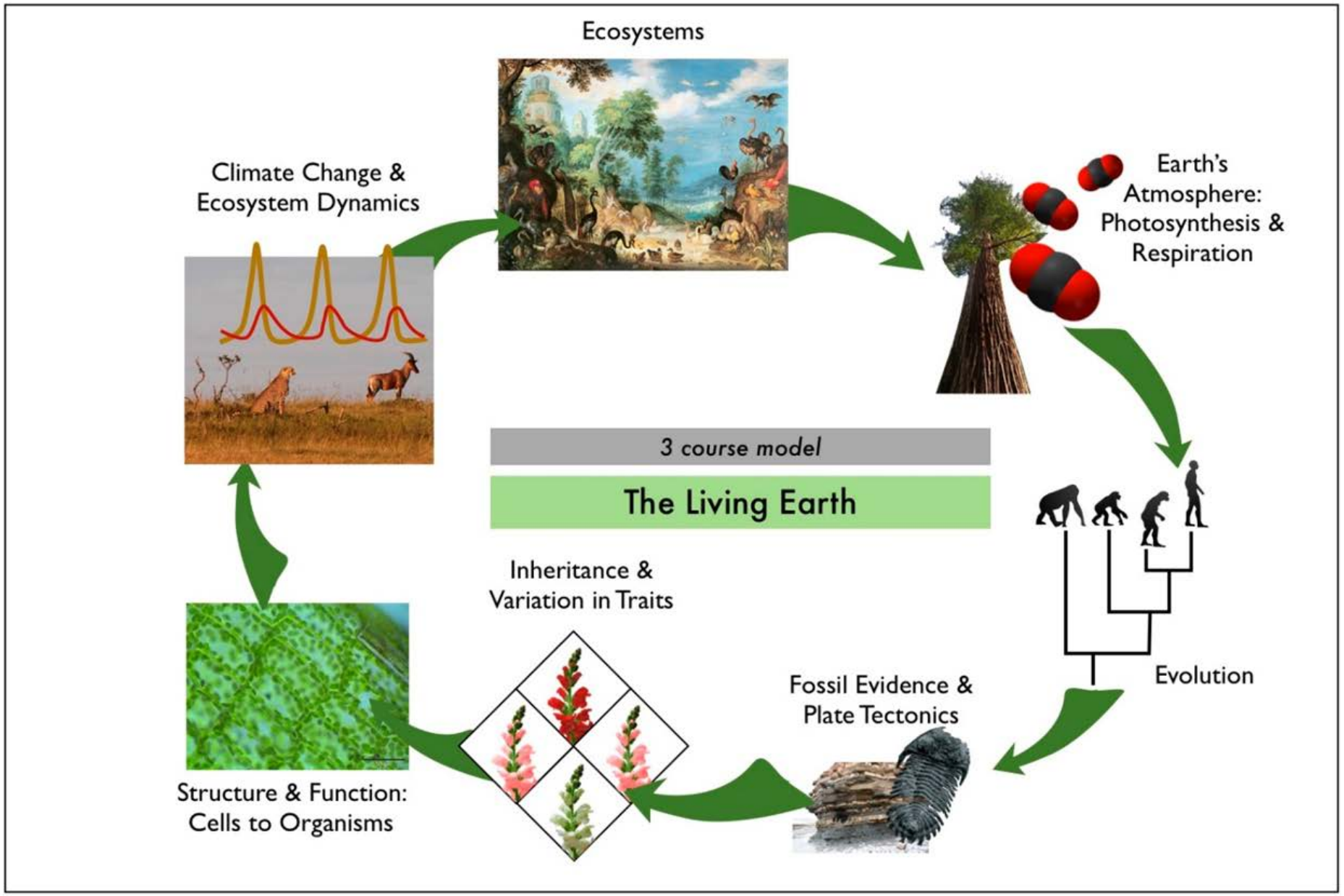


**Table 7.1. Overview of Instructional Segments for High School Living Earth**

| | | |
|---|---|---|
| | 5 | Students use models to create explanations |

| Biology in the Living Earth- Quarter 1 Overview | | | |
|---|---|---|---|
| **Quarter Topic Focus: *Energy Transfer in the Living Earth*** | | | |
| **Science & Engineering Practice (SEP)** | **Disciplinary Core Idea (DCI)** | **Crosscutting Concept (CCC)** | **Performance Expectation (PE)** |
| **How** students will demonstrate their understanding… | **What** students will understand… | How students will connect their understanding across units and courses… (**Why** they should know it) | A complete standard **(SEP + DCI + CCC = PE)** ***colors are associated with SEP (see page 1 for key)** |
| Use mathematical and/or computational representations to support explanations | of factors that affect carrying capacity of ecosystems | at different scales. (Scale, Proportion, and Quantity) | LS2-1 |
| Use mathematical representations to support and revise explanations based on evidence | about factors affecting biodiversity and populations in ecosystems | at different scales. (Scale, Proportion, and Quantity) | LS2-2 |
| Use mathematical representations to support claims for | the cycling of matter and flow of energy among organisms in an ecosystem. | (Energy and Matter) | LS2-4 |
| Evaluate evidence for | the role of group behavior or individual and species' chances to survive and reproduce. | (Cause and Effect) | LS2-8 |
| Use a model to illustrate how | photosynthesis transforms light energy into stored chemical energy. | (Energy and Matter) | LS1-5 |
| 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-based carbon molecules. (Energy and Matter) | LS1-6 |

| | | | |
|---|---|---|---|
| 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. (Energy and Matter) | LS1-7 |
| Construct and revise an explanation based on evidence for the | cycling of matter and flow of energy in aerobic and anaerobic conditions. | (Energy and Matter) | LS2-3 |
| Develop a model to illustrate the role of | photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere and geosphere. | (Systems and System Models) | LS2-5 |
| Apply scientific reasoning and evidence from | ancient Earth materials, meteorites and other planetary surfaces | to construct an account of Earth's formation and early history. (Stability and Change) | ESS1-6 |
| Develop a quantitative model to describe | the cycling of carbon among the hydrosphere, atmosphere, geosphere and biosphere. | (Energy and Matter) | ESS2-6 |
| Construct and argument based on evidence about | the simultaneous coevolution of Earth's systems and life on Earth. | (Stability and Change) | ESS2-7 |
| Use a computational representation to illustrate | the relationship among Earth's systems and how those relationships are being modified due to human activity. | (Systems and System Models) | ESS3-6 |

| Biology in the Living Earth- Quarter 2 Overview | | | |
|---|---|---|---|
| **Quarter Topic Focus: *Evidence of Evolution*** | | | |
| **Science & Engineering Practice (SEP)** | **Disciplinary Core Idea (DCI)** | **Crosscutting Concept (CCC)** | **Performance Expectation (PE)** |
| **How** students will demonstrate their understanding… | **What** students will understand… | How students will connect their understanding across units and courses… (**Why** they should know it) | A complete standard **(SEP + DCI + CCC = PE)** ***colors are associated with SEP (see page 1 for key)** |
| Communicate scientific information | that common ancestry and biological evolution are | supported by multiple lines of empirical evidence. (Patterns) | LS4-1 |
| 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. | (Cause and Effect) | LS4-2 |
| Construct an explanation based on evidence for how | natural selection leads to adaptation of populations. | (Cause and Effect) | LS4-4 |
| Evaluate the evidence for supporting claims that | changes in environmental conditions may result in (1) increases in the number of some species, (2) the emergence of new species over time, and (3) the extinction of other species. | (Cause and Effect) | LS4-5 |

| | | | |
|---|---|---|---|
| Evaluate evidence of | the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the age of crustal rocks. | (Patterns) | ESS1-5 |
| Plan and conduct an investigation of | the properties of water and its effects on Earth materials and surface processes. | (Structure and Function) | ESS2-5 |
| 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. (Cause and Effect) | ESS3-1 |
| Evaluate or refine a technological solution | that reduces impacts of human activities on natural systems. | (Stability and Change) | ESS3-4 |
| 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. | (Engineering) | ETS1-3 |

| Biology in the Living Earth- Quarter 3 Overview | | | |
|---|---|---|---|
| **Quarter Topic Focus: *Cellular Processes Driving Inheritance*** | | | |
| **Science & Engineering Practice (SEP)** | **Disciplinary Core Idea (DCI)** | **Crosscutting Concept (CCC)** | **Performance Expectation (PE)** |
| **How** students will demonstrate their understanding… | **What** students will understand… | How students will connect their understanding across units and courses… (**Why** they should know it) | A complete standard **(SEP + DCI + CCC = PE)** *colors are associated with SEP (see page 1 for key) |
| Ask questions to clarify relationships about | the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. | (Cause and Effect) | LS3-1 |
| 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. | (Cause and Effect) | LS3-2 |
| Apply concepts of statistics and probability to explain | the variation and distribution of expressed traits in a population. | (Scale, Proportion, and Quantity) | LS3-3 |
| 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. | (Cause and Effect) | LS4-2 |
| Apply concepts of statistics and probability to support explanations that | organisms with an advantageous heritable trait trend tend to increase in proportion to organisms lacking this trait. | (Patterns) | LS4-3 |

| | | | |
|---|---|---|---|
| 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. (Structure and Function) | LS1-1 |
| Develop and use a model to illustrate | the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. | (Structure and Function) | LS1-2 |
| Plan and conduct an investigation to provide evidence that | feedback mechanisms maintain homeostasis. | (Stability and Change) | LS1-3 |
| Use a model to illustrate | the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. | (Systems and System Models) | LS1-4 |

| Biology in the Living Earth- Quarter 4 Overview | | | |
|---|---|---|---|
| **Quarter Topic Focus: *Ecosystem Stability and Change*** | | | |
| **Science & Engineering Practice (SEP)** | **Disciplinary Core Idea (DCI)** | **Crosscutting Concept (CCC)** | **Performance Expectation (PE)** |
| **How** students will demonstrate their understanding… | **What** students will understand… | How students will connect their understanding across units and courses… (**Why** they should know it) | A complete standard **(SEP + DCI + CCC = PE)** *colors are associated with SEP (see page 1 for key) |
| Evaluate 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. (Stability and Change) | LS2-6 |
| Design, evaluate, and refine a solution | for reducing the impacts of human activities on the environment and biodiversity. | (Stability and Change) | LS2-7 |
| Evaluate the evidence supporting claims that | changes in environmental conditions may result in (1) increases in the number of individual species, (2) the emergence of new species over time, (3) the extinction of other species. | (Cause and Effect) | LS4-5 |
| Create or revise a simulation to test a solution (using mathematics and computational thinking) | to mitigate adverse impacts of human activity on biodiversity. | (Cause and Effect) | LS4-6 |
| 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's systems. | (Stability and Change) | ESS3-5 |

| | | | |
|---|---|---|---|
| Use a computational representation to illustrate | the relationships among Earth systems and how those relationships are being modified due to human activity. | (Systems and System Models) | ESS3-6 |
| Analyze a major global challenge | to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. | (Engineering CCC connection) | ETS1-1 |
| Design a solution to a complex real-world problem | by breaking it down into smaller, more manageable problems that can be solved through engineering. | n/a | ETS1-2 |
| 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, culture, and environmental impacts. | (Engineering CCC connection) | ETS1-3 |
| 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. | (Systems and System Models) | ETS1-4 |