Course: Biology A/B
Curriculum: Time4Learning
Date Reviewed: March 2020

This document addresses the full yearlong course. The following concepts will need to be added to this curriculum. Please work with your HST to identify resources that you will use to address these concepts.

- Complete all labs in the Biology Lab Kit/ICS Outline
- Complete Time4Learning Authentic Tasks

Time4Learning Lessons	Supplements
Chapter 3: Understanding Cells Chapter 4: Understanding Genetics	Construct a final product (i.e., video, powerpoint, model, diagram, etc) that traces the steps from DNA to protein synthesis. They will examine why and how DNA is protected within the nucleus, and the role of RNA in maintaining that protection. They will trace the steps of transcription and translation, using codons and anticodons to synthesize a protein from amino acids. They will identify and describe the role of stop and start codons, and differentiate between DNA, mRNA, rRNA, and tRNA. They will identify the site of each step in the process and the molecules engaged at that site. Students will identify errors in transcription and translation, and model the correct process.
Chapter 2: Understanding Living Things Chapter 3: Understanding Cells Chapter 6: Understanding Viruses Chapter 7: Understanding Prokaryotes Chapter 8: Understanding Protists Chapter 10: Understanding Plants Chapter 11: Understanding Animals Chapter 12: The Human Body	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. Emphasis of the model is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.
Chapter 12: The Human Body	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. Examples of investigations could include heart rate response to exercise, stomata response to moisture and temperature, and root development in response to water levels.
Chapter 3: Understanding Cells Chapter 8: Understanding Protists Chapter 10: Understanding Plants	Create a model that depicts the steps in photosynthesis. The model should show how 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.

Chapter 3: Understanding Cells	● Create a model of DNA using candy or other household items. All parts of the DNA model should be labeled, defined and their purpose/significance defined. ● Create a model that depicts the steps in cellular respiration. The model should show how 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. ● Research the differences between aerobic and anaerobic processes; complete a write-up on how these processes occur in different environments. In the write-up students should reflect on how matter and energy flow in both of these processes.
Chapter 13: The Interdependence of Life	Create a model that depicts the cycling of matter and the flow of energy among organisms in an ecosystem. Within this model students will use math to support their claims. Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.
Chapter 3: Understanding Cells Chapter 10: Understanding Plants	Create a model that depicts the role of photosynthesis and cellular respiration in cycling of carbon among the biosphere, atmosphere, hydrosphere and geosphere. The model should show how carbon flows, is released and absorbed. The model may include a simulation and/or math to support the representation. Students should be able to verbally and/or through writing describe each step in detail and expand upon the significance of carbon along with roles of photosynthesis and cellular respiration in supporting life on Earth.
Chapter 9: Understanding Fungi Chapter 10: Understanding Plants Chapter 11: Understanding Animals Chapter 13: The Interdependence of Life	Use mathematical representations (i.e., finding the average, determining trends and using graphical comparisons of multiple sets of data) to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.
Chapter 9: Understanding Fungi Chapter 10: Understanding Plants Chapter 11: Understanding Animals Chapter 13: The Interdependence of Life Chapter 14: Ecosystems and Human Impact	Research and 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. Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and extreme changes, such as volcanic eruption or sea level rise.

Chapter 14: Ecosystems and Human Impact	● Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. Examples of human activities can include urbanization, building dams, and dissemination of invasive species. ● Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity. Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.
Chapter 13: The Interdependence of Life	Research and evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. Focus on 1) distinguishing between group and individual behavior, 2) identifying evidence supporting the outcomes of group behavior, and 3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.
Chapter 4: Understanding Genetics Chapter 10: Understanding Plants	● Create a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. In the model each stage of the process should be labeled and describe what occurs at each stage. ● Ask questions (i.e., What and How questions) to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring. ● 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. ● Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.
Chapter 5: Understanding Evolution	● Communicate and research scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. Examples of evidence could include similarities in DNA sequences, anatomical structures, and the order of appearance of structures in embryological development. ● 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. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning. ● 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. ● Construct an explanation based on evidence for how natural selection leads to adaptation of populations. The focus should be on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations. ● Research and 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. Focus should be on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.