



Biology Curriculum, Instruction & Assessment (CIA)

UHS HHH

Department: Science

Teacher:

Distance Learning Course Summary

Please Note: This map is under construction, and it currently includes a large variety of lessons/activities that MAY be used by teachers. As NGSS are increasingly implemented in classrooms, this map will undergo intense revision.

Course Description		Textbooks And Other Curriculum Resources
<ul style="list-style-type: none"> Academic Handbook at UHS (for Course Descriptions): Biology: This college preparatory life science course, based on the Next Generation Science Standards is a yearlong course. Students will examine topics including structure and function of living systems, matter and energy in organisms and ecosystems, interdependent relationships in ecosystems, inheritance and variation of traits, natural selection and evolution. This lab based course involves active learning, modeling, and inquiry based activities. Honors Biology: Biology honors is designed for grade 9 students with exceptional math and writing skills who intend to pursue in-depth science study. This course furthers the use of scientific vocabulary, utilizes extended laboratory experiments, and introduces biochemistry and environmental science. 		Online Textbook and Access Glencoe Virtual Labs NOVA Virtual Labs CK-12 Biology TedEd Ed Puzzle PBS Learning #Project Phenomena - not just phenomena, NGSS resources too Learn.Concord - Interactive Stem Activities YouTube Videos (Bozeman, Amoeba Sisters, CrashCourse, NatGeo, In A Nutshell, BuzzFeed Sci.) Albert IO HASPI - Password "haspi" POGIL 5E Lesson Plans Newsela
Grading Guidelines	Assignment Submission Guidelines	Required Materials for Class
Standard Grading Scale will be used. A = 100% - 90% B = 89% - 80%	Students will submit assignments on a consistent basis. Types of assignments assigned:	Students will need a device such as a Chromebook-if students do not have a device the school can provide one

Biology Curriculum, Instruction & Assessment

<p>C = 79% - 70% D = 69% - 60% F = Below 60%</p> <p>Grading Categories: Assignments, Projects/Labs, Assessments</p> <p>Grading: Formative assignments like homework will be given a complete or incomplete. Complete is worth 100% of the grade and incomplete is worth 50% of the grade. Missing assignments will receive zero points.</p> <p>Late Work: Late work will be accepted up until the end of the unit.</p>	<p>5E Hyperdoc Lesson (include elements like edpuzzle, quizlet, virtual labs, reading, videos, drawings, etc.) CK-12 Lessons (read, video, quiz) Assign presentation/notes worksheet Projects Newsela</p>	<p>Text: ??? Need online access to a text Thoughts: access to CK-12. Possibly a year subscription to Gizmos, Labster, others.</p>
Modes of Communication	Technology Programs For Course	Types of Assessments
<p>Email: All students can contact teachers by school Google Account, private comments in Google Classroom.</p> <p>Phone: Remind Text, Google Voice</p> <p>Office Hours: Weekly/Biweekly Office Hours in Zoom</p>	<p>Flipgrid Padlet EdPuzzle Quizlet Google Suite Tools (Hyperdoc) Google Classroom Kahoot Screencastify Meet/Blocksi</p>	<p>Albert IO Reflections Project - give student choice (art, poetry, writing, diagram, photography, music, podcast, etc.) Portfolio - google slides Flipgrid - oral presentation</p>
Differentiation - Content (Engaging with the curriculum)	Differentiation - Process (Teaching Practices)	Differentiation - Product (Student Work)
<p>Engage! Start each activity with a task to engage student thinking, ask them to review their current understanding of a phenomenon, or provide an interesting piece of information and set the scene for learning.</p> <p>Visuals - Observe a phenomenon, annotated diagrams, photographs, graphs.</p> <p>Tasks - Analyze data or information, draw conclusions to answer questions, do research or investigate.</p> <p>Ask Questions - Ask an engaging question, Padlet.</p>	<p>Post lesson through a variety of media - Teacher recorded lesson, live zoom, video link (Khan Academy, EdPuzzle, YouTube, Crash Course, etc.), conduct an interview, give demonstrations.</p>	<p>Write - Write a summary, text to speech. Create - Create a poster, google presentation, storyboard, script, story, video, Games - Play a Kahoot, Quizlet, PearDeck Flashcard Factory,</p>

Biology *Curriculum, Instruction & Assessment*

Games - Play a quizlet to access prior knowledge.		
---	--	--

Biology Curriculum, Instruction & Assessment

Blended Learning Course Summary

Course Description		Textbooks And Other Curriculum Resources
Grading Policy	Assignment Submission Policy	Required Materials for Class
Modes of Communication	Technology Programs For Course	Types of Assessments
Email: Phone: Office Hours:		

Biology Curriculum, Instruction & Assessment

Biology Mapping Template

	First Quarter	Second Quarter
Standards NGSS Standards, CDE Literacy and Anchor Standards	IS1 Ecosystem Interactions and Energy IS1 Ecosystem Interactions & Energy Doc 1 Note: this document should be split into at least 2 documents. There are too many topics that need to be addressed. IS1 Ecosystem Interactions & Energy Doc 2 IS1 Ecosystem Interactions & Energy Doc 3	IS2 History of Earth's Atmosphere: Photosynthesis and Respiration IS2 History of Earth's Atmosphere: Photosynthesis & Respiration Doc 1 IS2 History of Earth's Atmosphere: Photosynthesis & Respiration Doc 2 IS2 History of Earth's Atmosphere: Photosynthesis & Respiration Doc 3 IS2 History of Earth's Atmosphere: Photosynthesis & Respiration Doc 4 IS2 History of Earth's Atmosphere: Photosynthesis & Respiration Doc 5
Content UHS Curriculum Maps Science CIA Guide DCI Progressions SEP Progressions CA Science Test Blueprint Best Practices for K-12 Online and Blended Learning Content Resources	Blended/Distance Learning Ideas: TOPIC: FIRST WEEK DISTANCE LEARNING Calendar Showing Each Meeting Day Virtual Syllabus Example Virtual Classroom Example Virtual Bulletin Board Back to School Night Presentation Student Information Sheet Digital Learning Styles Inventory Online Meeting Norms Online Breakout Session Norms Distance Learning Class Tracker Play Inky the Squid BioManBio to teach students to use Chrome Browser & how to Enable Flash. Characteristics of Life Card Sort First Week of School Activities Smart Start Week 1 Edu Protocols Student Activities How to Build Relationships Virtually from Albert IO Wed 8/26 Digital Citizenship Lesson Share With Care Thu 8/27 Digital Citizenship Lesson Secure Your Secrets Fri 8/28 Digital Citizenship Lesson It's Cool to be Kind Image Use in Google Lesson First Day of School Presentation by My Nguyen In a Million Words or Less... INTRO TO ECOLOGY: DAY 2 DISTANCE LEARNING Biology Day 2 Lesson Ecology by Megan Levels of Organization Partner Work	Blended/Distance Learning Ideas: TOPIC: CELLULAR ENERGY & ATP Engage: Phenomena: Body using energy/food as fuel, model ATP energy stored, ATP Interactive HHMI Explore/Explain: Elaborate: Evaluate: TOPIC: CELLULAR RESPIRATION Engage: Phenomena: Free-diving, lactic acid Explore/Explain: Elaborate: Cell respiration lab (yeast, root beer), blow into bromothymol blue, Pearson Cell Respiration Lab Evaluate: Model cell respiration 5E Student Packet: Cellular Respiration TOPIC: PHOTOSYNTHESIS Engage: Explore/Explain: Which colors of light are best for photosynthesis Glencoe Virtual Lab , Photosynthesis Tutorial Elaborate: Photosynthesis lab Evaluate: Model photosynthesis TOPIC: CONNECTING PHOTOSYNTHESIS & CELL RESPIRATION IN THE BIOSPHERE Engage: Phenomena: Earth's "lungs", Model Earth's Atmosphere , NASA's Climate Time Machine Explore/Explain: Bloomberg's What's Warming the World? , Carbon Cycle Game Elaborate: Model sewage treatment, Photosynthesis Cell Respiration Game BioManBio

Biology Curriculum, Instruction & Assessment

	<p>Asynchronous Assignments Day 2</p> <p>TOPIC: COMPONENTS OF ECOSYSTEMS Engage: Abiotic/Biotic factors Bozeman Abiotic/Biotic, Levels of Organization Quick Game (and distinguish between community and ecosystem), The Hunt BBC Episodes, Zoo Break Food Web, Angry Aliens Review Ecology Vocab BioManBio Game Explore/Explain: Nature's Spheres Activity from Nasa Describe general groupings of Earth's materials and processes (atmosphere, hydrosphere, biosphere, geosphere, anthrosphere) Elaborate: Calculate Water Footprint (Earth's Spheres) Where did Earth's Water Come From? (Earth's Spheres) Virtual Lab: Backyard Bingo Evaluate: Develop a model in Google Drawings to show interactions between the biotic and abiotic components of an ecosystem. Other possibilities: Quizlet, crossword puzzle, bingo, Google Form quiz</p> <p>TOPIC: POPULATION DISTRIBUTION Engage: Use citizen science websites to show distribution of organisms in an area (iNaturalist, citizen-science.gov, The Great Backyard Bird Count, Project Green Challenge, Zooniverse, Pollinator Live) Use handheld microscopes (if in person) Explore/Explain: Explore how population distribution varies and Explain why! Elaborate: Create a Google Drawing showing the three types of Population Distribution. Evaluate: Reflect: How do you think resource availability (food, water, space) affects distribution? Other Support Resources: Bozeman Populations,</p> <p>TOPIC: POPULATION GROWTH & TYPES OF GROWTH Engage: Human Population Counter, "How Did We Get So Big So Fast?", Rabbit Island in Japan Explore/Explain: Population Reading (immigration, emigration, birth rate, death rate), Populations in Nature Graphing Activity (shows logistic vs. exponential), Bozeman: Logistic Growth Elaborate: Simulations - Phet simulation - Rabbits, Lynx/Rabbit. Rabbits/Wolves Simulation, Populus (free download) https://cbs.umn.edu/populus/overview - use to model population growth, Population Ecology Labs Evaluate: Too Many Bears Population Activity, Data Nuggets - Mummichogs, Oh Deer! Activity Other Resources: Population Explosion, Biological Carrying Capacity</p> <p>TOPIC: FACTORS THAT LIMIT POPULATION GROWTH Engage: Videos - about population Nat Geo Strange Days, Wolves in Yellowstone, Predators/Invaders/Troubled Waters (YouTube) EdPuzzle can cut segments, St. Matthew Island Cartoon, The Threat of Invasive Species (Invasive Species affect Population), students can make</p>	<p>Evaluate: Model the Carbon Cycle</p> <p>TOPIC: FOSSIL FUELS AND THE ENVIRONMENT Engage: Phenomena: CO2 and Cars (can calculate), The Basics of Fossil Fuels Kahoot! Explore/Explain: Explore types of fossil fuels - show students and talk about chemical formulas, Explain why we use them, Explore the cost of extraction, The Life & Times of Carbon Unit Plan Elaborate: NOVA Energy Virtual Lab Evaluate:</p> <p>Assessment: 3D Photosynthesis Assessment, Cycles (Photosynthesis & Respiration) 3-Dimensional Assessment Bank</p> <p>cK-12 Core Content Resource (Reading):</p> <ul style="list-style-type: none"> • Photosynthesis • Light Reactions of Photosynthesis • Calvin Cycle • Photosynthesis Summary • The Photosynthesis Reaction • Biochemical Reactions • Cellular Respiration • Process of Cellular Respiration • Cellular Respiration Overview • Glycolysis • Krebs Cycle • Lactic Acid Fermentation • Electron Transport (advanced) • Photosynthesis Summary • Cellular Respiration • Anaerobic vs Aerobic Respiration • Flow of Energy • Carbon Cycle • Water Cycle • Nitrogen Cycle • Connecting Cellular Respirations and Photosynthesis <p>Labs</p> <ul style="list-style-type: none"> • Photosynthesis lab and video how to prepare disk • Student-designed lab to show carbon cycling • O2 Photosynthesis PASCO Lab • CO2 Photosynthesis PASCO Lab
--	---	---

Biology Curriculum, Instruction & Assessment

	<p>a “Wanted Poster” or an “Obituary”, Fearsome Frog (Invasive Species affect Population), PBS Video: Invasive Species</p> <p>Explore/Explain: Duckweed Population Lab, Yeast Competition Population Lab, Invasion Game by BrainPop (Invasive Species Affect Population), Citizen Science - iNaturalist or Eddmaps.org</p> <p>Elaborate: Kaibab Deer Graphing, Glencoe Population Virtual Lab, Newsela Technology is Resource Against Invasive Species (Invasive Species affect Population), Wolf & Moose Populations Article and Wolf & Moose Populations Assignmen.</p> <p>Evaluate: The Serengeti Rules Documentary - haven’t seen this, but looks promising. Watch and write reflective summary discussing how ecosystems rely on a balanced system.</p> <p>Other Resources: California Academy of Sciences: Introduced Species and Biodiversity, Wolves of Yellowstone, How Many People Can Earth Support?, Parasites Hyperdoc (Good for Halloween Lesson), Viruses Hyperdoc</p> <p>TOPIC: ENERGY FLOW THROUGH ECOSYSTEMS</p> <p>Engage: Take pictures of living things and post somewhere (GC, Prezi, Slides, Padlet)</p> <p>Quad Study (hula hoop biodiversity), Predator Prey Game Project Wild (or another, or another)</p> <p>Lab - HASPI (not sure if this can be done online?)</p> <p>Glencoe Lab</p> <p>Explore/Explain: Owl Pellet Food Webs, HHMI Ecological Pyramid</p> <p>Elaborate: Virtual Owl Pellet Lab</p> <p>Evaluate: Construct a model food web in Google Drawings and list 12 different food chains.</p> <p>TOPIC: NUTRIENT CYCLING THROUGH ECOSYSTEMS</p> <p>Engage: Photosynthesis from space</p> <p>Explore/Explain: Biogeochemistry, Nutrient Cycle Virtual Games, Carbon Cycle Virtual Game</p> <p>Elaborate: Global Carbon Cycle</p> <p>Evaluate:</p> <p>TOPIC: GROUP BEHAVIOR INFLUENCING POPULATIONS</p> <p>Engage: A group of Orca Whales work with one another, and with their environment, in order to capture food. (search Orca or Scroll down 6 rows), Dung Beetles Use Snapshots of Milky Way as GPS (scroll down 2 rows), Altruism and Selfishness in Animals, Swarming Engage PPT (Phenomena Set), Benefits of Schools Image Set (HHMI), Changing body temperature of group of bees, HHMI Biointeractive: How Animals Use Sound to Communicate</p> <p>Explore/Explain: Group Behavior Lab, Behavioral Ecology Lab, Science Bridge: Behavioral Ecology of Bees, You Talkin’ to Me? Investigations in Animal Behavior, Group Behavior and Epidemics Ebola Outbreak</p> <ul style="list-style-type: none"> ○ Teacher Info <p>Elaborate: Swarming Research Project with Presentation</p>	<ul style="list-style-type: none"> ● Dye-sensitized Solar Cell Lab <ul style="list-style-type: none"> ○ How to connect a circuit ○ Dye-sensitized Solar Cells Notes ○ Simplified Dye-sensitized Solar Cell Notes ● Photosynthesis Virtual Labs ● Photosynthesis and Medicine Lab <ul style="list-style-type: none"> ○ Teacher Info - Photosynthesis and Medicine ● Student-designed lab to show carbon cycling ● Explore: Cellular Respiration in a Balloon ● Cellular Respiration Lab - Live Crickets with Teacher Notes ● Exercise & Cellular Respiration ● Cellular Respiration & Exercise <ul style="list-style-type: none"> ○ Energy Flow and Fitness - Teacher Info ● Student-designed lab to show carbon cycling ● Carbon Transfer Snails and Elodea Virtual Lab (with handout) ● Climate & Earth's Energy Balance Lab ● Modeling Energy Flow <ul style="list-style-type: none"> ○ Teacher Info - Cycling of Matter and Energy Flow <p>Project Ideas</p> <ul style="list-style-type: none"> ● Engage for Photosynthesis ● Model of Photosynthesis ● UDL Energy Project ● Explore Photosynthesis ● Explain Photosynthesis ● Explore: Build a Rube Goldberg Machine ● Infographic on respiration & photosynthesis ● UDL Energy Project ● Google Drawing Project: <ul style="list-style-type: none"> ● Infographic Template (little support) Franz Ruiz ● Infographic Template (medium support) Ryan Mullen-Ballis ● Infographic Template (high support) Sheilah Sedore <p>Engineering Ideas</p> <ul style="list-style-type: none"> ● Corn as fuel activity ● Biofuel data nugget activities ● Solar Cells and Teacher Manual <p>Other Activities</p> <ul style="list-style-type: none"> ● How Plants Gain Mass
--	--	--

Biology Curriculum, Instruction & Assessment

	<p>Guided Notes for Audience , Animal Behavior Inquiry Project from SD Zoo</p> <ul style="list-style-type: none"> ○ SD Zoo Web Cams ○ Slides <p>Evaluate: Group Behavior Vocabulary Card Sort, Butterfly Migration Part 1, Butterfly Migration Part 2, Group Behavior and Survival</p> <p>Group Behavior other Videos & Animations: Black-Necked Stilt Foraging and Flocking, Animal Behavior: Inside the cunning, caring, and greedy minds of fish, Bozeman: Social Interactions and Group Behavior, Learned Behavior: Ecology and the Environment, What We Can Learn From Flocking Behavior, Prairie Dog Vocalizations, Buffalos and Crocodiles vs. Lions, Humpback Whales Attempt to Stop Killer Whale Attack, Bird Migrations</p> <p>Group Behavior other Readings and Articles: Swarming Up a Storm: Why Animals School and Flock, Bird Ballet: Science Behind Starling Murmurations, The Genius of Swarms Reading, Grouping Behavior Article with Pros/Cons WS, Effect of Social Behavior among Predator Prey Populations (included mathematical simulation/model) , Birds Do It. Bats Do It., Social Behavior, Animal Social Behavior, Global Health</p> <p>Assessment: Ecology Unit Assessment, Group Behavior 3-Dimensional Assessment Bank (<i>still under construction</i>)</p> <p>cK-12 Core Content Resource (Reading):</p> <ul style="list-style-type: none"> ● Levels of Ecological Organization ● Producers ● Ecosystems ● Habitat and Niche ● Food Chains and Food Webs ● Food Webs ● Consumers and Decomposers ● Energy Pyramids ● Symbiosis ● Succession ● Biodiversity ● Modern Biodiversity ● Importance of Biodiversity ● Animal Migration ● Reproductive Behavior of Animals ● Social Behavior of Animals <p>Labs</p> <ul style="list-style-type: none"> ● Coastal Sage Scrub Biodiversity Hotspot from SD Zoo <ul style="list-style-type: none"> ○ Cards for food web of coastal sage scrub (keystone species, invasive species, and 	<ul style="list-style-type: none"> ● Explore: Can Seeds Germinate without Photosynthesis? <ul style="list-style-type: none"> ○ Pg2 Can Seeds Germinate without ● Photosynthesis Leaf Model ● Elaborate Photosynthesis ● Calculating the Rate of Photosynthesis ● Photosynthesis Website <p>Readings & Articles</p> <ul style="list-style-type: none"> ● Blue leaves ● Scientific American: Bionic Plants Offer Superpowered Photosynthesis ● Khan Academy: Intro to Photosynthesis ● Helix: The Power of Photosynthesis ● Photosynthesis and Medicine ● Cellular Respiration (PDF) ● Cellular Respiration and Exercise ● Mitochondrial Disease: Invisible Disease Killing Our Son ● Carbon. Life and Health <ul style="list-style-type: none"> ● CLOSE Reading ● Khan Academy- Intro to Biogeochemical Cycles ● Eating for Energy ● Energy Density and Weight Management <p>Videos & Animations</p> <ul style="list-style-type: none"> ● Wheat grass growing ● How trees gain mass ● Transpiration ● Explore: Photosynthesis and Cellular Respiration animation ● Rube Goldberg Videos ● TedEd Photosynthesis ● Engage: Deep Sea Thermal Vents or Life Without Light ● Explore: Photosynthesis and Cellular Respiration animation ● Explore: Bozeman Video with Worksheet ● Explain: Cellular Respiration ● 3 Foods Causing Obesity ● Bozeman Science- Cycles of Matter & Energy Transfer ● Bozeman- Biogeochemical Cycles ● Carbon Cycle- Khan Academy ● Carbon Footprint of...One Sandwich ● TEDEd Carbon Cycle
--	---	--

Biology Curriculum, Instruction & Assessment

	<p>threats)</p> <ul style="list-style-type: none"> <ul style="list-style-type: none"> ■ Invasive species CER and research ○ Percent cover data collection Survey123 questions ○ Point intercept data collection Survey123 questions ○ Slides <ul style="list-style-type: none"> ● How do Biologists Estimate Population Size ● Invasive Species Game ● Wormery Lab: The Role of Worms in an Ecosystem (needs some modification for NGSS) ● Ecosystems of the Body Lab <ul style="list-style-type: none"> ○ Teacher Info - Ecosystems of the Body ● Mark and Recapture: Population Sampling ● Science Bridge: Biodiversity: Patterns and Processes ● Acid Rain Lab ● Biodiversity and Health Study <ul style="list-style-type: none"> ○ Teacher Info - Biodiversity ● Yeast Habitat Carrying Capacity Lab ● HASPI: Modeling Carrying Capacity Lab ● Carrying Capacity Bear Lab ● Carrying Capacity: What is a Viable Population?-A lesson on Numbers and Space ● What Limits Your Species? A lab using candy to teach carrying capacity ● HASPI Cycling of Matter: Modeling Energy Flow ● Food Chains and Energy Lab ● Too Many Bears Carrying Capacity Lab ● Population Growth Simulation Lab ● HASPI: Carrying Capacity and Foodborne Illness Lab ● Scroll to pg. 9-19 for Human Impact and Population Change Lab <p>Project Ideas</p> <ul style="list-style-type: none"> ● Mental Model - How Wolves Change Rivers ● Predator-Prey Tag ● The Bottled Ecosystem ● Create an Imaginary Marine Ecosystem (National Geographic) ● Ecosystem Diorama <ul style="list-style-type: none"> ○ Diorama Assessment Kelly Verioti ○ Diorama Rubric Kelly Verioti ● NGSS Lesson: Bye, Bye Birdie ● Marine Food Chains & Biodiversity (National Geographic) ● Kentucky Environmental Education Council: Human Impacts on Biodiversity ● Elaborate: The Lorax Pollution Project <ul style="list-style-type: none"> ○ Answer Key 	<p>Simulations & Interactives</p> <ul style="list-style-type: none"> ● Photosynthesis Tutorial ● What's Cooking Photosynthesis Web Tutorial ● Photosynthesis: Light Reactions (Ck12-plex) ● Photosynthesis: Can it be reversed? (Ck12-plex) ● Light Reactions: Light and Dark Reactions (Ck12-plex) ● Leaf Pigments (ck12-plex) ● Chemistry of Running ● Cellular Respiration Lab with Crickets -Lab Bench ● Carbon Cycle ● Cellular Respiration (ck12-plex) ● 3D model of ATP (HHMI) ● Glucose and ATP (ck12-plex) ● Glycolysis (ck12-plex) ● Kreb's Cycle (ck12-plex) ● Electron Transport (ck12-plex) ● HASPI Carbon, Life, and Health ● Nitrogen Virtual Lab (requests login) ● Nitrogen cycle simulation ● Virtual: Carbon Transfer through Snails & Elodea ● Changes in the Carbon Cycle ● Investigating the Real Carbon Cycle ● Water Cycle (ck12-plex) <p>Phenomena and Data</p> <ul style="list-style-type: none"> ● P.O.E. vinegar and baking soda ● Oriental hornets powered by solar energy ● Photoelectric Effect Demo Apparatus ● Mental Model ● Animals Getting Drunk: Fermentation video ● Where Does This Energy Come From? ● Explore: Rube Goldberg Machine <ul style="list-style-type: none"> ○ Rubric for Rube Goldberg Machine ● Explore: Water Cycle Lab/Demo (switch from pdf to doc) ● Carbon Monoxide Poisoning
--	--	---

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none">• Carrying Capacity and Bears in Alaska• Marine Food Webs (National Geographic) <p>Engineering Ideas</p> <ul style="list-style-type: none">• Biomes and Population Dynamics - Balance within Natural Systems• Constructing Sonoran Food Chains and Food Webs• Bees: The Invaluable Master Pollinators• Population Explosion• The Benefits of Biodiversity• Implementing Biomimicry and Sustainable Design-Application of Ecological Principles• Biomes and Population Dynamics-Balance Within Natural Systems <p>Supplemental Readings & Articles</p> <ul style="list-style-type: none">• KPBS: Wolf Wars: America's Campaign to Eradicate the Wolf• Climate Change and Ecosystems• National Science Foundation: Stability and Diversity in Ecosystems• Ecosystems of the Body• Disturbance and Succession Packet• California Education & the Environment Initiative:• Bee decline and crop production• Biodiversity - The Keystone to life on Earth• The Environmental Literacy Council: Carrying Capacity• Khan Academy: Exponential and Logistic Growth• HASPI Modeling Carrying Capacity - CLOSE Reading• HASPI Carrying Capacity and Foodborne Illness• Short Reading on Biomass• Population Growth Reading and Questions• GreenFacts: Biodiversity & Human Well Being• What Factors Influence the Biodiversity of an Area?• Climate Change: A Deadly Threat to Coral Reefs• Engage- The Lorax• Ecosystems, Biodiversity and the Body• Biodiversity and Health• Fields of Change• Bioaccumulation• Gorongosa: Restoring Mozambique's National Treasure (HHMI)• Why is the sea salty? (Earth Science connection)• Why birds of a feather poop together (bird feces and algal blooms)	
--	---	--

Biology Curriculum, Instruction & Assessment

	<p>Additional Ecology Resources: Bozeman Communities, Bozeman Ecosystems, BioManBio Ecology Games, Bozeman Ecological Succession, Amoeba Sisters Ecological Succession, Bozeman Niche, Bozeman Ecosystem Ecology, Frank Gregorio Biomes, Bozeman: Ecosystem Change, Khan Academy: Ecological Succession-Change is Good, Amoeba Sisters: Ecological Succession: Nature's Great Grit, PBS: Life Returns to Mt. St. Helens, Biodiversity Video from "The Wild Classroom", Meet the Frog Licker, California Academy of Sciences: Human Activities that threaten Biodiversity, Teach Engineering: Computer Simulation of the Sonoran Desert Community, Seed Dispersal and Habitat Fragmentation (HHMI), Biome Project</p>	
<p>Skills/Key Vocabulary</p>	<p>Skills</p> <ul style="list-style-type: none"> Identify various abiotic and biotic components of ecosystems. Analyze and interpret data [SEP-4] [SEP-5] to describe how abiotic and biotic components influence one another [CCC-2] [LS2.A]. In what way is the Earth a system of systems? Describe the general groupings of Earth materials and processes (atmosphere, hydrosphere, biosphere, geosphere, anthrosphere) each of which is shaped by its own processes and interactions with other systems [LS2.A] [CCC-4]. Develop a model to show how the spheres interact [SEP-2]. What is a population [LS2.A]? Describe different patterns of population growth and explain the role of carrying capacity in limiting population growth. Use mathematical and computational thinking [SEP-5] and modeling [SEP-2] to predict the effect of chosen interdependent factors on the size of a population over time [HS-LS2-1]. Conduct investigations [SEP-3] to test how different parameters change population size [CCC-7]. Analyze your findings [SEP-4] and describe the population changes mathematically [SEP-5]. Use mathematical representations to support and revise evidence-based explanations [SEP-6] about factors affecting populations and diversity in ecosystems of different scales [LS2.A] [CCC-3]. How well does an ecosystem model at one scale relate to a model at another scale? [HS-LS2-2] Categorize factors influencing population growth as density dependent (DD) or density independent (DI) and describe how they are different [LS2.A] [CCC-3]. Analyze and interpret data to explain how DD and DI factors affect the flow of energy and matter and that this is how they affect population size [SEP-2] [SEP-4] [CCC-2]. Describe the ways organisms obtain and store energy. Explain how this energy is transferred in ecosystems through food chains and food webs [LS2.A]. Use the conceptual model of an energy pyramid [SEP-2] and calculate energy fluxes [SEP-5] to explain the energy available at each successive trophic level in an ecosystem [CCC-5]. Use predictive models [SEP-2] of predator-prey population cycles to support claims about the relative amounts of energy at different trophic levels [HS-LS2-4]. Explain how nutrients (matter) cycle within and between ecosystems including between abiotic and biotic components [LS2.B]. Use mathematical representations to show that matter and 	<p>Skills</p> <ul style="list-style-type: none"> Living organisms use cellular respiration as the process by which organic molecules are broken down to release energy and form molecules of ATP. ATP is an energy transfer molecule and its hydrolysis provides the energy to do cellular work [CCC-5]. Use a model to show how ATP provides energy to carry out life's functions [LS1.C]. Recall the differences between producers (autotrophs) and consumers (heterotrophs) and explain the relationship between them [CCC-5] [LS1.C]. Photosynthesis is the process that captures light energy and converts it into stored chemical energy. Use a model [SEP-2] to show how photosynthesis transforms light and transformation of energy by producers [LS1.C] [HS-LS1-5]. Life on Earth is carbon based. Carbon can form covalent bonds with four other atoms and can form both single and double bonds. The same raw materials can be reconfigured to produce molecules, such as glucose and starch, with different chemical energy during these changes. Construct and revise an explanation based on evidence for how organisms build a wide range of organic molecules (amino acids, nucleic acids, fats) from the carbon, hydrogen and oxygen in glucose [LS1.C] [CCC-5] [SEP-6] [HS-LS1-6]. Using the models you have constructed so far, explain the ways in which heterotrophs use the raw materials they ingest. Describe what happens to the heat energy released from the chemical reactions of metabolism and explain why ecosystems rely on a constant influx of energy from the Sun? [LS1.C] [CCC-5] [SEP-6] [HS-LS1-6] [HS-LS1-7]. Build a model of glucose to show how it can be split up to form CO₂, O₂, and H₂O. Use your model to illustrate the chemical process of cellular respiration, showing that bonds in oxygen and food molecules are broken and bonds in new compounds are formed, resulting in a net transfer of energy [SEP-2] [CCC-5] [LS1.C] [HS-LS1-7]. Compare aerobic and anaerobic pathways for ATP production in different organisms. Construct and revise explanations based on evidence (the results of simple experiments of yeast fermentation) for the flow of energy and cycling of matter in aerobic and anaerobic conditions [SEP-6] [CCC-5] [LS2.B] [HS-LS2-3]. Obtain information about the stages involved in the treatment of human waste in wastewater treatment facilities [SEP-8]. Make a model of the waste water treatment process [SEP-2] and use it to investigate the effect of aeration to the rate of waste water treatment. Use your

Biology Curriculum, Instruction & Assessment

	<p>energy are conserved as matter cycles and energy flows through ecosystems [SEP-5] [CCC-5] [HS-LS2-4].</p> <ul style="list-style-type: none"> • How do populations behave as a system with many interacting parts (members). Evaluate the evidence for the role of group behavior in the survival and reproductive success of individuals and populations [SEP-7] [LS2.D] [CCC-5] [HS-LS2-8]. • Explain how humans, by altering the availability of resources and changing the landscape (including through climate change), might cause density dependent and density independent changes to ecosystems [SEP-6] [LS2.C]. Describe how these changes might affect the size and diversity of populations [CCC-2] [CCC-5] [HS-LS2-4]. • Obtain information to summarize the various positive and negative ways in which humans influence ecosystem resources and disrupt the usual nutrient cycles [SEP-8] [LS2.C] [CCC-5] [EP&Cs: II, IV]. <p>Vocabulary Population (N), carrying capacity (K), predation, competition (intraspecific, interspecific), biodiversity, abiotic, biotic, ecosystems, distribution (random, clumped, uniform), invasive species, niche, density dependent, density independent, food chains, food webs, trophic level, predator, prey, logistic (S = sigmoidal), exponential, birth rate (B), death rate (D), immigration, emigration, equilibrium, per capita, biotic potential (r_{max}).</p> <p>Formulas r_{max} = biotic potential r = maximum per capita population growth rate for a population B = Births D = Deaths N = Population Number K = Carrying Capacity t = Time d = Change dN/dt = Population Growth over Time</p> <p>Biotic Potential: $r_{max} = B - D / N$ Logistic Growth: $dN/dt = rN(K-N/K)$ Exponential Growth: $dN/dt = r_{max}N$</p>	<p>findings to construct an explanation about the effect of changing oxygen concentration of the rate of biological processes in a waste water treatment plant [SEP-6] [CCC-5] [LS2.B] [HS-LS2-3] [EP&Cs: II, IV].</p> <ul style="list-style-type: none"> • Photosynthesis and cellular respiration provide most of the energy needed to carry out essential life processes. Construct a physical model of these processes [LS2.B] to illustrate the connections between them, emphasizing the inputs and outputs of energy and matter [SEP-2] [CCC-5] [LS2.B] [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. Include a reference to the chemical, physical, geological, and biological processes by which carbon is exchanged among these spheres [SEP-2] [CCC-4] [LS2.B] [HS-LS2-5]. • How have scientists determined the age of the Earth and what it was like when it was first formed? At what point in Earth's history did the cycles of energy and matter we see now begin [CCC-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 [SEP-6] [CCC-7] [ESS1.C] [HS-ESS1-6]. • Explain how the evolution of photosynthetic organisms marked the beginning of the biosphere's interaction with the global carbon cycle [CCC-4]. Use evidence as well as your own model of photosynthesis to construct an argument about the coevolution of life and other Earth systems. Your argument should emphasize the dynamic causes, effects, and feedback between the biosphere and Earth's other systems and use suitable illustrative and supporting examples (microbial life and the formation of soil, leading to the evolution of land plants) [SEP-7] [CCC-7] [ESS2.E] [HS-ESS2-7] [HS-LS2-5]. • Explain how scientists can track the movement of carbon through the Earth's spheres. Develop a quantitative model to show how the cycling of carbon among the ocean, atmosphere, soil, and biosphere (including humans) provides the foundation for living organisms. Your model should include reservoirs of carbon accumulation, processes by which carbon is exchanged within and between reservoirs, and the relative importance of these processes and reservoirs [SEP-2] [CCC-4] [CCC-5] [ESS2.D] [HS-ESS2-6]. • Explore various representations of the carbon cycle to build conceptual models of the processes involved in exchanges between reservoirs of carbon. Use simple physical models to investigate interactions between the atmosphere and hydrosphere [SEP-3] and construct explanations about changes occurring in ocean chemistry as a result of differences between the amount of carbon stored and released by the oceans [SEP-6] [CCC-2] [HS-ESS2-6]. • Explain how the lowering of ocean pH can cause major damage to the ocean's coral reefs and planktonic organisms (those at the base of ocean food chains). Discuss the implications of these changes to ocean biodiversity and productivity [SEP-6] [CCC-2] [LS2.A] [LS2.B]. • Analyze computational models to explore the relationships between different Earth systems and quantify the impact of human activities on these systems.
--	--	--

Biology Curriculum, Instruction & Assessment

		<ul style="list-style-type: none"> Explain how carbon has come to accumulate in the largest reservoir, the geosphere, describing the role of heat and pressure during the burial of dead organic matter in the formation of fossil fuels (coal, oil, and natural gas) [SEP-6] [CCC-5] [CCG-7] [LS1.C] [HS-LS1-6]. Use published work to generate a model (drawing) summarizing the stages of oil formation [SEP-2]. Discuss the advantages and disadvantages associated with the use of fossil fuels, including environmental issues associated with their extraction and use [EP&Cs: II, IV, V] and the impact of carbon extraction on the natural carbon cycle [EP&Cs: III]. <p>Vocabulary adenosine tri phosphate, adenosine di phosphate, adenine, ribose, phosphate groups, mitochondrion, cytoplasm, photosynthesis, carbon dioxide, glucose, light dependent, light independent, chloroplast, thylakoid, grana, stroma, chlorophyll, NADPH, NADP, NADH, FADH, hydrolysis, glycolysis, pyruvate, electron transport system, Krebs's Cycle, aerobic, anaerobic, lactic acid fermentation, alcoholic fermentation, relative dating, absolute dating, deca, half-life, coevolution, pH, fossil fuels</p>
Assessments	<ul style="list-style-type: none"> Formative: Observations, questioning, discussing, journal, assignments, projects, quizzes (not graded), exit tickets, written responses, graphic organizers, concept maps, self assessments, oral presentations. Summative: Cumulative work, final portfolio, end of unit test, research paper, lab report. 	<ul style="list-style-type: none"> Formative: Observations, questioning, discussing, journal, assignments, projects, quizzes (not graded), exit tickets, written responses, graphic organizers, concept maps, self assessments, oral presentations. Summative: Cumulative work, final portfolio, end of unit test, research paper, lab report.
Performance Tasks	Lab reports, projects, presentations, portfolios, performances, problem-solving.	Lab reports, projects, presentations, portfolios, performances, problem-solving.
	Third Quarter	Fourth Quarter
Standards	<p>IS3 Evidence of Common Ancestry and Diversity Note: these documents need to be created.</p> <p>IS4 Inheritance of Traits IS4 Inheritance of Traits Doc 1 IS4 Inheritance of Traits Doc 2 IS4 Inheritance of Traits Doc 3 IS4 Inheritance of Traits Doc 4</p>	<p>IS5 Structure, Function and Growth IS5 Structure, Function & Growth Doc 1 IS5 Structure, Function & Growth Doc 2 IS5 Structure, Function & Growth Doc 3 IS5 Structure, Function & Growth Doc 4</p> <p>IS6 Ecosystem Stability and the Response to Climate Change IS6 Ecosystem Stability & Response to Climate Change Doc 1 IS6 Ecosystem Stability & Response to Climate Change Doc 2 IS6 Ecosystem Stability & Response to Climate Change Doc 3</p>

Biology Curriculum, Instruction & Assessment

<p>Content/ Content Resources</p>	<p>Blended/Distance Learning Ideas:</p> <p>5 E Distance Learning Hyperdoc: Intro to Evolution Hyperdoc</p> <p>TOPIC: LAYERS OF ROCK & FOSSILS Engage: Explore/Explain: Radioactive Dating Game Phet Simulation Elaborate: Evaluate:</p> <p>TOPIC: EVIDENCE FOR EVOLUTION Engage: Explore/Explain: Elaborate: Evaluate: 5E Distance Learning Hyperdoc: Evidence for Evolution Hyperdoc & Digital Poster</p> <p>TOPIC: NATURAL SELECTION Engage: Peppered Moth Game Explore/Explain: How are fish adapted to their environment Glencoe Virtual Lab, How are birds adapted to their environment Glencoe Virtual Lab, Phet Simulation Rabbits Natural Selection Elaborate: Model Natural Selection Glencoe Virtual Lab, Snurfle Island BioManBio Game, Angry Aliens Evolution Vocabulary BioManBio Game, Rock Pocket Mouse Evolution Video, Learn.concord Natural Selection Evaluate: 5E Distance Learning Hyperdoc: Natural Selection Hyperdoc, NOVA Evolution Virtual Labs, PBS Learning Evolution Labs</p> <p>TOPIC: SPECIATION Engage: Kaibab Squirrel vs. Abert Squirrel, Bird Calls Explore/Explain: Lizard Evolution HHMI Virtual Lab, Explore types of Isolation Elaborate: Bear Island Speciation Game Evaluate: Speciation Simulator</p> <p>TOPIC: HUMAN-INDUCED CHANGES IN ENVIRONMENT & EFFECT ON EVOLUTION Engage: Explore/Explain: Elaborate: Evaluate:</p>	<p>Blended/Distance Learning Ideas:</p> <p>TOPIC: WHAT IS LIFE? Engage: Explore/Explain: Elaborate: Evaluate:</p> <p>TOPIC: CELL DIFFERENTIATION Engage: Review cell parts Glencoe Lab Explore/Explain: Elaborate: Evaluate:</p> <p>TOPIC: HIERARCHICAL ORGANIZATION OF LIFE Engage: Explore/Explain: Elaborate: Evaluate:</p> <p>TOPIC: PROTEIN STRUCTURE & FUNCTION Engage: Make "Wanted" Posters for proteins our bodies need Explore/Explain: Elaborate: Evaluate:</p> <p>PROTEIN SYNTHESIS Engage: Explore/Explain: DNA & RNA Role in Protein Synthesis Glencoe Virtual Lab, RNA NOVA Virtual Labs Elaborate: Protein Synthesis Race BioManBio Game Evaluate:</p> <p>TOPIC: THE ROLE PROTEINS PLAY Engage: Explore/Explain: Types of Proteins Interactive Learn Genetics, Transcribe and Translate Interactive Learn Genetics, Elaborate: Evaluate:</p>
--	---	--

Biology Curriculum, Instruction & Assessment

	<p>TOPIC: HUMAN EVOLUTION Engage: Explore/Explain: Elaborate: Evaluate:</p> <p>cK-12 Core Content Resource (Reading):</p> <ul style="list-style-type: none"> • Theory of Evolution by Natural Selection • Theory of Evolution • Fossils • Living Species • Biogeography • Structural Evidence for Evolution • Molecular Evidence for Evolution • Molecular Biology and Evolution • Theory of Evolution by Natural Selection • Natural Selection • Natural Selection and Populations (Advanced) • Artificial Selection & Coevolution • Population Genetics • Allele Frequencies • Microevolution • Mutation and Gene Flow (Advanced) • Population Size and Genetic Drift • What is a Species? • Origin of Species Repeat of info in Isolation Mech section below • Extinction and Radiation of Life • Tracing Evolution • Isolation Mechanisms & Speciation • Human Causes of Extinction <p>Labs</p> <ul style="list-style-type: none"> • Evidence for Evolution Station Lab <ul style="list-style-type: none"> ○ Teacher Info ○ Student Lab Sheet for Stations ○ Station Directions ○ Station 1 - Articles ○ Station 2 - DNA Sequences ○ Station 3 - Digestive Tracts ○ Station 4 - AA Sequences 	<p>TOPIC: THE CELL CYCLE & GROWTH & REPAIR OF CELLS Engage: Phenomena: Cancer Explore/Explain: Elaborate: Evaluate:</p> <p>TOPIC: FEEDBACK MECHANISMS Engage: Phenomena: Extreme hot/cold situation. Use survivor stories. Explore/Explain: Elaborate: Evaluate:</p> <p>TOPIC: HOMEOSTASIS Engage: Explore/Explain: Labster has a homeostasis lab (need subscription), Heart Rate Lab Elaborate: Cell Homeostasis Virtual Lab Evaluate:</p> <p>cK-12 Core Content Resource (Reading):</p> <ul style="list-style-type: none"> • Chemistry of Life • Organic Compounds • Significance of Carbon • Carbohydrates • Lipids • Proteins • Types of Nutrients • Food and Nutrients • Choosing Healthy Foods • Chemical Substances Periodic Table • Energy in Biochemical Reactions • Digestive System Organs Digestion Reading Notes Template • Cell Cycle • Cell Division • Mitosis and Cytokinesis • Cancer • Carcinogens and Cancer • Meiosis • Cell Biology • Organization of Cells • Organelles
--	--	--

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> ○ Station 5 - Embryos ○ Evidence Walk-Around Foldable ○ Walk-Around Summary ● Evidences for Evolution Project ● Blubber Adaptation Lab ● HHMI Stickleback Virtual Lab ● Picking off the Peppered Moth Virtual Lab ● Sooty Selection Lab ● HHMI Beaks as Tools Lab ● Antibiotic Resistance Lab <ul style="list-style-type: none"> ○ Antibiotic Resistance Student Reading ○ Teacher Info - Antibiotic Resistance ● HIV Immunity Adaptations Simulation <ul style="list-style-type: none"> ○ HIV Immunity Student Reading ○ Teacher Info - HIV Immunity ● Lactose Intolerance Lab <ul style="list-style-type: none"> ○ Lactose Tolerance Student Reading ○ Teacher Info - Lactose Tolerance ● Jelly Bellicus Mimicry Mini-Lab ● Effects of antibiotics and antibacterial products Lab ● Lizard Evolution Virtual Lab ● Speciation Mini-Lab ● Clover Collection - Adaptive Polymorphism Project ● Analyzing Pterosaur Adaptive Radiation ● Adapting to the Environment Activity <ul style="list-style-type: none"> ○ Teacher Info <p>Project Ideas</p> <ul style="list-style-type: none"> ● Darwin's Great Voyage of Discovery ● Using DNA Sequencing to Trace the Blue Whale's Evolutionary Tree ● Create a Comic Strip about Natural Selection using Survival of the Sneakiest as a sample ● Adapted Animal Project ● Research and emerging disease (antibiotic resistant TB) driven by natural selection webquest ● Adapted Animal Project ● Types of Speciation Project ● Speciation Project - making a TED ED video <p>Engineering Ideas</p> <ul style="list-style-type: none"> ● Biomimicry: The "Natural" Intersection of Biology and Engineering ● Simulating the Bug 	<ul style="list-style-type: none"> ● Organization of the Human Body ● Organization of the Human Body Note: Different from above ● Cells of the Human Body ● Tissues of the Human Body ● Human Organs and Organ Systems ● System Interactions in the Human Body ● Respiration ● Cardiovascular System ● Components of Blood ● Heart ● Nervous System ● Nerve Cells and Nerve Impulses ● Barriers to Pathogens ● Immunity ● Inflammatory Response ● B and T Cell Response ● HIV and AIDS ● RNA ● RNA Structure ● Transcription of DNA to RNA ● Translation of RNA to Protein ● Proteins ● Protein Synthesis and Gene Expression ● Cell Membrane ● Phospholipid Bilayers ● Passive Transport ● Active Transport ● Cell Transport ● Homeostasis I ● Homeostasis II ● Hormone Regulation ● Diabetes ● Organs & Organ Systems for case studies <p>Labs</p> <ul style="list-style-type: none"> ● Worksheet for Microscope Activity ● Stem Cell Lab ● Observing Specialized Cells ● Enzyme Reaction Rate Lab ● Cell Specialization & Systems Lab
--	---	--

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> • Sickle cell and malaria simulation • Finch Beak Data Analysis and questions to lead discussion and formative assessment questions <p>Other Activities</p> <ul style="list-style-type: none"> • Effects of Natural Selection on Finch Beak Size <ul style="list-style-type: none"> ◦ Adapted activity with graphing • Evolution In Action: Isolation and Speciation in the Lower Congo River with EdPuzzle video • Becoming Human Web Activity • Calculating Extinction Rates • Coevolution in Action • Ethnicity and Death • PBS Evidence for Evolution WebQuest • Amino Acid Comparison • Analyzing the Fossil Record • Adaptations & Natural Selection Games • Beetle Battles • How the Cricket Lost Its Song • Candy Evolution • Cancer Evolution • Pocket Mouse • Beak of the Finch • How Humans Lost their Fur • Sorting Finch Species • Why Don't Antibiotics work like they used to? • Evolution of Lactase Persistence Packet • Analysis of Human Traits • A Taste for Spices • Constructing Explanations • Creating a Family Pedigree • Emerging Disease Immunity • Evaluating Evidence • Killer Microbes • Presenting an Argument • Probability and Human Traits • Supporting or Refuting an Argument • Writing a Cause & Effect Paragraph <p>Readings & Articles</p> <ul style="list-style-type: none"> • Evidence for Evolution Reading • Fossil Evidence of Right-Handedness 	<ul style="list-style-type: none"> ◦ Teacher Info - Cells and Systems ◦ Answer Sheet ◦ Station Sheets <ul style="list-style-type: none"> • Regeneration in planaria • Planaria Regeneration Lab (HHMI) • Seed Germination Lab • Onion Root Mitosis Lab • The Cell Cycle and Cancer Virtual Lab • Decoding Cancer Virtual Lab • Design Your Own Bacteria Lab • Bacteria and Cleaners Lab • Chemotherapy Lab <ul style="list-style-type: none"> ◦ Lab materials and set up • NGSS Enzyme testing lab • NGSS Starch and Protein testing investigation • Carbohydrate Identification Lab • Macromolecules, Digestion and Enzymes <ul style="list-style-type: none"> ◦ Teacher Info - Macromolecules • What Macromolecules are in Your Food? Inquiry Lab • Explore: Murder Mystery Lab <ul style="list-style-type: none"> ◦ Murder Mystery Lab in Table Format • Bacteria and gene expression • Genes, Proteins and Disease Lab <ul style="list-style-type: none"> ◦ Teacher Info - Genes, Proteins & Disease ◦ Normal CFTR Gene ◦ Abnormal CFTR Gene ◦ RNA Nucleotide Template ◦ RNA Polymerase Template ◦ tRNA Template ◦ Ribosome Template ◦ Amino Acid Sheet ◦ Cell Membrane Template • Reaction to Stimulus Lab • Pulse Lab • Stressors on Homeostasis Inquiry Lab • Pulse present vs absent model • Homeostasis and Diagnostic Testing <ul style="list-style-type: none"> ◦ Teacher Guide Diabetes: When Homeostasis Fails ◦ Teacher Guide • Hemolysis Lab
--	---	--

Biology Curriculum, Instruction & Assessment

- [Giraffe Neck Evolution](#)
- [Fossils Aid Understanding of Evolution](#)
- [Lemur Evolution and Humans](#)
- [Hairs, Feathers, and Scales \(Homologous\)](#)
- [Evidences of Evolution Reading w/Questions](#)
- [Early Modern Homo sapiens Reading](#)
- [Darwin on Trial: A lawyer Finds Evolution Lacking Evidence](#)
- [Humans Never Stopped Evolving](#)
- [Natural Selection and Human Selection](#)
- [Silence of the Crickets](#)
- [NPR: Dung Beetles Navigate Poop Pile Getaways using Celestial Snapshots](#)
- [Species Take Different Genetic Paths to Reach Same Trait](#)
- [Sexual Selection](#)
- [Understanding Evolution](#)
- [Human Traits](#)
- [Evolution of Corn](#)
- [Chimps and Bonobos Swapped Genes](#)
- [Speciation in Real Time](#)
- [Ring Species: Salamanders](#)
- [Tigons and Ligers](#)
- [Stabilizing, Directional, and Diversifying Selection](#)
- [Adapting to the Environment](#) Not NGSS Everything is explained

Videos & Animations

- [All living things are related](#)
- [Recipe For Evolution](#)
- [Intro to Human Origins](#)
- [Sources of Variation](#)
- [Biography of Charles Darwin](#)
- [Sickle Cell and Malaria](#) (has film guide and student quiz)
- [Finch Evolution](#) (longer)
- [Galapagos Finches](#) (shorter)
- [Theory of evolution short film \(HHMI\)](#)
- [Evolution of bird beaks \(HHMI\)](#)
- [How the Dung Beetle Uses the Stars to Navigate](#)
- [Hiding, Camouflage, and Mimicry](#)
- [10 Amazing Animal Disguises](#)
- [Have We Ever Seen Evolution?](#)
- [Natural Selection \(Amoeba Sisters\)](#)
- [Artificial vs. Natural Selection](#)

- [Blood Flow Investigation](#)
- [Venom Study Lab](#)
 - [Materials & Set-up](#)

Project Ideas

- [Specialized Cell Project](#)
- [Organ System Infographic Project](#)
- [Building a Model of the Digestive System](#) with [Group and Self-Evaluation](#)
- [What's In Your Food?](#) Nutrition Tri-fold
 - [Day 1 instructions](#)
 - [Reflective presentation](#)
 - Example below
- [What's In Your Food](#) [rubric](#) and example project photos
- [Biomolecule sentence starters](#) (for paragraphs in the What's In Your Food project)
- Copy of [Rubric](#) with Photo
- [Digestive Disease Infomercial](#)
- [Digestive Disease Informational Essay](#)
- [Schmoo Gene Expression Activity](#)
- [Protein Mini-Research Project](#)
- [Bead in Translation](#) and [DNA messages](#)
- [Baby Genetic Disease](#)
- [Patient case studies](#)
 - [Case study instructions](#)
 - [Graphic organizer](#)
- [Exploring Further: Factors Affecting Blood Flow research assignment](#)
- [Global Epidemics Research](#)
- [Global Healthcare Systems](#)
- [Examining Epidemic Research](#)

Engineering Ideas

- [Design a better circulatory system Video](#) and [Lesson Plan](#)
- [Tissue Engineering Classroom Activities](#)
- [Stem Cells](#)
- [CRISPR Lesson](#) and [Video](#)
- [Cell Membrane Structure & Function demos and activities](#) intracellular engineering lesson (application to drug delivery)
- [Heart Function demos and activities EKG lesson](#) (application to detection of heart malfunction)
- [Heart Valve Replacement](#) (Engineering Activity created by [DiscoverE](#))

Readings & Articles

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> • Reproductive Isolation and Speciation in Lizards • Speciation in Real Time • Hummingbird Species in the Transitional Zone • Amoeba Sisters Speciation • Evolving switches - short film (HHMI) • Cities are Forcing Animals to Evolve Faster Than Normal • Salton Sea with Cause and Effect WS • Bird Speciation <p>Simulations & Interactives</p> <ul style="list-style-type: none"> • Rock Pocket Mice (Learn Genetics) • Evolution of Flight (Teacher Demo/Requires Java) • NOVA: Evolution Web Lab • Peppered Moth Simulation • Phylogeny & Cladistics: Cladogram (ck12-plex) • Comparative Embryology (ck12-plex) • Natural Selection & Evolution Simulation • Charles Darwin / Theory Simulation • The Mating Game • Conflicting Selection Pressures • Hardy Weinberg Simulation Click Try it in NetLogo web then click Launch on the top menu bar. • Bioman Biology Snurfle Island Game - link to worksheet at bottom • Natural Selection: Peppered Moths (ck12-plex) • Natural Selection: natural disasters (ck12-plex) • Natural Selection: Of seasons and species (ck12-plex) • Pedigrees and Lactose Intolerance • An Origin of Species • All in the Family <p>Phenomena and Data</p> <ul style="list-style-type: none"> • 3 Phenomena for evolutionary evidence • Different Animals Look the Same at One Point in their Lives (Scroll down to find the specific phenomena) • Guess the Embryo • Human/Ape Image w/ Mental Model for Phenom • Elephants born Tuskless • Peppered Moth • Extinctions since 1970 • Salton Sea Before and Afters • Stick Insect 	<ul style="list-style-type: none"> • Daily Intake Guide website (for research during What's In Your Food project) • Salt Article (for research during What's In Your Food project) • Macromolecules Reading • Nobel Prize on Biomolecules • Why Sugar is So Bad For You • What's in your food? Haspi Reading • Mitosis Reading • Cell Division, Cancer, & Chemotherapy Reading <ul style="list-style-type: none"> ○ Teacher Info - Cell division, cancer and chemotherapy ○ HASPI Lab 05 Cell Division & Cancer Lab Folder • Bacteria Reading <ul style="list-style-type: none"> ○ Student Foldable • Khan Academy Rdg <ul style="list-style-type: none"> ○ Tissues, Organs, & Organ Systems Reading Notes (for Khan reading) • Cell Specialization & Organ Systems Reading • I am Joe's Cell • ScienceNews: Fighting Cancer • When Genes Don't Work • Stronger than Steel • ScienceDaily: Inherited Epigenetics • NIH: What is Precision Medicine? • DNA, RNA, and Protein Synthesis (GVL) • Genes, Proteins and Disease • Hierarchy Reading • Artificial Pancreas • Homeostasis and Diagnostic Tests • When Homeostasis Fails • Case Study - Bacteria <p>Videos & Animations</p> <ul style="list-style-type: none"> • Youtube Video (Colored flowers) • Stanford Researchers Direct Stem Cell Development • First Open Database of Live Human Brain Cells (also see NPR Reading below) • TedTalk - Meet Your Microbes • Skin Color Cell Specialization and worksheet (HHMI) • Autism Mechanisms Video (HHMI) • How Dengue Virus Enters a Cell Video (HHMI) • HIV life cycle Video (HHMI) • Cell Cycle and Cancer • Chemotherapy
--	--	---

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> • Smart Moths • Cricket chirping • Ladybird Beetles (Ladybugs) • Puffins vs. Penguins • Owl Camouflage • Evolution of corn (HHMI) short film • Adaptations Picture/Description Collection <p>Assessments: Natural Selection & Speciation 3-Dimensional Assessment Bank (<i>still under construction</i>), Natural Selection & Speciation 3-Dimensional Assessment Bank (<i>still under construction</i>), Evidence for Evolution 3-Dimensional Assessment Bank (<i>still under construction</i>)</p> <hr/> <p>5E Distance Learning Hyperdoc: Intro to Genetics</p> <p>TOPIC: DNA STRUCTURE & MODERN GENETICS Engage: Explore/Explain: Build a DNA Model Interactive Learn Genetics, How do geneticists read chromosomes? Learn Genetics Make a Karvotype Learn Genetics, Stretching DNA Phet Simulation Elaborate: Evaluate:</p> <p>TOPIC: SOURCES OF VARIATION Engage: Explore/Explain: Mitosis, Meiosis & Fertilization Learn Genetics, Sexual vs. Asexual Reproduction Learn Genetics, The Outcome of Mutation Interactive Learn Genetics Elaborate: Evaluate:</p> <p>TOPIC: USING PUNNETT SQUARES AS A MODEL Engage: Explore/Explain: Make a Monster Glencoe Virtual Lab, Punnett Squares Fruit Flies Glencoe Virtual Lab Elaborate: Evaluate: 5E Distance Learning Hyperdoc: Mendelian Genetics</p> <p>TOPIC: ENVIRONMENTAL CONTROL OF GENE EXPRESSION Engage:</p>	<ul style="list-style-type: none"> • Sisters Bacteria: The Good, the Bad, and the Kinda Gross • Giant Sequoia Time lapse 1 • The Story of the Cell Cycle • Engage: Flesh eating bacteria video very graphic • Explore: How Do Bacteria Grow? • Genes for Regeneration in Planaria Stem Cells Video (HHMI) • CTE-linked phenomena for cancer & cell division <ul style="list-style-type: none"> ○ <i>Arts, Media & Entertainment</i> <ul style="list-style-type: none"> ■ Fighting Cancer - Art Life Giribaldi ■ Art Therapy: An Oasis in the Cancer Journey ○ <i>Business & Finance</i> <ul style="list-style-type: none"> ■ Cancer is Serious Business ○ <i>Education & Child Development</i> <ul style="list-style-type: none"> ■ Victoria Emmons Story ■ Mary Browder Had Cancer ○ <i>Fashion & Interior Design</i> <ul style="list-style-type: none"> ■ If Only For a Second ■ The Face of Cancer ○ <i>Health Science & Medical Technology</i> <ul style="list-style-type: none"> ■ My Last Days ■ Markell Keeps His Head Up ○ <i>Manufacturing & Product Development</i> <ul style="list-style-type: none"> ■ Cancer Warriors ■ Can you Cure My Cancer? (60 minutes) ○ Phenomenon Reflection (CTE-linked videos) • Amoeba Sisters Biomolecules YouTube video • Fat Loss EdPuzzle • Lactose digestion (HHMI) • Just How Small is an Atom? • Basic Atomic Structure video • Intro to transcription • DNA to Protein (EdPuzzle) • What Makes Fireflies Glow • How Enzymes Work • Transcription • Transcription Tutorial • Translation • Translation Tutorial • Translation Animation-Sumanas
--	---	--

Biology Curriculum, Instruction & Assessment

	<p>Explore/Explain: Elaborate: Evaluate:</p> <p>cK-12 Core Content Resource (Reading):</p> <ul style="list-style-type: none"> • DNA, the genetic material • The DNA Double Helix • DNA • DNA Structure and Replication • DNA Replication (HHMI) • Sources of Genetic Variation • Meiosis • Punnett Squares • Genetic Variation • Mutation and Gene Flow • Effect of Environment on Genetics • Mutations • Mutation Causes • Mendel's Laws and Genetics • Population Genetics • Allele Frequencies • Punnett Squares • Probability and Inheritance • Effect of Environment on Genetics <p>Labs</p> <ul style="list-style-type: none"> • DNA model lab • DNA extraction • Extracting DNA from your Cells <ul style="list-style-type: none"> ○ Teacher Prep • Monstrous Mutations • Demonstrating Meiosis with Gummy Candies • Breeding Mutations in Fruit Flies Virtual Lab • Polycystic Kidney Disease Electrophoresis <ul style="list-style-type: none"> ○ HASPI Genetic Variation - Teacher Info • 3:1 ratio in tobacco seeds assessment below. • Paper Pet Genetics • NGSS Genetics Lab • Variations on a Human Face Lab • Baby Lab 	<ul style="list-style-type: none"> • DNA, Transcription and Translation Practice • Protein Synthesis, modification and transport through cell • TEDTalk: A Promising Test for Pancreatic Cancer From a Teenager • TED Talk: Understanding Cancer through Proteomics • Protein Synthesis Animation • Highered.mheducation Tutorials in Genes and How They Work • Sequencing DNA and Cancer Video • Crash Course: Protein Synthesis • TED Talk: How CRISPR allows us to edit our DNA • CRISPR Video • Epigenetics Tutorials • EdPuzzle: Body Systems • EdPuzzle: Amoeba Sisters: Homeostasis • EdPuzzle: How Much Pain Can You Handle • YouTube videos for case studies: <ul style="list-style-type: none"> ○ Diabetes ○ Coronary heart disease ○ Fractured femur • PBS Homeostasis: Fever video • PBS Blood Flow & Thermoregulation Animation • 3D Animated Blood Flow video • 3D Cardiac Cycle systole and Diastole video • Blood Pressure video • Blood Vessels and Pressure graphic image • Action potential graphic image • Mitral Valve Regurgitation video • Heart-rate-instructions image • Snake Venom: Healing Medicine & Toxic Menace video • Diary of a Snakebite Death video • PBS Venom: Nature's Killer video • Amoeba Sisters: Homeostasis video • Antibiotic Animations(e-bug) e-bug Worksheet <ul style="list-style-type: none"> ○ Why is Homeostasis Important <p>Simulations & Interactives</p> <ul style="list-style-type: none"> • Cell Type Foldable • Lipids - click and learn (HHMI) • Mental Model (for Colored Flower) • Organization of Living Things (Ck12-plex) • Mitosis-Meiosis-Compare
--	--	---

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> • Virtual Fruit Fly Genetics • Blood Types & Transfusions Lab <p>Teacher Info</p> <p>Project Ideas</p> <ul style="list-style-type: none"> • DNA model activity inquiry approach argument • Genetic Markers: Connecting the Dots (Nat. Geographic) • Model of DNA Vocabulary Words • Origami DNA • Explore: Guided DNA notes • Explain: Google Drawing of DNA • Engage: Nature (article on DNA structure audion) • Explore: DNA replication • Explain: DNA replication / folder of images • Elaborate: DNA replication • Karvotyping • Genetic Disorder Brochure - Research Project or Students Create PPTs - adjust to incorporate “engaging in argument” • Mutation and Genetic Disease Research adjust to incorporate “engaging in argument” • Dragon Genetics <ul style="list-style-type: none"> ○ Dragon Sheet ○ Dragon Homologous Chromosomes key ○ Dragon Lab • Probability Projects • State Your Traits w/ handout showing traits • The Genetics of Taste • Were the Babies Switched? w/ Teacher Guide and optional portion on Twins and Epigenetics • Cloning a Living Organism <p>Engineering Ideas</p> <ul style="list-style-type: none"> • DNA Replication assembly line activity • Hands on the DNA • Mutations <p>Readings & Articles</p> <ul style="list-style-type: none"> • Structure of DNA • DNA helicase • How DNA and Genes Work • James Watson and Francis Crick paper in Nature • Gene Expression and Regulation 	<ul style="list-style-type: none"> • Watch Mitosis • Make a karyotype • Stem Cells • Cell Division: cancerous cell growth (Ck12-plix) • Cell Cycle: phases of the cell cycle (Ck12-plix) • Mitosis: wound healing process (Ck12-plix) • Biomolecules Quizlet • Meet Your Macromolecules lesson • Types of Biomolecule Reactions: building or breaking (ck12-plix) • Enzymes: Penny Machine (ck12-plix) • Lipids - click and learn (HHMI) • How the body uses fat (HHMI) • Acids & Bases: Pepsin Biology (ck12-plix) • Learn Genetics: DNA to Protein • Learn Genetics: Transcribe and Translate with worksheet • WISC Online: Transcription and Translation with same worksheet as for previous website (one on each side) • Cancer Protein structure and function - click and learn (HHMI) • Types of Proteins • Protein Synthesis Race Game • Epigenetics - Lick Your Rat • Transcription: Making mRNA (ck12-plix) • Central Dogma: DNA to RNA to Protein (ck12-plix) • Genetic Code: Translate the message (ck12-plix) • PBS Body Control Center simulation • PBS Human Body Regulation (temperature) • Diffusion (Ck12-plix) • Passive Transport: Transport Proteins (Ck12-plix) • Passive Transport (Ck12-plix) • Homeostasis (ck12-plix) • Membrane Proteins: Specificity (ck12-plix) • Osmosis (ck12-plix) <p>Phenomena and Data</p> <ul style="list-style-type: none"> • Colored flower via transport (image) • Cancer cell invasion (HHMI) • Specialized Cells Images: Structure-Function • Herpes Spike at Coachella (article) • The woman's face is disappearing- phenom <ul style="list-style-type: none"> ○ Mental Model (prokarvote)
--	--	--

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> • Biology Hub: DNA Structure and Function • Diagnosing Chromosome Disorders • Genetics of Eye Color • Genetics reading and activities • Your Grandmother's Tomatoes • Mutations Causes Real-Life Example - Chemical use in Hinkley, CA <ul style="list-style-type: none"> ○ Mutation Causes Jigsaw • Zika Virus Info from CDC • Fukushima Accident • Chernobyl Accident • Genetic Disease and Electrophoresis • Is Obesity Genetic? • CK-12: Genetics (For remediation) • Genetics of Eye Color • Genetics reading and activities • Blood Types • Genetics of Blood Type • Cilantro Tasting <p>Videos & Animations</p> <ul style="list-style-type: none"> • DNA structure (Ed Puzzle) • DNA replication (Ed Puzzle) • Double Helix - short film (HHMI) • Structure of DNA (HHMI) • DNA replication HHMI animation • Hydrogen bonding - video (HHMI) • DNA replication JohnKirk animation • DNA Replication Wiley College animation • Animated genome • Genome timeline • Albinism video • DNA from the beginning • Cold Springs Harbor DNA Animation Library • The Human Genome • Meiosis • JohnKyrk: Meiosis • Cells Alive: Meiosis • Crossing Over Animation • Learn Genetics: Sources of Variation • EduMedia: Law of Independent Assortment Animation 	<ul style="list-style-type: none"> • Flesh eating bacteria video & How do bacteria grow images • Why Two Heads? (On a planaria) (HHMI) • Root movement (HHMI) • Sequoia Seedling • General Sherman • Giant Sequoia Time lapse 1 <ul style="list-style-type: none"> ○ Mental Model (tree / eukaryote) • Cancer cell invasion (HHMI) • Mental Model Biochemistry & Digestion • Subway Veggie Delight "dissection" video (intro to What's In Your Food project) • Macromolecules sorting (use a picture or actual food labels) • Macromolecules Cards (post around room and have students compare/contrast) • Origin of Freckles #1 / #2 • Cystic Fibrosis (HHMI) • Shark Attack YouTube video. (This video goes with model below) <ul style="list-style-type: none"> ○ Shark model directions and 60 min interview <p>Other Activities</p> <ul style="list-style-type: none"> • Fat shapes Biointeractive slideshow (using models to depict macromolecules) • Modeling Macromolecules • Help Guide • Explore: Molecules and Energy Kits ppt • Student Notes page • Explain: Carbon Bonding Worksheet • Engage: Biomolecules Food Groups Sort • Explore: Biomolecules Structures Sort • Explore: Building Biomolecules Worksheet • Explain: Reciprocal Teaching WS Pg1 (w/ Haspi Reading) • Reciprocal Teaching WS Pg2 • Explain: Close Reading Doc (use with Haspi Reading) • Macromolecules Review • In-Class Review Activity • Explain: Matter & Energy CER • Explore: Digestive System Paper Model • Explain: Digestion Notes • Student Notes Page • Elaborate: Building a Model of the Digestive System' • Calculating Digestion and Absorption Rates Digestive Disorders • Investigation Diet Supplements • The Story of the Cell CycleCoffee Talk on cell cycle
--	---	---

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> • Sumanas: Law of Independent Assortment Animation • Mendel and the Dihybrid Cross • Law of Segregation Animation • Inheritance • Mutation • What is a Mutation? • Mistakes in Meiosis • Fertilization Terminology EdPuzzle • Amoeba Sisters: Meiosis EdPuzzle • Meiosis EdPuzzle • Meiosis 5:32 • Meiosis Crossing Over and Variability 6:45 • Genetic Diversity 1:39 • Genetic Variation 2:57 • Amoeba Sisters: Chromosomes Numbers 5:46 • TEDx: Why Sex Really Matters 20:13 • TEDED Epigenetics • Monohybrid cross (Ed puzzle) • Dihybrid cross (Ed puzzle) • Mendel (Ed puzzle) • Inheritance • What is Sickle Cell Anemia? <p>Simulations & Interactives</p> <ul style="list-style-type: none"> • Structure of DNA explained • DNA structure: Concord Consortium • DNA extraction activities • DNA replication • DNA: Avery & Griffith's Experiments (ck12-plex) • DNA Fingerprinting (ck12-plex) • Nucleic Acids: build the complementary strands (ck12-plex) • Pedigrees and Lactose Intolerance • Geniverse: Meiosis Simulation • Mutant organisms • Meiosis Activity <ul style="list-style-type: none"> ○ Example Student Handout Template (make a copy and modify) • Environmental Factors Causing Mutations • Mendel's Laws of Heredity (ck12 plix) • Mendel's Laws Sorting Traits (ck12 plix) • Molecular Genetics: Modern Genetics (ck12 plix) 	<ul style="list-style-type: none"> ○ Coffee Talk ppt • Mitosis Practice • Gene expression in stem cells data nugget activity • Normal Cell Growth vs. Cancer Growth • Cancer KWL Chart • SCI: Skin Cancer Investigation • Going Deeper: Inside Cancer • Cancer Research • Predicting Cancer Growth • Predicting Cancer Growth • CTE Extension Activities • Specialized Cell Activity (Click launch anyway) • Specialized Cell Activity Worksheet • Model of an Organ System • Organ System Expert Research Disease Symptoms • How much do you know about the reproductive system? <p>Assessments: Macromolecules 3-Dimensional Assessment Bank (<i>still under construction</i>), Cell Specialization & Differentiation 3-Dimensional Assessment Bank (<i>still under construction</i>), Cell Specialization & Differentiation 3-Dimensional Assessment Bank (<i>still under construction</i>), System Interactions & Plasma Membrane Assessment by Kelly Verioti, Protein Synthesis 3-Dimensional Assessment Bank (<i>still under construction</i>), Group assessment (needs pictures), Homeostasis 3-Dimensional Assessment Bank (<i>still under construction</i>)</p> <hr/> <p>TOPIC: CHANGES IN ECOSYSTEMS & EFFECT ON POPULATIONS Engage: BioMan Bio Succession Game Explore/Explain: Elaborate: Evaluate:</p> <p>TOPIC: HUMAN IMPACTS & EFFECT ON ECOSYSTEMS Engage: Explore/Explain: Elaborate: Evaluate: 5E Distance Learning Hyperdoc: Human Impacts & Biodiversity</p> <p>TOPIC: CHANGES IN CLIMATE & EFFECTS ON LIFE Engage: Explore/Explain:</p>
--	--	---

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none">• Genetic Variation: Alien Genetics (ck12-plex)• Mendel's First Experiment (ck12-plex)• Mendel's Second Experiment (dihybrids) (ck12-plex)• Probability: was it grandma or grandpa (ck12-plex)• Mutation Causes (ck12-plex)• Mendelian inheritance• Was it Grandma or Grandpa?• Non-Mendelian Inheritance: Patterns of inheritance (ck12-plex)• Sex-Linked Inheritance (ck12-plex)• Blood Types (ck12-plex)• Population Genetics: Jean Pool (ck12-plex) <p>Phenomena and Data</p> <ul style="list-style-type: none">• Unexpected traits and worksheet• Twin Girls - Why do they look so different? w/ worksheet• Treehopper Ant - adaptations to harsh environmental conditions• DNA errors during replication (source)• Increase in food allergies article, graphs• Increase in peanut allergy video• Are You a Supertaster? video <p>Assessments: DNA Inheritance 3-Dimensional Assessment Bank (still under construction) Inheritance of Traits SPA, Genetic Variation 3-Dimensional Assessment Bank (still under construction), Population Genetics 3-Dimensional Assessment Bank (still under construction)</p>	<p>Elaborate: Evaluate: SE Distance Learning Hyperdoc: Climate Change</p> <p>cK-12 Core Content Resource (Reading):</p> <ul style="list-style-type: none">• Habitat Destruction• Human Actions and the Sixth Mass Extinction• Climate Change• Protecting Biodiversity• Renewable Energy Resources• Outdoor Air Pollution• Sources of Water Pollution <p>Labs</p> <ul style="list-style-type: none">• Modeling Overfishing - Bean Lab• Pollution Lab• Pollution, Biodiversity and Health Investigation<ul style="list-style-type: none">◦ Teacher Info - Pollution and Health• Bioaccumulation Simulation<ul style="list-style-type: none">◦ Modeling Bioaccumulation in the Body◦ Teacher Info - Human Impact on Biodiversity• Mitigating Bioaccumulation <p>Project Ideas</p> <ul style="list-style-type: none">• Analyzing Student Carbon Footprint Data & Designing Action Plans• Project Wild Ecology Based Activities• How Big is Your Carbon Footprint• International Student Carbon Footprint Supplement Student Handout• CPalms: Human Impact on the Environment• The Lifestyle Project• Human Population Simulation• National Geographic: Captive Breeding Case Studies: For current Captive Bred Species List Click Here<ul style="list-style-type: none">◦ Google Doc Supporting Activity• Anthropogenic Change• Project Clean-Up<ul style="list-style-type: none">◦ Instructions◦ Student Planning Packet◦ Student Peer Review Packet
--	--	---

Biology Curriculum, Instruction & Assessment

		<ul style="list-style-type: none">○ Teacher Rubric● NSTA Solution to Human Impact Project<ul style="list-style-type: none">○ Human Impact Student Project Planning Sheet○ Build a Water Treatment System○ CER Argumentative Rubric○ Human Impact Student Group Project Rubric <p>Engineering Ideas</p> <ul style="list-style-type: none">● Working Together to Live Together<ul style="list-style-type: none">○ Instruction Sheet● Renewable Energy Living● ID Pollutants in Your Neighborhood● Viral epidemic and public health simulator <p>Readings & Articles</p> <ul style="list-style-type: none">● Interesting Engineering: 10 Ways Humans Impact the Environment● Erdas: Reducing the Human Impact on the Environment● WWF: Tips on How to Lessen Your Impact on the Environment● 100 Ways to Reduce Your Impact● Gorongosa: Restoring Mozambique's National Treasure or Alternate Short Version with Questions● Resurrecting Mozambique's Magnifique Gorongosa● Pollution, Biodiversity and Health <p>Videos & Animations</p> <ul style="list-style-type: none">● Crash Course: 5 Human Impacts on the Environment● Crash Course: The Science of Overpopulation● The Shocking Human Impact on our Planet *warning: some images may be considered disturbing-watch first● Tracking Lion Recovery in Gorongosa National Park (HHMI) with Handout● HHMI: Coral Bleaching and Saving Coral Reefs● Think Like a Scientist: Gorongosa (HHMI)● The Great Elephant Census (HHMI)● A Science Based Approach to Restoring Gorongosa Wildlife (HHMI)● Surveying Ant Diversity in Gorongosa National Park (HHMI)● Conserving and Restoring Ecosystems Video Lecture (HHMI)● Surveying Gorongosa Biodiversity (HHMI)● The Guide: A Biologist in Gorongosa (HHMI) with Film Guide● A Science-Based Approach to Restoring Gorongosa's Wildlife (HHMI)● Tracking the Impacts of Climate Change in Yellowstone (HHMI)● Wildlife in Protected Areas Can Often Become Casualties of War (Newsy)
--	--	--

Biology Curriculum, Instruction & Assessment

		<p>Simulations & Interactives</p> <ul style="list-style-type: none"> • Environmental Scratch coding activities • Wildcam Gorongosa-Interactive Wildlife Tracker (HHMI) (or Panama Wildlife Tracker) • Survey Methods: Elephants (HHMI) • Gorongosa Timeline (HHMI) group timeline worksheet and timeline questions • Gorongosa Interactive Map with Scavenger Hunt Activity Worksheet and C-E-R template • Gorongosa-Marroneu Corridor • HHMI: Anthropocene: Human Impact on the Environment • Human Impact Board Game <p>Phenomena and Data</p> <ul style="list-style-type: none"> • NASA time lapse of Amazonian Rainforest • Scuba Diver in Bali-So Much Trash! With Additional Data and Questions • Using Genetic Evidence to Identify Ivory Poaching Hotspots (HHMI) • Tracking Global Changes in Forest Cover (HHMI) • Dead Zones in Coastal Ecosystems (HHMI) • Forest being destroyed <p>Assessments: Solutions to Human Impact 3-Dimensional Assessment Bank (<i>still under construction</i>)</p>
<p>Skills/Key Vocabulary</p>	<p><u>Skills</u> <u>IS3</u></p> <ul style="list-style-type: none"> • The fossil record provides a history of life on Earth recorded in the rocks. It allows us to look back through time in order to better understand how organisms and their environments have changed over time [CCC-7]. Use a model [SEP-2] to describe how fossils are formed by burial in an environment that prevents decay [CCC-2], how they become part of the geosphere, and how they provide a record of the physical and biotic environment of the time [LS4.A]. • Recall how rock strata are dated by both relative and absolute dating methods. Apply basic principles of stratigraphy to interpret sedimentary rock sequences and explain how the ordering of layers and arrangement of materials [SEP-4] [CCC-6] can reveal clues about past environments and geologic events [LS4.A] [ESS2.C]. • Describe how rock, when exposed at the Earth's surface is subjected to weathering by physical, chemical, and biological processes. This weathered material may then be removed through erosion and be transported and deposited elsewhere. Use a stream table to investigate [SEP-3] the role of erosion and deposition in producing CA's fertile Central Valley [CCC-2]. Use your findings to explain how erosion and deposition have provided the basis for CA's agricultural economy [HS-ESS3-1]. • Use your stream table to investigate [SEP-1] [SEP-3] the role of water in producing the Earth's distinctive surface features [CCC-2], such as the Grand Canyon and Table Mountain in Tuolumne county [ESS2.C] [HS-ESS2-5]. Use your understanding to explain [SEP-6] why there are layers 	<p><u>Skills</u> <u>IS5</u></p> <ul style="list-style-type: none"> • What does it mean to be alive? What are the criteria for deciding if something is living or not? Is non-living the same as dead? Categorize objects as living or non-living according to your criteria [SEP-6] [LS1.A] [CCC-6]. • Recognize cells as the fundamental unit of life. Categorize cells as either prokaryote or eukaryote based on the presence or absence of characteristic features. Using evidence from a model organism, explain how cells within a multicellular organism [SEP-2] are specialized to perform specific roles that contribute to the functioning of the organism as a whole [SEP-6] [LS1.A] [CCC-6]. • Develop and use a model [SEP-2] to show how a complex multicellular organism is produced and maintained through cell division and differentiation from stem cells. Use the model to explain [SEP-6] how the expression of different genes during development leads to cells with different structure and function [LS2.B] [CCC-6] [HS-LS1-4]. Using skin as an example, construct an explanation for how differentiation of stem cells in the skin replenish the dead cells lost from the skin's surface. Use a model [SEP-2] to explain [SEP-6] how stem cells can be used to engineer new tissues such as skin [ETS1.B] [CCC-6]. • Develop and use a model [SEP-2] to show how the hierarchical organization of interacting systems (cells, tissues, organs, and organ systems) provides specific functions within multicellular organisms [LS1.A] [CCC-6] [HS-LS1-2].

Biology Curriculum, Instruction & Assessment

	<p>of rock and how these layers are deposited and accumulate over time. How does each layer preserve a record of the environment at the time?</p> <ul style="list-style-type: none"> • Use your stream table to model [SEP-2] changing rates of erosion and deposition [CCC-7] and use this to construct an explanation [SEP-6] for the rapid burial and preservation of organic material [HS-ESS2-5]. • Investigate coastal erosion in CA's Pacifica region. Using coastal erosion as an example, explain how the rates at which land-forming processes occur can vary over different time scales [CCC-3] [CCC-7] [HS-ESS2-5]. • Multiple lines of evidence provide support for common ancestry and biological evolution [LS4.A]. Evaluate and communicate [SEP-8] the contribution of each of these lines of evidence to the scientific understanding of the evolution of life throughout Earth's history. Communicate the information using writing, visual displays (such as diagrams, charts, and annotated photographs), or oral presentations [HS-LS4-1]. Construct evidence-based arguments [SEP-7] for common ancestry and biological evolution including: <ul style="list-style-type: none"> ○ Fossil evidence, including transitional fossils (Archaeopteryx) and fossil sequences documenting morphological change in a taxon over time (horses, whales) [CCC-1]. ○ Anatomical evidence, like limb homology in vertebrates [CCC-1] [CCC-6]. How do analogous structures provide evidence for the role of adaptation in the evolution of structures with a similar function in unrelated groups [CCC-2]? ○ Molecular evidence, like DNA sequences and protein homologies [CCC-1] [CCC-6]. ○ Developmental evidence, like the order of appearance of structures in embryos [CCC-1]. • Describe variation in natural populations and recognize its origin in the differences in both genetic makeup of individuals and the environment in which they develop. Collect, analyze, and interpret data from humans (classmates, extended family) to provide evidence for variation in natural populations [SEP-3] [SEP-4] [LS4.B] [HS-LS4-2]. Do you see any patterns in the data you have collected [CCC-1]? • Analyze and interpret data from natural populations to show that some of the variation in individuals is inherited and that individuals within the species produce many more offspring than survive (because resources are limited) [SEP-4] [LS4.B] [HS-LS4-2]. • Analyze and interpret data to show that those individuals within the population with particular combinations of traits have higher fitness (survival and reproduction) under certain environmental conditions than other individuals [SEP-4] [LS4.B] [HS-LS4-2]. • Develop and use a model to demonstrate how differential survival of favorable phenotypes (natural selection) can lead to phenotypic change over time. Use your model and the evidence you have analyzed from natural populations to explain the process of evolution (change in the genetic makeup of a population over time) [SEP-6] [LS4.B] [CCC-7] [HS-LS4-2]. • Analyze shifts in the numerical distribution of phenotypic traits (beak size, coat color) to support your explanations that organisms with a favorable heritable trait increase in proportion to individuals without that trait [SEP-4] [LS4.B] [CCC-1] [HS-LS4-3]. 	<ul style="list-style-type: none"> • Describe the structure of proteins and explain how the variety of amino acid building blocks and their many possible arrangements enables a great protein diversity. Can you think why scientists in the early 20th century thought that proteins must carry the code? • Use a model to show how proteins are made by first transcribing the instructions in DNA and then translating them into a protein molecule using the cell's molecular machinery [SEP-2]. Can you think of an analogy for this process? Construct an explanation based on evidence for how the structure of DNA determines the structure of a protein [SEP-6] [LS1.A] [CCC-6] [HS-LS1-1]. • Come up with a list of roles that proteins carry out in our bodies. Use examples and models (molecular models or drawings) to explain how the shape of a protein determines its function [SEP-2] [SEP-6] [LS1.A] [CCC-6]. • Describe the structure of the plasma, including the role that proteins play as part of its functional structure. Use a model to explain how different substances move through membranes by diffusion, osmosis, or active transport [SEP-2] [SEP-6] [CCC-6]. Make the connection between these processes and the functioning of the cell and the organism as a whole [LS1.A] [CCC-6]. • Explain how the usual movement of water molecules in osmosis can be reversed in order to treat or desalinate water. How could reverse osmosis be used to solve a water shortage problem? What is the cost? [SEP-2] [ETS1.B] [CCC-5] [HS-ETS1-3] • Use what you have learned about the way proteins are made to predict the effect of DNA mutations of protein structure and function. Use a simple model to represent a body system to test your prediction. Explain how scientists determined the function and location of specific genes by looking at loss of function in mutant strains of organisms [CCC-2]. Plan your own investigation into the effect of a mutation on the survival of an organism in different environments [SEP-3] [LS1.A] [CCC-2]. • Using specific examples of human disorders, explain how mutations lead to a loss of function and disruption of the system (disruption of membrane transport in cystic fibrosis or disruption of a metabolic pathway in PKU [SEP-6] [LS1.A] [CCC-6]). • Has your skin ever peeled off after you have been sunburned? Or have you had a blister that has burst and left a flap of dead skin? Recall how organisms grow and cells are replaced by cell division and how cells differentiate into the different cell types that make up tissues and organs. Why must a cell duplicate its DNA before it divides into two identical cells? Compare different models of DNA replication and then model Meselson and Stahl's experiments that showed DNA replication is semi-conservative [SEP-2]. Use these models to explain how the DNA is copied so that each cell contains the full set of genetic instructions for the organism [SEP-2] [SEP-4] [LS1.B] [CCC-6] [HS-LS1-4]. How are proteins (enzymes) involved in the process? • Recognize DNA replication as one part in the life cycle of a cell called the cell cycle. Describe the events and sequence of events in a model of the cell cycle. Use the model to explain how an organism grows and how dead cells are replaced in order to repair and maintain the organism [SEP-2] [LS1.B] [HS-LS1-4]. Show on your model how some cells may leave the cell cycle and stop dividing once they have differentiated or when they have become old and die. Use your
--	--	--

Biology Curriculum, Instruction & Assessment

	<ul style="list-style-type: none"> Construct an evidence-based explanation for how differences in selective environments contribute to genetic change in populations and result in the adaptations we see in organisms. Evidence could include examples of convergence in different taxa as well as modern examples such as insecticide resistance in pest insects and antibiotic resistance in bacteria [SEP-6] [LS4.C] [CCC-1] [CCC-2] [HS-LS4-4]. Explain how the study of organisms with short generation times can record observable change in the genetic makeup of populations [CCC-7]. Create and use a computational model [SEP-2] to explain how quickly antibiotic resistance can spread in a bacterial population given a specific selective environment [SEP-6] [LS4.C] [HS-LS4-4] and argue the case for completing prescription medication for treatable bacterial infections. Evaluate the evidence for claims that natural or human-induced changes in the environment may contribute to the expansion of some species, the emergence of new species (speciation), or species extinction [SEP-7] [LS4.C] [CCC-2] [HS-LS4-5]. While changing environments can lead to the emergence of new species, existing species may become extinct if they are unable to adapt. Now you will ask questions [SEP-1] and evaluate the evidence for the role of different selection pressures in the evolution of the human family [SEP-7] [SEP-8] [LS4.C] [CCC-2]. The epicenter of human evolution was eastern Africa. Study a model [SEP-2] of hominin evolution (which is less like a linear timeline and more like a bushy tree), noting the large number of species, often coexisting in time and space. One species, <i>H. sapiens</i>, thrived, while the others, hugely successful in their own right at the time [CCC-3] did not persist. Investigate the relative importance of human evolution: climate change [ESS2.E] [ESS3.D] [CCC-7], physical changes in the evolution of humans [LS1.A] [CCC-6], molecular evidence of human ancestry and evolution [CCC-1], and human cultural evolution (behavior and communication [LS2.D] [CCC-2]). Analyze data [SEP-4] and evaluate and communicate information [SEP-8] about each role in the emergence of <i>Homo sapiens</i> and the success of our species. <p>IS4</p> <ul style="list-style-type: none"> Describe the accumulation of the experimental evidence through the 20th century that led to our understanding about the role of DNA and chromosomes in coding for inherited traits [LS1.A] [LS3.A] [HS-LS3-1]. What questions did they ask about inheritance and how did they go about answering them [SEP-1] [CCC-2]? How did the accumulation of evidence lead to Watson and Crick building their DNA model in 1953? Find out more about their model [SEP-8] to understand its significance to our understanding of inheritance. Make and use a model that incorporates some of the features of Watson and Crick's 1953 model. How does the model you have built carry information? What happens if you change a component of the model [SEP-2] [LS1.A] [LS3.A] [CCC-2]? The discovery of DNA's structure paved the way for modern genetics, including the continuing study of how changes in DNA (mutations) affect the phenotype of organisms. Explain how the experiments of Mendel with peas and Thomas Hunt Morgan with fruit fly mutations provided 	<p>model [SEP-2] to predict the effect of mistakes in DNA replication or in the cell cycle process [CCC-7]. Analyze data [SEP-4] to show that environmental stimuli can affect events in the cell cycle.</p> <ul style="list-style-type: none"> Explain why organisms need to maintain a relatively stable state, called homeostasis, even though the environment around them may be fluctuating. Describe examples to show how the body works as a set of interacting systems [CCC-4] to maintain this stable state. Conduct an investigation [SEP-3] of the body's response in different individuals [SEP-1] [LS1.A] [CCC-7] [HS-LS1-3]. Use diagrams or other conceptual models to explain [SEP-2] the role of feedback mechanisms in homeostasis. Distinguish between negative feedback and positive feedback and explain why negative feedback loops are more common in biological systems. Using humans as an example, describe how feedback mechanisms between the body's systems maintain a relatively constant temperature [SEP-6] [LS1.A] [CCC-7] [HS-LS1-3]. Humans and other mammals use metabolism to generate the heat they need to maintain a constant body temperature (homeothermic endotherms). What is the cost of this process (thermoregulation)? How is this different from the mechanisms used by ectotherms such as reptiles? Predict the effect of body size on the ability for large and small animals to maintain body temperature when the environmental temperature fluctuates. Use an analogy [SEP-2] to model the behavior of a system with interacting components [LS1.A] [CCC-7]. How is your analogy like the interacting systems of the human body? Now create your own model of interacting systems in the human body, showing how outputs are affected by how the interacting parts respond to inputs [SEP-2] [CCC-2] [CCC-7] [HS-LS1-2]. Extend and refine your model to show how a disease such as cystic fibrosis affects the normal functioning of the body systems. Find out about how modern medicine has allowed us to diagnose and treat diseases or disorders so that homeostasis is restored. Make an evaluation of the feasibility of treatments and their success (considering costs and benefits) and communicate your findings as an oral report, poster, or infographic [SEP-8] [LS1.A] [CCC-2]. <p>IS6</p> <ul style="list-style-type: none"> Describe examples of ecosystems that appear stable over time and those that seem to change dramatically. Using evidence from real ecosystems [SEP-7], construct an argument for the stability or change [CCC-7] in ecosystems over time. Describe factors that might cause an ecosystem to change so dramatically that it cannot recover its original state. Use evidence from populations to evaluate the effect of ecosystem change on populations [SEP-7] [LS2.C] [LS4.C] [CCC-7] [HS-LS2-6] [HS-LS4-5] [EP&Gs: V]. Develop and use a model to show how populations might change in response to a shift in climate [SEP-2] [LS2.C] [CCC-7]. Explain how some individuals within a population might respond differently to changes in temperature and explain how this might influence the ability of these populations to adapt to climate change [LS4.C]. Describe evidence that documents changes in the Earth's climate. Create and use simple models [SEP-2] of the Earth's energy budget to illustrate the flows of energy into, within, and
--	---	---

Biology Curriculum, Instruction & Assessment

	<p>early evidence for the role of chromosomes as the carriers of genetic material [SEP-1] [LS3.A] [CCC-2] [HS-LS3-2].</p> <ul style="list-style-type: none"> • Use information from phenotype studies to explore the effect of heritable single gene mutations on phenotype and the occurrence of specific diseases (polycystic kidney disease and sickle cell disease) [SEP-1] [LS3.A] [CCC-2] [HS-LS3-1]. Obtain information [SEP-8] about how genotype matching is used to match patients for organ and tissue transplants. What genes are important in tissue typing and why? • Provide evidence from variation from your own observations [SEP-7] and explain how variation arises through mutation and sexual reproduction. use a physical model to visualize and provide evidence for how sexual reproduction produces variation in populations [LS3.B] [CCC-2] [HS-LS3-2]. • Provide examples as evidence that some mutations may be viable but result in a genetic disease. These may be autosomal mutations or sex chromosome mutations. Explain how mutations may be beneficial in some circumstances or in some environments [LS3.B] [CCC-2] [HS-LS3-2]. • Use Punnett squares as a mode [SEP-2] to show how variation can arise from the mating of two biological parents. Analyze [SEP-4] the quantity and proportion [CCC-3] of possible outcomes to explain the variation we see in the offspring of genetic crosses (including in the inheritance of genetic diseases) [LS3.B] [HS-LS3-3]. • Use pedigrees as another mode [SEP-2] to look at patterns of inheritance across generations. Evaluate possible genetic combinations and predict the chances of traits appearing in certain individual offspring [SEP-7] [LS3.B] [CCC-1] [HS-LS3-1]. • Describe examples to show how the environment can affect expression of the phenotype. Analyze the frequency or distribution [SEP-5] of traits in a real population to construct an argument [SEP-7] for the effect of environment on phenotype [LS3.B] [CCC-2] [HS-LS3-2]. • Draw connections between the variation in populations and how selection acts on the phenotype of the individuals within those populations. Analyze data from real populations [SEP-4] to explain [SEP-6] how the frequencies of particular traits can change from generation to generation [CCC-1] [CCC-2] and how populations adapt and evolve [LS4.B] [LS4.C] [HS-LS4-2] [HS-LS4-3]. Recall how some mutations may have a selective advantage in some situations. How does the frequency of these mutations globally provide evidence for their origin and spread or for their selective advantage in certain environments [SEP-4] [SEP-7] [LS4.B] [LS4.C] [HS-LS4-2] [HS-LS4-3]. <p>Vocabulary <u>IS3</u> absolute dating, relative dating, stratigraphy, sedimentary rock, weathering, deposition, erosion, homology, analogy, taxon, cladogram, variation, fitness, natural selection, adaptation, convergence, antibiotic resistance, speciation, plate tectonics, continental drift</p>	<p>out of the Earth system [SEP-5]. Explain the Greenhouse Effect and understand the significance to life on Earth. Analyze and interpret data relating to the increase in greenhouse gases in the atmosphere [SEP-4] and construct an evidence-based argument for the relationship between increases in greenhouse gases and climate change and the role of humans in this [ESS3.C] [ESS3.D] [CCC-3] [CCC-7] [HS-ESS3-5].</p> <ul style="list-style-type: none"> • Describe how the cause and effect relationship between greenhouse gases and global temperature is complicated by negative (counterbalancing) and positive (reinforcing) feedback loops within and between the Earth's various systems [CCC-2] [CCC-4]. Create and use a simple model [SEP-2] to show how an increase in the Earth's surface temperature can create a reinforcing feedback loop and then investigate this using a model of ice sheet melting [SEP-2] [SEP-3] [ESS3.D] [CCC-7] [HS-ESS3-5]. • Explain how scientists develop, use and test climate models to predict the effects of increased greenhouse gases on the Earth's systems [CCC-4] (sea level changes or changes to the distribution of crops or diseases) [ESS3.D] [CCC-7] [HS-ESS3-5]. Evaluate the evidence for changes in populations predicted under different climate change scenarios [SEP-7] [LS4.C] [CCC-2] [CCC-7] [HS-LS4-5]. • Analyze and interpret data about the effects of climate change on sea levels in coastal parts of the US. Explain how modeling can help us to understand and predict future sea level changes and mitigate their effects on the organisms affected [SEP-5] [ESS3.D] [CCC-2] [CCC-7] [HS-LS3-5]. • Use a computational representation to illustrate the relationships among Earth's systems and how human activities are modifying them [SEP-5] [ESS3.D] [CCC-4] [HS-ESS3-6]. • Use examples to illustrate how humans, through their ability to model and predict changes in the Earth's climate, are finding out more about how the Earth's systems interact and are altered by human activity [ESS3.D] [CCC-4]. • Design, evaluate, and refine a solution for reducing the effect of human-induced climate change of biodiversity [SEP-6] [LS2.C] [LS4.D] [ESS3.C] [ETS1.B] [CCC-7] [HS-LS2-7] [HS-ESS3-4] [HS-ETS1-3]. <p>Vocabulary <u>IS5</u> cells, prokaryote, eukaryote, multicellular, unicellular, differentiation, genes, protein, amino acid, transcription, translation, mutations, homeostasis, negative feedback, positive feedback <u>IS6</u> succession, adaptations, climate change, Greenhouse Effect, greenhouse gases, feedback loops (positive and negative), biodiversity</p>
--	--	---

Biology Curriculum, Instruction & Assessment

	<p><u>IS4</u> chromosomes, traits, inheritance, heredity, phenotype, genotype, Punnett squares, variation, mutations, autosomal chromosomes, sex chromosomes, sexual reproduction, asexual reproduction, pedigree, epigenetics, allele, dominant, recessive</p>	
Assessment	<ul style="list-style-type: none"> • Formative: Observations, questioning, discussing, journal, assignments, projects, quizzes (not graded), exit tickets, written responses, graphic organizers, concept maps, self assessments, oral presentations. • Summative: Cumulative work, final portfolio, end of unit test, research paper, lab report. 	<ul style="list-style-type: none"> • Formative: Observations, questioning, discussing, journal, assignments, projects, quizzes (not graded), exit tickets, written responses, graphic organizers, concept maps, self assessments, oral presentations. • Summative: Cumulative work, final portfolio, end of unit test, research paper, lab report.
Performance Tasks	<p>Lab reports, projects, presentations, portfolios, performances, problem-solving.</p>	<p>Lab reports, projects, presentations, portfolios, performances, problem-solving.</p>