Carolina Kits | 3D® FLEX Digital

for Environmental Science

A full year of high school environmental science investigations that provide flexible learning solutions for remote or at-school labs.

www.carolina.com
What is Carolina Kits 3D® FLEX Digital for Environmental Science?

A curated set consisting of 17 digital investigations from our biology and earth science programs that can be conducted entirely online.

**How are the investigations structured?**

Each set of investigations begins with a phenomenon that students seek to explain as they participate in digital student investigations and digital teacher demonstrations. The activities are designed around students engaging in science and engineering practices and crosscutting concepts as they build their understanding of the disciplinary core ideas.

**Digital Student Investigations**

Students engage in authentic data collection online while they watch videos, view images, and work through interactive lessons.

**Teacher Digital Demonstrations**

Teachers use videos of demonstrations to solicit observations and reasoning from students. These videos have no audio, which provides teachers the opportunity to differentiate for their classes.

**What else comes with the package?**

**To provide greater flexibility we’ve also included:**

- 4 sets of investigations that can be conducted as hands-on remote investigations.
- 7 sets of investigations that can be conducted as hands-on investigations when students are in the classroom.
- Full in-class, hands-on instructions for each of the 16 digital laboratory investigations.

**To get the materials for any of these hands-on options you can:**

- Order the classroom kit and split apart the materials to make individual student kits.
- Consult the provided materials list to put together your own materials. Use the materials that you already have and order those that you don’t.

**Whether at home or in class, Carolina Kits 3D® FLEX Digital helps teachers connect students to a true laboratory experience.**
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**Algae Bead Photosynthesis**
Builds towards NGSS Performance Expectation HS-LS1-5
*Description:* Produce a refined model of photosynthesis that includes the role light wavelengths play in the photosynthesis process.
*Science Topics Included:* Photosynthesis; Cellular respiration

**Investigating Aerobic and Anaerobic Respiration in Yeast Beads**
Builds towards NGSS Performance Expectation HS-LS1-7
*Description:* Students use evidence from collected data to construct and revise a model of the cycling of carbon and flow of energy in aerobic and anaerobic systems.
*Science Topics Included:* Aerobic respiration; Anaerobic respiration; Fermentation; Cellular respiration

**Contributors to the Carbon Cycle**
Builds towards NGSS Performance Expectation HS-LS2-5
*Description:* Create and refine a small-scale model of the carbon cycle in a closed freshwater system by collecting evidence about plants and animals and their interactions, in daylight and dark environments.
*Science Topics Included:* Carbon cycle; Matter cycles; Photosynthesis; Cellular respiration

**Modeling the Carbon Cycle**
Builds towards NGSS Performance Expectations HS-ESS2-6 and HS-ESS3-6
*Description:* Students develop models showing the biological, geological, and anthropogenic impacts to the carbon cycle.
*Science Topics Included:* Carbon cycle; Biogeochemical cycles; Anthropogenic, biological, and geological processes in the carbon cycle

**Coevolution of Earth’s Systems**
Builds towards NGSS Performance Expectations HS-ESS2-7 and HS-ESS2-2
*Description:* Students collect evidence on how feedback between the biosphere and other Earth systems causes a continuous co-evolution of Earth’s surface.
*Science Topics Included:* Earth’s systems; Banded iron formation; Photosynthesis; Precipitation reactions; Composition of the atmosphere

**Building Ecological Pyramids**
Builds towards NGSS Performance Expectation HS-LS2-4
*Description:* Construct a model food chain based on the contents of an owl pellet and consider energy transfer between trophic levels.
*Science Topics Included:* Food chains; Energy pyramids; Energy transfer; Efficiency of energy transfer

**Carrying Capacity and Algal Blooms**
Builds towards NGSS Performance Expectation HS-LS2-1
*Description:* Conduct an investigation to test the effects of different concentrations of nutrient solution on algal growth and apply the results to explain the ecological phenomenon of algal blooms.
*Science Topics Included:* Carrying capacity; Population growth; Exponential growth; Logistic growth; Limiting factors

**Group Behavior and Social Insects**
Builds towards NGSS Performance Expectation HS-LS2-8
*Description:* Evaluate evidence from two different insect species that communication and cooperative behaviors can increase the chances of survival.
*Science Topics Included:* Animal behavior; Animal communication; Pheromones; Experimental design

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<th>Description</th>
<th>Science Topics Included</th>
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<td>Seafloor Spreading and Crustal Rocks</td>
<td>HS-ESS1-5</td>
<td>Description: Students use different types of evidence to support the idea of seafloor spreading and to explain the relative ages of oceanic and crustal rocks.</td>
<td>Age of crustal rocks; Age of oceanic rocks; Seafloor spreading; Core sampling; Magnetic seafloor data; Plate tectonics</td>
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<td>Plate Tectonics and Island Formation</td>
<td>HS-ESS2-3 and HS-ESS2-1</td>
<td>Description: Students seek to describe the formation of the Hawaiian Islands as they construct an explanation of how matter cycles in Earth’s interior and apply it to the movement of Earth’s plates.</td>
<td>Island formation; Volcano formation; Tectonic plates; Hotspots; Convection currents; Density</td>
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<td>Transformative Properties of Water</td>
<td>HS-ESS2-5</td>
<td>Description: Students investigate the properties of water and how they affect Earth’s materials and processes as they seek to understand how water can change rock.</td>
<td>Properties of water; Mechanical weathering; Chemical weathering; Frost wedging</td>
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<td>Modeling Destructive Earth Processes</td>
<td>HS-ESS2-1</td>
<td>Description: Students use models to explore destructive Earth processes such as sinkholes, landslides, and glaciers as students discover mechanisms that cause changes in Earth’s features.</td>
<td>Sinkholes; Landslides; Glaciers; Change’s in Earth’s features; Surface processes; Internal processes</td>
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<td>Succession on Mount St. Helens</td>
<td>HS-LS2-6</td>
<td>Description: Analyze the eruption and biotic changes on Mount St. Helens since the 1980 eruption to produce evidence for the succession stage directly after the eruption and 30 years past.</td>
<td>Biodiversity; Succession; Impact on human systems</td>
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<td>DNA Damage: Studying the Impact of UV Light</td>
<td>HS-LS3-2</td>
<td>Description: After investigating the effect ultraviolet light has on different strains of yeast cells, students design an experiment to test the effectiveness of different ultraviolet preventatives.</td>
<td>Adaptations; Variation of traits; Experimental design; DNA repair enzymes</td>
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<td>Natural Selection</td>
<td>HS-LS4-3</td>
<td>Description: Use a simulation of moth populations and environmental changes to develop the concept of genetic equilibrium which is confirmed or rejected through allele frequency calculations.</td>
<td>Evolutionary relationships; Anatomical characteristics; Amino acid sequencing; Cladograms; Phylogenetic trees; Biological evolution; Common ancestry</td>
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<td>Antibiotic Sensitivity</td>
<td>HS-LS4-4</td>
<td>Description: Gather laboratory evidence of bacterial antibiotic sensitivity and construct an explanation for how antibiotic resistant bacteria evolve.</td>
<td>Antibiotic sensitivity; Evolution; Natural selection; Adaptation; Antibiotic resistance</td>
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Modeling Population Genetics and Evolution

Builds towards NGSS Performance Expectation HS-LS3-3

Description: Gather evidence of phenotypes and allele frequencies in genetic corn to determine if changes in allele frequencies provide evidence of an evolving population.

Science Topics Included: Natural selection; Adaptation; Evolution; Genetic equilibrium; Allele, Genotype, and Phenotype frequencies; Hardy-Weinberg equilibrium

Cladograms and Evolution

Builds towards NGSS Performance Expectation HS-LS4-1

Description: Use external features and DNA evidence to argue evolutionary relationships among a set of organisms.

Science Topics Included: Evolutionary relationships; Anatomical characteristics; Amino acid sequencing; Cladograms; Phylogenetic trees; Biological evolution; Common ancestry

Climate Variation

Builds towards NGSS Performance Expectations HS-ESS2-4 and HS-ESS2-2

Description: Students describe the major processes that lead to Earth’s climate variation as they explore the mechanisms that produce the patterns seen on a Köppen-Geiger climate map.

Science Topics Included: Climate; Solar energy; Earth’s tilt, Light intensity; Impact of Earth’s surfaces on energy absorption; Convection currents; Coriolis effect; Köppen-Geiger climate map

Climate Patterns and Species Distribution

Builds towards NGSS Performance Expectation HS-LS2-2

Description: Conduct an investigation to gather evidence and make a claim regarding taxonomic diversity of protists at different temperatures.

Science Topics Included: Species distribution; Climate patterns; Adaptations; Population size

Plate Tectonics and Island Formation

Transformative Properties of Water

Modeling Destructive Earth Processes

Antibiotic Sensitivity

Hands-on Remote Investigation  Digital Teacher Demonstration  Digital Student Investigation  No Remote Option Available (In-class only)
Earth Systems and Climate Change
Builds towards NGSS Performance Expectations HS-ESS3-5 and HS-ESS2-2
Description: Explain how the ocean, the atmosphere, and the biosphere interact while investigating climate change in the classroom as they explain the degradation of calcium carbonate shells in pteropods.
Science Topics Included: Interactions in the atmosphere, biosphere, and geosphere; Climate change; Ocean acidification; Carbon dioxide concentrations

Analyzing Patterns in Climate Change
Builds towards NGSS Performance Expectation HS-ESS3-5
Description: Through analysis of tree ring data students collect indirect evidence about how the climate of a region has changed over time.
Science Topics Included: Climate; Climate change; Indirect evidence; Proxy data

Changing Ecosystems
Builds towards NGSS Performance Expectation HS-LS2-6
Description: Through a simulation card game, develop a model of an unstable ecosystem using evidence of population changes due to habitat changes in a temperate forest.
Science Topics Included: Biodiversity; Population size; Habitat loss; Pollution; Overharvesting; Climate change; Invasive species

Endangered Species
Builds towards NGSS Performance Expectation HS-LS4-5
Description: Use evidence to support claims for how changes in environmental conditions may result in the extinction of a species.
Science Topics Included: Endangered species; Threatened species; Extinction; Conservation efforts; Threats to species (human and natural)

Hydroponics and Sustainability
Builds towards NGSS Performance Expectation HS-ESS3-3
Description: Students explore hydroponics and explain its uses and limitations as a tool to help sustain human populations and manage natural resources.
Science Topics Included: Hydroponics; Urbanization; Natural resources; Sustainability

Analyzing Wind Power Potential
Builds towards NGSS Performance Expectations HS-ESS3-4 and HS-ETS1-3
Description: Students build and refine a design for a wind turbine and analyze constraints as they evaluate sites for a proposed wind turbine.
Science Topics Included: Wind power; Alternative energy; Energy production; Engineering; Criteria and constraint

Biofuels
Builds towards NGSS Performance Expectation HS-LS2-3
Description: Students design and engineer an apparatus to capture and measure the production of gas during fermentation. The role of enzymes and microbes in the production of ethanol biofuel is investigated.
Science Topics Included: Biofuel production; Cellular respiration; Anaerobic fermentation; Matter cycling; Carbon cycle

Oil Spill Bioremediation
Builds towards NGSS Performance Expectation HS-LS2-7
Description: Using manipulatives, generate a procedural model of the flow of information through DNA translation and transcription of a region on the beta-hemoglobin gene then apply the model to the mutation associated with sickle-cell disease and its associated physiological effects.
Science Topics Included: Bioremediation; Human impact on ecosystems; Biodiversity; Endangered species
Carolina Kits 3D® FLEX Digital is also available for Biology!

Carolina Kits 3D® FLEX Digital is also available for Chemistry!

Carolina Kits 3D® FLEX Digital is also available for Earth and Space Science!

For more information about Carolina Kits 3D® FLEX Digital, visit us online at www.carolina.com/flex-digital