

## Environmental Health

**Context:** From farms to cities, environmental contaminants impact ecosystem and human health. In this unit, students explore a field of biology that affects all of us, and investigate the following question: **How can we use plants and other living things to remove toxins from our environment?** One way to address environmental contaminants is to use a process called bioremediation, in which bacteria, fungi, or plants remove contaminants from a natural area. By studying this process, students will strengthen connections between their everyday practices, their communities, and the environment, and learn about cellular and organismal structures and processes that help remove contaminants from the environment.

**Project:** Students carry out studies testing the efficacy of various species of fast-growing plants (brassica spp) in removing metals and other contaminants from water. They analyze and graph their experimental data and communicate their findings in a formal research report, which is critiqued by peers and experts.

**Approach:** Students design and conduct experiments to understand how plants can be used to remove chemical contaminants from environments, a process called phytoremediation. They report the implications of their scientific work to their peers and professionals in scientific and environmental fields via a digital presentation.

**Literacy Design Collaborative (LDC) Template Task:** Students will engage in extended reading and scientific writing as they maintain a research journal and complete research design plans outlining their investigations.

**LDC Task:** After researching background information on contaminants in the environment and phytoremediation, write a research plan that poses a testable scientific question, discusses why the question is important, states a hypothesis related to your question, outlines the methods you will use to investigate your question, and describes how you will know if your data does or does not support your hypothesis. **(Informational or Explanatory/Procedural-Sequential)**

**Expert Involvement:** At the beginning of the unit, experts and students get to know each other through a forum discussion in which the students and experts ask and answer questions about each other. Experts review and provide feedback to students on their experimental design and the final analysis of their data collection. Students revise their work in response to expert feedback.

**Digital Tools:** digital survey; transpiration simulation; osmosis simulation; interactive cells simulation.

<b>Primary Standards: Next Generation Science Standards- Performance Expectations</b>
<ul style="list-style-type: none"> <li>• HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.</li> </ul>
<ul style="list-style-type: none"> <li>• HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.</li> </ul>
<ul style="list-style-type: none"> <li>• HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.</li> </ul>
<ul style="list-style-type: none"> <li>• HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.</li> </ul>
<ul style="list-style-type: none"> <li>• HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.</li> </ul>
<ul style="list-style-type: none"> <li>• HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.</li> </ul>

- 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.
- HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.\*

**Primary Standards: CC Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects**

- WHST 9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- WHST 9-10.7 Conduct short, as well as more sustained, research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

**Primary Standards: CC Reading Standards for Literacy in Science and Technical Subjects**

- RST.9-10.10. By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.