



Environmental and Human Health

Driving Question:
How can plants and
other living things save
our polluted planet?

Context: From farms to cities, environmental contaminants impact ecosystem and human health. In this unit, students explore a field of biology that affects us all. 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 strengthen connections between their everyday practices, their communities, and the environment.

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

Approach: To better understand the problem, students explore food chains, biomagnification, plant and animal cells, photosynthesis, carbon and nitrogen cycles, transpiration and the water cycle. They design and conduct experiments to

understand how plants can be used to remove chemical contaminants from environments. They report the implications of their scientific work to their peers and professionals in scientific and environmental fields via a digital presentation.

Expert Involvement: Classrooms that choose to use experts invite them to answer questions about phytoremediation in a discussion board. Experts review and provide feedback to students on experimental design and the final analysis of their data collection.

Primary Standards: Next Generation Science Standards- Performance Expectations

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.

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.

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.

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.

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.

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.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

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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.

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.