uBEATS Teacher's Guide:

Water and Health

This teacher guide is a supplementary text to support the use of the uBEATS "Water and Health" module for grades 6-12.

To help students develop the knowledge necessary for an incredible future in health care, we created UNMC Building Excellence in Academics Through STEM (uBEATS), an online health science resource for Nebraska students.

UNMC uBEATS modules are short (15 minutes or less), interactive online health science modules to supplement curriculum taught in grades 6 – 12. These do not replace curriculum, but they are a supplement for teachers and students incorporating evidence-based information and UNMC expert guided material. Each module is chunked into sections with formative and summative assessments with immediate feedback provided.

Tips on how to utilize uBEATS modules:

- Internet access is required to view uBEATS modules.
- For those who have access to one-to-one technology, modules can be used in or outside of the classroom as a topic introduction, extension, or review. For classrooms without individual student devices, modules can be used in whole group instruction. Formative assessment questions can use the teacher's preferred call and response method and summative assessment questions can be displayed on the board and answered individually by students or printed and distributed to students after viewing the module.

Objectives

- Describe the water cycle.
- Understand the importance of water to life.
- Recognize relationships between human activities, water scarcity, water quality degradation, and ecological and health consequences.
- Understand how water can become contaminated.
- Understand what individuals, governments, and communities can do to help protect water.

Introduction

"Thousands have lived without love, not one without water."

-- W. H. Auden

Water, it's everywhere, not just in the physical sense, but water has been integrated into our culture. From sacred rivers to fountains of youth to the foundation of Maslow's Hierarchy of Needs. It is destructive. It is life-giving. Our life is centered around water. Therefore, as a community, we need to share and take care of our water resources.

Prior Knowledge

Before beginning this module, the teacher should understand the Next Generation Science Standards (NGSS) featuring Three-Dimensional Learning.

Core Idea LS4.D: Biodiversity and Humans. A Framework for K-12 Science Education

Human beings are part of and depend on the natural world. Biodiversity—the multiplicity of genes, species, and ecosystems—provides humans with renewable resources, such as food, medicines, and clean water. Humans also benefit from "ecosystem services," such as climate stabilization, decomposition of wastes, and pollination that are provided by healthy (i.e., diverse and resilient) ecosystems. The resources of biological communities can be used within sustainable limits, but in many cases humans affect these ecosystems in ways—including habitat destruction, pollution of air and water, overexploitation of resources, introduction of invasive

species, climate change—that prevent the sustainable use of resources and lead to ecosystem degradation, species extinction, and the loss of valuable ecosystem services.

National Academies of Sciences, Engineering, and Medicine. 2012. A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Washington, DC: The National Academies Press. https://doi.org/10.17226/13165.

Science and Engineering Practices NGSS

Analyzing and Interpreting data

Crosscutting Concepts NGSS

Cause and Effect

Key Terms/Vocabulary

Water cycle, evaporation, condensation, precipitation, water phases, gas, liquid, solid, water vapor, atmosphere, solar energy, percolation, transpiration, sublimation, deposition, greenhouse gas, positive feedback loop, drought, impurities, degradation, contamination, universal solvent, photosynthesis, reagent, ecological health, deforestation, reforestation, urbanization, agriculture, anthropogenic climate change, geological epoch, Holocene, hectare, topsoil runoff, sediment, biodiversity, impermeable, urban heat island effect, irrigation, aquifer, filtration, erosion, watershed, salinization, heavy metals, sodium, nitrogen, phosphorous, microbial contaminants, pesticides, leaching, nitrate contamination, algal bloom, dead zone, eutrophication, hypoxic, acidification, carbonic acid, calcium carbonate, pH, diarrhea, cholera, typhoid, hepatitis, polio, dysentery, lead, copper, arsenic, salts, bleach, pharmaceuticals, cardiovascular, neuronal, renal.

Science Standards

Nebraska's College and Career Ready Standards for Science 2024

Nebraska Science Standards

Weather and Climate: SC.HS.12

Extensions of the lesson

To help students become more familiar with the Key Terms of this module, the teacher can use the vocabulary list for a classroom Word Wall, or integrate the vocabulary into classroom word games during review sessions.

Encourage students to check current events for the latest news involving water-related effects of climate change and global warming, including: the status of Lake Mead; water disputes between Nebraska and Colorado; water disputes between Kansas and Nebraska; water quality issues.

As student misconceptions become apparent, the teacher may need to reinforce these important concepts:

- Water is essential for all life. Sadly, not all people have equitable access to clean water.
- Water can also be destructive. Life depends on a delicate balance between too little and too much water.
- As Planet Earth travels through Space, the water cycle keeps us from using up all of the water on Earth. However, over the most recent 200 years, the human population has grown so much that it is changing the water cycle. Urbanization, agriculture, and industrialization risk using too much water too fast, while forests and other natural filtering systems are being reduced.
- Humans must protect Earth's water cycle and water supplies by taking these actions:
    - Stop wasting water.
    - Reduce water contamination.
    - Protect water supplies from hazardous chemicals.
    - Slow the process of global warming.
    - Preserve forests and other ecological systems.
- These are only a few of the necessary remedies, but they must be encouraged on the personal level as well as throughout all communities.

Enrichment

Contact your local county Health Department to ask about the effects of climate change on water quality and water availability in your own community.

The World Health Organization (WHO) provides more information at Climate Change and Health.

Examples of classroom activities to explain the water cycle can be found at Water Cycle Lessons.

The Nature Conservancy offers ideas: Protect our Watersheds.