uBEATS Teacher's Guide:

Radon & Cancer

(Grades 6-12)

This teacher guide is a supplementary text to support the use of the uBEATS Radon & Cancer 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 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

- What radon is, and where it comes from
- How radon can enter your home and affect your health
- How to detect radon and reduce radon levels in your home

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Introduction

What causes cancer? Cancer researchers are still working to figure this out. However, we do know that there are specific environmental hazards that can cause cancer, sometimes referred to as “carcinogens.” In this module, we will be learning about one carcinogen called radon, and how it affects our lungs and causes cancer. Now that might sound a little bit scary. Well, don’t worry. As with most risk factors, knowledge is the key to keeping you and your family safe and healthy.

This module will be teaching you about radon and how it can enter your home. We will teach you how to conduct a radon test in your own home with the permission of your parents. Last, we will also talk about what you can do if you find high levels of radon in your home.

Prior Knowledge

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

Core Idea PS1.C: Nuclear Processes

Because of the high-energy release in nuclear transitions, the emitted radiation (whether it be alpha, beta, or gamma type) can ionize atoms and may thereby cause damage to biological tissue. A Framework for K-12 Science Education.

Core Idea LS3.A: Inheritance of Traits

Mutations also cause variations, which may be harmful, neutral, or occasionally advantageous for an individual. Environmental as well as genetic variation and the relative dominance of each of the genes in a pair play an important role in how traits develop within an individual. Complex relationships between genes and interactions of genes with the environment determine how an organism will develop and function. A Framework for K-12 Science Education.

Core Idea ESS3.B: Natural Hazards

By the end of grade 5. A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions, severe weather, floods, coastal erosion). Humans cannot eliminate natural hazards but can take steps to reduce their impacts. A Framework for K-12 Science Education.

Science and Engineering Practices NGSS

- Asking questions and defining problems (cancer)

Crosscutting Concepts NGSS

- Cause and Effect
- Systems and system models

Key Terms/Vocabulary

Radon, radium, uranium, thorium, element, Earth's crust, cancer, carcinogen, gas, environment, toxin, radioactivity, ionizing radiation, Marie Curie, unit of measurement (Ci), pCi/L, alpha radiation, beta radiation, gamma radiation, Environmental Protection Agency (EPA), regulation, detection, mitigation, Centers for Disease Control and Prevention (CDC), inhalation, DNA, mutation, tumor, Active Soil Depressurization (ASD), ventilation.

Science Standards

Nebraska Science Standards

High School Physical Sciences: SC.HS.3.3

Structure and Properties of Matter

High School Physical Sciences: SC.HS.5.5

Chemical Reactions

High School Life Sciences: SC.HS.9.4

Heredity: Inheritance and Variation of Traits

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 radon and lung cancer.

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

- Radon gas occurs naturally all around us, but we cannot see, taste or smell it.
- Radon gas comes from the soil and it can affect the air quality inside a house.
- Radon is the second leading cause of lung cancer (cigarette smoking is the leading cause).
- Radon safety includes finding out (detection) if your home has too much radon, followed by actions (mitigation) to make the home safer.

Enrichment

- For information about Healthcare Career Opportunities, see UNMC's Careers in Healthcare.
- To learn more about the **YES! Program** that helped fund this learning module, see Youth Enjoy Science.
- To learn more about the **Native Indigenous Centered Education** program of the Omaha Public Schools which helped the development of this Radon module, see NICE.
- Encourage students to read the EPA's **A Citizen's Guide to Radon** at EPA.
- For a classroom activity about the movement of radon from the soil into homes, see the EPA's RadTown Radon Activity 1: Ground Up.
- For a video (4:40) about radon detection and mitigation, see Facts about Radon Gas -- It's Deadly.
- To study the correlation between the Nebraska Science Standards and the Next Generation Science Standards (NGSS) see the Crosswalk.