

Curriculum Summary

Dartmouth Rural STEM Educator Partnership

An educational outreach project funded by SEPA-NIGMS

Climate and Disease - Human Health	
Lesson	Brief Description
Lesson 1: Mystery disease	In this lesson, students will learn about how the human body responds to invasion by germs. The main focus is on the immune system and its role in defending us from infections.
Lesson 2: Bacterial growth	In this lesson, students will grow bacteria from their hands on agar plates. They will compare differences in bacterial growth using hand sanitizer and antibiotics.
Lesson 3: Disease vectors	A discussion of various vectors through which diseases can move from host to host.
Lesson 4: Vector identification	Students will review fictional case studies of people suffering from Lyme disease in an attempt to identify the vector for Lyme disease.
Lesson 5: Agar plate analysis	Microbes (bacteria) are found almost everywhere, but are nearly always too small to be seen by the unaided eye. Given ideal environmental conditions (incubation) and an abundance of nutrients (agar plates), bacteria can grow quickly, and form colonies that are easily seen by the naked eye.

Climate and Disease - Ticks	
Lesson	Brief Description
Lesson 1: Ticks 101	In this lesson, students will learn how to use a microscope in order to make observations about tick samples.
Lesson 2: Tick life cycles	In this lesson, students will learn about the tick life cycle and tick questing behavior. Students will also learn how tick activity changes seasonally through a graphing activity.
Lesson 3: Food Webs	In this lesson, students will learn about food webs, and how ticks are connected to other species in a food web.
Lesson 4: Transmission of Lyme disease	This lesson will help to teach students about bacterial and viral infection. Specifically, it will teach students how Lyme disease is transmitted from one host to another via a vector (tick). This lesson includes a brief presentation and a game for students to play to learn more about disease transmission.
Lesson 5: Reflections	In this lesson students will reflect on what they have learned so far. They will compile all of the information into a form of their choice.

Climate and Disease - Weather and Climate Change

Lesson	Brief Description
Lesson 1: Weather vs. Climate	Students will collect data and interpret graphs to gain an understanding that climate is the long-term behavior of temperature and precipitation in a region whereas weather involves short term fluctuations that are essentially random.
Lesson 2: Greenhouse gas experiment	Students will develop hypotheses about the role of gasses in the atmosphere and how they do or do not impact climate. Students will test these hypotheses by developing an experiment that quantifies how much CO ₂ affects air's ability to absorb heat from light.
Lesson 3: Carbon footprint	In this lesson students will first learn about how and why gasses are contributing to climate change. Then they will calculate their carbon footprint and brainstorm ideas to cut it down.
Lesson 4: Historical climate data	Students will be able to describe the difference between weather and climate by observing and analyzing weather and climate changes over time in two cities, Hanover, NH and Phoenix, AZ.
Lesson 5: Climate and tick-borne illness	Students will investigate the impact of increasing temperatures on tick questing behavior in a card game format. A subsequent collective group discussion will link global warming -> increased questing behavior -> increased tick-borne illnesses.
Lesson 6: The future?	Students will create a report, poster, podcast, or video to describe what the future looks like for ticks, Lyme disease, and climate.

Terraria

Lesson	Brief Description
Lesson 1: Experimental variables	In this lesson students will explore different experimental variables that could be used to answer questions about plant growth and health such as light, humidity, seeding density, soil composition, water, and fertilizer. Students will design experiments to help them answer hypothesis-driven questions.
Lesson 2: Measuring Outcomes	In this lesson students will develop skills and knowledge while measuring and recording changes in plant health characteristics. They will form and test hypotheses that guide their learning about how experimental conditions affect plant growth.

Forensic Science

Lesson	Brief Description
Lesson 1: Blood spatter	In this lesson students will make fake blood and use it to simulate blood spatter. They will then use scientific tools to record observations between height the blood was dropped and the diameter of the blood droplets.
Lesson 2: Blood typing	Students will learn about chemical reactions by experimentally determining the "type" of a mystery simulated blood sample.
Lesson 3: Fingerprinting	In this lesson students will observe that fingerprints are unique and can be used to identify individuals.
Lesson 4: Gel electrophoresis	In this lesson students identify a suspect using DNA electrophoresis, which separates DNA fragments based on size.
Lesson 5: Chromatography - Ink Analysis	A ransom note is left in the classroom. Students are tasked with collecting pens from suspects and using chromatography/component analysis to determine who wrote the note.
Lesson 6: Fiber analysis	Students use microscopes to analyze different fibers and match unknown fibers to those in a database.
Lesson 7: Motion Sensors	Students will learn how heat affects the ability of motion sensors to identify movement. Additionally, students will learn ways to avoid detection by altering heat signatures by using different materials.
Lesson 8: Shoeprint Analysis	Students will examine their own shoes and those of their peers, identify unique characteristics, and make comparisons. They will then make a shoe-print cast and discuss how it represents individual evidence.