Closed Beach

Unit Overview

Students begin with trying to understand why their local recreation area is closed. The students will learn about the basics of food webs and ecosystems to understand that all life within an area is connected and impacts each other. Then they learn about photosynthesis, to help understand how all food webs begin with the sun and that energy flows through organisms and environments from there. Next, students tackle the understanding of how energy and matter are conserved and flow within an ecosystem. Next, they dive deeper into biodiversity, its importance, and how resource limitations affect ecosystems. The next focus is on how humans impact ecosystems and their reliance on resources from the environment. Once students have an understanding of all these concepts they tie it all together by revisiting their initial model of the closed recreation phenomenon and explain why it was closed. Finally, they create a design solution for a new recreation area that is able to maintain biodiversity and ecosystem services.

Performance Expectations

- MS-LS1-6 Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.
- MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.
- MS-LS2-2 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS2-3 Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.
- MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
- MS-LS2-5 Evaluate competing design solutions for maintaining biodiversity and ecosystem services.*
- MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Energy Drinks

Unit Overview

Energy drinks are very popular with kids today because they offer high doses of caffeine and sugar . Energy drinks can provide as much caffeine and sugar as one to three cups of coffee. Unfortunately, kids do not understand the health risks associated with the drinks. High amounts of sugar can cause weight gain or cause dental problems. Withdrawal from high amounts of caffeine can cause anxiety, irritability, or drowsiness. In this unit, students explore the chemistry of energy drinks and how the body processes chemical compounds.

Students are shown discrepant events related to the use of energy drinks: (1) advertisements for energy drinks and (2) news articles/videos showing that they end in death. Students debate whether or not energy drinks should be regulated. Students generate questions about energy drinks, their components and the effects of use.

Students investigate the differences between natural and synthetic substances. Students gather evidence and multiple sources of information (notes from the unit, and outside sources, if needed), as to the safety of energy drinks and whether energy drinks are worse for you than coffee or soda. Students research and then develop a final model that shows how chemical processes are used to create synthetic materials (Sucralose, caffeine) from natural resources. Students respond to the question of whether energy drinks should be regulated for those under 16 years of age.

Performance Expectations

- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.
- MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
- MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. *This PE is not fully accessible.

Lyme Disease

Unit Overview

Students are asked to depict how a host gets Lyme disease. Students explore the 7 common characteristics of living things, both unicellular and multicellular. In the transmission of Lyme disease, the deer tick, a multicellular organism, acts as the host for a spirochete, a unicellular organism. The systems of the two organisms work together to allow for the transmission of the disease to humans or other animals. Students investigate cellular structure and function to understand how scientists use this information about the bacterium to treat and prevent its transmission. Knowing the interactions between the body systems helps students to better understand the wide range of symptoms caused by the disease. Such system interactions include the sensory receptors and the brain, students investigate the different sense receptors and ultimately describe how a tick is able to embed itself in a host without the host sensing or perceiving the parasite. Students design a park minimizing the transmission of Lyme disease as well as providing information about Lyme disease for park visitors.

Performance Expectations

- MS-LS1-1 Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Bees

Unit Overview

This unit is about reproduction and growth and focuses on how systems interact between plants and animals, how plants have specialized structures, and how animals have specific behaviors to help aid reproduction. It includes how environmental and genetic factors can affect survival. It also provides evidence for the genetic variation that occurs with sexual reproduction and the lack of variation that occurs with asexual reproduction.

The anchoring phenomenon for this unit is the declining bee population. From videos, articles and other sources, students make observations, share prior knowledge, and ask questions about bee behavior and the bee/plant relationship. Then, students explore the structures of bees and flowers that are involved in sensing the environment, to explain how bees sense and respond to stimuli. Students research the impacts of humans on bee populations. Through virtual or physical dissection of flowers, students uncover ideas about the features that enable plant reproduction. Through videos and pictures, students uncover ideas about what animal behaviors impact reproduction. Students use this information- to better understand the interconnected relationships between pollinators (bees) and flowers and the impact that climate change has on the ability of these organisms to reproduce.

Students explore the different methods of reproduction both asexual and sexual for bacteria and more complex organisms. Students analyze the advantages and disadvantages of both sexual and asexual reproduction. Students explain how asexually reproducing bees could help or hurt the declining bee population. Students uncover the basic ideas about traits and inheritance. They take a survey of their own traits and then continue to build upon their learning by visiting online resources to learn about the genetics behind traits. Students then connect the idea of traits to the declining bee population, constructing an argument from evidence for which type of genetic trait or lack of it would most likely be leading to the declining bee population.

Finally, students construct punnett square models to predict the genotype and phenotype of offspring. Students look at how food such as corn and carrots have changed over time due to genetic engineering. Students then connect back to the declining bee population by compiling a list of factors that negatively impact it and then developing a possible solution to lessen this negative effect.

Performance Expectations

- MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- MS-LS1-4 Use arguments based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- MS-LS1-5 Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- MS-LS1-8 Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories.
- MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.
- MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.