Title: ***Chia Pets in Oily Situations***
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Background Information

Coastal wetland vegetation is essential to the coastal area because it provides a barrier for the local community, a nursery habitat for juvenile organisms, and a highly productive environment for the marine life. This form of vegetation has a very high potential to come in contact with pollution, originating from inshore or offshore sources, because it is in areas usually separating ocean from land. The most recent and notable offshore drilling incident was the BP Deepwater Horizon oil spill which was responsible for releasing millions of barrels of oil into the Gulf of Mexico and the surrounding coast. There are different types of oils and each has varying degrees of physical harm for proximal vegetation and soil, inducing and/or intensifying coastal erosion. The pollutant decays the root area of plants, creating a looser soil with a weaker support system.

Louisiana State Standards (Grade-Level Expectations)

SI GLE: Generate testable questions about objects, organisms, and events that can be answered through scientific investigations (SI-M-A1)
Use a variety of sources to answer questions (SI-M-A1)
Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)
Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2)

SI GLE: Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2)
Identify independent variables, dependent variables, and variables that should be controlled in designing an experiment (SI-M-A2)

SI GLE: Identify the difference between description and explanation (SI-M-A4)
Use data and information gathered to develop an explanation of experimental results (SI-M-A4)

SI GLE: Develop models to illustrate or explain conclusions reached through investigation (SI-M-A5)
Identify and explain the limitations of models used to represent the natural world (SIM-A5)

SI GLE: Use relevant safety procedures and equipment to conduct scientific investigations (SI-M-A8)
Given a description of an experiment, identify appropriate safety measures (SI-H-A7)
PS GLE: Differentiate between the physical and chemical properties of selected substances (PS-M-A3)
Compare physical and chemical changes (PS-M-A3)
PS GLE: Compare how heat is transferred by conduction, convection, and radiation (PS-MC5)
PS GLE: Assess environmental issues related to the storage, containment, and disposal of wastes associated with energy production and use (PS-H-G4)
SE GLE: Explain how the use of different energy resources affects the environment and the economy (SE-M-A6)
SE GLE: Determine the interrelationships of clean water, land, and air to the success of organisms in a given population (SE-H-C1)
SE GLE: Relate environmental quality to quality of life (SE-H-C2)
LS GLE: Analyze the movement of water across a cell membrane in hypotonic, isotonic, and hypertonic solutions (LS-H-A2)
LS GLE: Analyze positive and negative effects of human actions on ecosystems (LS-H-D4) (SE-H-A7)

Ocean Literacy Principles

Principle 1e: Most of Earth's water (97%) is in the ocean. Seawater has unique properties: it is saline, its freezing point is slightly lower than fresh water, its density is slightly higher, its electrical conductivity is much higher, and it is slightly basic. The salt in seawater comes from eroding land, volcanic emissions, reactions at the seafloor, and atmospheric deposition.

Principle 2c: Erosion—the wearing away of rock, soil and other biotic and abiotic earth materials—occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.

Principle 5i: Estuaries provide important and productive nursery areas for many marine and aquatic species.

Principle 6e: Humans affect the ocean in a variety of ways. Laws, regulations and resource management affect what is taken out and put into the ocean. Human development and activity leads to pollution (such as point source, non-point source, and noise pollution) and physical modifications (such as changes to beaches, shores and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

Time Requirement

This is activity will require an initial setup, daily upkeep, and a waiting period due to plant growth (3-8 days). There are many steps to growing the chia pets, but the steps are relatively easy so students can be in charge of this experiment.

Materials

Gloves
Water (faucet)
Vegetable oil
Salt
Spoon
Motor oil
3 small bowls or containers
Large freezer bags
Small paint brushes
Chia pet (drugstores, department stores)

Lesson Description

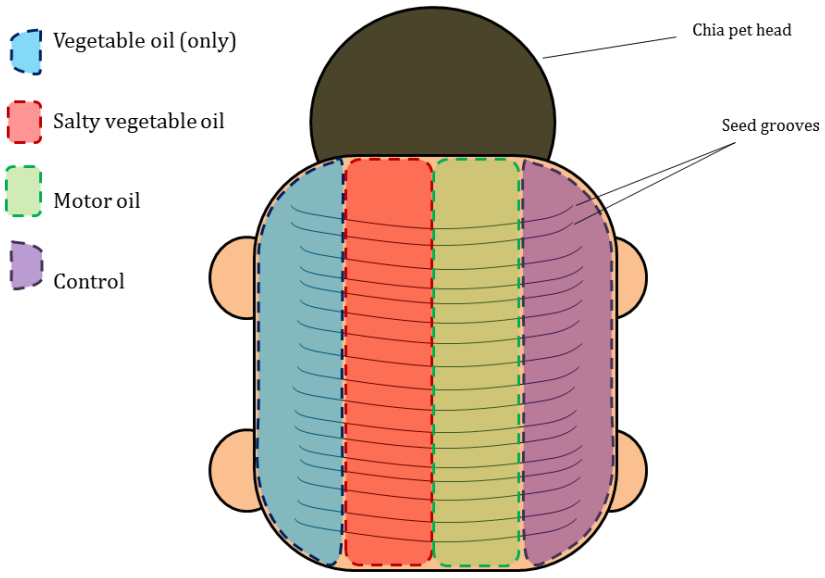
Creating the Chia Pets in Oily Situations Project

1. Soak the chia pet in water for 3-6 hours. The soil can dry easily and this is not beneficial to seed growth.
2. Soak the chia seeds in water for an hour (2 teaspoons of chia seeds in ¼ cup of water). This will create a gelatin paste; stir to negate clumps.
3. Make small bowls of: vegetable oil, salty vegetable oil, and motor oil.
4. Visually divide the chia pet into 4 areas; 3 out of these 4 areas will be subject to contamination and the last section will be the control section (i.e., normal section). Use the small paint brushes to add vegetable oil, salty vegetable oil, and motor oil onto 3 out of 4 areas of the chia pet; be liberal in the application.
5. Using gloves apply the gelatin-paste chia seeds into the grooves of the chia pet. Try not to mix the contaminants and sections associated with each.
6. Place a 'catch-tray' (should come with the purchase) under the chia pet and then slowly pour water over it. Fill chia pet to the top and monitor water level in try daily to make sure it is sufficient (if it is not, pour more water onto chia pet).
7. Place the chia pet in a sunny location.
8. Place large freezer bags over chia pet (and tray if possible), but make sure bag does not touch the seeds. Take the bag off the chia pet after 3 days. Growth should finish in 2-5 more days.

Methodology

Divide the class into groups (group number is dependent upon how much funds are available for purchasing chia pet[s]). The students will observe how different pollutants can disrupt or even prohibit plant growth. This is a

symbolic experiment for coastal wetland vegetation that may come in contact with light crude oil contamination (vegetable oil), heavier crude oil contamination (motor oil), or crude oil contamination in hypersaline environments. Light crude oil should be less harmful to wetlands in comparison to a heavier crude oil (more metal content) or even light crude oil in hypersaline areas (high salt content may absorb more water and nutrients from the plants, allowing for further smothering of the vegetation by oil).



AERIAL VIEW

Standard Evaluation (Student Deductions)

1. Did vegetation react the same to all pollutants? Which pollutant seemed to do the most damage? Which pollutant did the least amount of damage?
2. Why and how would botanists or ecologists use this in environments that have potential for oil contamination (natural or man-made)?
3. Salt is incorporated with vegetable oil as a pollutant. Why can a high amount of salt, alone, be harmful to plant growth or existence?
4. One of the steps of this experiment required the use of a clear, plastic freezer bag. Why would this be an important concept?
5. What would happen if the clear, plastic freezer bag stayed on for a shorter amount of time? What would happen if the bag stayed on for a much longer amount of time?

The evaluation can be in the form of a test, essay, questions and answers worksheet, or any other mode of measuring retainment or comprehension of material.