Title: ***A Bug's Life- Gulf of Mexico edition***
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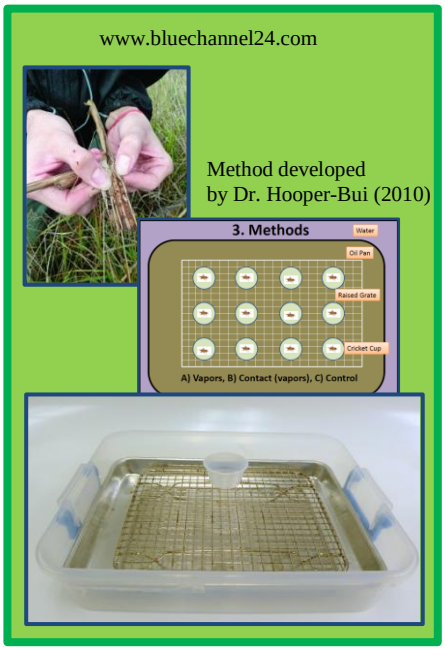
Background Information

Many times, people think about the environmental impacts of an oil spill and the main organisms (impacted) that come to mind are marine mammals, crustaceans, fish, birds, and even mollusks. Insects are often forgotten, but some species are closely associated to soil and plant life; therefore, some insects are of high ecological value. Some insects live within the shoots of dead Spartina, directly exposed to marshes in which oil contamination has occurred. Researchers want to know what happens to some of these insects that are exposed to oil by various means (e.g., direct contact, inhalation, ingestion, etc.). 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.



Louisiana State Standards (Grade-Level Expectations)

SI GLE: Ask questions about objects and events in the environment (e.g., plants, rocks, storms) (SI-E-A1)
Pose questions that can be answered by using students' own observations and scientific knowledge (SI-E-A1)
Generate testable questions about objects, organisms, and events that can be answered through scientific investigations (SI-M-A1)
Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)

SI GLE: Predict and anticipate possible outcomes (SI-E-A2)
Design, predict outcomes, and conduct experiments to answer guiding questions (SI-M-A2)
Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)

SI GLE: Express data in a variety of ways by constructing illustrations, graphs, charts, tables, concept maps, and oral and written explanations as appropriate (SI-E-A5) (SI-E-B4)
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)

Use evidence to make inferences and predict trends (SI-M-A5)
SI GLE: Use evidence and observations to explain and communicate the results of investigations (SI-M-A7)
SI GLE: Recognize that investigations generally begin with a review of the work of others (SIM-B2)
SE GLE: Explain how the use of different energy resources affects the environment and the economy (SE-M-A6)
SE GLE: Give examples and describe the effect of pollutants on selected populations (SE-H-A11)
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)
PS GLE: Create and separate mixtures (e.g., oil/water, rice/beans) (PS-E-A5)
LS GLE: Analyze positive and negative effects of human actions on ecosystems (LS-H-D4) (SE-H-A7)

Ocean Literacy Principles

Principle 6b: From the ocean we get foods, medicines, and mineral and energy resources. In addition, it provides jobs, supports our nation's economy, serves as a highway for transportation of goods and people, and plays a role in national security.

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 activity requires minimal setup by the teacher. If the plastic insect toys are not used, then laminate the pictures of insects (page below) and cut them out so they fit inside of a 2-4 ounce small plastic cup. The students can create the baking soda and water mix; some of the mixture will need to be poured into the mister bottle. Allow them to also mix the salt and water into another medium or large sized cup. The students will also be able to place the cups in a 3x4 setting (columns x rows). Complete set up (excluding laminating the insect cutouts) should take 10 minutes.

Materials

Color Changing Goldenrod paper (www.teachersource.com)
Laminated cutouts of insects or Toy plastic insects (optional)
Self-adhesive laminating sheets
Small plastic cups (2 or 4 oz.)

Flexible cutting mat, plastic place mat, etc.
Mister bottle
Scissors
Medium or large sized cup (3)
Baking soda
Water (faucet)
Salt
Spoon

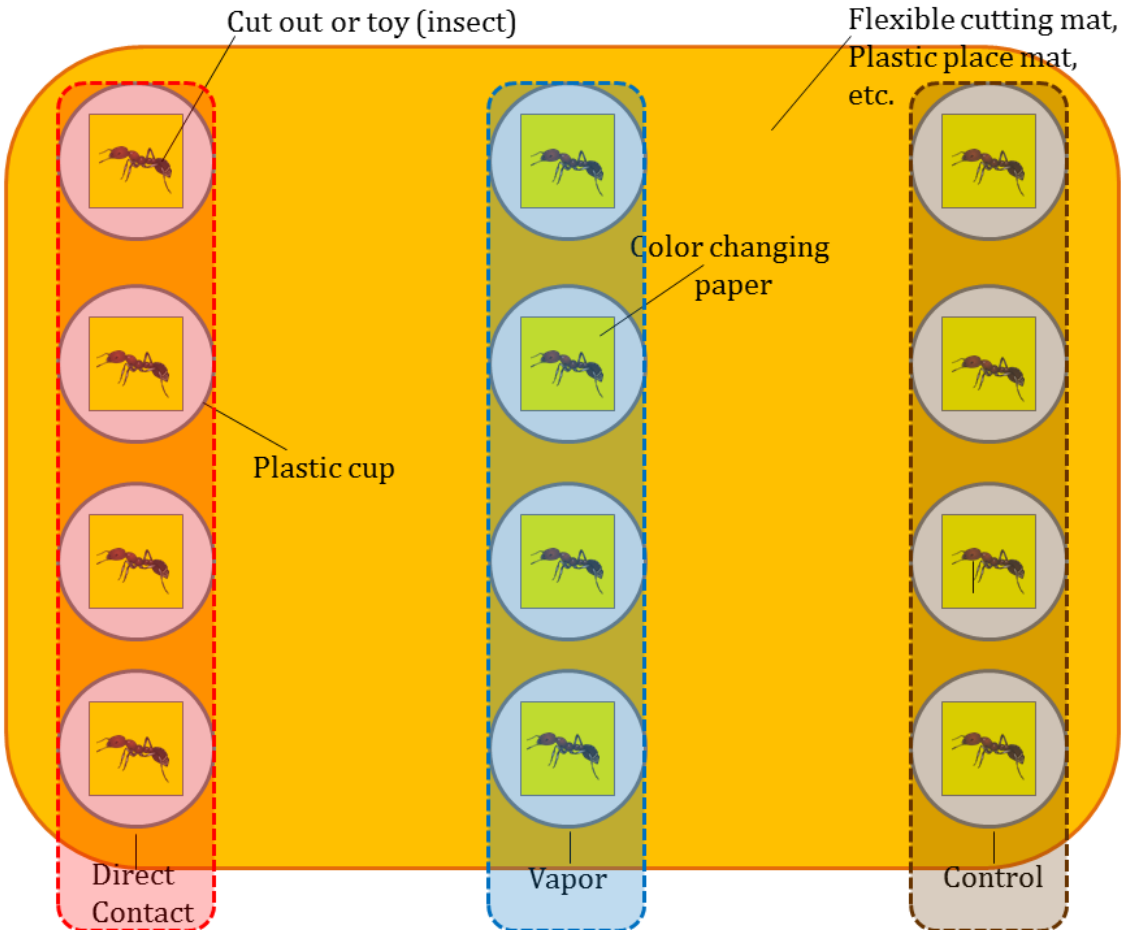
Lesson Description

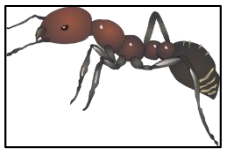
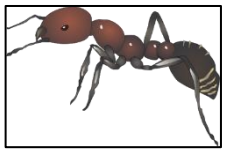
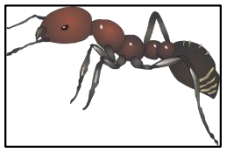
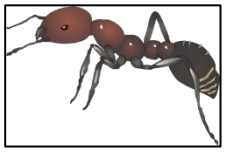
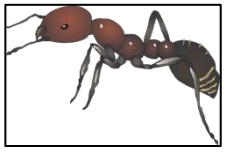
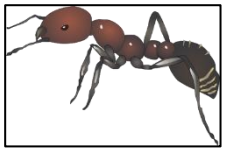
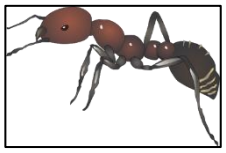
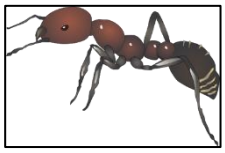
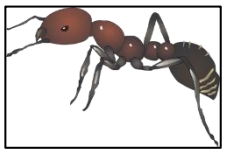
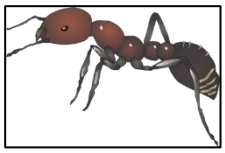
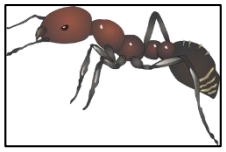
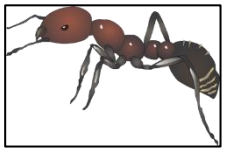
Creating the A Bug's Life- Gulf of Mexico edition experiment

1. Set a square cutout of color changing paper in each plastic cup.
2. Set a laminated insect cutout or insect toy inside each plastic cup on top of the color changing paper.
3. Place 'insect cups' in a 3x4 setting (columns x rows) on top of the flexible cutting mat, place mat, etc.
4. Mix baking soda and water with a spoon in a medium or large sized cup. Pour some of the mixture into a mister bottle.
5. Use spoon to place baking soda and water mix (i.e., direct contact) in each 'insect cup' within the first column.
6. Mist baking soda and water mix (i.e., vapor) onto each 'insect cup' within the second column.
7. Mix salt into water within a medium or large sized cup. Use a spoon to place the saltwater (i.e., control) in each 'insect cup' within the third column.

Methodology

Students will be re-enacting a methodology initiated by GoMRI researchers to identify insect abundance on oiled and unoiled plots of land. The weak basic solution (i.e., baking soda and water) will represent crude oil. Students will expose 2 out of 3 columns of insects to 'oiled water' that may be found in salt marshes along the Gulf coast. One source of exposure will be through direct contact in which students pour the weak basic solution inside the 'insect cups' and the other exposure method will be through vapor contact (i.e., misting the weak basic solution over the 'insect cup'). This experiment will test if the insects will die (i.e., the yellow color changing paper turning red once it comes in contact with a weak basic solution) once they have come in contact with crude oil through various exposure routes. Allow students to use a control (i.e., saltwater mixture) to test against the crude oil. To return the paper to the original yellow color, just expose it to a weak acid (e.g., vinegar, lemon juice).


Cut out or toy (insect)
Flexible cutting mat,
Plastic place mat,
etc.
Color changing
paper
Plastic cup
Direct
Contact
Vapor
Control

Standard Evaluation (Student Deductions)

1. Was there a difference in the amount of insects that 'died' between the three groups (i.e., direct contact, vapor, control)?
2. Which exposure route was the deadliest and why?
3. What are some ways that insects living inside dead Spartina shoots may be exposed to oil?
4. Did any insects 'die' in the control group? What is the importance of a control group within experiments?
5. When comparing direct contact with inhalation (i.e., vapor), which exposure route produces acute results and why? Which exposure route produces chronic results and why?

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.