**5E Template- Science**

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| **Name: Danny Cole** | **Date: 7/7/11** |
| **Content Area: Earth Science** | **Grade Level(s): 9** | **Topic(s): Direct and indirect negative effects of pollution around the ocean** |

**Standards (SOL)**

 ES.1 The student will plan and conduct investigations in which

ES.11 The student will investigate and understand that oceans are complex, interactive physical, chemical, and biological systems and are subject to long- and short-term variations.

*List the relevant SOL.*

*ES.1*

1. a scientific viewpoint is constructed and defended (the nature of science).

ES.11

1. importance of environmental and geologic implications;

**Objectives (UKD’s)**

*To understand that pollution can create many indirect negative effects, and how our environment has a balance between all living things.*

**Materials & Resources**

 Aquarium or clear plastic bin, sand, water, red food coloring, small plant (anything including a weed).

 **Safety Considerations**

Please be aware that the use of the aquarium has potential for glass breakage and can become heavy. Small plastic clear containers work very well.

Engage – Time Estimate \_\_ 5 minutes\_\_\_\_\_\_

*Engages students into lesson.*

Allow the students to play with the sand for a few minutes inside the containers.

**Explore – Time Estimate \_30 minutes\_\_\_\_\_\_\_**

 *With each student, mix a spoonful of soil in a glass of water and place it in front of them and ask, “are you thirsty?” Invite them to take a drink. When the drink is refused, ask why. Ask them what the word pollution means to them. Brainstorm with the students the many types of pollution that is around us and write them on the board. Then ask what appears to be the most serious pollution to them. Explain that all pollution is dangerous and they will conduct an experiment that will show how the pollution around the oceans and our water affects our world.*

Fill the containers about half full of sand. Dampen the sand and push most of it to one side of the container to create a slope, like you would see on a beach. Gently pour water into the “ocean” side until the water is a few inches high. Put a small plant somewhere along the highest part of the land sand and close to the edge (its great if you can plant and see the roots through the container)

Explain Time #1

Cont experiment. – Drop 10 drops of red food coloring about 1 inch from the edge of the water.

Explain time #2

**Explain -- Time Estimate \_15 minutes total\_\_\_\_\_\_\_**

Explain time #1 – Tell the students to imagine that the container is like the world it has both land and water. They can imagine fish swimming in the ocean and people and animals roaming on the land. Explain to them that some types of pollution occur when people dump wastes or chemicals on the ground. Ask them what problems could be caused by dumping just a little pollution on one small part of the land in the miniature world they just built. Have them state how pollution would harm the animals living in the small area.

Explain Time #2 – explain to them that the red food coloring represent pollutions that they have posted on the board and review it with them. Ask them to watch the red color closely and see if it remains in the place where you dropped the color in. Have student write down in time increments what the red coloring appears to be doing. Have each student answer the following questions.

 1) Did the pollution stay in the same spot?

 2) Why is it such a problem that pollution doesn’t stay in the same place?

 3) What could happen when the pollution begins to seep into the ocean?

4) If the pollution poisons the animals in the ocean, what happens to the other animals that eat them, including us?

Explain to them that much of the water that people get is pumped to the surface from groundwater. Show them the visible layer of water through the sand. Tell them that this is called aquifer. What would happen to us if we drank water contaminated by pollution? Explain how one small spot of pollution can get into all of our land environments and could affect the world.

**Extend -- Time Estimate \_\_10 minutes\_\_\_\_\_\_**

 *Now take a different color (usually a dark color) and have students put 15-20 drops in only the water. Watch how this begins to seep into that land sand etc.*

**Evaluate -- Time Estimate \_\_5 minutes\_\_\_\_\_\_**

Have student write down in time increments what the red coloring appears to be doing. Have each student discuss in groups of four what they saw in their container.

**Plans for Diversity**

 *For special needs students, you can pair the more severe students with another student of higher understanding. However, this experiment is very suitable for all levels of learning.*

**Connections**

 *This lesson is to begin and follow up on the balance of all living things. It explains how pollutants can cause a problem in that balance and how it can affect living things. It shows how a change in chemicals of our water can have long and short term affects. This experiment could be made into a larger scale over a longer period of time compared to a non polluted container and observe the plant life etc. over a period of time.*