Teacher's Guide for ODYSSEY

January 2011: Oil Spill!

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Teacher's Note:
This guide contains project ideas, short answer, extended response, fill-in, and true/false with correction. The variation is designed to have the students think critically, as well as to test their comprehension. An answer key to the short answer sections can be found at the end of the guide.

Extended Response: Comprehension & Critical Thinking
The questions below can be used as written, simply answered in complete sentences or easily transformed into longer essay (ELA) style questions, or even research topics. In any case, have the students support their answers with details from the text or use critical thinking skills to create a thorough and interesting answer. Consider the level of your students when deciding how to use the questions.

"Blowout!" p. 6-11

1. What is crude oil?
2. What is the Deepwater Horizon and what was its purpose?
3. What exactly went wrong on April 20 to cause this major disaster?
4. How did human error make the situation worse?
5. Why did the deepwater location present multiple problems?

Using the diagram on pages 8 and 9, match the vocabulary words below:

_____*1. blowout preventer*

_____*2. drill bit*

_____*3. pontoons*

_____*4. drilling mud*

_____*5. casing*

a. a long pipe that runs down the hole after the main section is drilled.

b. made of water and clay

c. at the end of the drill, it chews up the rock.

d. fill with water to keep the rig stable at the desired level.

e. a series of valves that are supposed to hold back the pressure and stop the flow quickly

6. Explain the deepwater conditions in which this rig was working.
7. BP made many attempts to stop the flow of gas and oil into the water. Explain at least (2) of the methods tried and the reasons for their failures.
8. What eventually did stop the leak?
9. What changes occurred as far as the support of drilling in US waters after this major environmental disaster?
10. Do you think that new regulations and safety measures will provide enough security to prevent this disaster from reoccurring? Why or why not?

Essay: *The Deepwater Horizon disaster caused extensive damage. There were obvious effects such as pollution, economic harm, effect on wildlife and health risks. Choose one of these areas and use facts to explain the damage that this catastrophe caused in relation to your topic. Be sure to include your opinion at the end and outlook for the future.*

"Measuring the Gulf Oil Spill…A Major Math Problem" p. 12-15

1. Why was it so difficult to measure the amount of oil spilling into the ocean?
2. Do you think BP underestimated the number of barrels per day being leaked on purpose? Why or why not?
3. Explain in your own words, how Dr. Werely calculated the speed and distance of the oil leak.
4. What is Particle Image Velocimetry (PIV) and how doe sit work?
5. What have scientists learned from this experience?

"Invasion of the Oil-Eating Microbes" p. 16-18

1. What is bioremediation?
2. What are some of the problems, as well as benefits of bioremediation?
3. Explain 'metagenomics".
4. What astonishing experiment did J. Craig Venter design?
5. Why does Hazen say that "the best thing to do may be nothing at all"?

"Shadows Across the Gulf" p. 20-23

1. Explain the cycle of life that takes place in the Barataria-Terrebonne estuary system.
2. What are some of the reason that fish didn't simply 'swim away' when oil started filling their water?
3. Why is it possible that an entire generation of tuna may have been lost due to the oil?
4. When the tide comes in and pulls oil with it, what happens to many of the sea animals?
5. How do scientists tests for oil contamination in organisms?
6. Why is it ironic that broad swaths of wetlands in the northern Gulf of Mexico were harmed?
7. How can 'citizen scientists' help NY's Cornell Lap of Ornithology?

"Learning from Disasters" p. 24-26
Mark the following statements TRUE or FALSE. Provide the correct answer if FALSE.

_____ 1. "Booms" are like fences on the water to help strain the oil through the water.

_____2. "Skimmers" move through the water sucking up oil and leaving the water behind.

_____3. The Exxon-Valdez and Deepwater Horizon disasters happened 10 years apart.

_____4. Physically removing the oil where that's possible is the quickest and most beneficial method for cleaning up spilled oil.

_____5. Microbes can consume much of the oil naturally and really do a very good job of cleaning up the environment.

_____6. Fertilizer helps support the growth of indigenous microorganisms and can speed up the process of oil consumption.

_____7. In the deep part of the Gulf, the temperature is close to minus 40 degrees Celsius.

_____8. The dispersant injection may have increased the biodegradation because it created small droplets of oil, and those degrade much faster.

_____9. The Exxon-Valdez spilled 68 million galls of oil.

_____10. The expectation is that the oil will biodegrade much faster in the Gulf of Mexico than in the Exxon-Valdez spill due to the type of oil and the overall different climate and environment.

"Where Did the Oil Go?" p. 30-31

1. How does Georgia Professor of Marine Sciences, Samantha Joye, prove that one person can make a difference even in a disaster this big?
2. What is Professor Joye's area of study?
3. Why was Joye's discovery of the giant plumes of oil under water so important?
4. What is Joye hoping to learn from her next expedition to the seafloor in the Alvin submersible?
5. Explain why ocean research is such hard work, and also why it is so exciting.

"The Pitfalls of Petroleum" p. 36-39

1. Why did many animals succumb to the La Brea Tar Pits?
2. What is a petroleum seep?
3. Where does the dark, sticky substance in Pitch Lake and the pits of LA come from?
4. Explain the mixture of chemicals that make up the tar pits.
5. What were some of the purposes that humans harvested the tar pits to their benefit?
6. Why is crude oil both natural and organic?
7. Name the three steps of oil refining and explain each.
8. Explain how human oil refineries process crude oil in much the same way that nature processes petroleum in seeps.

ANSWER KEY:

"Learning From Disasters"

1. False, to help keep the oil in one place
2. True
3. False, 20 years
4. True
5. True
6. True
7. False, temperature is 4 degrees Celsius
8. True
9. False, 11 million gallons
10. True