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| **Fellow Name:**  **Khadeejeh Mureb** | **Contact Info: murebkh@mail.uc.edu** | **Date:**  **02/11/15 and 02/12/15 8:45 AM to 10:23 AM** |
| **Teacher Name:**  **Brandon Williams** | **School Name:**  **Hughes STEM High School** | **Grade and Class: Engineering - Juniors/ Seniors** |

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| **Activity Title:** | **Oil Spill** |
| **Estimated Activity Duration:** | **2 Hours** |

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| **Setting:** | **Classroom Setting/ Indoors** |

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| **Activity Objectives:** |

**After this activity, students will be able to:**

* **Critically evaluate the environmental impact on the ecosystem**
* **Simulate an environmental disaster (oil spill) in a classroom setting**
* **Identify physical characteristics oil and water (i.e. density/surface tension)**
* **Identify possible ways to solve an oil spill problem**
* **Identify what responsibility humans have toward an ecosystem**

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| **Activity Guiding Questions:** |

* **How can an oil spill be removed from water?**
* **How long does it take to completely clean an oil spill?**
* **How could oil be contained without spreading in the water?**
* **What property determines if a fluid float on water?**
* **What did we learn about corporate environment responsibility? (Students are asked to research the topic in advance).**

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| ☐ Asking questions (for science) and defining problems (for engineering) | ☐Patterns |
| ☐ Developing and using models | ☐ Cause and effect |
| ☐Planning and carrying out investigations | ☐ Scale, proportion, and quantity |
| ☐Analyzing and interpreting data | ☐ Systems and system models |
| ☐Using mathematics and computational thinking | ☐Energy and matter: Flows, cycles, and conservation |
| ☐ Constructing explanations (for science) and designing solutions (for engineering) | ☐Structure and function. |
| ☐Engaging in argument from evidence | ☐Stability and change. |
| ☐Obtaining, evaluating, and communicating information |  |

| **Ohio’s New Learning Standards for Science (ONLS)** |
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| **Expectations for Learning - Cognitive Demands(Check all that apply)** |
| ☐Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| ☐Demonstrating Science Knowledge **(D)** |
| ☐Interpreting and Communicating Science Concepts **(C)** |
| ☐Recalling Accurate Science **(R)** |

| **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice(Check all that apply)** | |
| ☐Make sense of problems and persevere in solving them | ☐Use appropriate tools strategically |
| ☐Reason abstractly and quantitatively | ☐Attend to precision |
| ☐Construct viable arguments and critique the reasoning of others | ☐Look for and make use of structure |
| ☐Model with mathematics | ☐Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, ONLS and/or CCSS):** |

**ONLS- Ohio Revised Science Standards and Model Curriculum High School- Advanced Science,**

**Environmental Science -Syllabus and Model Curriculum:**

* **Identify questions and concepts that guide scientific investigations**
* **Design and conduct scientific investigations**
* **Formulate and revise explanations and models using logic and evidence (critical thinking)**
* **Recognize and analyze explanations and models**
* **Communicate and support a scientific argument**

**Environmental Science –Earth Resources:**

**Water and Water Pollution:**

**Point source and non-point source contaminate**

**Global Environmental Problems and Issues:**

**Human pollution**

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

* **Preparation Material:** 
  + **Empty buckets/ aluminum cooking pans**
  + **Vegetable oil**
  + **Cocoa mix**
  + **Water**
* **Activity Selection Materail:**

**Rubber bands, paper clips, straws, balloons, plastic wraps, plastic spoons, tongue depressors, masking tape, hand-made fan, dishwashing detergent, grass, cooked rice, hair, sponge (pieces), string, 24” paper towels, 12 cotton balls, 1 bag woodenmulch, 1 syringe, 1 bag of shredded paper, 2 newspaper sheets**

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| **Teacher Advance Preparation:** |

* **Give an overview of activity plan to the students.**
* **Show students “Oil Spill Activity- Student Work Sheet”.**
* **Divide students into groups of 3-4 students, providing a worksheet for each group.**
* **Explain the need of teamwork to perform the activity.**
* **The lab room set-up will be ready with 6 tables and a bucket/aluminum cooking pan filled with a known amount of water.**
* **The oil mixture (vegetable oil with cocoa mixed -1/2 cup oil for every 1 tablespoon of cocoa mix) will be ready.**
* **Available materials will be on a separate table where all students can access.**

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| **Activity Procedures:** |

**A 15 to 20-minute lesson (a presentation with pictures/video clips) will be given to the students in the classroom, the following points will be covered:**

* **Crude oil drilling & refining operation**
* **BP Deep Water Horizon 2010**
* **Properties of liquid: density and surface tension**

**After the preparation lesson:**

* **Students groups will be asked to do a quick brainstorming/planning and write it on their worksheets**
* **Student groups will move to the lab-room to perform the experiment.**
* **Students will be asked to pour a known amount of the oil mixture in the water bucket/pan**
* **Students will be asked to use available material to clean oil from water (up to 5 items are allowed).**
* **Students are asked to write their progress on the worksheets**
* **Success measures are associated with the comparison of initial and final percentages/ amounts of oil/water as well as the cleanness of water (color/ density of a sample that is shaken-up)** 
  + **Student clean up systems will be scored based on the scale provided on their worksheet.**

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

* **Starting amount of water/oil vs. ending amount**
* **Cleanness of water (color/ density of a sample that is shaken-up)**
* **Student worksheet, students will be asked to work on their worksheet. The worksheet includes data collection on the steps the students performed in cleaning up the spill and rating their design based on a scale provided**

**Summative Assessments:** Prepare a Pre-Test and Post-Test with the input of the RET Teacher. This should be a simple 10-12 question assessment tool. These questions will cover the content related to the Standards. The Pre and Post Test will be identical. There may be several summative assessments at the end of this Activity. Besides the Pre and Post Tests, the students might create a product for which this is a rubric developed. The rubric is also a summative assessment tool. Link the assessment tools.

**PRE / POST –TEST**

1. **Does Water float in oil? And why?  (Mark the correct answer)**
2. **Yes. Density of water is higher than oil.**
3. **No. Density of water is higher that oil.**
4. **Yes. Density of oil is higher than water.**
5. **No. Density of oil is higher than water.**

1. **Mark True (T) or False (F) for the following:**
2. **Oil floats on water as oil’s density is HIGHER than water.**
3. **Small droplets of a liquid are spherical due to surface tension.**
4. **Soaking up spilled milk with a paper towel is called absorption.**

1. **What effects does oil spill have on the ecosystem of the ocean? (Mark ALL correct answers)**
2. **Animals ingest oil and this poisons them.**
3. **Oil spills provides lubrication and helps sea animals.**
4. **May kill sea birds when their feathers/fur come in contact with oil.**
5. **All of the above.**

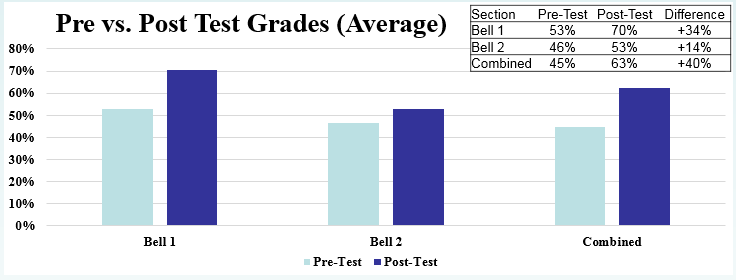
1. **One recent oil spill that has had devastating effects is the BP Oil Spill in 2010. What are some ways to clean up oil spills in general?**
2. **Absorbing the oil using absorbents.**
3. **Skimming the oil from the water.**
4. **Adding Chemical dispersant to the oil.**
5. **None of the above.**
6. **All of the above.**

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners. Refer to Activity Template for details. |

**According to students learning needs, the materials available to use were grouped into three groups intended to help all learners either meet the intent of the standard of the lesson. Thus, students’ thoughts were directed to think of the best possible material used from each group rather than focusing their attention to a particular material.**

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| **Reflection:** Reflect upon the successes and shortcomings of the Activity. This is done after the Activity is implemented. |

**After the activity is taught, students were able to gain environmental safety knowledge and were scaling up their thoughts to a larger scale solution for such a disaster. If I could change the lesson, I would make a better use of teamwork by changing the student grouping chart and giving individual tasks for each team member. I would also further re-group the material selection groups based on absorbance/containing material and limit the number of materials in each group to direct the students’ attention to some of the materials that could have been effective in the cleaning process but students did not select when performing the activity.**

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