Title:	Cleaning Up the Beach	
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Course: **Grade Level:**	**Biology, Physics, Earth Science, Environmental Science, Physical Science** 9-12	**Duration:** 2 class periods
Objective: Students will investigate ways to clean an oil spill from sand.		
Summary of Lesson: Using a cup of sand and vegetable oil, students will devise a plan to clean the sand while preserving the environment.		
Arkansas Standards:		

CODE	GRADE	SLE	STANDARD
Physics	**9-12**	**P2-ETS1-3**	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental factors
	9-12	**P3-ETS1-2**	Design a solution to a complex real-world problem by breaking it down into smaller, and more manageable problems that can be solved through engineering
Biology	**9-12**	**BI-ESS3-4**	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
		BI-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
Earth Science	**9-12**	**ES-ESS3-4**	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

Environmental Science	**9-12**	**EVS-LS2-7**	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
		EVS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
Physical Science	**9-12**	**PSI-LS2-7**	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Teacher Excellence Support System (TESS):
3b: Using questioning/prompts and discussion, 3d: Using assessment in instruction

Instructional Strategies and Practices:
Brainstorming and Discussion, Experiments, Labs, and Models, Visuals

Bloom's Level: Highest Level Only
Creating

Materials and Resources:

- Clear disposable cup filled with sand per lab station (2 students)
- 10 mL vegetable oil for each lab station
- White tissue paper

Formative Assessment:
Rubric:

4 -- Students removed most of the oil from the sand using a plan that would not endanger the environment.

3 -- Students removed most of the oil from the sand, but the plan would endanger at least some of the plants and animals.

2 -- Students removed at least some of the oil but had a plan that would endanger few plants and animals.

1 -- Students failed to remove oil from the sand, and the plan endangered plants or animals.

Notes to Teacher:
While washing the sand with dish detergent may work, animal or plant life would be damaged. However, adding water to the oil and allowing it to sit for several days, would lift the oil to the surface for easier removal.

Student Activity

Procedure:

Day One:

1. Distribute cups containing sand to each lab station.

2. Instruct students to measure 10 mL vegetable oil and pour it on top of the sand in the cup.

3. Students observe the oil as it permeates through the sand.

4. Each lab station will devise a method to extract the 10 mL of oil from the sand without harming any plant or animal life.

5. Students will then get approval for the plan from the teacher.

6. Homework: Students will prepare the oil and sand sample to be safely transported home. The approved method will be performed to remove the 10 mL of oil. The resulting sample will be returned to class when the clean-up is complete along with a lab report outlining the steps taken to clean up the "oil spill." A detailed description of the measures taken to protect plant and animal life will be included.

Day Two:

1. When the clean-up is accomplished, each group should empty their sand and spread it out on white tissue paper. Let stand overnight, and then observe for any oil that is absorbed by the tissue paper.

2. Students present their method of removal and explain the effects it might have on the environment.

3. The teacher will use the rubric in the **Teacher information Sheet** to assess students' success.

Teacher Information Sheet: A printable copy is available at https://arkansasenergyrocks.com/educators/lesson-plans-9-12/. Go to the lesson plan title, then select the Teacher Information Sheet.

Teacher Information Sheet
Cleaning Up the Beach | Rubric

Use the following rubric to assess the clean-up plan for each lab station:

4 -- Students removed most of the oil from the sand using a plan that would not endanger the environment.

3 -- Students removed at least some of the oil but had a plan that would endanger few plants and animals.

2 -- Students removed most of the oil from the sand, but the plan would endanger at least some of the plants and animals.

1 -- Students failed to remove oil from the sand, and the plan endangered plants or animals.