

INTERACTIONS IN THE ENVIRONMENT: How Does an Oil Spill Impact the Environment?



The Big Eco Idea: Ecosystems are in a constant state of change and these changes may be caused by human intervention.

Description Of the Task:

Students work in small cooperative learning groups as Ecologists to investigate and recommend cleaning agents for an oil spill. The task involves teamwork to investigate absorbent products with the final recommendations done by each individual student.

Curriculum Expectations:

SCIENCE & TECHNOLOGY-*Understanding Life Systems: Interactions in the Environment*

- 2.3 use scientific inquiry/research skills to investigate occurrences that affect the balance within a local ecosystem
- 2.4 use appropriate science and technology vocabulary in oral and written communication
- 3.1 demonstrate an understanding of an ecosystem as a system of interactions between living organisms and their environment
- 3.8 describe ways in which human activities and technologies alter balances and interactions in the environment

LANGUAGE

Oral Communications

- 2.3 communicate orally in a clear, coherent manner, using a structure and style appropriate to both the topic and the intended audience
- 2.4 use appropriate words, phrases, and terminology from the full range of their vocabulary, including inclusive and non-discriminatory language, and a range of stylistic devices, to communicate their meaning accurately and engage the interest of their intended audience
- 2.5 identify a range of vocal effects, including tone, pace, pitch, volume, and a variety of sound effects, and use them appropriately and with sensitivity towards cultural differences to communicate their meaning
- 2.6 identify a variety of non-verbal cues, including facial expression, gestures, and eye contact, and use them in oral communications, appropriately and with sensitivity towards cultural differences, to help convey their meaning

MATHEMATICS

Measurements

- 6.0 describe measurement concepts using appropriate measurement vocabulary
- 7.0 make increasingly more informed and accurate measurement estimations based on an understanding of formulas and the results of investigations

Lesson Title: How Does an Oil Spill Impact the Environment?

Unit: Science-Interactions in the Environment

Grade: 7

Time: 110 minutes (total)

- 30 minutes for the Introductory Activity (Schema Activation)
- 40 minutes for the Enhancing Activity (Hook – Oil Spill Investigation)
- 40 minutes for the Culminating Activity (Group Presentations and Recommendations)

Groupings

- Students working in small cooperative learning groups
- Students working individually
- Students working as a whole class
- Students working in pairs

Teaching / Learning Strategies

- Inquiry
- Discussion
- Measurement
- Science learning log/journal
- Brainstorming
- Performance task

Assessment

Assessment Strategies

- Science learning log/journal
- Observation
- Peer/self assessment
- Group presentation

Assessment Recording Devices

- Rubric
- Checklists
- Anecdotal record

Resources Required:



Materials

Oil Spill Investigation Activity

- Glass beaker (1/group - 250 ml)
- Water (200 ml)
- Vegetable or canola oil (50 ml)
- Liquid dish detergent (50 ml)
- Plastic container (1/group - 200 ml)
- Large plastic basins or a sink
- Paper towels (1 roll)
- Scissors
- Measuring tape/ruler (1/group)
- Scotch tape
- White labels
- Pencils
- Science learning log/journal
- Wire whisk (1/group)
- Cleaning brush (1/group)
- Ziploc plastic bags (1/group): feathers (2), yarn (20cm), string (20 cm), sponge (5x5 cm), cotton balls (6), tin foil, popsicle sticks (6), pipe cleaners (6), coffee filters (1), paper towel squares (10x10 cm), felt paper (10x10 cm)
- **BLM 1.1.a** – Oil Spill Investigation Task Card
- **BLM 1.1.b** – Oil Spill Investigation Student Worksheet
- **BLM 1.1.c** – Oil Spill Investigation Student Question Sheet
- **BLM 1.1.d** – Peer/Self Assessment
- **BLM 1.1.e** – I.N.S.I.T.E Model on Inquiry Card
- **BLM 1.1.f** – I.N.S.I.T.E. Method Description
- **BLM 1.1.g** – Criteria For Good Presentations
- **BLM 1.1.i** – Anecdotal Record Sheet
- **BLM 1.1.j** – Rubric for Inquiry and I.N.S.I.T.E
- **BLM 1.1.k** – Rubric for Oil Spill Investigation



Black Line Masters (BLM)

- **BLM 1.1.a** – Oil Spill Investigation Task Card
- **BLM 1.1.b** – Oil Spill Investigation Student Worksheet
- **BLM 1.1.c** – Oil Spill Investigation Student Question Sheet

Introductory Activity-Analysis of Oil Spill Cleanup Processes

- Chart paper/chalkboard
- Chalk/markers
- Science learning log/journal
- Pencils
- **BLM 1.1.i** – Anecdotal Record Sheet
- **BLM 1.1.I** – Checklist for Oil Spill Cleanup Processes
- **BLM 1.2.a** – Rubric for Science Learning Log/Journal
- **BLM 1.2.b** – Student Criteria for Science Learning Log/Journal
- **BLM 1.2.c** – Oil Spill Cleanup Processes Task Card
- **BLM 1.2.d** – Science Learning Log/Journal Page
- **BLM 1.2.e** – Photographs of Oil Spill
- **BLM 1.2.f** – Photographs of Oil Spill Cleanup Processes

Culminating Activity-Group Presentations and Group Discussion

- **BLM 1.1.d** – Peer/Self Assessment
- **BLM 1.1.h** – Group Presentations Checklist
- **BLM 1.1.i** – Anecdotal Record Sheet
- **BLM 1.2.a** – Rubric for Science Learning Log/Journal
- **BLM 1.2.b** – Student Criteria for Science Learning Log/Journal
- **BLM 1.2.d** – Science Learning Log/Journal Page
- **BLM 1.2.g** – Rubric for Group Presentations



Print and Websites

Parks, Peggy J. (2005) *Oil Spills (Our Environment Series)*. Detroit: KidHaven Press

Pringle, Laurence P. (1993) *Oil Spills: Damage, Recovery and Prevention (A Save the Earth Book)*. New York: William Morrow & Co.

- **BLM 1.1.d** – Peer/Self Assessment Form
- **BLM 1.1.e** – I.N.S.I.T.E. Model on Inquiry Criteria Card
- **BLM 1.1.f** – I.N.S.I.T.E. Method Description
- **BLM 1.1.g** – Criteria For Good Presentations
- **BLM 1.1.h** – Group Presentations Checklist
- **BLM 1.1.i** – Anecdotal Record Sheet
- **BLM 1.1.j** – Rubric for Inquiry and I.N.S.I.T.E
- **BLM 1.1.k** – Rubric for Oil Spill Investigation
- **BLM 1.1.l** – Checklist for Oil Spill Cleanup Processes
- **BLM 1.2.a** – Rubric for Science Learning Log/Journal
- **BLM 1.2.b** – Student Criteria for Science Learning Log/Journal
- **BLM 1.2.c** – Oil Spill Cleanup Processes Task Card
- **BLM 1.2.d** – Science Learning Log/Journal Page
- **BLM 1.2.e** – Photographs of Oil Spill
- **BLM 1.2.f** – Photographs of Oil Spill Cleanup Processes
- **BLM 1.2.g** – Rubric for Group Presentations

Preparation:

1. Inform students the day before the Oil Spill Investigation Activity to dress appropriately, just in case oil is accidentally spilled on them.
2. Organize all of the materials required for the oil spill investigation prior to the experiment.
3. Remind students of the inquiry process and review the I.N.S.I.T.E Model on Inquiry Criteria Card.
4. When conducting the experiment in the classroom remember that access to water and a sink/lab is necessary for disposal of the oil spill remains.
5. Review with students the appropriate school safety procedures when conducting experiments. Have paper towels and a mop/bucket in case of a floor spill.
6. Photocopy all required Black Line Master sheets (**BLM 1.1.a, BLM 1.1.b, BLM 1.1.c, BLM 1.1.d, BLM 1.1.e, BLM 1.1.f, BLM 1.1.g, BLM 1.1.h, BLM 1.1.i, BLM 1.1.j, BLM 1.1.k, BLM 1.1.l, BLM 1.2.a, BLM 1.2.b, BLM 1.2.c, BLM 1.2.d, BLM 1.2.e, BLM 1.2.f, and BLM 1.2.g**)
7. Laminate appropriate activity Task Cards (**BLM 1.1.a and BLM 1.2.c**) and Photographs of Oil Spill (**BLM 1.2.e**) / Photographs of Oil Spill Cleanup Processes (**BLM 1.2.f**)
8. Review with students the criteria for a good Group Oral Presentation (**BLM 1.1.g**) and criteria for Science Journal (**BLM 1.2.b**).
9. Divide students into small cooperative learning groups of 4-5 to allow for heterogeneous grouping.

Vocabulary:

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| • Oil spill | • Cleaning agent | • Contamination | • Oil-eating bacteria |
| • Ecologist | • Crude oil | • Environmental disaster | • Ecosystem |
| • Absorbent material | • Industrial waste | • Containment | • Emulsified |
| • Investigating | • Skimmed | • Biotic | • Recommending |

Teaching / Learning:

Lesson Plan Progression

| A) Introductory Activity (Schema Activation) | Time | Assessment Techniques | Key Questions |
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| <p>Activate Prior Knowledge: Whole class discussion-Introduce the concept of oil spills. Questioning led by teacher:</p> <ul style="list-style-type: none"> • What is an oil spill? • How do oil spills occur? • What type of oil is involved in them? • What is the impact of an oil spill on the environment? • How are they cleaned up? • Who is responsible for cleaning up oil spills? <ol style="list-style-type: none"> 1. Students brainstorm their ideas and record responses on white board. 2. Show students photographs of various oil spill cleanup processes and discuss as a whole class what each specific procedure involves. 3. Students work with a partner to decide which cleanup strategy would work best for an oil spill occurring a) in an open ocean b) on a sandy beach and c) along a rocky coastline. Students will spend 15 minutes brainstorming and recording their ideas in their Science learning log/journal. 4. Encourage students to think about the specific problems that may arise for each of these regions. Suggest that they consider factors such as ocean currents, surface area, weather, and wildlife habitat. 5. Regroup as a whole class and discuss each group's ideas. | <p>30 0minutes</p> | <p>Observations: Observation notes will be made during discussion.</p> <p>Questions and Answers: Questions led by the teacher or student. Ask students to recognize and recall specific facts and ideas. Ask students to retell and summarize information</p> <p>Anecdotal Record</p> <p>Science Learning Log/Journal</p> <p>Checklist</p> <p>Rubric</p> | <p>a) What is the best strategy for an open ocean oil spill? b) What is the best strategy for an oil spill occurring along a coastline? c) What is the best strategy for an oil spill happening on the beach? d) Are there any differences between the 3 strategies? d) What are some specific problems that might influence your cleanup efforts?</p> |
| <p>B) Enhancing Activity: Hook Oil Spill Investigation Activity</p> <ol style="list-style-type: none"> 1. Introduce the oil spill investigation scenario to students. Read- <i>As an Ecologist, you have been given the role of investigating and recommending a cleaning agent for oil spills. The task involves investigating the absorbent products provided as a team, with the final recommendations done as an individual.</i> 2. Ask students what the following terms mean: oil spill, Ecologist, cleaning agent, absorbent material, biotic, contamination, crude oil, ecosystem, investigating, recommending, industrial waste, skimmed, emulsified, oil-eating bacteria, containment, and environmental disaster. Discuss definitions with whole class prior to beginning experiment. 3. Review safety procedures, cooperative learning criteria, and inquiry based criteria, and how to make a proper hypothesis before starting the learning task. 4. Divide students into small cooperative learning groups of 4 – 5 students. Within their groups, students will assign a role of recorder, engineer, scientist, material organizer, accountant, clarifier, encourager, observer etc. Teachers can decide which roles to assign to groups, or students can have the choice of several roles. 5. Each group spends a few minutes brainstorming and discussing which absorbent materials and | <p>40 minutes</p> | <p>Observations: Observation notes will be made during discussion.</p> <p>Anecdotal Record</p> <p>Peer/Self Assessment</p> <p>Rubric Science Learning Log/Journal</p> | <p>a) What is a hypothesis? b) As a scientist, which one of the tested materials would you rate best for absorbing oil? Why? c) Identify absorbent material(s), both those tested as well as any others, which may not be</p> |

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| <p>technique they are going to use to separate the oil from the oil/water mixture.</p> <ol style="list-style-type: none"> 6. The experimental design should reflect what is possible in a real life scenario. The aim is to contain the oil spill and separate as much oil as possible from the water, with the least amount of money. 7. Each group makes a hypothesis and records it on their individual datasheet. Their hypothesis should include materials and the technique involved in the experiment. 8. Teacher initials hypothesis. 9. Each group is given the required materials (Ziploc Bag) to begin experiment. 10. Students use the selected absorbent materials and technique outlined in the above hypothesis. They measure and record the quantity of oil that is separated from the oil spill. 11. Students also determine how much money was spent on the cleanup process and complete the budget chart outlined on the data sheet. 12. Students complete the questions individually, but can brainstorm ideas with group members. 13. Tidy up group area. 14. Prepare for group presentations and recommendations. | | | <p>appropriate for cleanup of a large-scale oil spill.</p> <p>d) Which separation procedure would be the most efficient in a real life situation? Explain.</p> |
| <p>C) Culminating Activity (Wrap Up Activity): Group Presentations and Group Discussion</p> | <p>Time</p> | <p>Assessment Techniques</p> | <p>Key Questions</p> |
| <ol style="list-style-type: none"> 1. Have students sitting at individual desks for wrap up discussion. Each group will be given 5 minutes to discuss their results and recommendations. 2. Compile results in a whole class chart and discuss results. 3. Students glue data sheet into science learning log/journal. | <p>40 minutes</p> | <p>Anecdotal Record</p> <p>Rubric</p> <p>Checklists for Group Presentation</p> <p>Peer/Self Assessment</p> | |

Notes to Teacher:

Strategies for Oil Spill Clean Up Operations:

- **Open Ocean** - Since currents and wind will play a factor when trying to clean up an oil spill, use equipment to skim the oil from the water's surface before it spreads. Equipment is usually used by boat, but often times it also needs to be transported by a plane.
- **Rocky Coastline** – To remove oil from rocks, scientists scrub them with brushes and liquid detergents to minimize damage to fish and wildlife habitats.
- **Sandy Shoreline** – Scientists will usually sift the oil away from the sand to try and remove the oil that is being washed up on shore. When large quantities of oil appear on shore, it makes cleanup very difficult and rescuing wildlife challenging.

Additional Activities:

Oil and Water Demonstration:

1. Before students begin the Oil Spill Investigation Activity, conduct an oil and water demonstration to show students what happens when the two substances mix.
2. Students observe how the oil forms a layer on top of the water. Ask students why this is occurring.
3. Select a volunteer to stir up the oil and water, using a wire whisk.
4. Students observe how the oil changes its appearance by forming smaller droplets that will eventually disperse in the open ocean and spread out.
5. Explain to students that this is one technique that is used in a cleanup operation.

Oil and Feather Demonstration:

1. Each group should conduct this experiment together.
2. Put a fake bird feather into a container filled with oily water.
3. Observe what happens to the bird feather and ask students to attempt to clean the feather using liquid detergent and a brush.

Adaptations:

All accommodations must take into account the student's Individual Education Plan. All of the learning tasks and activities are created to accommodate the needs of students at different ability levels. The lesson plan includes pictures and/or examples of a step-by-step process, lists, and graphic organizers to enhance learning. The series of pictures are used to break tasks into easier, more understandable steps. Many of the learning activities provide opportunities for peer or group interactions, encouraging the use of cooperative learning/social skills and risk taking. Adaptations can be made in the following manner:

- Alternatives to written tasks (data sheet and question task), such as drawing, pointing to the correct answers, and fill-in-the blanks could be done as well. The use of keypads, word processors and writing software to support the writing task can be utilized.
- For cooperative learning tasks, students can take on a role that they are comfortable doing rather than that of the recorder or presenter.
- Reduction in the length or number of written responses to the Oil Spill Investigation Question Sheet.
- Students should be given extended timelines for task completion if required.
- All materials, equipment, and manipulatives should be labelled with text and visual aids.
- Students can be given exemplars (e.g., sample of a completed hypothesis or budget chart to demonstrate the expectations of the task.).

Teacher Reflections: