STEM Careers Coalition

CLASSROOM ACTIVITY

Geoscientists

OBJECTIVE

Students will take on the role of exploration geologists as they simulate locating oil reserves and consider the challenges faced when searching for petroleum below Earth's surface.

MATERIALS

- For groups of four students:
  - Container or box with lid (shoebox size or slightly smaller)
  - Small water balloon filled with water
    - Note: This water balloon must be smaller than the depth of the container
  - Enough sand and pebbles/small rocks to fill the container
    - Note: Keep these two materials separate from each other
  - Second empty container or bowl (at least half the size of the original container)
  - Graph paper, two sheets
  - 3 colored drawing utensils
  - Teaspoon
- Oil Reserve handout, one per student
- Oil Well Image, one for the instructor to share or project

ENGAGE

- Begin the session with a game of three truths and one lie. Explain that you are going to share four statements about petroleum and the petroleum industry. Students should listen and then decide which of the four statements is actually a lie.
- If needed, before you begin, explain that:
  - Oil and natural gas are fossil fuels.
  - They are called fossil fuels because they form deep underground from the remains of ancient marine organisms like algae and plants.

  - Humans can get oil and natural gas by using drilling machines that go deep into the Earth.
  - Once it is removed from the ground, it is sent to a refinery or industrial plant where it is cleaned and separated into different useable parts, including energy to create electricity, heat buildings, and power vehicles.
- Then share the following four statements, and encourage students to listen and think about which one may not be true:
  - Oil and natural gas are the most consumed (or used) energy sources in the United States.
  - The United States is the world's leading producer of oil and natural gas.
  - Oil and natural gas can be found only in reserves under the ocean floor.
  - The oil and natural gas industry supports more than 11 million American jobs.
- Read through the statements a second time, this time pausing after each one and encouraging students to raise their hand if they believe the statement is a lie.
- Once all students have taken a guess, tell the class that the third fact (Oil and natural gas can be found only in oil or natural gas reserves under the ocean floor) is the lie.

  Explain that oil reserves *are* large deposits of oil found underground (same with natural gas). However, these deposits are not just found under the ocean floor—they can be found under land too!

EXPLORE

- Tell students that the process of finding and extracting oil and natural gas from the ground is complex. Today, they will create a model that helps them understand how it occurs.
- Divide the class into groups of four and distribute one Oil Reserve handout to each group.
- Review the Background section and Part One together and show students where they can find their materials.
- Give students about 10 minutes to carefully complete Part One and build their oil reserves.
- Once students have finished their models and the lids are on their containers, redistribute the models among the class so each group has a model that another group created.
- Then prepare students for the second part of the activity by performing the following steps:
  - Read Part Two from the Oil Reserve handout aloud and tell students that they will now simulate searching for oil.
  - Explain that once they complete their sound test and their Oil Reserve Map, they must follow this map (e.g., searching in high possibility areas first, followed by moderate possibility areas, and then low possibility areas) until they find the petroleum.
  - Be sure students understand that they should discard everything they dig into the empty container. This will enable them to keep track of how much they dug before reaching oil. Reiterate that their goal is to find the oil as quickly as possible!

APPLY

- Once students have found their oil reserves, instruct the groups to reconvene as a class with their discard containers in hand. Encourage each group to show how much they had to dig before they found their oil reserve.
- Ask:
    - What factors made the search more complicated? What factors made the search less complicated?
        - Be sure students acknowledge that factors such as the distance of the reserve from the surface as well as the accuracy of their maps both contributed to the facility of the search for petroleum.
    - When searching for oil or natural gas, why do you think it is important to find it as efficiently as possible?
    - Is there anything your group could have done differently to better protect the Earth and disrupt it less?
- Wrap up by explaining that geologists use a similar but much more precise technique to locate oil and natural gas prior to drilling. Explain:
    - In a technique called seismic imaging, sound waves are sent into the ground through the rock layers. Geologists then study the waves that bounce back to the surface. Based on their speed, they are able to interpret what kinds of rocks there are underground and where oil or natural gas is likely to be found.
    - If an area seems promising, a test hole called an exploratory well is drilled.
    - Hold up the Oil Well image and explain that if enough oil or natural gas is found in the exploratory well, a wider and deeper well called a development well is created to extract the resource.

OIL RESERVE

Background

Oil and natural gas can be found in reserves deep in the Earth, amidst rocks called reservoir rocks. You are about to create a model of these reserves! In your model:

- The pebbles represent the rocks that contain and surround the oil.
- The water balloon represents the oil.
- The sand represents the sand and other sediment that exists in Earth's crust.

Materials

Your group will need:

- Container with a lid
- Sand
- Pebbles/small rocks
- Small water balloon filled with water
- Teaspoon
- Additional empty container
- Graph paper
- 3 colored drawing utensils

Part One: Create Your Oil Reserve

1. Begin to fill your container with layers of sand and pebbles.
2. Place the water balloon amidst the layers. It can be placed anywhere except at very top of the container.
3. Continue to fill the container with layers of sand and pebbles until it is entirely full.
4. Place the top on the container. If there is space between the sand/pebbles and the lid, continue filling the container until the lid can rest upon the sand and pebbles.

Part Two: Search for Oil

1. Trade models with another group.
2. Place graph paper on top of the container. You may need to tape a couple pieces of paper together in order to fully cover the lid.
3. Tap on the graph paper and listen carefully. Any areas that sound different from other areas may be where you should search for oil.
4. Use the graph paper to create a map of where your group believes it makes the most sense to search for oil. On the map, use one color to demonstrate where there is a strong possibility of finding oil, another color for a moderate possibility, and a third color for the lowest possibility.
5. Remove the lid and graph paper from the box.
6. Your goal is now to find the oil in as few digs as possible! With the map as your guide, use the teaspoon to dig carefully.
7. Discard each dig into your empty container.
8. Continue referring to your map until you hit the oil reserve balloon with your spoon.
9. Stop digging once you have found oil!

OIL WELLS