Oil Drop Hide and Seek

Renewable and Non-renewable Sources of Energy
Time: approximately 1-2 Class Periods

Adapted from Little Bits— An Elementary Earth Science Curriculum, developed for the Oklahoma Energy Resources Board, an agency of the State of Oklahoma.

Grade Level: 2-7
Subject: Science, Social Studies, Math

WONDER WHY…

Have you ever wondered why it is difficult to find oil and natural gas?

CONCEPT

Oil comes from nature and is a non-renewable source of energy.

MATERIALS

- 200 black discs or laminated drop shaped cut-outs (**See Teacher Information template that follows the lesson for oil drops.)**
- Pinwheel
- Crude oil sample—available from the following web site: https://www.onta.com/2-crude-oils.html

  (If crude oil is not available, simulate your own. Several types of syrup may be used. Some examples are: molasses for heavy crude, pancake syrup, dark corn syrup, and light corn syrup to simulate lighter crudes.

  You may also try to mix you own using a mixture of such things as used motor oil, tar, diesel fuel, paraffin and a small amount of WD-40 in your recipe. If you choose this option, **EXTREME CAUTION MUST BE EXERCISED WHILE PREPARING YOUR SAMPLE.)**

- Blank overhead transparency or Smartboard documents for developing definition of renewable and non-renewable resources
- Overhead markers
- Crayons
- Four three-ounce plastic cups per pair of students
- Pencils
- Oil Drop Hide and Seek Teacher Sheet
- Oil Drop Hide and Seek Data Sheet

TEACHER BACKGROUND:

Refer to the following web site for more background information. If the website is no longer available search the internet for similar resources using the key phrase "refining oil and natural gas."

http://science.howstuffworks.com/environmental/energy/oil-refining1.htm

Crude Oil is the term for "unprocessed" oil, the stuff that comes out of the ground. It is also known as petroleum**.** Crude oil is a fossil fuel, meaning that it was made naturally from decaying plants and animals living in ancient seas millions of years ago -- most places you can find crude oil were once sea beds. Crude oils vary in color, from clear to tar-black, and in viscosity, from water to almost solid.

Crude oils are such a useful starting point for so many different substances because they contain hydrocarbons. Hydrocarbons are molecules that contain hydrogen and carbon and come in various lengths and structures, from straight chains to branching chains to rings.
There are two things that make hydrocarbons exciting to chemists:

1. Hydrocarbons contain a lot of energy. Many of the things derived from crude oil like gasoline, diesel fuel, paraffin wax and so on take advantage of this energy.
2. Hydrocarbons can take on many different forms. The smallest hydrocarbon is methane **(**CH_4), which is a gas that is a lighter than air. Longer chains with 5 or more carbons are liquids. Very long chains are solids like wax or tar. By chemically cross-linking hydrocarbon chains you can get everything from synthetic rubber to nylon to the plastic in Tupperware. Hydrocarbon chains are very versatile!

The major classes of hydrocarbons in crude oils include:

- **Paraffins** general formula: CnH2n+2 (n is a whole number, usually from 1 to 20) straight- or branched-chain molecules can be gasses or liquids at room temperature depending upon the molecule examples: methane, ethane, propane, butane, isobutane, pentane, hexane
- **Aromatics** general formula: C6H5 - Y (Y is a longer, straight molecule that connects to the benzene ring) ringed structures with one or more rings, rings contain six carbon atoms, with alternating double and single bonds between the carbons typically liquids examples: benzene, napthalene
- **Napthenes or Cycloalkanes** general formula: CnH2n (n is a whole number usually from 1 to 20) ringed structures with one or more rings, rings contain only single bonds between the carbon atoms typically liquids at room temperature examples: cyclohexane, methyl cyclopentane
- Other hydrocarbons **Alkenes** general formula: CnH2n (n is a whole number, usually from 1 to 20) linear or branched chain molecules containing one carbon-carbon double-bond can be liquid or gas examples: ethylene, butene, **isobutene Dienes and Alkynes** general formula: CnH2n-2 (n is a whole number, usually from 1 to 20) linear or branched chain molecules containing two carbon-carbon double-bonds can be liquid or gas examples: acetylene, butadienes

The most common product of crude oil is fuel of all sorts—gasoline, liquefied petroleum gas (LPG), kerosene, naphtha, and diesel. Other products include lubricants, wax, asphalt, tar, petroleum coke, sulfuric acid, and hundreds more.

To learn about everyday products we use that are made from petroleum use the web site below or explore web sites using key words: petroleum products; oil and gas products and petrochemicals.

https://en.wikipedia.org/wiki/Petroleum_product

PROCEDURE:

1. Prior to class, hide 200 oil drops around the classroom. Make sure that some are hidden in very obscure places.

   (Note: This activity could also be done outside.)

2. Begin class by showing a container of crude oil or simulates samples and asking for student volunteers to tell what it is and how it is used. Help students identify products they may not know are made from petroleum. (See Teacher Background for ideas.) Record the responses.

   (*Possible answers: Crude oil is a dark substance consisting mainly of hydrocarbons created through the heating and compression of organic materials over a long period of time. It is used for fuel of all sorts-- gasoline, liquefied petroleum gas (LPG), kerosene, naphtha, and diesel. Other products include lubricants, wax, asphalt, tar, petroleum coke, sulfuric acid, and hundreds more. [****Simplify for lower grades****])*

3. Lead the students to classify it as a source of energy.

4. Show the students a pinwheel and demonstrate its movement by blowing toward it or let a volunteer show how this is done.

5. Again ask students to identify the source of the energy. (If they say "you," be sure to translate that into "wind" that comes from nature or "nature.")

6. Ask how the pinwheel uses the wind – how it is captured or harnessed. Students should be able to recognize and explain that the shape of the pinwheel creates the rotation when a current of air strikes it.

7. Ask students to suggest which one of the energy sources is more likely to run out of its supply—**petroleum/oil or wind**.

8. In comparing the two energy sources, students should explain why they think one will likely run out and the other is not likely to run out.

9. Label the two energy sources: non-renewable (oil) and renewable (wind). Write the definition of non-renewable and renewable resources on the Smartboard or marker board. Students will copy the definition in their notes.

   Renewable: any natural resource (as wood or solar energy) that can be replenished naturally with the passage of time

   Non-renewable: any natural resource that exists in limited supply and cannot be replaced if it is used up; also, any natural resource that cannot be replenished by natural processes.

10. Arrange students in pairs and hand out the **Oil Drop Hide and Seek Data Sheet,** plastic cups, pencils and permanent markers.

11. Tell students that they are going to form an oil company and begin searching for a nonrenewable source of energy (oil drops). Show an example of the oil drops that are hidden around the room.

12. The students should come up with a name for their oil company and write the name on the space provided on the **Oil Drop Hide and Seek Data Sheet**.

13. Using their marker, have students label their cups 1 through 4. For younger students, you may want to pre-label the cups.

14. Give students four 15-second opportunities to find the oil drops.

    An interesting variation to add after the third round: Save a few of the oil drops. After the third round sprinkle more drops in an area closest to one of the teams. When time is called that team has the advantage of collecting many more oil drops. This simulates oil companies finding new reserves of petroleum

15. After each search, have them count and record the number found and deposit the oil drops into a cup (one labeled for each search).

16. At the end of four searches, they should make a bar graph (with color crayons) on their data sheet and analyze their data.

17. When the paired groups have completed the data sheet, ask for volunteers to share their results. Once a few pairs share similar results, lead the class in a discussion. From the data, students should be able to deduce that, due to a limited supply, the search probably yielded smaller returns each time.

18. Ask questions such as:

    - Look at your graph. Did you collect the most oil drops in the first, second, third or fourth search?
    - What is the difference between the number of oil drops you found in your tallest graph and your shortest graph?
    - Why do you think it became increasingly harder to find oil drops?

    - What other factors may have influenced the exploration for petroleum
      (Possible answer: If one group has more members explain how that can affect how exploration can be determined by the size of oil companies. If more oil drops are distributed after round three explain how that can influence oil exploration when new deposits are found. This could also trigger a discussion of the advanced methods used to extract these deposits and how that affects energy independence for the United States.)

(Activity variation: Have students divide into 4 groups (oil companies). Each group should name their company. Have one group conduct the first search for oil drops; group 2 conducts the second search, etc. Once each group has searched, compare data. Which group discovered the most oil?)

STUDENT HANDOUT AND TEACHER INFORMATION SHEET– (See Arkansas Energy Rocks web site for printable Word documents)

Oil Drop Hide and Seek
Student Handout

Data Sheet

Oil Company Name:_____

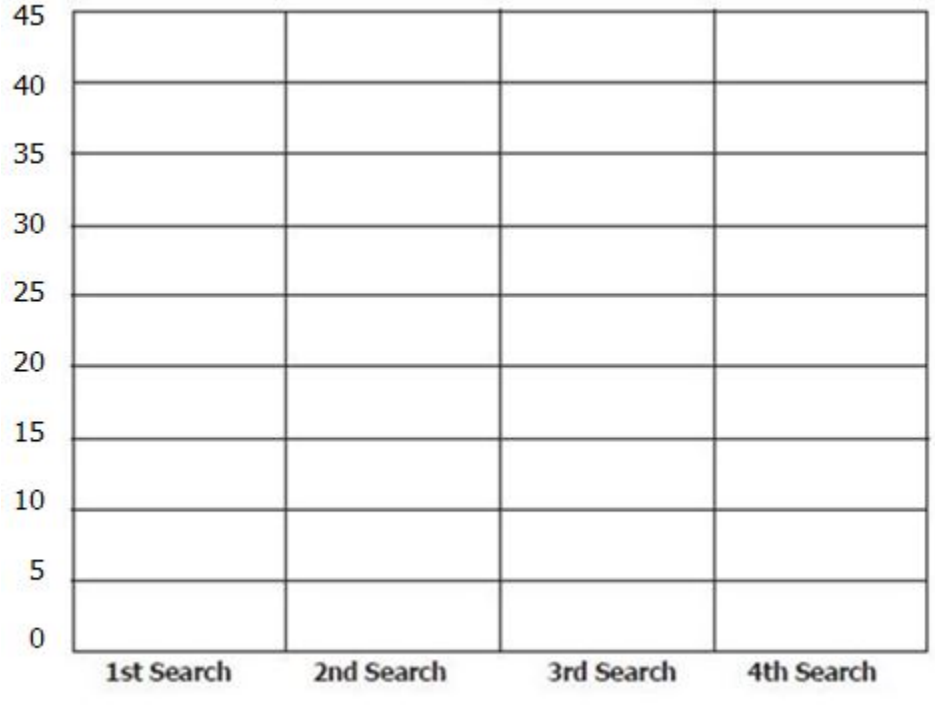
1st Search _____

2nd Search _____

3rd Search _____

4th Search _____

Graph Your Search Results



Activity Questions:

1. Look at your graph. Did you find the most oil in the 1st, 2nd, 3rd or 4th search?

2. What is the difference between the number of oil drops you found in your tallest graph and your shortest graph?

3. Why do you think it became increasingly harder to find oil drops?

OIL DROP PATTERN

Using construction paper, make 20 copies of this page of oil drops. (You may want to laminate and cut out the drops for reuse.) Hide the drops around the room before students arrive.