Oil Drop Hide and Seek

Renewable and Non-Renewable Resources

Grades 5-8

TEACHER RESOURCE

Subject	Arkansas Standard Correlations:
Science	5-PS1-3 Make observations and measurements to identify materials based on their properties. 5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances. 6-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment 6-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems 7-PS1-1 Develop models to describe the atomic structure of simple molecules and extended structures. 7-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. 7-ESS3-1 Construct a scientific explanation based on evidence for how the uneven distribution of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
Math	AR.Math.Content.5.MD.A.1 Convert among different sized standard measurement units within the metric system AR.Math.content.5.MD.C.3 Recognize volume as an attribute of solid figures and understand concept of volume measurement AR.Math.Content.6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. AR.Math.Content.6.SP.A.2 Determine center, spread, and overall shape from a set of data AR.Math.Content.6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots AR.Math.Content.7.RP.A.3 Use proportional relationships to slove multi-step ratio and percent problems. AR.Math.Content.7.SP.C.5 Understand that probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring AR.Math.Content.7.SP.C.7 Develop a probability model and use it to find probabilities of events AR. Math.Content.8.EE.B.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph.
History	G.2.5.4 AR Research how environmental characteristics have impacted the culture of states, places, and regions over time. This may include seafaring/trading in coastal communities, farming cultures in river valleys and nomadic cultures in arid climates. G.2.5.9 Explain the influence of geography on current events and issues and future planning using maps, charts, and available geospatial technologies. G.3.5.9 Explain levels of cooperation among people in various places and regions who solve human and environmental issues. HS.7.7.2 Compare advantages and disadvantages of one location over another in the access to factors of production (e.g., human resources, natural resources, capital resources, entrepreneurship) HS.8.7.3 Analyze conflicting territorial claims from multiple perspectives (e.g., water sources or access, mineral rights, natural resources) ES.10.7.3 Evaluate the sustainability of resources achieved through civic actions
English	5.V.1, 6.V.1, 7.V.1, 8.V.1 Determine or clarify the meaning of words and phrases in a text read aloud or

	independently 5.V.3, 6.V.3, 7.V.3, 8.V.3 Consult materials to clarify pronunciation and/or precise meaning of words. 5.W.2..5/6.W.2.5 Write informative or explanatory pieces, using multimedia sources to examine a topic. 5.CC.1.OL, 6.CC.1.OL, 7.CC.1.OL, 8.CC.1.OLParticipate in collaborative conversations, following class reacted discussion guidelines to expand upon conversations.

Teacher Lesson Plan

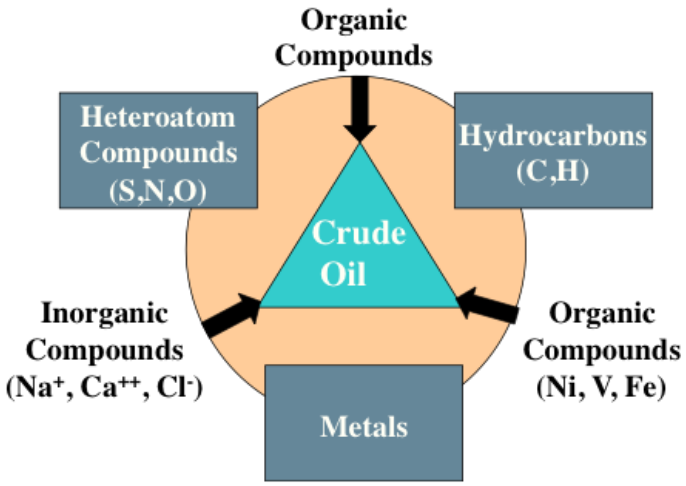
Teacher Background Information:

Crude oil is a fossil fuel, meaning that it was made natural-ly 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. The Earth is millions of years old and overtime all of the plants and animals that have died, have collected on the land and created layer upon layer overtime becoming solid layers of rock called sedimentary rocks. Organisms break down the parts of these rocks and that turns into methane or oil depending on how deep the layer is. Crude oil is unprocessed oil that comes directly from the ground, also known as petroleum. This oil contains Hydrocarbons which is molecules of hydrogen and carbon. Some things to know about Hydrocarbons contain a lot of energy and come in many different forms. Many of the things derived from crude oil like gasoline, diesel fuel, paraffin wax and so on take advantage of this energy. The smallest hydrocarbon is methane (CH4).

There are classes of hydrocarbons called paraffins, aromatics, naphthenes, and alkenes. The most common product of crude oil is fuel of all sorts—gasoline, liquefied petroleum gas (LPG), kerosene, naphtha, and diesel. Many of these hydrocarbons are in products we purchase daily such as shampoos, lotions, cleaning supplies, lubricants, wax, sulfuric acid, food packaging and more.

Youtube video on hydrocarbons:
https://youtu.be/CjmriZq5xRo
Youtube video on Refining:
https://youtu.be/vD0kbdIS6kE

Chemical Components of Hydrocarbons:



Additional links:

https://science.howstuffworks.com/environmental/energy/oil-refining1.htm
https://www.teachengineering.org/lessons/view/cub_earth_lesson07
https://www.need.org/resources/oil-natural-gas-materials/
http://www.chem4kids.com/
https://www.middleschoolchemistry.com/lessonplans/chapter1/lesson2

Lab Materials:

- 200 Black discs of laminated drop shape cut-outs (template below)
    - Hide 200 oil drops around room before starting activity and could also be done outside
    - Variations:
        - groups are in pairs
        - save a few oil drops for after the 3rd round to sprinkle closer to one of the team (simulates an oil company finding new reserves of oil)
        - 4 groups-1 group conduct the first search, 2 group second and so on and compare data. (have students repeat activity multiple times to determine probability)
- Pinwheel
- Crude oil sample link-https://www.onta.com/2-crude-oils.html
    - Alternative option: simulate using molasses-heavy crude, light corn syrup for lighter crudes
    - Mixture of motor oil, tar, diesel, paraffin and small amount of WD-40 (extreme caution when preparing this sample)
- Transparency, smartboard, whiteboard, posterboard for developing definition of renewable and nonrenewable resources

- Overhead markers
- Crayons
- 4-3oz. cups per pair of students
- Oil Drop Hide and Seek Teacher Sheet
- Oil Drop Hide and Seek Data Sheet

Teacher Introduction and Demonstration:

Ever Wonder….How did you arrive at school today? Did you take a bus or a car? What is the most common way people get around??? (answers will vary)

What….What made the vehicle run to get you from point A to point B? (Gasoline)
Do you know what gasoline is or where it comes from? (Gasoline is a product of petroleum, or oil. It is a refined by-product of the crude oil that comes from the ground.)

How….How do we get "oil" out of the ground?

1. Begin class by showing a container of crude oil or simulation of and ask students what is it and how is it used? Help students identify products they may know that are made from petroleum. Record the responses on the overhead or whiteboard so students can see the responses. (possible answers: it is a fossil fuel, gasoline, gas stations, plastic, seen in news stories when there is a spill, natural gas is another fossil fuel along with coal, asphalt, tar)

2. Lead students to classify it as a source of energy.

3. Show students a pinwheel and demonstrate its movement by blowing toward it or let a volunteer show how it is done. (you can also purchase a class set of pinwheels for each student)

4. Question: What is the source of energy when the pinwheel moves? (If they say "you" be sure to translate that into "wind" comes from the movement of Earth, natural processes, the water cycle, etc.)

5. Question: How does the pinwheel use the wind? or How does the pinwheel capture or harness the wind? Students should be able to recognize that the shape of the pinwheel creates the rotation when a current of air strikes it.

6. Question: Which energy source is more likely to run out of its supply? Petroleum/Oil or Wind? Compare the two on the board or class made chart table with non-renewable (oil) and

renewable (wind) columns and fill in as students make comparisons. Students can add to their notes on their student lab sheet.

Renewable	Non-Renewable
Any natural resource that can be replenished naturally with the passage of time	Any natural resource that exists in limited supply and cannot be replaced if it is used up

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

8. Tell students 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.

Variations:

- Create a name for their oil company and add to their lab sheet
  using a marker have students label the cups 1-4. Pre-label for younger grades
- Give students four 15-second opportunities to find the oil drops stopping between intervals.
- After each search have them count and record the number of oil drops found in the cup
- Divide room into quadrants and have each group in a quadrant to determine statistical success based on number of oil drops per area.

10. At the end of 4 searches, they should make a bar graph on their data sheet and analyze their data.

11. Share results as a class and lead the class in a discussion on limitations of the activity and how that relates to limits of supply and demand-the less you have the more in demand a product is, the more you have, the less of a demand.

- Take a 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 oil?
    - size of companies
    - more oil drops in a particular location
    - if oil drops were taken from one location over another

Student Activity Sheet

GROUP MEMBERS: _____

OIL COMPANY NAME: _____

Student Notes/Information:

First, to harvest oil, we must find it even though it is deep underground where we cannot see. After drilling test holes, engineers set up equipment to drill in the exact area that their tests show contain a lot of oil. The oil is extracted, brought up to the surface by a pump. Sometimes parts of the sediments cannot be used and can be harmful to the environment so the engineers make sure to dispose of them carefully to avoid spilling. Then the oil is transported to a refinery where it is broken down into multiple substances that can be used to make many products. Most of our nation's cars run on gasoline, which is made from oil, and many houses are heated by oil, as well as the production of plastic products.

Vocabulary:

- renewable energy
- nonrenewable energy
- fossil fuel
- oil
- natural gas
- coal
- capture
- harness

Video Notes: Hydrocarbons

Hydrocarbons contain only _____ and _____.
Crude oil is mostly made up of dead _____, _____and _____ turned the dead material into crude oil.
Oil is a _____resource meaning if we continue to use it at a high rate, then one day we will run out.
_____ _____is the process of separating out all of the hydrocarbons from the oil.
All of the compounds have different _____ points.
The hydrocarbons with the longest chemical chains, have the _____ boiling point.

Data Collection:

1st Search _____

2nd Search _____

3rd Search _____

4th Search _____

Graph your results:

45				
40				
35				
30				
25				
20				
15				
10				
5				
0				
	1st Search	2nd Search	3rd Search	4th Search

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?

4. What happens as demand of oil increases?

5. How do we prevent using up all of the available oil?

6. What would be some good strategies or ideas for limiting over production to avoid running out?

7. How can humans reduce the overuse of fossil fuels to preserve these resources for the future generations?

8. Based on location in the “room” what was the probability of success for each quadrant of the room?


ARKANSAS ENERGY
Rocks!

Oil Drop Pattern

Using heavy paper, make 21 copies of this page of oil drops (210 drops)