2015-2016

Oil, Gas, and Their Energy

Hands-on and language arts activities that provide primary students with an introduction to energy and how oil and gas are formed, transported, and used.

Grade Level:

Pri Primary

Subject Areas:

Science

Social Studies

Language Arts

Math

Technology

NEED

National Energy Education Development Project

Teacher Advisory Board

NEED Mission Statement

The mission of The NEED Project is to promote an energy conscious and educated society by creating effective networks of students, educators, business, government and community leaders to design and deliver objective, multi-sided energy education programs.

Teacher Advisory Board Statement

In support of NEED, the national Teacher Advisory Board (TAB) is dedicated to developing and promoting standards-based energy curriculum and training.

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Energy Data Used in NEED Materials

NEED believes in providing the most recently reported energy data available to our teachers and students. Most statistics and data are derived from the U.S. Energy Information Administration's Annual Energy Review that is published yearly. Working in partnership with EIA, NEED includes easy to understand data in our curriculum materials. To do further research, visit the EIA website at www.eia.gov. EIA's Energy Kids site has great lessons and activities for students at www.eia.gov/kids.

NEED
National Energy Education Development

1.800.875.5029
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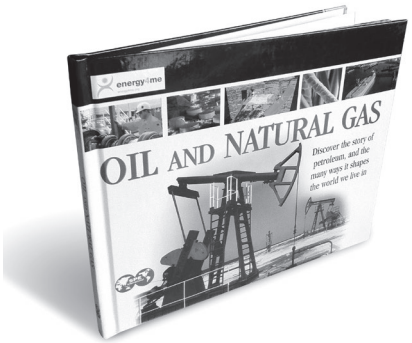
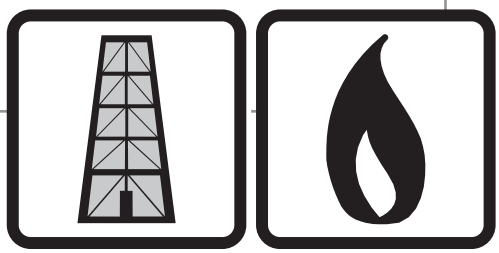
Oil, Gas, and Their Energy



Oil and Natural Gas, from the Society of Petroleum Engineers, is a great resource that supplements the information and activities in *Oil, Gas, and Their Energy*. Available in several languages, this book showcases the geology, technology, careers, and difficult concepts of oil and natural gas in a fun, colorfully illustrated, and informational way.

To order a free classroom copy, visit http://www.energy4me.org/order/oil-and-natural-gas/.

Table of Contents



Standards Correlation Information

www.NEED.org/curriculumcorrelations

Next Generation Science Standards

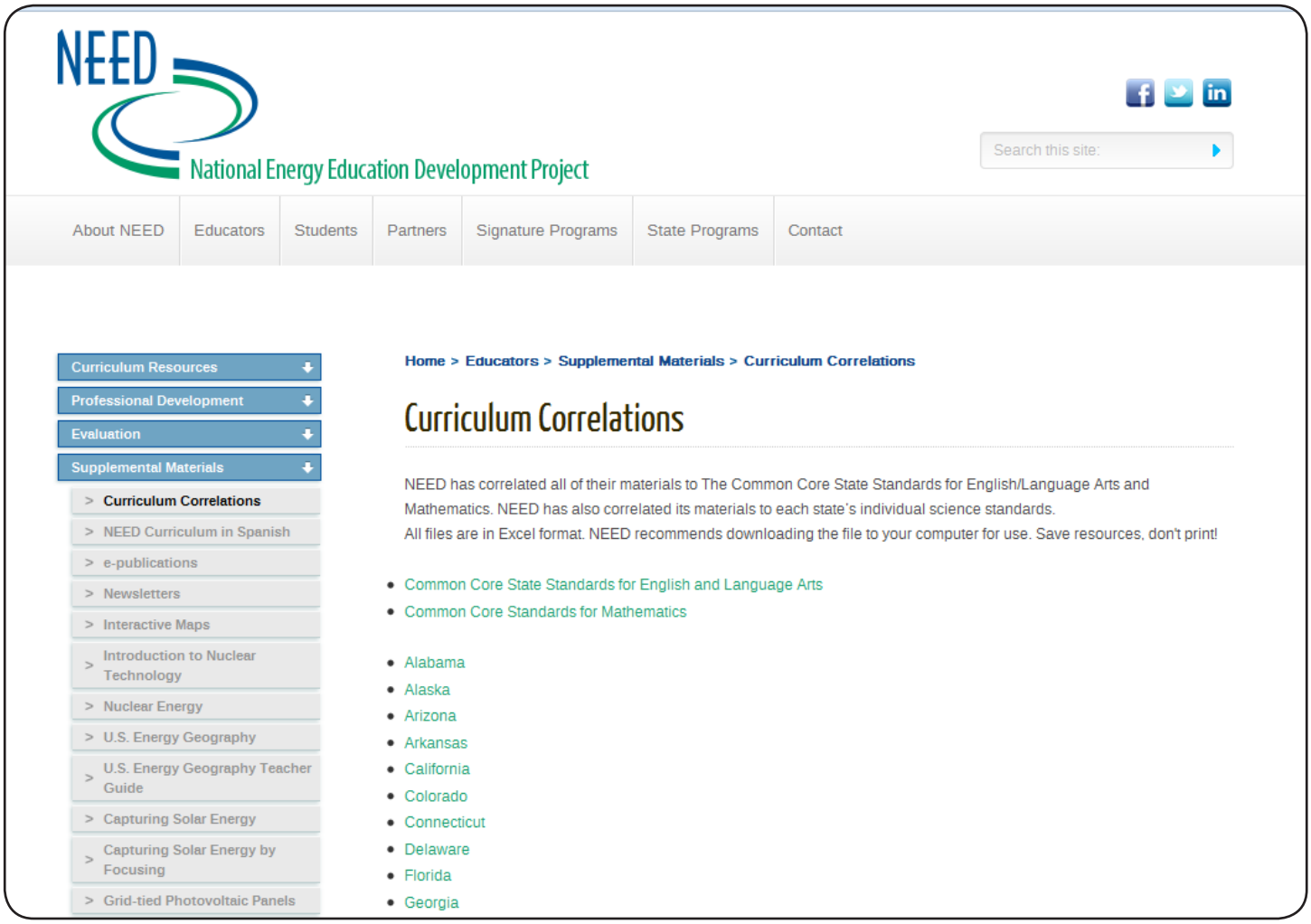
- This guide effectively supports many Next Generation Science Standards. This material can satisfy performance expectations, science and engineering practices, disciplinary core ideas, and cross cutting concepts within your required curriculum. For more details on these correlations, please visit NEED's curriculum correlations website.

Common Core State Standards

- This guide has been correlated to the Common Core State Standards in both language arts and mathematics. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED curriculum correlations website.

Individual State Science Standards

- This guide has been correlated to each state's individual science standards. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED website.



Differentiating Instruction K-2

Students' abilities in Kindergarten through second grade are varied, as are the abilities of individual students within each classroom. Here are some suggestions for using this curriculum across the K-2 setting.

Reading

The student text for *Oil, Gas, and Their Energy* can be found within this guide. Depending on your students' reading level, you may want to make a master copy to read aloud to your class. You can also download this guide from www.NEED.org and project the text onto a screen that the entire class can see. Older children may be able to read the text independently.

Writing

Kindergarten

As much as possible, students should be interacting with materials and investigating individually or with partners. Students can each have their own science notebook or individual sheets. Teachers may choose to create a classroom set of worksheets or science notebook. Drawing scientific or realistic pictures should be modeled to the students and attempted in their work. Students should be encouraged to label pictures with as many sounds as they can hear, even if this is only the initial consonant at first. Students' individual observations can be glued into a classroom notebook made of large construction paper or chart paper. The teacher should write a summary sentence or two in the class science notebook based on the students' discussion and observations. While the teacher can assess students' pictures, listening to students to gauge their understanding is important. Parent volunteers can be a valuable resource during this unit, helping with investigation management, preparing materials, and being a scribe for students.

First Grade

Depending on the time of year that you teach this unit, you may find yourself using some of the Kindergarten strategies or moving toward second grade strategies. In general, students should be able to follow directions and work independently or with partners on investigations. Each student should have his or her own science notebook or individual worksheets and be encouraged to communicate his or her thinking in pictures and words, although allowing dictation for non-writers is appropriate. Pictures should be realistic in nature and include labels as needed. It is suggested that teachers create a word wall with pertinent vocabulary for the unit that students can use as a resource. Parent volunteers continue to be a good support for investigation management and preparing materials.

Second Grade

As second graders become more comfortable with the inquiry process, teachers are encouraged to extend the investigations further, exploring student generated questions. Second graders should be given more opportunities to record measurable data and units such as length in centimeters.

Oil and Natural Gas Writing Introduction

Have students start thinking about oil and natural gas by integrating it into your writing unit. Depending on whether you are focusing on fiction or nonfiction, you may want to use one of the following prompts:

Personal Narrative: Tell me about how you get to school, practice, church, or a grandparent's house. What would your weekend be like if there was no gasoline for your car?

Fictional Narrative: Pretend you lived at a time where there was no gasoline and no cars. Write a story describing what a day in your life would look like.

Science Notebooks

You are encouraged to have students record their thinking in science notebooks during this unit. There are many different looks to science notebooks, ways to use them, and ways to assess them. If you currently use student notebooks (or journals) in your classroom you may have your students continue using these as they learn about oil and gas. If you are not using science notebooks, you can make them out of paper that your students are familiar using. If you would like more structure to your science notebooks, you can copy the worksheets included in this guide and staple them together, or have students glue these pages into their existing science notebooks.

A checklist for assessing science notebooks can be found on page 8. Carrying the checklist with you as you circulate among your students will allow you to make some notes for formative assessment and guide your conversation with students as you help them become stronger scientists. You may want to customize the checklist based on your state standards.

Oil, Gas, and Their Energy Materials

ACTIVITY	MATERIALS NEEDED
Where is the Oil and Gas?	▪Pencils ▪Crayons or colored pencils
Illustrating Stories	▪Construction paper ▪Art supplies ▪Poster board or cardstock ▪Binding materials (staples, yarn, rings, etc.)
Exploring Core Sampling	▪Dark sand ▪Light sand ▪Soil ▪Small gravel ▪Clear straws ▪Opaque plastic cups ▪Spray bottles ▪Water ▪Plastic spoons ▪Rulers
Petroleum Ponder	▪Various petroleum products ▪Various non-petroleum products ▪Box
Sequence Oil and Gas	▪Scissors ▪Glue sticks ▪Paper
Pretzel Power	▪3x5" Note cards ▪Bag of pretzels ▪Plastic sandwich bags ▪Three signs or sheets of paper

Teacher Guide

Inquiry based, hands-on activities and language arts reinforcement to introduce students to the energy-rich resources, oil and natural gas.

Background

Primary students are introduced to the concept of energy and how oil and gas are formed, transported, and used. Bold graphics, simple words and sentences, and supporting activities are used to learn science content as well as enhance their reading, comprehension, and critical thinking skills.

The *Oil, Gas, and Their Energy* text is designed to be read aloud to students. Each section contains background information for the teacher and easy to understand information for students. Additional information is provided in each section for teachers and students who want to go deeper into the topic. You may project this guide so that more advanced readers may read at their own pace, where applicable. *Oil, Gas, and Their Energy* is also available in an e-reader format, which is great for projection on a smart board or for use on tablets. Download this guide from www.NEED.org.

★ Skills

- Nonfiction Reading
- Listening
- Critical Thinking
- Sequencing
- Vocabulary
- Compare and Contrast

Preparation

1. Pre-read the student and teacher sections, and consult additional resources as needed for further information.
2. Decide which activities you want to conduct to reinforce the information presented in the nonfiction text.

   Note: If you decide to conduct the activity Exploring Core Sampling*, depending on the level of your students, you may want to set up the cups ahead of time.*
3. Plan your unit and procure any materials you need to conduct the activities. Consult the chart on page 6 for a list of materials needed.
4. Make copies of any worksheets and activities needed and prepare digital or physical copies of masters for projection.

✔ Procedure

1. Introduce energy, oil, and natural gas to the students with a brief discussion about energy. Ask students what they know about oil and natural gas. If they are able, have them write or draw their thoughts and associations in a KWL chart. A template can be found on page 9.
2. Read the guide with the students. "What is..." pages could also be projected for the class as you read aloud. Have students add to their KWL charts by writing or drawing pictures to show what they've learned.
3. Conduct the activities you have planned to reinforce the information.
4. Assess student writing and work using the checklist on page 8.
5. Evaluate the activities with the students using the evaluation form on page 47 and return it to NEED.

Grade Level

- Primary, grades K-2

Time

Approximately 5-10 class periods, depending on the extent of activities you choose to utilize in the unit

Additional Resources

NEED has many other resources that can be used in the classroom to enhance student learning or as additional background for the unit. Visit www.NEED.org to find these titles and more:

- *Energy on Stage*
- *Energy Rock Performances*
- *Energy Stories and More*
- *Primary Energy Infobook*

Also, check out these great websites for additional information on energy and oil and natural gas:

- EIA Kids — www.eia.gov/kids/
- Energy4me — www.energy4me.org

Science Notebook Skills Checklist

Designed to be a formative assessment tool, you may find this checklist useful as you work with students. Put all of your students' names down the left hand side. When you look at a student's worksheet or science notebook and see a skill demonstrated, put a dot in the box. Decide how many times (typically 3–5) you want to see the student use the skill independently before checking off the box as a sign that the student has mastered this skill.

Student Name	Drawings	Picture is realistic (colors, shape, size)	Includes appropriate labels	Notes and Observations	Uses senses to record observations	Observations are "big picture"	Observations focus on details	Graphs and Charts	Data is accurate	Includes appropriate labels	Clear presentation	Communication	Communicates verbally	Communicates in writing	Makes predictions	Makes predictions with reasoning	Uses evidence to support reasoning	Compares and contrasts	Communication is personal

KWL Chart

What I Think I KNOW	What I WANT TO KNOW	What I LEARNED

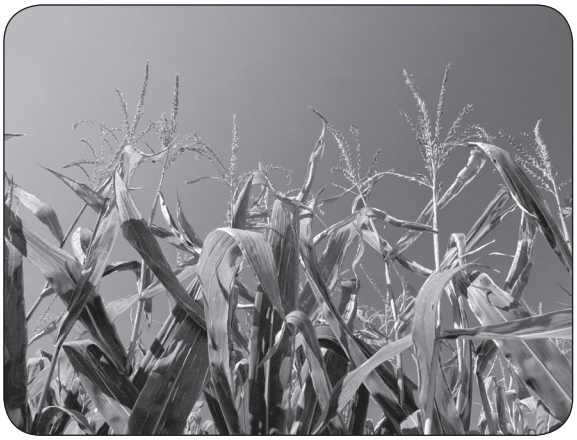
What is Energy?

TV

Girl

Rain

Car



Corn

Energy makes change.

Energy
TEACHER

What is Energy?

Energy makes a change of some kind; it does things for us. We use energy to move cars along the road and boats over the water. Energy is used to bake a cake in the oven, and to keep ice frozen in the freezer. It provides power so we can listen to our favorite songs on the radio, and light our homes. Energy makes our bodies grow and allows our minds to think. Scientists define energy as the ability to do work.

Energy is found in many different forms such as light, heat, motion, sound, and growth.

Discussion Questions

1. What changes occur with the objects in the pictures (on page 10)?
2. Where does the girl get her energy? *(food that she eats)* How is she using energy? *(to move, see, hear, think, stay warm or cool)*
3. Where does the television get its energy? *(electricity)* What kind of energy does it make? *(sound, light, heat)*
4. Where does the car get its energy? *(battery and gasoline)* What kind of energy does it make? *(motion, sound, heat)*
5. Where does the rain get its energy? *(the sun and gravity drive the water cycle)*
6. Where does the corn get its energy? *(light from the sun)*

Activity

1. Look around the classroom and point out things that are using energy *(computer, clock, lights, plants, animals)*. Decide where each item gets its energy and how it uses it.

What is Oil?

These machines called pumpjacks are used to pump oil out of the ground.

Oil is a liquid found underground. It can be thick like honey, or thin like water. It can be a yellowish color or dark brown. Oil must be pumped out of the ground so we can use the energy stored in it. Oil is also called petroleum or crude oil.

What is Oil?
TEACHER

What is Oil?

Petroleum is a liquid that is found underground. Sometimes we call it oil. Oil in its natural state is called crude oil and can be as thick and black as tar or as thin and transparent as water. Petroleum has a lot of energy in it. We can turn it into different fuels—like gasoline, diesel fuel, jet fuel, kerosene, and heating oil. Many other products are made from petroleum, such as rubber, plastics, inks, and crayons.

We use more petroleum than any other energy source, providing more than one-third of our energy. Most petroleum is used for transportation or making products.

More Information

1. Oil is a mixture of many different compounds, and must be separated before it can be used. Ask (or show) students to think about oil and water or salad dressing and how they can be mixed up or separated. The process of separating the compounds in petroleum is called refining.

2. The ancient Egyptians burned crude oil for light.

3. Edwin Drake drilled the first oil well in 1859. The well was only 69 feet deep, which is very shallow compared to oil wells drilled today. Most wells today can be a mile deep or more.

Discussion Question

1. How do we get the energy from oil? *Oil is turned into different fuels, like gasoline, diesel fuel, and jet fuel, and is used in the engines of cars, trucks, and jet planes. Oil is also burned for light in kerosene lamps and in homes in oil furnaces.*

What is Natural Gas?

Some cooking stoves burn natural gas using flames like this one.

Natural gas is invisible, like the air we breathe, but it is very different from air. You cannot see natural gas. We add odor to natural gas so we can smell it. We burn natural gas to get energy from it.

What is Natural Gas?
TEACHER

What is Natural Gas?

Natural gas is like the air we breathe—it is a mixture of gases you can't see, smell, or taste. But it is different, too. It has a lot of energy in it. You can burn it to make heat. Ancient people discovered natural gas many centuries ago and used it in their temples.

About 2,500 years ago the Chinese burned natural gas to separate salt out of seawater, using evaporation. In 1816, street lamps in Baltimore, MD used natural gas.

Today, natural gas is the country's second largest source of energy, providing a little more than one quarter of our energy.

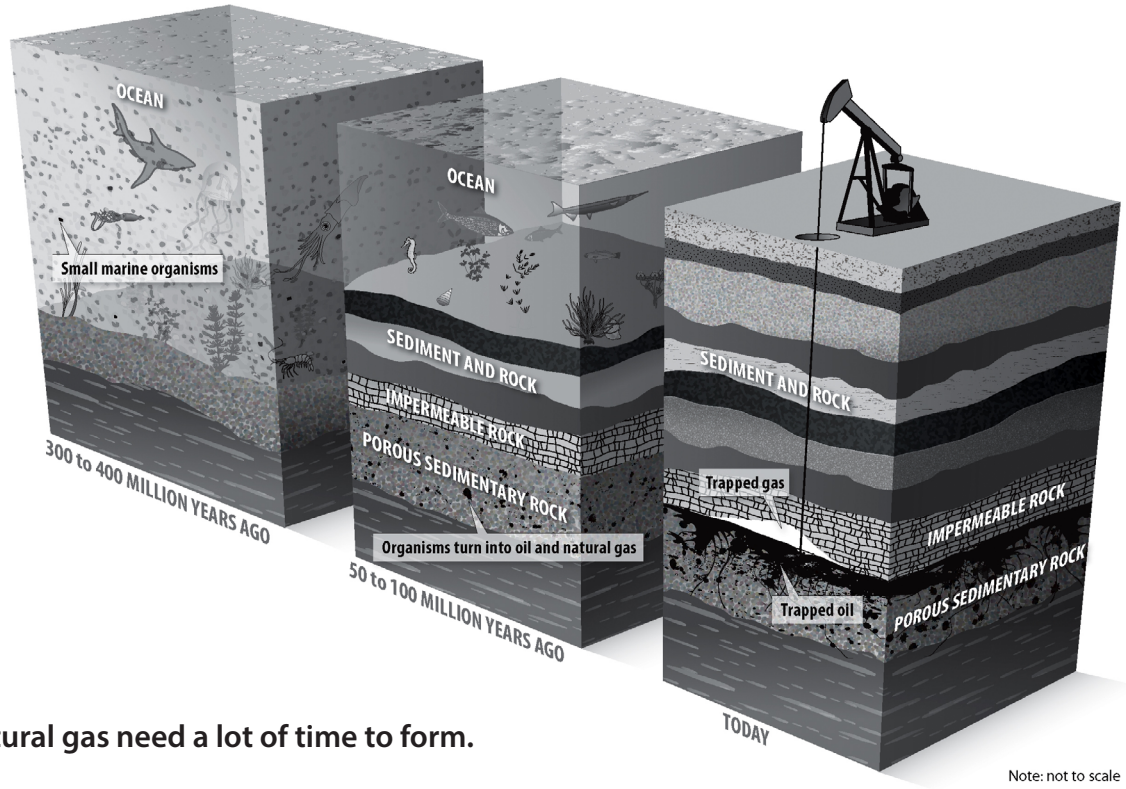
More Information

1. Natural gas can be found alone, or in combination with petroleum. It is also often found in coal deposits.
2. The mixture we call natural gas is a mixture made mostly of methane. A chemical, called mercaptan, is added to give it an odor and make it detectable if a leak occurs.
3. Most natural gas is nonrenewable, which means we cannot make more in a short amount of time. However, some sources of natural gas are renewable, such as landfills and biogas from livestock farms.

Discussion Questions

1. What is natural gas? *Natural gas is a clear, colorless gas we burn for energy.*
2. How is natural gas the same as air? How is it different from air? *Natural gas and air are both gases at room temperature, and are both invisible. Natural gas can be burned for energy, and air cannot.*
3. How is oil the same as natural gas? How is oil different from natural gas? *Like natural gas, oil is found in rocks underground. Oil has many different uses and can be made into many products. Natural gas is mostly burned for heat, cooking, or electricity.*

How Did Oil and Natural Gas Form?



Oil and natural gas need a lot of time to form.

A very long time ago, the oceans were filled with many different plants and animals. The dead plants and animals were buried and turned into oil and natural gas. Oil and natural gas are called fossil fuels.

Nonrenewable

NON - re - NEW - a - ble

NOT able to be NEW again

COAL NATURAL GAS PETROLEUM PROPANE URANIUM

Some energy sources take hundreds of millions of years to form.

How Did Oil and Natural Gas Form?

TEACHER

Natural Gas and Petroleum are Fossil Fuels

Natural gas was formed in the Earth hundreds of millions of years ago, before the dinosaurs. Oceans covered much of the Earth, filled with tiny sea plants and animals. When the plants and animals died, they sank to the bottom of the ocean, and were eventually covered by sand. Layers of dead plants, animals, and sand built up over time.

Over time, heat and pressure changed the sand into sedimentary rock, and the plants and animals were changed into oil and natural gas. Since oil and natural gas are made from the remains of plants and animals, they are called fossil fuels.

The plants and animals received their energy when they were alive from the sun. That energy was stored in them when they died. This is the energy found in oil and natural gas.

Natural Gas and Petroleum are Nonrenewable

The natural gas and petroleum we use today took hundreds of millions of years to form. That's why we call them nonrenewable energy sources. We can't make more in a short time. The United States doesn't produce enough oil to meet our needs. We buy about 40% of the oil we use from other countries.

More Information

1. Oil and natural gas are usually trapped in porous rocks, the way water is trapped in a sponge. The most common rocks in which oil and natural gas are found are sedimentary rocks like sandstone and limestone.

2. To keep the oil or natural gas from seeping to the surface, the deposits must be capped with a nonporous rock.

3. The tiny plants and animals that eventually formed natural gas and oil were living about 400 million years ago, which is about 150 million years before the dinosaurs roamed the Earth.

4. Natural gas can be found along with oil underground, but it can also be found alone.

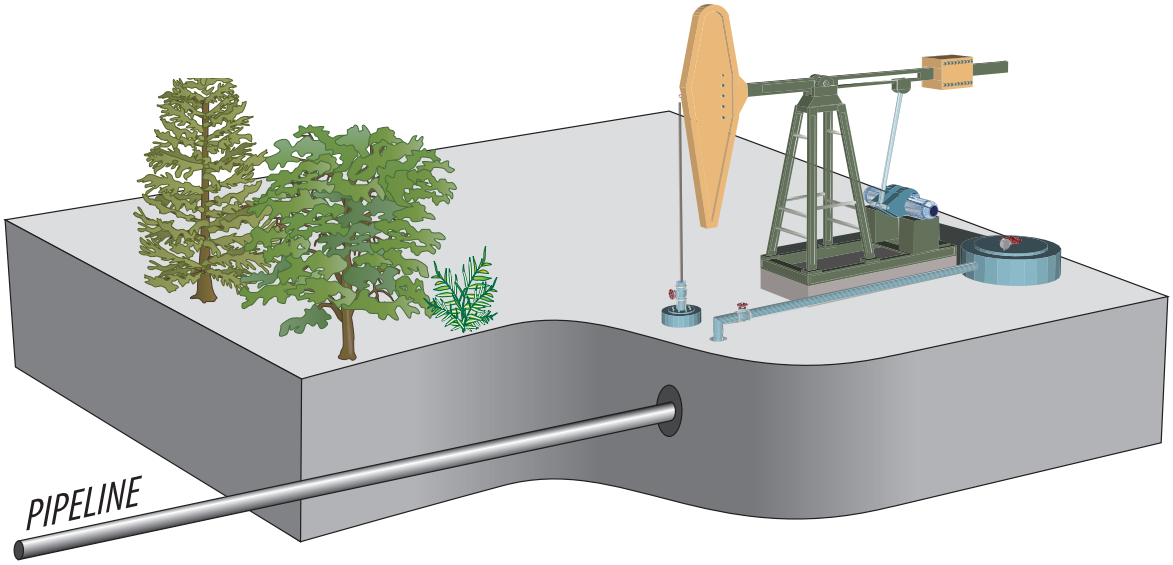
Discussion Questions

1. What has to happen to make oil and natural gas? *A great many plants and animals must die and be buried by many layers of rock and dirt. Also, a very long time must pass with lots of heat and pressure before the plants and animals have been turned into oil and natural gas.*

2. Why are oil and natural gas called fossil fuels? *Fossil fuels are energy sources made from dead plants or animals that died a long time ago. Plants and animals that were not turned into fossil fuels might be discovered today preserved in rocks as fossils.*

3. Why are oil and natural gas called nonrenewable? *It takes a very long time and just the right conditions to make oil and natural gas. We cannot make more in a reasonable amount of time. Therefore, they are nonrenewable.*

How Do We Get Oil and Natural Gas?



Natural gas is moved from one place to another through pipelines.

Scientists must explore deep below the surface. A hole called a well is drilled. Oil or natural gas is then pumped out of the ground. Natural gas is carried by pipes underground. Oil is carried by tankers to refineries.

An oil tanker. Image courtesy of BP

How Do We Get Oil and Natural Gas?

TEACHER

Drilling for Natural Gas

Natural gas is trapped in underground rocks. We drill wells into the ground to reach the gas. Some wells are a mile or more deep! Natural gas can be found under land or under the ocean's floor.

Natural gas is a mixture of gases. The main ingredient in natural gas is methane. Methane has no color, odor, or taste. To be safe, gas companies add a rotten egg smell to the gas so that leaks can be easily found.

Transporting Natural Gas

We move natural gas from one place to another in pipelines. There are almost two million miles of pipeline all across the United States. These pipes connect wells to refineries, to power plants, and to our homes, factories, and other buildings.

Oil Production

Petroleum is buried underground in tiny pockets in rocks. Geologists locate oil and gas deposits deep within the Earth using special equipment. We drill oil wells into the rocks to pump out the oil. The typical well today is about one mile deep (select a familiar site about one mile from the school and explain to students that this is about how deep most wells are today). Oil can be found under land. Texas and North Dakota are the states that produce the most oil.

A lot of oil is also under the oceans along our shores. Oil rigs that can float are used to reach this oil. Most of these wells are in the Gulf of Mexico.

Transporting Oil

We move oil from offshore wells and other countries with large ships called tankers. The tankers take the oil to special places called refineries, where the oil is separated into its many different compounds, such as gasoline or jet fuel. Then the compounds are transported by truck or train.

Technology and the Petroleum Industry

Current drilling techniques are better now because of technology. Computers and other special instruments are used by workers to greatly improve the amount of oil produced by a well, which is good for the economy and the environment.

Special drills let companies drill down and across and in different directions so that they can reach oil in a big area from just one oil well. This type of well saves a lot of land and uses only one well instead of many wells. An engineer in one location can operate a drill in a location very far away. This saves a lot of money and time by helping scientists to drill wells only in places where oil is found.

More Information

1. Many different types of technology are used to explore for oil and natural gas. Seismic technology uses sound waves to reveal what lies deep in the ground. 3-D imaging uses several seismic instruments and underground probes to construct a 3-D image of the area. When exploring in oceans, boats tow cables with hydrophones to locate oil beneath the ocean floor. Slight differences in the density of the rocks will show slight differences in gravitational pull, and these differences can be used to reveal certain subterranean features that could house oil or natural gas.

2. Getting oil out of the ground first begins with obtaining permission, and then drilling the well. While drilling, rocks and other debris must be removed. Once the hole is drilled, a number of different steps must be taken before pumping can begin. This is called completion.

3. A detailed description of the exploration and drilling process can be found in the guide *Exploring Oil and Gas*.

Discussion Questions

1. Why can't oil be transported by pipeline the way natural gas can? *Oil first has to be separated into its different compounds before it can be used. Natural gas can be used straight out of the ground.*

2. How do geologists know where to drill a well? *Geologists use special equipment that helps them find the oil and gas deep within the Earth.*

How Do We Use Oil and Natural Gas?

Some city buses run on natural gas.

We use oil and natural gas every day. Many homes are heated with natural gas. Natural gas is used to make electricity and is even used in cars and buses.

How Do We Use Oil and Natural Gas?

Lipstick

Action figures

Tape

Rubber bands

Oil is used to make gasoline, diesel fuel, jet fuel, and plastics. Plastic bags from the store, your toys, and even some clothing are all made from oil.

How Do We Use Oil and Natural Gas?

TEACHER

We Use Natural Gas Every Day

Almost everyone in the United States uses natural gas.

Factories are the biggest users. Factories burn natural gas to produce heat to make products like paper and cement. Natural gas is also an ingredient in paints, glues, fertilizers, plastics, medicines, and many other products.

Natural Gas is Cleaner to Burn

You need to burn natural gas to get to its energy. Anytime something is burned, pollutants are put in the air. However, natural gas doesn't pollute the air as much as coal or oil. That's why it is a good fuel for heating our homes, for making electricity, and for transportation.

Homes are big users of natural gas. More than half of the homes in the United States use natural gas for heating! Many also use it for cooking and heating water.

Schools, stores, offices, churches, and hospitals use natural gas, too!

Natural gas is also used to make electricity. Natural gas plants can produce electricity quickly. It is the second biggest source for electricity.

Natural gas burns cleaner than regular gasoline. Some cities use natural gas in their city buses and school buses. Some parks use natural gas in their vehicles. There aren't many gas stations that sell natural gas, so most families do not have natural gas powered cars.

We Use Petroleum Every Day

People have burned oil for a long time. Long ago, they didn't drill for it. They gathered oil that seeped from under the ground into ponds. It floated on the water. This oil was burned where it was found.

Now, oil is pumped from underground and used elsewhere. After the oil is pumped to the surface, it is shipped from one place to another through pipelines and by ships and trucks to special processing plants called refineries. At the refineries, it is separated into different fuels and made into other products. The first crude oil was refined into kerosene for use in kerosene lamps for lighting. At that time, the rest of the product was tossed away until Henry Ford began making lots of automobiles in 1913. Because automobiles use gasoline, the need for gasoline greatly increased. Today, almost half of all crude oil is made into gasoline.

Today, our country would come to a stop without fuels made from petroleum. Most of our cars, trucks, ships, and planes are powered by petroleum products. We depend on petroleum fuels to travel from place to place and to bring us food and other items that we need in our daily lives.

Our factories use oil to make plastics and paints, medicines, and soaps. Did you ever think about your action figures, your CDs, or even lip balm being made from petroleum? We also burn oil to make electricity that runs our lights and appliances. We use more petroleum than any other energy source.

How Do We Use Oil and Natural Gas?
TEACHER

More Information

1. Before it can be used, oil must be separated into its different compounds. A process called fractional distillation, which heats the oil until it boils, is used for the separation.

2. The mixture we call natural gas is a mixture made mostly of methane. A chemical, called mercaptan, is added to give it an odor and make it detectable if a pipeline leak occurs.

3. There are many, many different jobs available in the oil and gas industries. More information about careers can be found in *Exploring Oil and Gas* and from the U.S. Department of Energy and the Society of Petroleum Engineers.

Discussion Questions

1. What are three things for which natural gas is used every day? *Heating homes, generating electricity, and in factories as a source of heat*

2. Which part of our society uses the most natural gas? *Industry uses the most natural gas, followed by electric power plants and homes.*

3. What are the major uses of oil? *Oil is used to make fuels for transportation, and products such as toys and CDs.*

4. What would happen if suddenly there was no oil? *Almost all vehicles run on a fuel made from oil. Very few cars, trucks, buses, trains, or jet planes would be able to move. Products and people could not move from place to place, and some areas would run out of food because it could not be trucked in to them. We use more oil than any other energy source.*

Where is the Oil and Gas?

Question

- Where can oil and gas can be found in the United States?

Time

- 20 Minutes

Materials

- Copies of maps, *Top Natural Gas Producing States, 2013*, and *Top Oil Producing States, 2013*
- Pencils and crayons

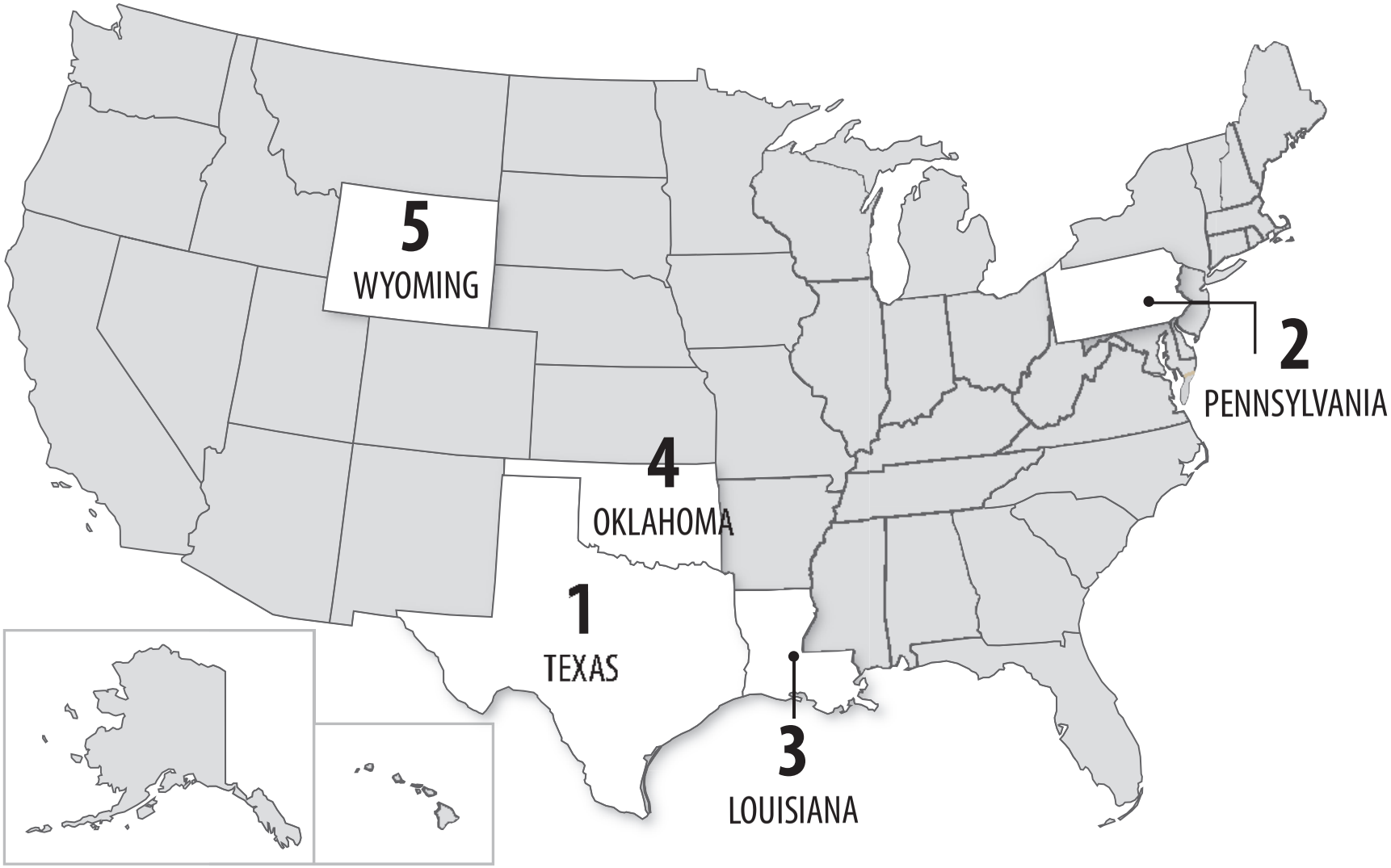
Preparation

- Make copies of each map for each student.

Procedure

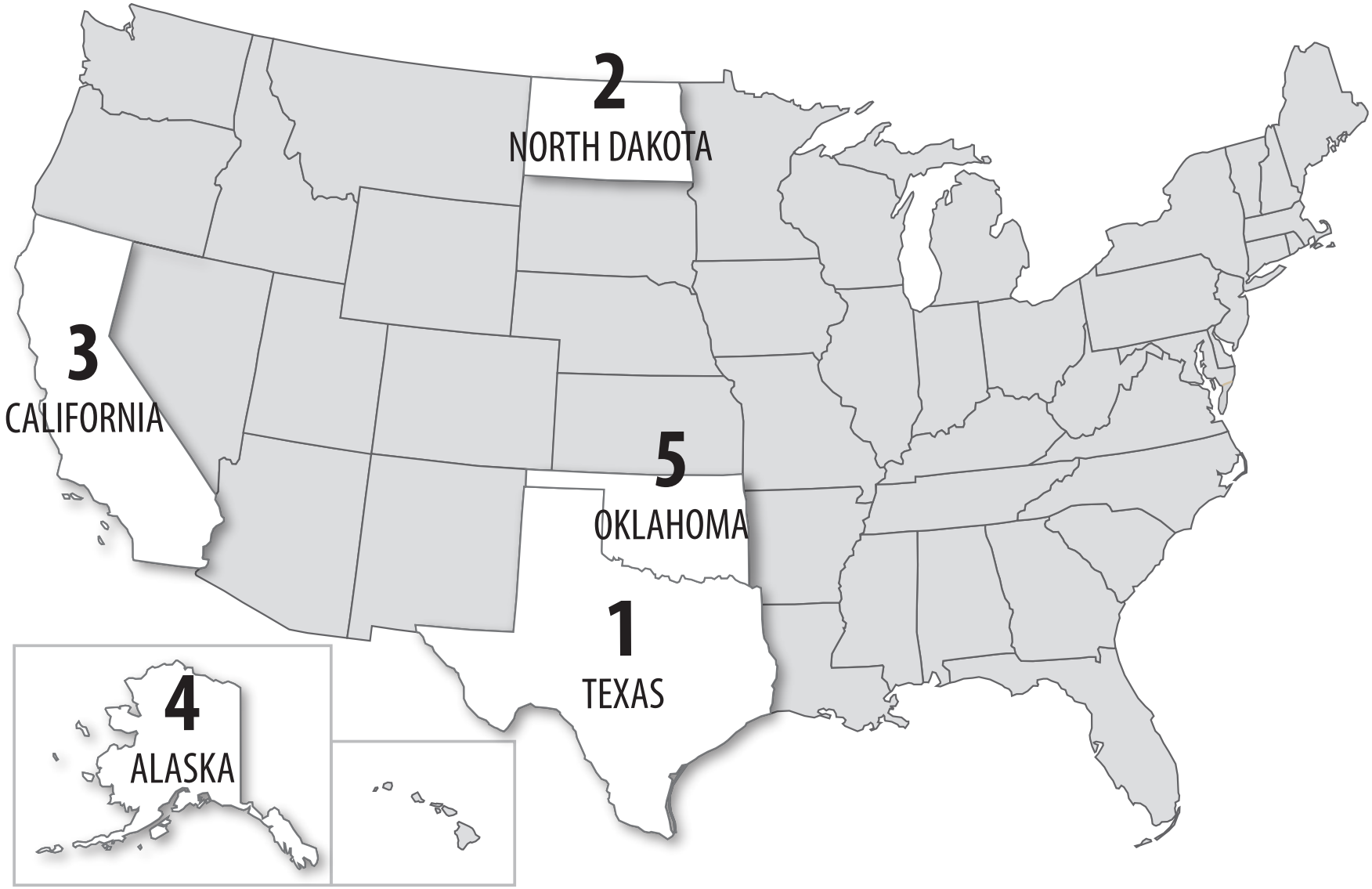
1. Have students locate their home state on each map and color it.
2. Identify the states that produce petroleum and natural gas by putting a red star on each one.
3. Discuss your state compared to the maps. Discuss how oil and natural gas might be transported to your state. Have students brainstorm what might be easy or difficult about getting these energy sources to their area.

Top Natural Gas Producing States, 2013



Data: Energy Information Administration

Top Oil Producing States, 2013



Data: Energy Information Administration

Illustrating Stories

Questions

- How were oil and natural gas formed?
- How do we get them from under the ocean?

Materials

- Construction paper
- Poster board or material for cover
- Markers or crayons
- Binding materials
- Copies of stories

Stories

- *Under the Sea*, found in *Energy Stories and More*
- *Into Deep Water: Drilling for Oil and Gas*, found in *Energy Stories and More*

NOTE: *Energy Stories and More* can be accessed on the NEED website at www.NEED.org.

Procedure

1. Have students work in groups of 3-4.
2. Each group should be given one copy of one story.
3. Students read their stories, then brainstorm ways to illustrate the story. *Alternative Option: Students write their own stories about oil or natural gas.*
4. Students draw scenes from their given stories, and write the story beneath the illustration.
5. Students create a cover for their stories. They can use construction paper, poster board, or something heavy that will provide a good, sturdy cover.
6. Help students bind their stories and covers, either by stapling them together, or by punching holes and tying them together with yarn or string.
7. If you like, your class can go to the classroom of younger or different students to share their stories.

Exploring Core Sampling

Background

Scientists explore the Earth to find oil and gas and then drill deep down in the Earth to get it out. Explore what it's like to drill deep down into the Earth.

Question

- Are all core samples the same?

Materials

- 1 Bag of dark sand
- 1 Bag of light sand
- 1 Bag of soil
- 1 Bag of small gravel (aquarium size)
- 1 Clear plastic straw
- 1 8 oz. Opaque plastic cup or container
- Water in a spray bottle
- Plastic spoons
- Ruler

NOTE: When layering earth materials in cups, students can arrange the layers in any order.

Procedure

1. Using the ruler to measure, place a 1 cm layer of one of the earth materials in the cup with a spoon. Mist the layer with water to make it a bit damp.
2. Place another earth material 1 cm deep on top of the first layer. Moisten with water until damp.
3. Continue alternating layers of earth materials and water. The total height of the layers stacked in the cup will be at least 4 cm deep.
4. Students should trade cups so they are not pulling a core sample from their own cup.
5. Use a straw to extract a core sample by pushing the straw straight down through the layers in the cup.
6. Place a finger tightly over the top end of the straw and withdraw it from the cup. Observe the layers in the straw core sample.
7. Lay several core samples from different cups side by side. Compare results.

Conclusions

- What are core samples?

- What are petroleum geologists looking for when they examine core samples?

Petroleum Ponder

Question

- What materials are made from petroleum?

Activity Goal and Rules

The object of *Petroleum Ponder* is for each team to correctly identify as many items as possible that are made from petroleum in their *Petroleum Ponder* box. In a relay fashion, each team member will get the chance to look over the contents of the box and return to "home base" to write down as many items as they can remember. Each team member will proceed to the box in numerical order, however the pencil or pen must remain at home base, and there is no talking while the game is being played. As soon as the first player arrives at the box, they may "ponder" the contents of the box without touching the items or stopping. This player returns to home base, tags the next player, and begins to write down as many items that he/she can remember from the box that were made from petroleum. The second player returns from the box, tags the next player and begins to record. Players waiting their turn should review the list silently and carefully to be sure they look for new items when it becomes their turn to "ponder." Once all players have walked past the box, they may add or cross off items on their list. The team with the most correctly identified items will be the winner.

At least one item in the box is NOT made from petroleum. If these items appear on the team's final list, five points will be deducted. One point will be awarded for each correctly identified item. No item can receive more than one point if listed more than once. For example, if pencil is on the list, it will not be awarded 2 points for pencil AND writing utensil; only one point will be awarded.

Materials *FOR EACH GROUP*

- Sheet of paper
- Pen or pencil
- *Petroleum Ponder* box

Preparation

- Gather supplies and assemble Petroleum Ponder boxes from the list of supplies on the next page. Assemble an appropriate number of boxes to correspond with the number of student teams you will have. Make sure to include **at least** one item ***not*** made from petroleum.
- Divide students into teams. Pre-assign each group member a number, if desired.
- Set up the room with home bases that are separate or at a small distance from each *Petroleum Ponder* box.

✔Procedure

1. Send student groups to their home base. Remind students not to go near the box until instructions have been given.
2. Each team will need a sheet of paper and one pen or pencil. Instruct teams to put their name on their paper.
3. Assign each participant a number if they were not pre-assigned.
4. Go over the goal and the rules for the activity, and when ready, begin team play.
5. At the close of the game, identify and discuss all of the items contained in the box and have student teams record their scores.

⁂ Suggestions for Petroleum Ponder Box Ingredients

- Nylon
- Crayon
- Scotch tape
- Masking tape
- Garbage bag
- Sandwich bag
- Aspirin or vitamin bottle
- Plastic cup
- Styrofoam cup
- Makeup
- Phone
- Hand lotion
- Football/sports equipment
- Toothpaste
- Balloons
- Fertilizer
- Deodorant
- Insect repellent
- Sunglasses
- Pen
- Paint brush
- Clothing (polyester or nylon)
- Fake nails
- Anything plastic
- Lipstick
- Chap Stick®
- Dice
- Toothbrush
- Umbrella
- Perfume
- Shoe polish
- Roof shingle
- Novelty candy
- Chunk of asphalt
- Wax paper
- Camera
- Comb
- CD
- Paint
- Toy cars
- Golf balls
- Shoes
- Shampoo
- Petroleum jelly
- Glue
- Electrical tape
- Fishing lures

Sequence Oil and Gas

Question

- What is the process of getting oil and gas from beginning to end?

Materials

- 5 Pictures
- Scissors
- Glue sticks
- Science notebook or separate sheets of paper

Preparation

- Make copies of *What Order?* on page 34 for each student.

Procedure

1. Review what oil and gas are and tell students they will need to sequence 5 pictures showing the steps from formation to products.

2. Instruct students to cut the pictures apart. Emphasize that they are not printed in order.

3. Have students glue the pictures in order on a separate sheet of paper or in their science notebooks, and instruct students to label what each picture represents in the sequence. They may do this individually or you can provide them with a word bank.

Word Bank Example

- formation
- movement
- uses
- exploration and drilling
- pumping

What Order?

Lipstick

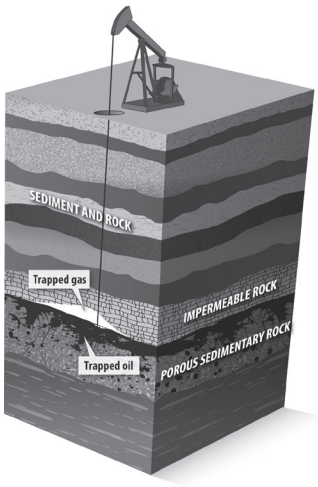
Action figures

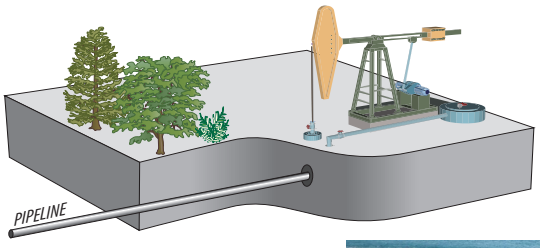
Rubber bands

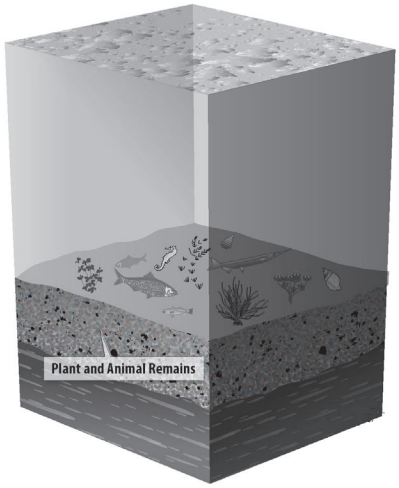
Natural gas flame

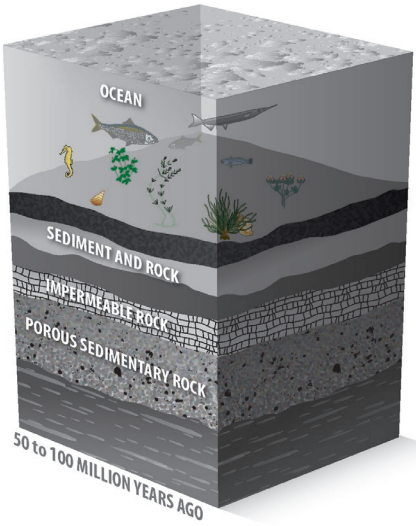
Tape

Pen









Pretzel Power

Background

Oil and natural gas are widely used as transportation fuels. Most of our cars run on petroleum. Some vehicles are more efficient than others and allow us to go farther with less fuel while being kind to the environment.

Question

- Why is the miles per gallon (mpg) rating of a car important?

Materials

- 3" x 5" Cards
- Internet access for students (see "optional" note below)
- Bag of pretzels
- Plastic sandwich bags
- Three signs (Home, Near Town, Far Town)

Preparation

- Prepare a plastic bag with ten pretzels for each student.
- Make three signs, one labeled "Home", one labeled "Near Town", and one labeled "Far Town." The signs should be large enough to see from across the room.
- Select a large area and place the Home, Near Town, and Far Town signs on poles or walls. The distance from Home to Near Town should be 50 steps. The distance from Home to Far Town should be 100 steps. (Do not give these distances to students.)

Procedure

1. Have students look up a car they would like to drive on www.fueleconomy.gov. On 3" x 5" cards, students should record the car's name, model year, miles per gallon, and the number of passengers the car holds. It may be helpful if students have chosen an FFV (flex fuel vehicle), that they choose which fuel they will use—gasoline or E85—before recording mileage.

   OPTIONAL: Depending on the age and independence of your students, you may wish to use the information on pages 37-44 to print pre-made automobile cards. If you would like to print the cards on adhesive labels use Avery 5392. When handing out cards for vehicles using Flex Fuel, assign the fuel choice to students.

2. Distribute a bag of pretzels to each student. Tell students not to eat the pretzels until they are instructed to begin.
3. Explain to the students that each pretzel represents one gallon of gasoline, and each step (heel-to-toe) the student takes represents one mile traveled.
4. Students eat a pretzel and take the appropriate number of steps before eating the next pretzel. All steps are heel-to-toe.

❶ Round One

- Use only five pretzels for this round. Each person will drive his/her car to work in Near Town and return Home. If anyone runs out of fuel (pretzels), he/she must stay at that point until round one is over. Line up at Home and start stepping!
- Discuss:
  - Which cars got you to work and home? Which didn't?
  - Did anyone have extra fuel remaining?
  - What alternatives to driving your own car are there?

❷ Round Two

- Use the remaining five pretzels and try some of the alternative suggestions discussed above. Everyone will travel to Far Town and return Home. Expect "negotiations". Suggest students carpool to work. Drivers may eat each passenger's pretzels as fuel. Line up at Home and start stepping!
- Discuss:
  - Who made it to Far Town and back? How did you do this?
  - Who did not make it to Far Town and back? Why not?

2015 Audi A4

FUEL	Gasoline
CLASS	Compact
NUMBER OF PASSENGERS	4
COMBINED MPG	27

2015 Bentley Continental GT

FUEL	Flex Fuel E85
CLASS	Compact
NUMBER OF PASSENGERS	4
COMBINED MPG	15 on gasoline 11 on E85

2015 Bugatti Veyron

FUEL	Gasoline
CLASS	Sports Coupe
NUMBER OF PASSENGERS	2
COMBINED MPG	10

2015 Buick LaCrosse eAssist

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	29

2015 Buick LaCrosse FFV

FUEL	Flex Fuel E85
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	21 on gasoline 16 on E85

2015 Buick Verano

FUEL	Gasoline
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	25

2015 Cadillac ELR

FUEL	Plug-in Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	82 MPGe

2015 Chevrolet Camaro

FUEL	Gasoline
CLASS	Compact
NUMBER OF PASSENGERS	4
COMBINED MPG	22

2015 Chevrolet Equinox

FUEL	Flex Fuel E85
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	18 on Gasoline 23 on E85

2015 Chevrolet Impala

FUEL	Flex Fuel E85
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	22 on gasoline 16 on E85

2015 Malibu

FUEL	Gasoline
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	29

2015 Chevrolet Spark EV

FUEL	Electric (Dedicated)
CLASS	Subcompact
NUMBER OF PASSENGERS	4
COMBINED MPG	119 MPGe

2015 Suburban 4WD

FUEL	Flex Fuel E85
CLASS	SUV
NUMBER OF PASSENGERS	8
COMBINED MPG	18 on gasoline 12 on E85

2015 Chevrolet Volt

FUEL	Plug-In Hybrid Electric
CLASS	Compact
NUMBER OF PASSENGERS	4
COMBINED MPG	98 MPGe

2015 Chrysler 200 Convertible

FUEL	Gasoline
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	23

2015 Chrysler Town & Country

FUEL	Gasoline
CLASS	Minivan
NUMBER OF PASSENGERS	7
COMBINED MPG	20

2015 Dodge Charger

FUEL	Flex Fuel E85
CLASS	Large
NUMBER OF PASSENGERS	5
COMBINED MPG	23 on gasoline 17 on E85

2015 Ferrari FF

FUEL	Gasoline
CLASS	Midsize
NUMBER OF PASSENGERS	4
COMBINED MPG	13

2015 Fiat 500e

FUEL	Electric (Dedicated)
CLASS	Mincompact
NUMBER OF PASSENGERS	2
COMBINED MPG	116 MPGe

2015 Ford C-max Energi

FUEL	Plug-in Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	4
COMBINED MPG	88 MPGe

2015 Ford C-max Hybrid

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	4
COMBINED MPG	40

2015 Ford Explorer 2WD

FUEL	Flex Fuel E85
CLASS	SUV
NUMBER OF PASSENGERS	7
COMBINED MPG	20 on gasoline 15 on E85

2015 Ford F150

FUEL	Gasoline
CLASS	Pickup Truck
NUMBER OF PASSENGERS	4
COMBINED MPG	15

2015 Ford Feista

FUEL	Gasoline
CLASS	SubCompact
NUMBER OF PASSENGERS	5
COMBINED MPG	36

2015 Ford Focus FWD

FUEL	Flex Fuel E85
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	30 on gasoline 23 on E85

2015 Ford Focus Electric

FUEL	Electric (Dedicated)
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	105 MPGe

2015 Ford Fusion Energi

FUEL	Plug-in Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	88 MPGe

2015 Ford Fusion Hybrid

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	42

2015 GMC Savana 2500

FUEL	Flex Fuel E85 (only)
CLASS	Passenger Van
NUMBER OF PASSENGERS	8
COMBINED MPG	9

2015 GMC Terrain AWD

FUEL	Gasoline
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	23

2015 Honda Civic CNG

FUEL	Natural Gas
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	31

2015 Honda Civic Hybrid

FUEL	Hybrid Electric
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	45

2015 Hyundai Sonata

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	38

2015 Jaguar XJL FFV 6 cyl.

FUEL	Flex Fuel E85
CLASS	Large
NUMBER OF PASSENGERS	5
COMBINED MPG	20 on gasoline 14 on E85

2015 Jeep Grand Cherokee 2WD

FUEL	Diesel
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	25

2015 Kia Optima Hybrid

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	38

2015 Kia Soul Electric

FUEL	Electric (Dedicated)
CLASS	Small Station Wagon
NUMBER OF PASSENGERS	5
COMBINED MPG	105 MPGe

2015 Lexus CT 200h

FUEL	Hybrid Electric
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	42

2015 Lexus LS 460

FUEL	Gasoline
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	19

2015 Lexus RX 450h

FUEL	Hybrid Electric
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	30

2015 Lincoln Navigator

FUEL	Gasoline
CLASS	SUV
NUMBER OF PASSENGERS	7
COMBINED MPG	18

2015 Mazda 5

FUEL	Gasoline
CLASS	Minivan
NUMBER OF PASSENGERS	6
COMBINED MPG	24

2015 Nissan Leaf

FUEL	Electric (Dedicated)
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	114 MPGe

2015 Nissan Pathfinder

FUEL	Hybrid Electric
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	26

2015 Porsche Cayenne S Diesel

FUEL	Diesel
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	23

2015 Porsche Cayenne S e-Hybrid

FUEL	Plug-in Hybrid Electric
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	47 MPGe

2015 Ram 1500

FUEL	Diesel
CLASS	Pickup Truck
NUMBER OF PASSENGERS	5
COMBINED MPG	23

2015 Smart fortwo Coupe

FUEL	Gasoline
CLASS	Two-Seater
NUMBER OF PASSENGERS	2
COMBINED MPG	36

2015 Tesla Model S

FUEL	Electric (Dedicated)
CLASS	Large
NUMBER OF PASSENGERS	4
COMBINED MPG	89 MPGe

2015 Toyota Avalon Hybrid

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	40

2015 Toyota Camry

FUEL	Gasoline
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	28

2015 Toyota Camry

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	41

2015 Toyota Highlander Hybrid

FUEL	Hybrid Electric
CLASS	SUV
NUMBER OF PASSENGERS	7
COMBINED MPG	28

2015 Toyota Prius

FUEL	Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	50

2015 Toyota Prius Plug-in

FUEL	Plug-in Hybrid Electric
CLASS	Midsize
NUMBER OF PASSENGERS	7
COMBINED MPG	95 MPGe

2015 Toyota Sequoia 4WD

FUEL	Flex Fuel E85
CLASS	SUV
NUMBER OF PASSENGERS	7
COMBINED MPG	14 on gasoline 10 on E85

2015 Toyota Tundra 4WD

FUEL	Flex Fuel E85
CLASS	Pickup Truck
NUMBER OF PASSENGERS	5
COMBINED MPG	15 on gasoline 10 on E85

2015 Volkswagen Beetle

FUEL	Diesel
CLASS	Compact
NUMBER OF PASSENGERS	2
COMBINED MPG	34

2015 Volkswagen Jetta Hybrid

FUEL	Hybrid Electric
CLASS	Compact
NUMBER OF PASSENGERS	5
COMBINED MPG	45

2015 Volkswagen Passat

FUEL	Diesel
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	34

2015 Volkswagen Touareg

FUEL	Diesel
CLASS	Midsize
NUMBER OF PASSENGERS	5
COMBINED MPG	34

2015 Volkswagen Touareg Hybrid

FUEL	Hybrid Electric
CLASS	SUV
NUMBER OF PASSENGERS	5
COMBINED MPG	21

Youth Awards Program for Energy Achievement

All NEED schools have outstanding classroom-based programs in which students learn about energy. Does your school have student leaders who extend these activities into their communities? To recognize outstanding achievement and reward student leadership, The NEED Project conducts the National Youth Awards Program for Energy Achievement.

This program combines academic competition with recognition to acknowledge everyone involved in NEED during the year—and to recognize those who achieve excellence in energy education in their schools and communities.

What's involved?

Students and teachers set goals and objectives, and keep a record of their activities. Students create a digital project to submit for judging. In April, digital projects should be uploaded to the online submission site.

Want more info? Check out **www.NEED.org/Youth-Awards** for more application and program information, previous winners, and photos of past events.

NEED's Online Resources

NEED'S SMUGMUG GALLERY

http://need-media.smugmug.com/

On NEED's SmugMug page, you'll find pictures of NEED students learning and teaching about energy. Would you like to submit images or videos to NEED's gallery? E-mail info@NEED.org for more information.
Also use SmugMug to find these visual resources:

Videos

Need a refresher on how to use Science of Energy with your students? Watch the Science of Energy videos. Also check out our Energy Chants videos! Find videos produced by NEED students teaching their peers and community members about energy.

Online Graphics Library

Would you like to use NEED's graphics in your own classroom presentations, or allow students to use them in their presentations? Download graphics for easy use in your classroom.

SUPPLEMENTAL MATERIALS

Looking for more resources? Our supplemental materials page contains PowerPoints, animations, and other great resources to compliment what you are teaching in your classroom! This page is available under the Educators tab at www.NEED.org.

THE BLOG

We feature new curriculum, teacher news, upcoming programs, and exciting resources regularly. To read the latest from the NEED network, visit www.NEED.org/blog_home.asp.

EVALUATIONS AND ASSESSMENT

Building an assessment? Searching for standards? Check out our Evaluations page for a question bank, NEED's Energy Polls, sample rubrics, links to standards alignment, and more at www.NEED.org/evaluation.

E-PUBLICATIONS

The NEED Project offers e-publication versions of various guides for in-classroom use. Guides that are currently available as an e-publication will have a link next to the relevant guide title on NEED's curriculum resources page, www.NEED.org/curriculum.

SOCIAL MEDIA

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Follow us on Twitter. We share the latest energy news from around the country, @NEED_Project.

Follow us on Instagram and check out the photos taken at NEED events, instagram.com/theneedproject.

Follow us on Pinterest and pin ideas to use in your classroom, Pinterest.com/NeedProject.

NEED ENERGY BOOKLIST

Looking for cross-curricular connections, or extra background reading for your students? NEED's booklist provides an extensive list of fiction and nonfiction titles for all grade levels to support energy units in the science, social studies, or language arts setting. Check it out at www.NEED.org/booklist.asp.

U.S. ENERGY GEOGRAPHY

Maps are a great way for students to visualize the energy picture in the United States. This set of maps will support your energy discussion and multi-disciplinary energy activities. Go to www.NEED.org/maps to see energy production, consumption, and reserves all over the country!

Oil, Gas, and Their Energy Evaluation Form

State: _____ **Grade Level:** _____ **Number of Students:** _____

1. Did you conduct the entire unit?	❑ Yes	❑ No
2. Were the instructions clear and easy to follow?	❑ Yes	❑ No
3. Did the activities meet your academic objectives?	❑ Yes	❑ No
4. Were the activities age appropriate?	❑ Yes	❑ No
5. Were the allotted times sufficient to conduct the activities?	❑ Yes	❑ No
6. Were the activities easy to use?	❑ Yes	❑ No
7. Was the preparation required acceptable for the activities?	❑ Yes	❑ No
8. Were the students interested and motivated?	❑ Yes	❑ No
9. Was the energy knowledge content age appropriate?	❑ Yes	❑ No
10. Would you teach this unit again?	❑ Yes	❑ No

Please explain any 'no' statement below.

How would you rate the unit overall?	❑ excellent	❑ good	❑ fair	❑ poor
How would your students rate the unit overall?	❑ excellent	❑ good	❑ fair	❑ poor

What would make the unit more useful to you?

_____

_____

_____

_____

Other Comments:

_____

_____

_____

_____

Please fax or mail to: **The NEED Project**
8408 Kao Circle
Manassas, VA 20110
FAX: 1-800-847-1820

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