



Oil Pull

GRADE RANGE

3–5

TIMING

45–60 minutes

OBJECTIVES

Students will be able to:

- **Learn** how oil is pulled from rock to the surface.
- **Model** how oil wells pump oil.
- **Draft** hypothesis based on an investigation.

OVERVIEW

In this activity, students will learn about how oil pumping units are used to pull oil out of reservoir rock and pump it to a well at the surface. They will conduct an investigation using straws and various viscosities of liquids to model the up and down movement of a pump and determine whether the length of tubing and viscosity of liquid affects the efficiency of the pump. Students will draft formal hypotheses using “if-then” statements.

MATERIALS

- **Artificial Lift System** diagram, one copy enlarged or displayed electronically
- **Oil Pulling Kit**, one per group
 - 8–10 standard drinking straws
 - 8–10 wider drinking straws
 - 12 oz of colored, low-viscosity liquid (soda, grape juice, chocolate milk, tea, etc.)
 - 4 oz of thick syrup (chocolate, breakfast, corn, etc.)
 - 2 plastic cups
 - Masking tape
 - Ruler
 - Scissors
 - Towel or rag
- Additional paper towels
- **Oil Pulling Procedures and Notes** student handout, one per group
- **If-Then Statements** student handout, one per group

NOTE

Consult school or district policies regarding food and drink in the classroom, gain permissions when necessary, and always consider students with allergies.

NATIONAL STANDARDS

Next Generation Science Standards

- **3-PS2-1.**
Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- **4-ESS3-1.**
Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

PROCEDURE

Engage

1. Spend 4–5 minutes discussing and making predictions about one or more of the following questions:
 - Do you think it would be easier to bring oil to the surface of the Earth from underground with a long tube or a short tube?
 - Do you think it would be easier to bring oil to the surface of the Earth from underground if the tube was wide or narrow?
 - Would it be easier if the oil was thick or thin?
 - *Note:* To prepare students for the activity at the end of the session, encourage them to state their predictions in “If-then” statements.

Learn

2. Explain to students that an artificial lifting system is part of an oil well and helps pull oil out of the underground rock and bring it up to the well at the surface of the Earth.
3. Display the **Artificial Lift System** diagram, either enlarged or displayed electronically, to the class. Using the diagram as reference, explain that a hole pump is connected by steel rods which are screwed together. The up and down movement at the surface activates the pump and creates pressure, and as it pushes down, oil from below the surface is forced up into the well.

Investigate

4. Split the class into groups of 3-4.
5. Distribute one **Oil Pulling Kit** to each group and explain that they are going to build simple models of oil wells to investigate the questions you discussed at the start of the session.
6. Distribute one **Oil Pulling Procedures and Notes** handout to each group and review with the class aloud. Address any questions as they arise.
 - *Note:* For younger students, it might be helpful to model construction with an extra set of materials.
7. Each group should decide on an Oil Well Operator and Operation Manager and record their names on the group handout.

8. Instruct students to follow the procedures to conduct their investigations, making sure to collaborate and discuss along the way, so the Operation Manager can take notes.
 - *Note:* Remind students to use their towel/rag for any cleanups and have plenty of extra paper towels handy.

Apply

9. Students should review the results of their investigations with their groups by confirming and discussing the Operation Manager's notes.
10. While students are discussing, distribute one **If-Then Statements** handout to each group.
11. As a team, students should construct three "If-then" statements based on the results of their investigation, and the Operation Manager should record them on the handout.
 - *Note:* For younger students, you may choose to complete the first statement as a whole group or give them the "If" portion as a sentence starter (i.e., "If the tube is shorter, then...")
12. As time allows, ask volunteers to share statements with the class. Discuss whether the hypotheses shared are common among all the groups.

Reflect

13. To facilitate students' reflection on their experiences during the session, ask one or more of the following questions:
 - Did it require less effort to use the long tube or the short tube? Explain why.
 - Was it difficult to bring the syrup to the "surface"? Explain why.
 - Did using the wider tube change the amount of effort that the Oil Well Operator needed to use? Explain.

EXTENSION IDEAS

- Research various types of automatic lift systems and oil wells and explore how they work. Using what they learned in their investigations, students can argue for which type is most effective/efficient.
- Explore various careers in the oil industry, including their roles and responsibilities, required education or training, and employment potential.



1. Choose a student to be the Oil Well Operator. This student will be the only person to put his/her mouth on the straws. Write the Oil Well Operator's name here: _____
2. Next, choose an Operation Manager. This student will be in charge of recording notes and observations throughout the investigation. Write the Operation Manager's name here: _____
3. Create one long tube by connecting all the standard straws together end to end. To do this, cut a 1 cm slit in each straw, slide it together with the next straw, and use masking tape to securely tape them together.
4. Carefully pour the liquid into a cup on the floor. The Oil Well Operator will insert one end of the tube into the cup and attach the other end to his/her mouth on the other end. Team members can help support the tube if necessary.
 - o **TIP!** The straighter the tube, the better, so it might help to stand up on a step, step stool, or safe chair to get a little higher!
5. The Oil Well Operator should begin sucking on the straw to use suction to try to bring the liquid to the "surface" (the top of the straw). The Operation Manager should record the team's observations here:

6. Use the scissors to cut the tube in half. The Oil Well Operator should try again to bring the liquid to the "surface" (the top of the straw). Place the cup somewhere where it won't get knocked over while the Operation Manager notes any changes or new observations:

- Carefully pour the syrup into the second cup and transfer the tube into this cup. The Oil Well Operator should, again, begin sucking on the straw to use suction to attempt to bring the liquid to the "surface" (the top of the straw). Cut off three inches of straw at a time until the Oil Well Operator can successfully bring the liquid to the "surface." The Operation Manager should note the process here:

- Now, create another long tube by connecting all the wide straws together end to end. Again, cut a 1cm slit in each straw, slide it together with the next straw, and use masking tape to securely tape them together.
- Bring the cup with the liquid back to the floor and have the Oil Well Operator insert one end of the tube into the cup and stand with his/her mouth on the other end. Again, team members can help support the tube if necessary.
- The Oil Well Operator should begin sucking on the straw to use suction to try to bring the liquid to the "surface" (the top of the straw). The Operation Manager should record the team's observations and any notes regarding changes in ease or with difficulty here:

IF _____

THEN _____

IF _____

THEN _____

IF _____

THEN _____
