Activity Title: How Fluids are Stored Underground

Recommended Grades

Kindergarten, Grade 1, Grade 2, Grade 3, Grade 4, Grade 5, Grade 6

Curriculum Connections

Matter
- K – properties of objects
- 1 – measurements (water and oil can be measured)
- 3 – how materials can be changed
- 5 – density of liquids
- 6 – particle model of matter

Energy
- 4 – forces act without contact (gravity)
- 5 – renewable and nonrenewable resources
- 6 – investigate energy resources

Earth Systems
- 2 – components of earth (land, water)
- 3 – human activities change Earth's surface (connect to oil wells, fossil fuels)
- 4 – natural resources (oil)

Computer Science
- K – interpret instructions
- 1 – instructions to be followed, have steps

Scientific Methods
- 1 – make observations, record data
- 4 – data can be qualitative or quantitative
- 5 – variables
- 6 – hypotheses

Time

10-15 minutes for setup, wait additional 30 minutes to make observations

Skills Focused On

• Critical Thinking • Hypothesizing	• Observation

Materials Needed

- Cooking oil
- Water
- Food dye
- 2 mason jars with lids
- Marbles (enough to fill 1 mason jar)

Background Information

How are fluids, like oil, stored underground?

Let's start by thinking about what happens when you mix oil and water. Because water is more dense (the molecules are closer together), it will sink to the bottom while the oil rises to the top. Unless you add an emulsifier, like mustard powder, to stabilize the mixture, oil and water will always separate.

Underground, there are rocks and soil in the way which can prevent the oil and water from completely separating. Little pockets of oil forms in between rocks. Humans extract these pockets of oil by drilling deep into the ground and cracking rocks apart with fracking fluid, freeing the oil that is trapped inside.

Experimental Steps

Part 1 (No Marbles):

1. Add food dye to your water.
2. Add coloured water and cooking oil to one of your mason jars (about half water, half oil).
3. Close the lid tight!
4. Make a prediction. What do you think will happen when you shake the jar? (*Optional:* record your prediction on paper)
5. Shake up your mason jar until the oil and water are mixed.
6. Wait 5 minutes and observe what happens. (*Optional:* record your observations and how they match or do not match your prediction)

Part 2 (Marbles):

1. Fill your second mason jar with as many marbles as you can fit inside.
2. Add your coloured water and cooking oil (about half water, half oil, just like the first time).
3. Close the lid tight!
4. Make a prediction. What will happen when you shake the jar? Will it be different with the marbles? (*Optional:* record your prediction on paper)
5. Shake your jar until the oil and water are mixed.

6. This time, you may want to wait a little longer to make your final observation - 15-30 minutes. (*Optional:* record your observations and how they match or do not match your prediction)

Discussion/Experimental Extensions

Possible discussion questions include:

- Why does the oil float to the top, while the water sinks to the bottom?
- Why do you think the water and oil didn't separate as easily when we added marbles?
- (Grade 5) What variable changed between the first and second parts of our experiment? Why do we only want to change one variable at a time?

Extension ideas:

- Try a different kind of liquids, e.g., a different oil, juice instead of water, a carbonated drink. Did this change anything? Why?
- Try changing the temperature of your liquids – if you used room-temperature water, try cold or hot water. Did this change anything? Why?
- Is there anything you can add to your water and oil to keep them mixed? (e.g., an emulsifier like mustard) Why do you think this happens?
- Can you think of any liquids inside the Earth which people might want to access (e.g., oil)? Do some research to explore how we extract liquids from deep within the Earth.

Additional Resources

How Are Fluids Stored Underground? experimental video produced by Future Energy Systems - provides background information and instructions for experiment: https://youtu.be/TPq1OlEPArk?feature=shared.

Learn more about Future Energy Systems (https://www.futureenergysystems.ca/) and access more learning content, including storytimes, lab tours, ask an experts and more (https://www.futureenergysystems.ca/engage/learning https://www.youtube.com/channel/UCJr8N9KyFJ6d-t36TPtUlwg).