

**Title:** The Separation Game

**Essential Question:** What are the major components to producing and processing natural resources?

**Grade:** 9-12

**Time:** 30 minutes – 1 hour

### **Overview**

Students will play a game to see the wide range of components required when extracting, moving, and processing resources.

### **Teacher Information and Procedure**

Prior Knowledge for students: The basic process required to extract and refine natural resources.

Source: Alaska Resource Education

### Materials needed

Per group of 4 students:

- 6 different color blocks, ball, pom-poms or other manipulative that is easy to grab (different colored, individually wrapped candy would work too)
- 1 box or bag
- 2 paper plates

### What to do in advance

Prepare each set of materials.

### **Teaching the Lesson**

#### Gear-up

Review the overall process of extraction of the mineral you are using. i.e. gold or oil.

#### Explore

Tell the students the objectives of the game: Get the oil or mineral out of the ground and refined into a final product without harming the environment.

#### ***For Oil:***

Put three colors underground (in the box) and put it under the desk or where the students cannot see into it. You can use even numbers 16 of each. Or you can make it harder on the students by having more water and natural gas than oil.

For example:

Blue = water

Yellow= natural gas

Purple = crude oil

Have the students blindly pull the blocks out of the box and into the separation facility (on a paper plate). If any spill off the plate it is considered an environmental spill, and they have to stop for 10 seconds to clean up the spill. The water and natural gas need to be reinjected into the ground, (put back in the box), and the oil separated and kept out.

They will then transport the oil blocks across the room to the refinery. Again, if they spill/drop any blocks, it will result in 10 sec hold for “cleanup”.

At the refinery students will have to refine the oil into other products (different colored blocks)  
Explain that the refinery can make many different items from oil.

This particular refinery can make:

plastic (orange)  
asphalt (green)  
gasoline (red)

Give the refinery:

8 orange  
10 green  
12 red

Explain that it takes different amounts of oil to make each end product:

3 – oil (purple) = 1 plastic (orange)  
2 – oil (purple) = 1 asphalt (green)  
1 – oil (purple) = 1 gasoline (red)

Explain that the students will have 30 seconds to extract the oil/gas/water, re-inject the natural gas and water, transport the oil to the refinery, and refine the oil into final products. Have students select roles and make a plan. Remind them that if blocks come off the plate at the separation facility or get dropped during transport, they have to wait 10 seconds before they can start extracting and processing again.

As a group record who made how much of each final product.

Ask them if they think gasoline, plastic and asphalt are all equal in value. Assign a value to each for the next round:

Plastic = \$500 per cube  
Asphalt = \$300 per cube  
Gasoline = \$200 per cube

Play another round and calculate how much money each group made. If they all made all plastic first, then you can explain that there is a surplus of plastic on the market and now it is only worth \$100 per cube.

### **For Mining:**

Put three colors underground (in the box) and put it under the desk or where the students cannot see into it. You can use even numbers 16 of each. Or you can make it harder on the students by having more water and natural gas than oil.

For example:

Blue = water

Yellow= rock

Purple = mineral (gold, zinc etc.)

Have the students blindly pull the blocks out of the box and into the mill (on a paper plate). If any fall off the plate it is an environmental spill, they have to stop for 10 seconds to clean up the spill. The water and rocks get put into a tailing facility, (put onto a different plate), and the mineral separated and kept out.

They will then transport the mineral blocks across the room to the smelter. Again, if they spill/drop any blocks, it will result in a 10 seconds hold for "cleanup".

At the smelter students will have to refine the mineral into other products (different colored blocks)

Depending on the mineral, the smelter can make different products. For example, for gold:

gold bars (orange)

electronic circuits for TVs (green)

jewelry (red)

If the mineral is zinc, it is refined and can be used for:

Galvanizing steel (orange)

Brass in electronics (green)

Rubber manufacturing (red)

Give the refinery:

8 orange

10 green

12 red

Explain that it takes different amounts of minerals to make each end product

For example:

1 – gold (purple) = 1 gold bar (orange)

2 – gold (purple) = 1 electronic circuits (green)

3 – gold (purple) = 1 jewelry (red)

Explain that the students will have 30 seconds to extract the oil/gas/water, re-inject the natural gas and water, transport the oil to the refinery, and refine the oil into final products. Have students select roles and make a plan. Remind them that if blocks come off the plate at the separation facility or get dropped during transport, they have to wait 10 seconds before they can start extracting and processing again.

As a group record who made how much of each final product.

Ask them if they think all of the products are all equal in value. Assign a value to each for the next round:

Gold bar = \$500 per cube  
Electronic Circuit = \$300 per 2 cubes  
Jewelry = \$200 per 3 cubes

Play another round and calculate how much money each group made. If they all made all jewelry first, then you can explain that there is a surplus on the market and now it is only worth \$100 per cube.

### Generalize

Connect the game to Alaska:

- The oil/natural gas and water would be found on Alaska's North Slope. There are large separation facilities on the North Slope to separate the water and natural gas from the oil. Since most of the natural gas is not used, it and the water are reinjected into the ground to help re-pressurize the reservoir. Transporting the oil is what the Trans Alaska Pipeline and the tankers leaving the Valdez terminal do. Most of the oil from Alaska is sent to refineries on the west coast or in Asia to be made into other products.
- Minerals like gold and zinc are produced here in Alaska, but are transported to refiners and smelters around the world to be made into products we use in our everyday lives.

### Assess

Can students diagram or explain the basic process of extracting, transporting and refining oil or minerals?

### **Extensions, adaptations, and more resources**

Start with 3 or 4 times the amount of blocks – 50 oil, 75 water and natural gas. Do not re-set the reservoir each round. This way you will reinforce the non-renewable resource component. They will realize round after round they have less oil.

Discuss the potential for a natural gas pipeline. Discuss what they would need in order to take the natural gas as well as the oil. They would need another person to transport it as well as a different refinery. You could also discuss needing a customer to buy the natural gas.

Discuss new mining projects and the potential for more production of minerals like copper that has an increased demand on the world market for renewable energy technology.