

ACTIVITY SNAPSHOT

SUPPORTING AREAS

Renewable energy and natural resources

ESTIMATED TIME

35 minutes

PURPOSE

Students will explore ethanol production from farm to fuel and learn how Nebraska farmers grow corn crops to create a renewable fuel and provide food for livestock.

STATE STANDARDS IT SUPPORTS

SC.4.4.2.F Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment.

MATERIALS

- Fritos, 1 bag per group
- Sugar packet, 1 per group
- Dry yeast packet, 1 per group
- Snack-sized Ziploc bag, 1 per group
- 1/3 cup warm water, 1 per group
- Farm to Fuel Matching Cards, 1 set per group

Farm to Fuel

Activity Summary

Corn is an a-maize-ing crop! Popcorn, sweet corn, and candy corn are some tasty treats, but did you know that corn can also fuel vehicles? In this lesson, students will engage in an interactive matching game to discover how corn travels from the farm to local gas stations!

Background Information

Corn is a versatile crop. It is the major grain grown for livestock feed by farmers in the United States, leading all other feed crops in value and volume of production. Corn is a major component in foods like cereals, peanut butter, and snack foods, and it is also processed into a wide range of industrial products, including ethanol. The kernel is used as oil, bran, starch, glutamates, animal feed, and solvents. The silk is combined with other parts of the corn plant to be used as part of animal feed, silage, and fuels. Husks are made into dolls and used as filling materials. The stalk is used to make paper, wallboard, silage, syrup, and rayon (artificial silk).

The U.S. and other nations throughout the world currently depend on petroleum resources to fuel vehicles, provide power, and produce many products used every day. Dependence on this one, finite resource has negative implications for energy security, environment, and the local economy. Agriculture can provide a cleaner, domestically produced, renewable alternative to petroleum — ethanol.

Interest Approach

1. Begin by asking students how they got to school today. Did they ride the bus, get dropped off by their parents, walk, or ride a bike?
2. Ask students, "If you rode in a vehicle or bus, what fuel powered your travels?" Gasoline, diesel, or ethanol
3. Share with students that some crops in Nebraska can be used to produce fuel for our vehicles. Today students will be exploring the steps farmers take to turn corn into a renewable fuel called Ethanol.

Activity Procedure

Activity 1 – Ethanol Fermentation Activity

1. Split students into 4-5 groups and pass out the ethanol-in-a-bag supplies to each group.
2. Share with students the following directions:
 - a. Carefully open your Ziploc bags and pour the small packet of sugar inside
 - b. Add bag of yeast
 - c. Add 1/3 cup of warm water (do not use hot water as this will kill the yeast and the experiment will not work)
 - d. Carefully zip your bag and GENTLY massage the ingredients together in the bag
 - e. Let the experiment sit

Activity 2 – Ethanol Knowledge

1. Ask students, "What is ethanol?" Ethanol is the fuel that we can make from plants!
2. Share with students that they might recognize ethanol as E85 at their local gas station.
3. Ask students, "But why would we want to put ethanol in our vehicles and not regular gasoline?"
 - a. Ethanol is renewable, which means because it's from plants, we can always make more of it. Ethanol is also much cleaner and better for the environment than regular gasoline and as you see from this map of all of the ethanol plants in the United States, Nebraska has lots of them! By putting ethanol in your vehicle, you support Nebraska farmers!

Activity 3 – Farm to Fuel Activity

1. Pass out the Farm to Fuel matching cards to each group.
2. Instruct students to work together to put their cards in the correct order from farm to fuel.
3. After students have put their cards in order, discuss the answers and walk them through the ethanol production process.

4. Ask students to make any changes to their cards based on the video.
5. Review with students the correct order from farm to fuel:
 - a. Corn harvest
 - b. Grain cart to semi-truck
 - c. Grain delivery
 - d. Hammer mill
 - e. Liquification/slurry tank
 - f. Fermentation (ethanol-in-a-bag)
 - g. Distillation/dehydration
 - h. Distillers
 - i. Ethanol
 - j. Delivery to gas station
 - k. Fuel in cars
6. Instruct students to re-evaluate their ethanol-in-a-bag experiments and discuss with their group the changes they see.
7. Share with students that the Ziploc bags are filled with CO₂ because of the chemical reaction between the corn chips, sugar, and yeast. The reaction we saw in the bags mimics the fermentation step in the ethanol process.

Concept Elaboration and Evaluation

After conducting these activities, review and summarize the following key concepts:

- Ethanol is a renewable fuel that is made from corn
- Ethanol is a clean-burning fuel that is better for the environment
- Farmers raise corn and soybeans to create renewable energy in Nebraska
- Distillers are a byproduct of ethanol production and can be fed to livestock





