Near Town/Far Town

Objective
Students will explore the energy efficiency of different kinds of transportation and the benefits of ridesharing for the environment.

Curriculum Focus
Science
Math
Social Studies

Materials
- Copies of "Car Cards"
- Five Signs: Home, Near Town, Far Town and two Charging Stations
- Tape for signs

Key Vocabulary
Hybrid vehicle
Electric vehicle (EV)
Diesel vehicle
Flex-fuel vehicles
Compressed natural gas vehicle

Next Generation Science Correlations
MS-PS1 - 3
MS-PS2 - 3
MS-PS3.A
MS-ESS3 - 3
MS-ESS3.C
MS-ETS1 - 3
HS-PS3 - 2
HS-ESS3 - 4
HS-ESS3 - 6
HS-ETS1 - 3
HS-ETS1.B

Common Core
RI.7
W.2
SL.1
6-7.NS.3

Introduction

According to the U.S. Energy Information Administration, nearly 30% of the total energy used in the United States is used for transportation. The choices we make regarding how we get around are important because traditional vehicles emit pollution-causing byproducts like carbon dioxide and other gases from an internal combustion engine. These pollutants are known as greenhouse gases and can trap heat from the sun in our atmosphere. In most situations, electric and/or hybrid cars can decrease greenhouse gas emissions when compared to traditional internal combustion engines.

In this activity, students will investigate transportation options with an activity where participants are assigned various types of vehicles with different fuel sources and efficiencies: gasoline, hybrids, electric, diesel, flex-fuel or compressed natural gas. Through this exercise, students will explore how they can be more efficient and environmentally conscious with their transportation choices.

Procedure

1. Copy and cut apart the car cards.
2. Select a large area (such as a long hallway or outside) and place signs on the walls reading Home, Near Town and Far Town. Near Town should be 100 steps from Home. Far Town should be 200 steps from Home. Students should not know the number of steps. Add a Charging Station to Near Town and Far Town.
3. Give each student a car card and explain the activity, as outlined in the instructions below.

General Rules

For this activity, each student will receive five gallons of gas to put in the car that they have been assigned. If they are assigned an EV, they will receive one charge, which is the financial equivalent of five gallons of gas.

The activity has two rounds. The goal of round one is to "drive" their car from Home to Near Town and back Home. In round two, students have to drive twice as far, to Far Town and back Home. This must be done without running out of fuel or charge. Students will model driving their car by taking steps, heel to toe. Each step represents one mile.

In round one, no carpooling is allowed; everyone must drive their own car until they run out of fuel or charge. In round two, carpooling is allowed and passengers may share their fuel, five gallons per person. EVs can also recharge at a charging station, with one charge for each additional person in the car besides the driver.

1. Make sure students understand how many steps they are able to take depending on their car. For example, a car that gets 25 mpg can go 25 mpg times five gallons or 125 miles. This equals 125 steps heel to toe before running out of fuel. The range is the distance an EV can travel before recharging.
2. Round one: Students will drive from Home to Near Town to meet their friends at a concert. They have to make it to the concert and back Home without running out of fuel or charge. When you give the signal, participants take the appropriate number of steps. Remind them all steps should be taken heel to toe.
    - Each person will drive their own car. Everyone in an EV gets one charge (no recharge at Near Town), while fuel vehicles have five gallons in the tank.
    - Line up at Home. Participants will drive to Near Town and then return Home. Begin stepping, heel to toe.
    - If anyone runs out of fuel or charge, they must stay at that point until the round is over.
3. Check for understanding. Ask the following questions:
    - Which cars made it home from the concert? Which cars did not?
    - Why? What are some variables between all the cars and drivers?
    - What could make this task more efficient for everyone?
4. Round Two: Students start over with five gallons of gas or one charge. Students are traveling to Far Town for a soccer game then returning Home. They may carpool for this round.
    - Negotiations are encouraged to increase efficiency.
    - Drivers may use each passenger's fuel; they are pooling their gas money. However, if the car they are riding in does not use gas, carpooling does not necessarily extend the range of the vehicle unless they pass a Charging Station. Everyone in an EV gets one additional charge per passenger that they can use at Near Town and/or Far Town if they have enough passengers.
    - Everyone should line up at Home and start stepping!
    - If the vehicle runs out of fuel or charge, everyone in the vehicle stops at that point until the round is over.
5. Check for understanding. Ask the following questions:
    - Who made it to the soccer game and back? How did you accomplish this?
    - Who did NOT make it to the game and back? Why? For those who made it back, how many steps did you have remaining "in the tank?" How did steps remaining differ between individuals, carpools and vehicle types?
    - Which car is the most efficient? Least efficient?
    - What factors should you look at when buying a car?
    - What is the environmental impact of gasoline powered vehicles versus hybrid or electric?

To Know and Do More

1. Have students compare and contrast different types of alternative fuel vehicles such as electric cars, gas/electric hybrids, fuel cell cars, etc. What are the pros and cons of using these vehicles?
2. How did round two help offset the CO_2 emissions of many of the students? How can these strategies be translated to real life to help the actual CO_2 emissions we may produce?
3. Discuss ways to reduce our contribution to climate change (buying an EV or a car with better fuel economy; getting the best fuel economy out of your car; using a low carbon fuel such as compressed natural gas, walking, biking or taking public transit more often, etc.).
4. STEM Project: Have students design an alternative fuel vehicle and create a poster or an advertising brochure to sell their car.

Gasoline Vehicle

You drive a gas powered hatchback car.
Your five gallons gets you 180 steps (36 mpg).
It seats four people.

Gasoline Vehicle

You drive a gas powered sedan.
Your five gallons gets you 130 steps (26 mpg).
It seats four people.

Gasoline Vehicle

You drive a gas powered sports car.
Your five gallons gets you 75 steps (15 mpg).
It seats two people.

Gasoline Vehicle

You drive a gas powered truck.
Your five gallons gets you 85 steps (17 mpg).
It seats three people.

Gasoline Vehicle

You drive a gas powered sport utility vehicle.
Your five gallons gets you 130 steps (26 mpg).
It seats five people.

Electric Vehicle

You drive an all electric hatchback car.
Your charge gets you 285 steps (109 mpge).
It seats four people.

Electric Vehicle

You drive an all electric sedan.
Your charge gets you 225 steps (119 mpge).
It seats four people.

Electric Vehicle

You drive an all electric sports car.
Your charge gets you 375 steps (111 mpge).
It seats two people.

Electric Vehicle

You drive an all electric truck.
Your charge gets you 230 steps (121 mpge).
It seats five people.

Electric Vehicle

You drive an all electric sport utility vehicle.
Your charge gets you 204 steps (74 mpge).
It seats five people.

Plug-in Hybrid Vehicle
Electricity-Gasoline

You drive a hybrid hatchback car.
Your five gallons gets you 230 steps (46 mpg).
It seats two people.

Plug-in Hybrid Vehicle
Electricity-Gasoline

You drive a hybrid sedan.
Your five gallons gets you 260 steps (52 mpg).
It seats two people.

Plug-in Hybrid Vehicle
Electricity-Gasoline

You drive a hybrid sports car.
Your five gallons gets you 105 steps (21 mpg).
It seats two people.

Plug-in Hybrid Vehicle
Electricity-Gasoline

You drive a hybrid truck.
Your five gallons gets you 115 steps (23 mpg).
It seats three people.

Plug-in Hybrid Vehicle
Electricity-Gasoline

You drive a hybrid sport utility vehicle.
Your five gallons gets you 135 steps (27 mpg).
It seats five people.

Electric Vehicle

You drive an all electric motorcycle.
Your charge gets you 200 steps (146 mpge).
It seats one person.

Compressed Natural Gas Vehicle

You drive a compressed natural gas fueled sedan.
Your five gallons gets you 135 steps (27 mpg).
It seats two people.

Gasoline Vehicle

You drive a gas powered motorcycle.
Your five gallons gets you 175 steps (35 mpg).
It seats one person.

Compressed Natural Gas Vehicle

You drive a compressed natural gas fueled truck.
Your five gallons gets you 70 steps (14 mpg).
It seats five people.

Electric Vehicle

You drive an all electric truck.
Your charge gets you 230 steps (121 mpge).
It seats three people.

Diesel Vehicle

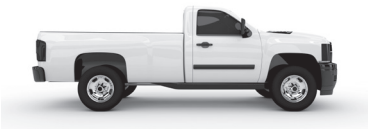
You drive a diesel hatchback car.
Your five gallons gets you 175 steps (35 mpg).
It seats four people.

Diesel Vehicle

You drive a diesel sedan.
Your five gallons gets you 170 steps (34 mpg).
It seats five people.

Diesel Vehicle

You drive a diesel sports car.
Your five gallons gets you 210 steps (42 mpg).
It seats two people.



Diesel Vehicle

You drive a diesel truck.
Your five gallons gets you 110 steps (46 mpg).
It seats three people.

Diesel Vehicle

You drive an all electric sport utility vehicle.
Your five gallons gets you 200 steps (40 mpg).
It seats five people.

Diesel Vehicle

You drive a diesel hatchback car.
Your five gallons gets you 175 steps (35 mpg).
It seats two people.

Flexible Fuel Vehicle Gasoline-Ethanol (E85)

You drive a flex-fuel sedan.
Your five gallons gets you 100 steps (20 mpg).
It seats two people.

Flexible Fuel Vehicle Gasoline-Ethanol (E85)

You drive a flex-fuel sports car.
Your five gallons gets you 85 steps (17 mpg).
It seats two people.

Flexible Fuel Vehicle Gasoline-Ethanol (E85)

You drive a flex-fuel truck.
Your five gallons gets you 80 steps (16 mpg).
It seats five people.

Flexible Fuel Vehicle Gasoline-Ethanol (E85)

You drive a flex-fuel sport utility vehicle.
Your five gallons gets you 75 steps (15 mpg).
It seats five people.