Near Town/Far Town

Objectives
Students will understand how individual and societal values influence the purchase and use of different vehicles and recognize 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"
- Four signs: HOME, CHARGING STATION, NEAR TOWN, FAR TOWN
- Tape for signs

Key Vocabulary
Hybrid vehicle

Electric vehicle

Diesel vehicle

Flex-fuel vehicles

Compressed natural gas vehicle

Learning Standards
Next Generation
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

American Driver and Traffic Safety Education
C 12.2.2
C 12.6.1
C 12.6.2
C 12.6.3

Introduction
In this activity, students investigate transportation, energy resources and resource planning through an activity. Participants are assigned different types of vehicles with different fuel efficiencies and fuel sources: gasoline, hybrids, electric, diesel, flex-fuel or compressed natural gas. Fossil fuel powered cars emit byproducts from an internal combustion engine such as carbon dioxide and other gases that cause pollution. These gases can trap heat from the sun and are known as greenhouses gases. In some situations, electric and/or hybrid cars can decrease greenhouse gas emissions.

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. 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.

Activity

Give each student a car card and explain how the activity works.

General Rules

According to the U.S. Energy Information Administration, 28% of total energy used in the United States is used for transportation. Because of the high cost of gasoline, you can afford to buy 5 gallons (20 liters) of gas to put in the car that you have been assigned. If you have an electric vehicle, you can afford one charge, which is the financial equivalent to 5 gallons of gas.

The activity has two rounds. The goal of the first round is to "drive" your car from HOME to NEAR TOWN and back HOME. In the second round, you have to drive twice as far, to FAR TOWN and back HOME. This must be done without running out of fuel or charge. You will model driving your 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, carpool members may share fuel, or they may take turns driving. If they pass a charging station, the electric vehicle may recharge.

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 5 gallons, or 125 miles. This equals 125 steps heel to toe before running out of fuel. The range is the distance an electric vehicle can travel before recharging.
2. Tell students they are going to meet their friends at a concert in NEAR TOWN. They have to make it home that night after the concert without running out of fuel or charge. Play round one. 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 his/her own car.
    - Participants will drive to NEAR TOWN then return HOME.
    - Line up at HOME and start stepping heel to toe.
    - If anyone runs out of fuel or a charge, he or she must stay at that point until the round is over.
    - Everyone in an electric vehicle gets one charge.

- If you are charging your electric vehicle, you must wait one minute before continuing to your destination.

1. 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 can be the driving attribute of the size of a person's foot? (Larger feet travel longer distances and could be attributed to more efficient driving, braking, coasting to stops, good tire pressure, clean air filter, well maintained car, etc.)
    - Discuss alternatives to each person driving his or her own car.
2. Students start over with 5 gallons of gas or one charge. Students are traveling to FAR TOWN for an away football game then returning HOME. They may carpool for this round. Encourage them to try some suggestions that came up in the discussion.
    - Expect "negotiations."
    - Drivers may use each passenger's fuel; you are pooling your gas money. However, if the car they are riding in does not use conventional gas, carpooling does not necessarily extend the range of the vehicle unless they pass a charging station.
    - So if there are four people in the car, there are 20 gallons of fuel available. If you have an electric vehicle, you still only get one charge, unless you pass a charging station.
    - 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.
    - Everyone in an electric vehicle gets one charge per passenger.
3. Check for understanding - Ask the following questions:
    - Who made it to the football game and back?
    - How did they accomplish this?
    - Who did NOT make it to the game and back? Why?
    - Which car is the most efficient? Least efficient?
    - What factors should you look at when buying a car?
    - What is the environmental impact of burning more gas fuels?

To Know and Do More

1. Discuss how government regulations, such as emissions, safety equipment and fuel mixes, affect the cost of purchasing and operating a vehicle. Discuss incentives for buying an alternative fuel vehicle.
2. 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?
3. Have students calculate the CO_2 produced in their drive for round one. They used up to 5 gallons of gas, depending on their car. How much CO_2 was offset when they carpooled in round two?
4. Discuss ways to reduce the contribution to climate change (buying an electric vehicle 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.)
5. 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 five people.

Gasoline Vehicle

You drive a gas powered sedan.

Your five gallons gets you 130 steps (26 mpg).
It seats five people.

Gasoline Vehicle

You drive a gas powered sports car.

Your five gallons gets you 75 steps (15 mpg).
It seats five 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 five people.

Electric Vehicle

You drive an all electric sedan.

Your charge gets you 125 steps (119 mpge).
It seats five 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 three people.

Plug-in Hybrid Vehicle Electric-Gasoline

You drive an all electric sport utility vehicle.

Your charge gets you 204 steps (74 mpge).
It seats five people.

Plug-in Hybrid Vehicle Electric-Gasoline

You drive a hybrid hatchback car.

Your five gallons gets you 230 steps (46 mpg).
It seats five people.

Plug-in Hybrid Vehicle Electric-Gasoline

You drive a hybrid sedan.

Your five gallons gets you 260 steps (52 mpg).
It seats five people.

Plug-in Hybrid Vehicle Electric-Gasoline

You drive a hybrid sports car.

Your five gallons gets you 105 steps (21 mpg).
It seats two people.

Plug-in Hybrid Vehicle Electric-Gasoline

You drive a hybrid truck.

Your five gallons gets you 115 steps (23 mpg).
It seats three people.

Plug-in Hybrid Vehicle Electric-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 five 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 three people

Electric Vehicle

You drive an all electric bus.

Your charge gets you 234 steps (23 mpge).
It seats 29 people

Diesel Vehicle

You drive a diesel hatchback car.

Your five gallons gets you 175 steps (35 mpg).
It seats five 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 bus.

Your five gallons gets you 145 steps (5 mpg).
It seats 29 people.

Flexible-fuel Vehicle Gasoline-Ethanol (E85)

You drive a flex-fuel sedan.

Your five gallons gets you 100 steps (20 mpg).
It seats five 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 three 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.